Identifying Primary Healthcare Providers' Barriers to Prescribing Physical Activity as Medicine in Comparison to their own Physical Activity Level

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Abstract

Objective. The objective was to examine healthcare providers' barriers to counseling physical activity with their patients. The secondary objective was to examine the same primary providers' own physical activity level over the course of 7 days (1 week) using a pedometer. *Methods.* The study consisted of 30 healthcare providers aged 26-70 years. At baseline, demographic information along with health history and the English short version of the International Physical Activity Questionnaire (IPAQ) was completed. After the initial visit, participants were asked to wear a pedometer for 7 days, recording activity in minutes and total steps per day on a pedometer wear log. Pedometer data was collected to determine if physicians, physicians' assistants, and nurse practitioners' personal physical activity level affected their prescription or counseling characteristics. These three groups of healthcare providers were selected because they all have the ability to directly prescribe medication to patients, if they chose to do so. Post pedometer, participants completed a barriers questionnaire to assess the perceived barriers related to physical activity counseling with patients. *Results.* In reference to the barriers questionnaire questions, 33.3% of participants felt lack of time during office visit was "somewhat" the reason for lack of prescription/counseling and 33.3% felt that lack of time during office visit was "very much" the reason. Thirty percent of participants felt "not at all" in terms of unsure what to recommend and only 3% felt that "very much." Although lack of time during office visits had the most variety in responses, this was the most prevalence barrier

amongst participants. The associations between physical activity (i.e., average activity in minutes per day and total MET-minutes per week) and barriers pertaining to physical activity counseling and prescribing (e.g., lack of time, lack of knowledge, etc.) were assessed using a Pearson's correlation. There was no statistically significant relationship between total amount of barriers and activity level. Physical activity was assessed using the IPAQ Short version total score to determine total MET-min/week and pedometer data was used to assess average activity in min/week. The Pearson correlation determined that there is negative correlation between physical activity level and total barriers (r= -0.1813, r= -0.032 respectively) for average activity in minutes per day and total MET-minutes per week. *Discussion.* The purpose of this study was to assess the relationship between physical activity (i.e., average minutes per day and total MET-minutes per week) and barriers pertaining to physical activity counseling and prescription (e.g., lack of time, lack of knowledge). Using Pearson's correlation we determined if physicians, physicians' assistants, and nurse practitioner personal physical activity level affected their prescription or counseling characteristics. The results indicated that there was no relationship between health care providers' physical activity level and perceived barriers to discuss physical activity among patients. With no correlation, this strikes an interesting conclusion that even healthcare providers that are physically active are struggling to prescribe or counsel patients on physical activity.

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Chapter I- Introduction

There is a dose-response relationship between physical activity and health (Khan, Weiler, & Blair, 2011). Those who maintain an active way of life live longer, healthier lives. In contrast, those who are sedentary are more likely to develop chronic diseases and die prematurely (Sallis, 2009; Warren, Barry, Hooker, Sui, Church, & Blair, 2010). There is clear scientific evidence proving that physical activity is beneficial for an individual's physical and mental health. Regular physical activity can prevent the onset of chronic diseases such as Type II diabetes, hypertension, and osteoporosis, just to name a few (Samitz, Egger, & Zwahlen, 2011; Warburton, Nicol, & Bredin, 2006). Physical activity is also essential in weight management, and there is a direct correlation between physical activity and all-cause mortality (Fox & Hillsdon, 2007; Samitz et al., 2011). Physical activity can be used as to manage certain chronic diseases, such as depression, diabetes, and obesity (Blair et al., 1996; Warburton et al., 2006).

Although there is a strong evidence base that physical activity can be used to prevent or manage many medical conditions (Blair, Sallis, Hutber, & Archer, 2012), there is still a gap between healthcare providers and physical activity promotion professionals. An overwhelming amount of evidence confirms physical activity can provide prescriptive value (Sallis, 2011); however, very few healthcare providers utilize physical activity prescriptions. The American College of Sports Medicine recommends providers assess each patient's physical activity habits at every clinical visit as a vital sign (Joy, 2012). The clinician should use this information to determine the appropriate physical activity prescription. Unfortunately, providers do not generally utilize physical activity as medicine. This is why it is imperative to understand what barriers providers face in prescribing physical activity so that we can begin breaking down those barriers and prescribing more physical activity to patients.

Purpose Statement

The purpose of this study was to examine three groups of primary providers' (physicians, physician assistants, and nurse practitioners) barriers to prescribing physical activity to their patients. A secondary purpose was to examine the same primary providers' own physical activity level over the course of 7 days (1 week) using a pedometer. These data were used to examine if there was a relationship between the healthcare providers' personal physical activity levels and the barriers they face prescribing physical activity.

Research Question

Research Question 1: What barriers are healthcare providers' faced with when prescribing physical activity to patients?

Research Question 2: Are primary healthcare providers' that are more physically active more likely to prescribe physical activity to their patients?

Research Hypotheses

The following hypothesis will be tested:

1. Providers that are more physically active will be faced with fewer barriers when it comes to prescribing physical activity to their patients.
2. Providers' that are more physically active will be more likely to prescribe physical activity to their patients.

Significance of the Study

The Exercise is Medicine (EIM) Campaign, a global health initiative managed by the American College of Sports Medicine (ACSM) focused on encouraging primary care physicians and other health care providers to include physical activity when designing treatment plans for patients and referring their patients to the Exercise Is Medicine (EIM), was initiated in 2004

(Exercise Is Medicine, 2015c). Considering the lack of physical activity prescription in a world where rates of chronic disease and obesity are skyrocketing, it is important to determine the barriers healthcare providers face when discussing, implementing, and prescribing physical activity to patients in need of a lifestyle change. Primary healthcare providers have the opportunity to impact thousands of individuals who are physically inactive by promoting the importance of physical activity in regards to their health during regular visits.

Limitations

This study is limited by its sample size due to the location of the study, eastern North Carolina; accuracy of testing; accuracy of questionnaire responses; the variety of healthcare providers'; the type of equipment available for physical activity monitoring; and lastly, by the fulfillment and retention of study participants.

Key Terms

Physical Activity- any bodily movement produced by the contraction of skeletal muscles that results in a substantial increase in caloric requirements over resting energy expenditure

Health Fitness Zone- standards established by The Cooper Institute that represent levels of fitness that offer some degree of protection against diseases that can result from sedentary living

Chronic Disease- a long-lasting condition that can be controlled but not cured

Chapter II- Review of the Literature

Introduction

The purpose of this study is to examine if there is a direct correlation between healthcare providers physical activity levels and their likelihood of prescribing physical activity to patients. The contents of this chapter will illustrate the existing literature and its applicability to the aim of the current study. Topics discussed include 1) current physical activity statistics, 2) physical activity and health, 3) healthcare providers' other behavior counseling, and 4) healthcare providers' involvement in the Exercise Is Medicine (EIM) campaign.

Physical Activity Statistics

According to the CDC, despite common knowledge that physical activity is good for health, more than 60% of American adults are not regularly active, and 25% of the adult population is completely sedentary (Centers for Disease Control, 2014). Chronic diseases, such as cardiovascular disease, diabetes, obesity, and cancer, are currently responsible for 65% of all deaths worldwide and are projected to cause over 75% of all deaths by 2030 (Blair et al., 2012). Since there is evidence of a causal relationship between chronic disease and physical inactivity, sedentary lifestyles are one of the most momentous health problems of the 21st century (Blair, 2009).

The Lancet articles published in July 2012 describe physical activity levels worldwide with data for adults (15 years or older) from 122 countries and for adolescents (13-15 years old) from 105 countries (Hallal et al., 2012). The 122 countries represented in this study have a combined population that represents 88.9% of the world's population (Hallal et al., 2012). Self-reported physical activity levels, defined as not meeting any of three criteria: at least 5 days a week, 30 min of moderate-intensity physical activity; at least 3 days a week, 20 min of vigorous-intensity physical activity; or an equivalent combination, were obtained in this particular study. Worldwide, 31.1% (95% CI, 30.9–31.2) of adults are physically inactive (Hallal et al., 2012). This value takes into account population sizes, representing the weighted average of the proportion in the countries studied. The frequency of inactivity varied greatly between WHO regions: 27.5% (95% CI, 27.3–27.7) of people are inactive in Africa, 43.3% (95% CI, 43.0–43.6) in the Americas, 43.2% (95% CI, 42.8–43.6) in the eastern Mediterranean, 34.8% (95% CI, 34.5–35.1) in Europe, 17.0% (95% CI, 16.8–17.2) in southeast Asia, and 33.7% (95% CI, 33.5–33.9) in the western Pacific (Hallal et al., 2012). In regards to sex differences, women are more inactive (33.9%) than are men (27.9%) (Hallal et al., 2012).

A. Children

The risks associated with inactivity begin in childhood and increase throughout the lifespan (Blair et al., 2012). Regular physical activity in childhood and adolescence is essential for overall health. Current recommendations state young people aged 6-17 years old participate in at least 60 minutes (1 hour) of aerobic physical activity daily and can be either moderate- or vigorous-intensity (World Health Organization, 2011). As part of their 60 minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week (World Health Organization, 2011).

In 2013, 27.1% of high school students surveyed participated in at least 60 minutes per day of physical activity on all 7 days before the survey, and only 29% attended physical education classes daily (Centers for Disease Control, 2015). In a nationally representative survey, 77% of children aged 9-13 years reported participating in free-time physical activity during the previous 7 days (Centers for Disease Control, 2015). In 2013, only 29% of high school students had participated in at least 60 minutes of physical activity per day on each of the 7 days prior to survey administration (Centers for Disease Control, 2015). The percentage of high school students that were physically active at least 60 minutes/day varied based on gender (females= 17.7%; males=36.6%) (Eaton et al., 2012). On a more positive note, according to the CDC (Centers for Disease Control, 2015), children and adolescents are more likely to meet the 2008 Physical Activity Guideline for aerobic activity than adults and older adults.

The purpose of a cross-sectional study by Belcher et al. (2010) was to further investigate physical activity levels by race/ethnicity, age, gender, and weight status in a representative sample of youth in the United States (Belcher et al., 2010). Youth ages 6 to 19 with at least 4 10-hour days of PA measured by an accelerometer were included (n=3,106). Outcomes included mean counts per minute and minutes spent in moderate-to-vigorous PA. Six to eleven year olds spent more time (88 min/day) in moderate-to-vigorous PA than 12 to 15 (33 min/day) and 16–19 (26 min/day) year olds ($p<0.001$ for both). Females spent fewer min/day in moderate-to-vigorous than males ($p<0.001$). Overall, obese youth spent 16 fewer min/day in moderate-to-vigorous than normal weight youth. However, non-Hispanic White males spent 3–4 fewer min/day in vigorous PA than Mexican American ($p=0.004$) and non-Hispanic Black ($p<0.001$) males but had lower obesity rates; and obese 12 to 15 year old Mexican American recorded similar minutes in MVPA per day as normal weight Mexican American ($p>0.050$). There was a significant 3-way age-BMI-race/ethnicity interaction for mean min/day in moderate-to-vigorous ($p<0.001$) (Belcher et al., 2010). Adjustment for total energy intake did not qualitatively alter these results (Belcher et al., 2010).

According to the Lancet articles published in July 2012, measurement of physical activity across groups is complex. So far, the most comprehensive sources of data for adolescent physical activity levels are the global school-based student health survey and the health behavior in school-aged children survey (Hallal et al., 2012). Using data from the global school-based student health survey, the Lancet articles estimated how many 13-15 year old adolescents in 66 countries reach the public health goal of at least 60 min per day of MVPA (Das & Horton, 2012; Hallal et al., 2012). The findings showed 80·3% (95% CI 80·1–80·5) of 13–15-year-olds did not do 60 min of moderate-to-vigorous. Girls are less active than are boys. Estimates of physical activity in adolescents were much higher than were those reported in adults. The proportion of adolescents not achieving 60 min per day was equal to or greater than 80% in 56 (53%) of 105 countries in boys, and 100 (95%) of 105 countries for girls (Hallal et al., 2012).

Socio-economic status (SES) has also proven to be an important determinant of health and physical activity in children and adolescents, although results for this are less consistent (Drenowatz et al., 2010). Drenowatz et al. (2010) examined whether physical activity and sedentary behavior differs in children by socio-economic status independent of body mass index. Data were from two cohorts including 271 children (117 males; 154 females) in study 1 and 131 children in study 2 (63 males; 68 females). The average age was 9.6 and 8.8 years respectively. Household income was used as the indicator of SES and was obtained by self-report from the parent(s)/guardian(s) on a demographic and health survey. Physical activity was assessed using different measures in two separate studies but similar protocols and processing strategies were used to analyze and compare the data (Drenowatz et al., 2010). In study 1, participants wore a pedometer for a seven-day period and recorded the time on/time off and number of steps accumulated over the subsequent duration. In study 2, participants wore an Actigraph GT 1M (a widely used accelerometer) for seven consecutive days. The results from both studies resulted in a trend that showed children from a low SES participated in lower PA levels and spent more time in sedentary behavior than high SES children. In study 1, average daily steps differed significantly among SES groups with lower SES groups approximating 10,500 steps/day compared to about 12,000 steps/day in the higher SES groups. These differences remained significant ($p<0.05$) when controlling for leg length (Drenowatz et al., 2010). Lower SES children, however, had higher body mass and BMI compared to higher SES groups ($p<0.05$) and PA no longer remained significant when further controlling for BMI. In study 2 results depended on the methodology used to determine time spent in moderate-to-vigorous. Differences in PA only occurred when one equation was used to determine time spent at moderate-to-vigorous PA, these differences remained after controlling for BMI ($p=0.015$) (Drenowatz et al., 2010). Significant differences between SES groups were shown for sedentary behavior in both cohorts ($p<0.05$) with higher SES groups spending less time watching TV than low SES groups (Drenowatz et al., 2010).

Physical activity importance in children and youth is reviewed in the Pediatrics: Official Journal of the American Academy of Pediatrics. Literature has found that there is strong evidence for beneficial effects of physical activity and disadvantages of a sedentary lifestyle on the overall health of children and adolescents across a broad array of domains (Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents, 2011). This review focused on the effects of activity on cardiovascular health, stating that a steady decrease in the amount of time children spend being physically active with an accompanying increase in time spent in sedentary activities. The evidence review strongly linked increase time spend in sedentary activities with reduced overall activity levels, detrimental lipid profiles, higher systolic blood pressure, higher levels of obesity, and higher levels of all the obesity-related cardiovascular risk factors including hypertension, insulin resistance, and type II diabetes. The expert panel concluded that there is enough evidence to strongly support the role of physical activity in optimizing cardiovascular health in children and adolescents (Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents, 2011).

There are a number of studies on children participating in aerobic physical activity, but few examine both aerobic and muscle strengthening. Muscle strengthening is an important health factor in regards to children and is included in the CDC's PA Guidelines for Children (Centers for Disease Control, 2013b). Morrow Jr. et al (2013) conducted a study consisting of 4621 middle school students in grades 6–8, ages ranged from 10-16 years old. This study examined the relationship between self-reported amounts of physical activity and fitness test results in youth. Self-reported physical activity was reported, using two questions reflecting aerobic and muscle-strengthening physical activity. Students were also asked to complete the FITNESSGRAM physical activity test. The descriptive statistics of the study explain prevalence of meeting aerobic and muscle strengthening guidelines by gender, ethnicity, economic status (measured by lunch support), and FITNESSGRAM "Healthy Fitness Zone" (HFZ) for aerobic capacity, BMI, and muscular fitness (Morrow et al., 2013). Approximately half of the participants were males and most (56%) were Caucasian and 59% received no lunch support, indicating middle to high SES (Morrow et al., 2013). When comparing demographic variables, boys (16.3%) were more likely to not met aerobic physical activity guidelines than girls (18.4%), but were more likely to meet muscle-strengthening guidelines (85.6%) when compared to girls (83.1%) (Morrow et al., 2013). In regards to race/ethnicity, Caucasian children were more likely to meet both sets of guidelines (55.9%) then non-Caucasian (44.1%) (Morrow et al., 2013).

From a 7-day recall, participants self-reporting 3 days per week of muscle-strengthening physical activity had higher odds of being in the Needs Improvement Zone (NIZ) for cardiorespiratory fitness (OR 1.64; 95% CI, 1.32- 2.03; $p<0.001$) (Morrow et al., 2013). Those failing to meet the muscle-strengthening physical activity guidelines were at increased odds of being in the NIZ for BMI (OR 1.39; 95% CI, 1.14-1.70; $p<0.001$) and muscle-strengthening (OR 3.42; 95% CI, 2.75-4.25; $p<0.001$) (Morrow et al., 2013). Looking specifically at muscle-strengthening 80.9% of participants achieved the muscular fitness HFZ (Morrow et al., 2013). These results are some of the first to report a relationship between children meeting national physical activity guidelines and achieving the referenced health standards, suggesting that the importance of physical activity in our children is extremely beneficial to their health. Stressing the importance and instilling a solid physical activity foundation in children could be life changing as they continue to age.

B. Adults

The Federal Guidelines for physical activity state adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minute) a week of vigorous-intensity aerobic physical activity, or equivalent combination of moderate- and vigorous-intensity aerobic activity (Centers for Disease Control, 2015b). Less than half (48%) of all adults meet the 2008 Physical Activity Guidelines (Centers for Disease Control, 2015b). Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits (Centers for Disease Control, 2015b). Although these guidelines have been established, Hallal et al. (2012) determined that worldwide, 31.1% (95% CI, 30.9–31.2) of adults are physically inactive. This value takes into account population sizes, representing the weighted average of the proportion in the countries studied. The frequency of inactivity varied greatly between WHO regions: 27.5% (95% CI, 27.3–27.7) of people are inactive in Africa, 43.3% (95% CI 43.0–43.6) in the Americas, 43.2% (95% CI, 42.8–43.6) in the eastern Mediterranean, 34.8% (95% CI, 34.5–35.1) in Europe, 17.0% (95% CI, 16.8–17.2) in southeast Asia, and 33.7% (95% CI, 33.5–33.9) in the western Pacific (Hallal et al., 2012). In regards to sex differences, women are more inactive (33.9%) than are men (27.9%) (Hallal et al., 2012). In all WHO regions, inactivity increased with age. Adults aged 60 years or older from southeast Asia are much more active than individuals of the same age from all other regions, and are actually more active than young adults (ages 15-29 years) from the Americas, eastern Mediterranean, Europe, and the Western Pacific (Hallal et al., 2012).

When specifically looking at the Unites States, more than half of the United States adult population does not meet minimum PA guidelines causing health risks related to all-cause mortality to steadily rise (Centers for Disease Control and Prevention, 2013). In 2011 the CDC assessed adult participation in aerobic and muscle-strengthening physical activity, concluding that 20.6% of United States adults were classified as meeting both aerobic and muscle-strengthening guidelines including 23.4% men and 17.9% of women (Centers for Disease Control and Prevention, 2013). When broken down into age groupings it is apparent that physical activity decreases with age. The prevalence of meeting both aerobic and muscle-strengthening guidelines ranged. Ages 18-24 years were most likely to meet both sets of guidelines (30.7%) followed by ages 24-35 years (23.0%), ages 35-44 years (20.4%), ages 45-54 years (18.7%), ages 55-64 years (17.1%), and >65 years (15.9%) (Centers for Disease Control and Prevention, 2013). Among racial/ethnic groups, prevalence was lower among Hispanic adults (18.4%) than among African-Americans (21.2%) and Caucasians (20.7%). Adults with more education are more likely to meet federal guidelines for aerobic and muscle-strengthening physical activity than adults with less education (Centers for Disease Control and Prevention, 2013). By education level, college graduates had the highest prevalence of meeting both sets of guidelines (27.4%), this decreased by decreasing education levels with persons who had less than a high school diploma having the lowest prevalence (12.0%) (Centers for Disease Control and Prevention, 2013). Those with some college (22.2%) and those with a high school diploma (17.0%) fell in the middle of the two extremes (Centers for Disease Control and Prevention, 2013).

Among the 50 states and the District of Columbia, the prevalence of adults meeting both aerobic and muscle-strengthening guidelines ranged from 12.7% in West Virginia and Tennessee to 27.3% in Colorado. In North Carolina, only 18.3% of adults are meeting both sets of guidelines (Centers for Disease Control and Prevention, 2013). Nationwide, 51.6% met the aerobic activity guideline and 29.3% of U.S. adults met the muscle-strengthening guideline. In 2012, one year following the CDC's publication on physical activity recommendations, the Behavioral Risk Factor Surveillance System (BRFSS) reported, 75.1% of adults in North Carolina reported participating in physical activity during the past month, and 24.9% (95% CI 23.9-25.9) reported no participation (United Health Foundation, 2014). The BRFSS report took a closer look at the 24.9% of inactive North Carolina adults showing that the Hispanic population was the most inactive (32.6%), followed by American Indians (32%), then African Americans (28.1%), Caucasians (22.9%), and Asians (22.5%) (United Health Foundation, 2014).

C. Older Adults

The benefits of regular physical activity in older adults are important and well established (Klieman, Hyde, Berra, & Haskell, 2007; Spirduso & Cronin, 2001). However, there are far less data on the prevalence and incidence of physical activity in older adults. Regular physical activity, including aerobic, muscle-strengthening, flexibility, and balance activities, is essential for healthy aging (Klieman et al., 2007). Successful aging, or maintaining a high quality of life, is proposed using three aspects: freedom from disease, engagement with life, and physical and mental competence (Spirduso & Cronin, 2001). Federal guidelines for healthy older adults are the same recommendations as adults, with necessary modifications available for this population. When older adults cannot do 150 minutes of moderate intensity aerobic activity a week due to chronic aging conditions, they should be as physically active as their abilities allow (Centers for Disease Control, 2014). Current estimates indicate that 66% of adults over the age of 75 do not engage in any regular physical activity. Additionally, evidence suggests that 50% of sedentary older adults have no plan of initiating a more physically active lifestyle (Schutzer, 2004).

When looking at older adults physical inactivity across the United States, the prevalence among adults aged 65 and older varies from 22.8% (95% CI, 20.4-25.1%) in Oregon to 45.3% (95% CI, 42.6- 48.0%) in Mississippi (United Health Foundation, 2014). According to the 2012 BRFSS report, older adults (65+ years) ranked the highest in inactivity levels (32.5%) in the state of North Carolina (Centers for Disease Control, 2014). Nationally, 33.1% of seniors are physically inactive (United Health Foundation, 2014). Using data from the 2000 National Health Interview Survey, a report presents data on older adult physical activity involvement based on gender and age (Schoenborn & Barnes, 2002). Of United States adults, men aged 65 to 74 years 14.1% engaged in regular physical activity and men aged 75+ years 11.4% engaged in regular physical activity (Schoenborn & Barnes, 2002). Percentage of elderly women's involvement in regular physical activity was significantly lower. Of women aged 65 to 74 years, 9.1% engaged in regular physical activity and women aged 75+ years 6.4% engaged in regular physical activity (Schoenborn & Barnes, 2002).

Physical Activity and Health

The Centers for Disease Control and Prevention (CDC) defines chronic disease as a long-lasting condition that can be controlled but not cured (Centers for Disease Control, 2015g). Chronic diseases and conditions, such as heart disease, stroke, cancer, type II diabetes, and obesity, are among the most common, costly, and preventable of all health problems (Batt & Tanji, 2011; Draper, 2013). The rise in chronic diseases represents a global crisis that men, women, and children all over the world are at risk for developing chronic diseases (Blair et al., 2012). Chronic diseases, which are strongly linked to unhealthy lifestyles, are the leading cause of morbidity and mortality (Draper, 2013). Leading causes of global mortality are high blood pressure (13% of total deaths), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and obesity (5%) (Khan et al., 2011). Most of these leading causes of death are all linked to one common denominator: lack of physical activity (Blair et al., 1996; Warburton et al., 2006). Since physical activity is a modifiable risk factor, the general consensus is that the leading causes of global mortality may also be easily modified with an increase in physical activity level (Warburton et al., 2006). Some of the most prevalent chronic diseases in the United States today are cardiovascular disease, hypertension, type II diabetes, and cancer (Centers for Disease Control, 2015). The literature that is currently available on these factors suggests an interesting factor that links many of these diseases together. That link is physical activity. For example, routine physical activity has been shown to improve body composition, which is associated with obesity and metabolic syndrome (Warburton et al., 2006). There is a strong link between physical activity and cardiovascular disease, hypertension, certain types of cancer, type II diabetes, obesity, anxiety, and depression.

A. Cardiovascular disease/hypertension

The number one cause of death in the United States is cardiovascular disease (CVD) (American Heart Association, 2014c). CVD is caused by damage to the blood vessels in the heart by atherosclerosis, a buildup of fatty plaque in the arteries. This plaque buildup causes the arteries to stiffen, which inhibits blood flow to vital organs and tissues (American Heart Association, 2014a). CVD is often the result of additional health concerns, such as hypertension. Hypertension is a condition that causes the force of the blood against the artery walls to elevate resulting in high blood pressure. This constant pressure on the artery walls surrounding the heart could eventually cause serious health problems like CVD (American Heart Association, 2014b). However, this disease is usually caused by modifiable factors such as an unhealthy diet, lack of exercise, being overweight and smoking (Blair et al., 1996). Physical inactivity is a modifiable risk factor for CVD (Warburton et al., 2006). Simple lifestyle changes such as taking the stairs instead of the elevator can be made in order to increase an individual's level of physical activity. Physical activity both prevents and helps treat many established atherosclerotic risk factors, including elevated blood pressure, insulin resistance and glucose intolerance, elevated triglyceride concentrations, low high-density lipoprotein cholesterol, and obesity (Kohl, 2001).

According to the CDC, in 2010 the prevalence of coronary heart disease (CHD) was greatest among persons aged >65 years old (19.8%), followed by ages 45-64 years (7.1%), and ages 18-44 years (1.2%) (Fang, Shaw, & Keenan, 2011). CHD prevalence was greater among men (7.8%) than women (4.6%) and among those with less than a high school education (9.2%)

compared to high school graduates (6.7%), those with some college (6.2%), and those with more than a college degree (4.6%) (Fang et al., 2011). In regards to race/ethnicity, CHD incidence was greatest among American Indians/Alaska Natives (11.6%), followed by African-Americans (6.5%), Hispanics (6.1%), Caucasians (5.8%), and Asians/Native Hawaiians/Other Pacific Islanders (3.9%) (Fang et al., 2011)

While active lifestyle changes are a crucial part in decreasing the risk of CVD, some activity is better than none and more activity is associated with decreased risks of disease (Kohl, 2001). There have been several meta-analyses that conclude comprehensive, exercise-based cardiac rehabilitation can reduce mortality rates after a myocardial infarction (Thompson, 2003). Being fit or active is associated with a reduction in risk greater than 50% (American Heart Association, 2014c; Thompson, 2003). Earlier literature suggests that people who are fit yet have other risk factors for CVD may be a lower risk of premature death than people who are sedentary with no risk factors for CVD (Warburton et al., 2006). This emphasizes the importance of activity and the nature of health status. An increase in physical activity can reduce the risk of premature death while a decrease in physical activity will increase the risk.

A recent meta-analysis by Thompson et al. (2003) identified 51 randomized controlled trials of exercise-based cardiac rehabilitation. Over 8,440 patients who had a previous myocardial infarction or other heart condition or illness conducted supervised exercise training for 2 to 6 months followed by unsupervised exercise. After the follow up 2.4 years later, total mortality was reduced by 27% ($p<0.05$) with the exercise-only intervention and cardiac mortality was reduced by 31% ($p<0.05$) (Blair et al., 1996). The results from this study confirm that exercise-based cardiac rehabilitation reduces cardiac mortality and suggest that an exercise component is a critical aspect of recovery and prevention (Thompson, 2003).

Blair et al. (1996) conducted an earlier study with the objective to quantify the relation of cardiorespiratory fitness to CVD mortality. The results from this study were extremely significant (p=0.05) in producing an inverse relationship between physical activity level and all-cause mortality rates. Moderate and high levels of cardiorespiratory fitness seem to provide protection against a combination of forces in other mortality predictors on deaths. Death rates were higher in persons with multiple risk factors, but fitness was inversely associated with death rates in persons who had no other predictors (Blair et al., 1996). At the completion of the study, participants that were classified as low fitness (least fit 20%) had more deaths in each of the four categories observed (smoking status, systolic blood pressure, cholesterol, and health status) (Blair et al., 1996). There are major observational studies that relate the risk of CVD and mortality to physical activity, providing a very convincing dose-response relationship between physical activity and CVD (Kohl, 2001).

Although there is ample information supporting the dose-response relationship between physical activity and CVD, there are not many reviews that quantify the specific amounts of physical activity required for lower risks of CHD when assessing this relationship (Sattelmair et al., 2011). A recent meta-analysis by Sattelmair et al (2011) used epidemiological studies investigating physical activity and primary prevention of CHD. Thirty-three studies were used, nine of which allowed quantitative estimates of leisure-time physical activity. Individuals that met the minimum amount of physical activity per the 2008 US federal guidelines, 150 min/wk of moderate intensity leisure-time physical activity, had a 14% lower CHD risk (relative risk, 0.86; 95% CI 0.77-0.96) compared to those reporting no physical activity (Sattelmair et al., 2011). Those participants that engaged in the Federal Guidelines beyond minimum requirements, 300 min/wk of moderate-intensity leisure time physical activity, had a 20% (relative risk, 0.80; 95%

CI 0.74-0.88) lower risk (Sattelmair et al., 2011). Showing that at higher levels of PA, relative risks are modestly lower. There was also a significant interaction by gender (p=0.03); the association was stronger among women than men. Men who met the basic and advanced guidelines were at 9% (RR 0.91; 95% CI, 0.79-1.04) and 18% (RR 0.82; 95% CI, 0.74-0.91) lower risk of CHD, respectively, than men with no LTPA. Women who met the basic guideline were at 20% lower risk (RR 0.80; 95% CI, 0.69-0.92) of CHD than women who engaged in no LTPA; women who met the advanced guideline were at 28% lower risk (RR 0.72; 95% CI, 0.63-0.83) (Sattelmair et al., 2011). The findings of this study offer quantifiable data that supports the United States physical activity guidelines statement, "some activity is better than none" and "the more physical activity the better" (Sattelmair et al., 2011).

A recent article compiled with lessons learned from epidemiological studies across age, gender, and race/ethnicity was published in 2010 (Shiroma & Lee, 2010). Most studies on physical activity and CHD/CVD risk in the systematic evidence review behind the 2008 Guidelines were conducted in middle-aged adults, with median or mean ages of subjects ranging 45 to 60 years. The median or mean ages of subjects at baseline exceeded 60 years in only 8 studies, and in most of those studies the average age ranged 60 to 69 years (Physical Activity Guidelines Advisory Committe, 2008; Shiroma & Lee, 2010). These data suggest that physical activity is also inversely related to CHD/CVD risk among subjects older than 60 years (Shiroma & Lee, 2010). For example, in the Harvard Alumni Study, researchers prospectively followed 7,307 Harvard University alumni in participation in sports or recreational activities from 1988 to 1993 (Lee, Sesso, & Paffenbarger, 2000; Shiroma & Lee, 2010). The average age of men at the start of their study was 66 years and the results showed during follow-up, 482 men developed CHD (Lee et al., 2000). Those participants expending >4000 kcal/wk in physical activity experience a multivariate relative risk of 0.62 (95% CI, 0.41-0.96) for CHD compared to those expending <1000 kcal/wk (Lee et al., 2000).

The vast majority of intervention research related to CVD and physical activity has targeted young to middle-aged adults, typically defined as ages 16, 18, or 21 to 65 years (Marcus et al., 2006). Most of these intervention studies demonstrate overall moderate effects, with stronger effects in studies with behavior modifications (Marcus et al., 2006). For example, Hillsdon et al. (2005) assessed the effects of an intervention promoting increased physical activity in adults aged 16 year and older. Randomized, controlled trials comparing different physical activity interventions to encourage sedentary adults to become more active were searched for comparison (Hillsdon, Foster, & Thorogood, 2005). A total of 11 interventional studies (3,940 participants) on self-reported physical activity were positive and moderate, with a standardized mean difference of 0.31 (95% CI, 0.12-0.50) (Hillsdon et al., 2005). These studies included a treatment group and a control group. The treatment group(s) received supervised exercise sessions, an educational consultation, or a combination of both to determine effect of increase in PA on CVD. Seven studies (1,406 participants) were positive and had a moderate effect of cardiorespiratory fitness on adults with a standardized mean difference of 0.40 (95% CI, 0.09-0.70) (Hillsdon et al., 2005). This review suggests that physical activity interventions have a potentially moderate effect on self-reported physical activity and cardiorespiratory fitness, which could in turn decrease risk of CVD (Hillsdon et al., 2005).

Women generally have the same coronary heart disease risk factors as men. Similarly, physically active women have lower CHD rates than inactive women (Marcus et al., 2006). However, the association is unclear in whether differences are a result of intensity of activity or if women at high risk for CHD are at risk regardless of activity level. (Lee, Rexrode, Cook, Manson, & Buring, 2001). A cohort study of 39,372 female health professional aged 45 years or older were used to examine the relationship between physical activity and CHD among women, including those at high risk (Lee et al., 2001). Women in the study completed brief mailed questionnaires that inquired about compliance to their assigned treatment, including recreational activities such as walking and stair climbing (Lee et al., 2001). Through the course of the study, 244 cases of CHD occurred. The relative risks of CHD for <200kcal/wk was 1.00, relative risk of CHD for 200-599kcal/wk was 0.79 (95% CI, 0.56-1.12), relative risk for CHD for 600-1499kcal/wk was 0.55 (95% CI, 0.37-0.82), and the relative risk for CHD for >1500kcal/wk was 0.75 (95% CI, 0.50-1.12) (p=0.03). Relative risk was found using calories expended on all activities (Lee et al., 2001). Vigorous activities were associated with lower relative risk (0.63; 95% CI, 0.38-1.04), as did walking among women without vigorous activities (Lee et al., 2001). Even in women at high risk for CHD, the inverse association between physical activity and CHD risk did not differ by weight (p=0.95) or cholesterol levels (p=0.71) (Lee et al., 2001). The results from this study indicated that even light-to-moderate activity is associated with lower CHD rates in women, even women at high risk including those who were overweight, had high cholesterol, or were smokers (Lee et al., 2001).

Among women in the Women's Health Initiative, the age-adjusted relative risks of CVD, comparing the most active with the least active quintile in 3 ages groups of 50-59 years, 60-69 years, and 70-79 years were 0.45, 0.50, and 0.64 respectively (Manson et al., 2002). The relative risk of cardiovascular disease in the highest quintile of the metabolic equivalent (MET) score as compared with the lowest quintile was 0.55 (95% CI; 0.47 to 0.65) among Caucasian women and 0.48 (95% CI; 0.25 to 0.93) among African-American women (Manson et al., 2002). In multivariate analyses, after simultaneous control for age, race/ethnic group, smoking status, body-mass index, several dietary factors, and other covariates, physical activity remained a powerful predictor of the successive risk of cardiovascular events. For increasing quintiles of the total MET score, the relative risks were 1.00 (age), 0.89 (race/ethnicity), 0.81 (smoking status), 0.78 BMI), and 0.72 (dietary factors), respectively ($p<0.001$) (Manson et al., 2002). Increasing categories of walking were associated with similar reductions in risk ($p<0.001$) (Manson et al., 2002). Furthermore, similar risk reductions for vigorous exercise remained unchanged after simultaneous inclusion of walking and vigorous exercise (Manson et al., 2002). The results found in this study provide a cohort of ethnically diverse, postmenopausal women indicating that both walking and vigorous exercise are associated with significant reductions in the incidence of cardiovascular events (Manson et al., 2002).

Among older community-dwelling men and women (70-74 years old) in Washington state walking >4 h/week was associated with a 31% (10% to 52%) reduction in risk of hospitalization from CVD in both men and women (Shiroma & Lee, 2010). The data supports an inverse relationship between physical activity and CHD/CVD risk among older men and women of a magnitude similar to, if not comparable, to the results seen in younger individuals (Shiroma & Lee, 2010). In regards to gender, Shiroma et al (2010) pointed out that the inverse association between physical activity and risk of developing CHD/CVD is present in both men and women and is similar, potentially more pronounced, in women compared to men. The median risk reduction in women was 40% when most active women were compared with least active women, while it was 30% in men (Shiroma & Lee, 2010).

The panel of experts that conducted the systematic evidence review behind the 2008 Guidelines concluded that “greater amounts of activity appear to provide greater benefit, but the shapes of any dose-response relationship have not been well defined” (Physical Activity

Guidelines Advisory Committe, 2008; Shiroma & Lee, 2010). In conclusion, while there is a large body of evidence clearly supporting reduced risks of CHD/CVD with increased physical activity, details of the relationship are less clear. Furthermore, the relationship has not been fully examined in detail regarding outcomes based on race/ethnicity, age, and gender.

B. Diabetes

Diabetes mellitus is a problem within the body that causes blood glucose levels to rise higher than normal, also referred to as hyperglycemia (American Diabetes Association, 2014). Individuals with type II diabetes cannot properly regulate insulin. The pancreas is responsible for making insulin for the body, but over time it is not able to keep up with insulin production causing blood glucose levels to rise, resulting in insulin resistance (American Diabetes Association, 2014). Insulin resistance is believed to be the cause of a high glycemic diet combined with lack of physical activity (American Diabetes Association, 2014).

According to the CDC, from 1980 to 2013 the incidence of diagnosed type II diabetes increased from 3.3 to 7.1 per 1000 population. Similarly, the age–adjusted incidence increased from 3.5 to 6.8 per 1000 population (Centers for Disease Control, 2013a). In 2013, incidence was highest in ages 45-64 years (11.4 per 1000) followed by ages 65-79 years (10.5 per 1000) and ages 18-44 years (3.4 per 1000) (Centers for Disease Control, 2013a). When adjusting for age, women had a higher incidence (7.2 per 1000) than men (6.4 per 1000) (Centers for Disease Control, 2013a). In regards to race/ethnicity, Hispanics had the highest incidence (9.6 per 1000), followed by African-Americans (9.0 per 1000) and Caucasians (6.5 per 1000). Education seems to play an important role when predicting the development of type II diabetes cases. Those with a higher level of education appear to have a lower incidence of diabetes. Persons with less than a high school diploma had the highest incidence (11.0 per 1000) followed by those that graduated high school (7.8 per 1000) and those with more than a high school diploma (5.7 per 1000) (Centers for Disease Control, 2013a). These findings indicate that age, race, sex, race/ethnicity, and education all play a role in the incidence in type II diabetes cases. When looking specifically at North Carolina, 11.4% of adults in 2013 had diabetes, ranking North Carolina 8 out of 50 among states (Levi, Segal, & Rayburn, 2014).

Since low levels of physical activity have often resulted in overweight or obesity, there have also been studies that provide a relationship between type II diabetes and weight (Sigal et al, 2006). The major basis for the association of obesity with type 2 diabetes is the ability of obesity to stimulate insulin resistance (Kahn & Flier, 2000). Inversely, excess weight around the abdominal area can contribute to insulin resistance, high blood pressure, and abnormal levels or cholesterol and triglycerides in the blood (National Institute of Diabetes and Digestive and Kidney Diseases, 2009). Physical inactivity and body mass index (BMI) have been established independent risk factors in the development of type II diabetes (Weinstein et al., 2004). While the two factors are independent, it is true low levels of physical activity can increase BMI, resulting in an increased risk for developing type II diabetes.

However, both aerobic and resistance types of exercise have been associated with a decreased risk of developing type II diabetes (Weinstein et al., 2004). A large prospective study from the Warburton et al. (2006) review revels an increase in energy expenditure of 500 kcal per week was associated with a decreased incidence of type II diabetes of 6% (RR= 0.94; 95% CI, 0.90-0.98) (Warburton, et al., 2006). The Warburton et al. (2006) review also concluded that modest weight loss through diet and exercise reduced the incidence of the disease among high risk people by 40-60% over 3-4 years. Another randomized trial conducted by Sigal et al. (2006) found lifestyle interventions, including ~150 min/week of physical activity and diet-induced weight loss of 5-7% reduced the risk of progression from impaired glucose tolerance (IGT), or pre-diabetes, to type II diabetes by 58%. These studies provide firm evidence that increased physical activity with weight loss reduces the risk of developing type II diabetes in individuals that were at a high risk previously. The New England Journal of Medicine published a diabetes prevention program study that randomly assigned 3,234 non-diabetic participants with elevated fasting and post-load plasma glucose concentrations to one of three groups. The groups consisted of a placebo, metformin (850 mg twice daily), or a lifestyle-modification program with the goals of at least 7% weight loss and 150 minutes of physical activity per week. After an average of 2.8 years of follow-up, the incidence of type II diabetes was 11.0% control, 7.8% metformin, and 4.0% lifestyle groups, respectively (Church, 2011; Diabetes Prevention Program Research Group, 2002). The lifestyle intervention reduced the incidence of diabetes by 58% (95% CI, 0.48-0.66) and metformin by 31% (95% CI, 0.17-0.43) as compared to the placebo (Diabetes Prevention Program Research Group, 2002). The lifestyle intervention was significantly more effective than metformin ($p<0.0167$). The influence of physical activity on the prevalence of persons at high risk for developing diabetes is significantly reduced when patients increased levels of physical activity.

Excess weight is strongly associated with an increased risk of both metabolic syndrome (MetS) and type II diabetes (Church, 2011). There is strong evidence that even a moderate amount of weight loss achieved through increases in physical activity can greatly reduce these risks. In an overview by Tim Church (2011), there is an attempt to bring clarity to these issues, specifically the roles of physical activity and weight loss in preventing and treating type II diabetes and MetS (Church, 2011). The strongest evidence to date supporting the importance of diet in conjunction with physical activity and weight loss in prevention of type II diabetes in individuals at high risk comes from the Finnish Diabetes Prevention Study and the Diabetes Prevention Program (Lindstrom et al., 2003). Both of these studies consisted of large, long-term clinical trials investigating the benefits of behavioral-based changes in the prevention of diabetes using weight (Church, 2011).

Previously, Church et al. (2010) conducted a 9-month randomized controlled trial in 262 sedentary men and women to examine the benefits of aerobic and resistance training on hemoglobin A1c (HbA1c) in individuals with type II diabetes (Church et al., 2010). Participants were placed into four groups, 41 participants were assigned to the non-exercise control group, 73 to resistance training 3d/week, 72 to aerobic exercise expending 12 kcal/kg per week, and 76 to combined aerobic and resistance training expending 10kcal/kg per week and resistance training 2d/week (Church et al., 2010). The study included 63.0% women and 47.3% nonwhite participants who were a mean age of 55.8 years with a baseline HbA1c level of 7.7% (Church et al., 2010). The results showed a significant reduction in HbA1c in the combined aerobic training and resistance-training group compared to the control group (-0.34%). However, neither the resistance training (-0.16%; 95% CI, −0.46-0.15%; p=0.32) nor the aerobic (-0.24%; 95% CI, −0.55-0.07%; p=0.14) groups had significant changes in HbA1c compared to the control group (Church et al., 2010). However, subgroup analysis showed that individuals with elevated baseline HbA1c (≥7.0%) had an HbA1c difference of−0.5% to −6%, which would be expected to decrease risk of CVD events by 7% to 10% and microvascular complications by 18% (Church et al., 2010).

C. Cancer

Cancer is the second leading cause of death in the United States, exceeded only by heart disease. In 2010, nearly 575,000 people died of cancer, and more than 1.45 million people had a diagnosis of cancer (Centers for Disease Control, 2015g). Cancer can affect all ages, genders, races, and ethnicities but it does not affect all groups equally. Site-specific diagnosis can vary depending on some of these factors. For example, only men are at risk for developing prostate cancer, a site specific to gender. Fortunately, opportunities exist to reduce cancer risk and prevent some cancers. Cancer risk can be reduced by avoiding tobacco, limiting exposure to ultraviolet rays, eating a proper diet, maintaining a healthy weight, and being physically active (Centers for Disease Control, 2011; Courneya & Friedenreich, 2007).

The CDC provided data regarding the incidence of cancer from 1999-2011. The following statistics show how many people per 100,000 developed cancer for the most recent year (2011). All cancer sites combined, African-Americans had the highest incidence (458.3), followed by Caucasians (449.7), Hispanics (350.6), and American Indian/Alaskan Native (273.4) (Centers for Disease Control, 2011). Cancer rates appeared to steadily increase with age for all races up until 85 years old, with ages 75-84 years having the highest incidence (4526.5), followed by ages 65-74 years (3691.5), ages 55-64 years (2021.3), ages 45-54 years (930.8), ages 35-44 years (358.0), ages 25-34 (147.3) and so forth (Centers for Disease Control, 2011). In regards to geographic location, the state of North Carolina ranked 28 out of 50 states, with a state average slightly higher (460.7) than the United States national average (450.6) (Centers for Disease Control, 2011). The top three cancer sites regardless of sex and race are prostate (128.3), female breast (122.0), and lung/bronchus (61.0) (Centers for Disease Control, 2011).

Several reviews have been published regarding a strong relationship between cancer and routine physical activity (Courneya & Friedenreich, 2007). These reviews provide data from previous studies indicating that routine physical activity is associated with reduction in the incidence of specific cancers (Courneya & Friedenreich, 2007; Thune & Furberg, 2001;

Warburton et al., 2006). Men and women that were physically active exhibited a 30-40% reduction in the relative risk of colon cancer, and physically active women reduced their relative risk for breast cancer by 20-30% when compared to inactive counterparts (Warburton et al., 2006). Information regarding the effectiveness of physical activity in preventing death from cancer or from any cause in patients with cancer is available but limited (Courneya & Friedenreich, 2007). Many healthcare providers and cancer survivors believe that moderate levels of physical activity can help patients feel better during strong treatments. Some studies have been successful in finding regular physical activity presents a health benefit to patients with established cancer (Courneya & Friedenreich, 2007; Warburton et al., 2006). A dose-response relationship has been especially elaborated in relation to colon and breast cancer and physical activity. In an observational study consisting of 832 patients with stage III colon cancer enrolled in a randomized adjuvant chemotherapy trial. Patients reported on various recreational physical activities approximately 6 months after completion of therapy and were observed for recurrence or death. Meyerhardt et al. (2006) found that compared with patients engaged in less than three metabolic equivalent task (MET) -hours per week of physical activity, the adjusted hazard ratio for disease-free survival was 0.51 (95% CI, 0.26-0.97) for 18 to 26.9 MET-hours per week and 0.55 (95% CI, 0.33- 0.91) for 27 or more MET-hours per week (Meyerhardt et al., 2006). Similarly, Gonçalves et al. (2014) also conducted an observational study, aimed to evaluate the effects of physical activity on breast cancer prevention. Seven cohort studies and 14 case control studies were evaluated. Statistical evidence found that physical activity reduces the risk of breast cancer in case-control studies OR=0.84 (95 % CI, 0.81–0.88)] and cohort studies OR=0.61 (95% CI, 0.59–0.63), concluding that physical activity seems to prevent breast cancer, particularly in postmenopausal women (Gonçalves et al., 2014).

According to McTiernan (2008) about 25% of cancer cases worldwide are due to excess weight combined with a physical inactivity (McTiernan, 2008). The risk for developing various cancers may decrease with an increase in physical activity (McTiernan, 2008). Increasing physical activity can lower chances of cancer diagnosis by several mechanisms including decreasing sex hormones, metabolic hormones and inflammation, and improving immune system functions (McTiernan, 2008). However, physical activity is typically hard for some cancer patients, since most experience a common chemotherapy side effect referred to as cancer related fatigue (Andersen et al., 2013). Cancer related fatigue is associated with physical inactivity, lower functional level and lack of energy (Andersen et al., 2013). Andersen et al (2013) conducted an intervention study to evaluate whether a six-week exercise intervention could reduce the patient's cancer related fatigue, in turn, increasing patient's quality of life (Andersen et al., 2013). The study randomized 213 patients with different cancer diagnoses undergoing chemotherapy into an intervention group or a control group (Andersen et al., 2013). The intervention group participated in supervised exercise consisting of high-intensity cardiovascular and heavy resistance training and relaxation/body awareness training for 9 hr/wk for 6 weeks (Andersen et al., 2013). The primary outcome, cancer fatigue score, was evaluated by the Functional Assessment of Cancer Therapy- Anemia Questionnaire (FACT-An) using FACT-G score and FACT-An Anemia subscale (Andersen et al., 2013). The FACT-G score is a 27-item compilation of general questions divided into four primary quality of life domains: Physical Well-Being, Social/Family Well-Being, Emotional Well-Being, and Functional Well-Being. It is appropriate for use with patients with any form of cancer (Andersen et al., 2013). The results from the study found that cancer related fatigue was significantly reduced in the intervention group, resulting in a Fatigue Score reduction of 3.04 (effect size 0.44, 95% CI, 0.17-0.72;

p=0.002) (Andersen et al., 2013). The FACT-An score was also significantly reduced by 5.40 (*p*=0.015) (Andersen et al., 2013). However, there was no statistically significant effect on cancer patients overall quality of life and/or wellbeing scores (Andersen et al., 2013). These results conclude that a supervised exercise intervention with cancer patients undergoing chemotherapy can lead to significant benefits in patients' self-reported perception of cancer related fatigue (Andersen et al., 2013). A similar intervention study by Jarden et al (2012) investigated a single group trial in patients with acute leukemia during the course of a consolidation treatment in an outpatient clinic to determine the feasibility, safety and benefits of a 6-week exercise intervention (Jarden et al., 2013). The exercise intervention component of the study consisted of stationary cycling, initiated for a 20-25 minute period each session, six dynamic and resistance exercises using free hand weights, and one core exercise for abdominal and back muscles (Jarden et al., 2013). Once a week the exercises were followed by relaxation training, lying supine on a mat (Jarden et al., 2013). There was a significant improvement in Health-Related Quality of Life on the FACT-An subscale 'functional wellbeing' (*p*=0.0425), though no change in physical, social/family and emotional wellbeing were found (Jarden et al., 2013). However, there were significant improvements in total scores for FACT-G (0.0367), the anemia symptom subscale (*p*=0.0154) and total FACT-An (*p*=0.0209) (Jarden et al., 2013). The results from this study provide data concerning the feasibility, safety, and benefits of exercise designed to minimize the loss of physical capacity and functional performance in acute leukemia patients undergoing consolidation treatment (Jarden et al., 2013). The patients in this study were able to safely participate with an adequate adherence rate in the exercise component of the intervention while undergoing treatment in the outpatient setting (Jarden et al., 2013). Physical, functional and quality of life improvements all reduced the general symptom burden and symptom interference in daily life activities (Jarden et al., 2013).

The overall health benefits of participating in regular physical activity are widely documented and have shown a positive association to cancer. However, the strength of this evidence by cancer site is still uncertain. Bernstein (2008) reviewed recent data related to the impact of physical activity on risk of breast cancer, colon cancer, prostate cancer, lung cancer, and ovarian cancer (Bernstein, 2008). Since there is more available data on breast cancer, cohort and case-control studies have continuously found that invasive breast cancer risk is reduced by 15-50% among physically active women (Bernstein, 2008). In one of the earliest studies, a case-controlled study of women ages 40 or younger determined that breast cancer among women who averaged 3.8 hr/wk participating in physical activity had an odds ratio of 0.42 (95% CI, 0.27-0.64) relative to inactive women (Bernstein, Henderson, Hanisch, Sullivan-Halley, & Ross, 1994). The results from this study concluded almost a 50% reduction in risk among women who averaged almost 4 hour of activity per week during their reproductive years (Bernstein et al., 1994). Similarly, postmenopausal women with higher amounts of recreational physical activity have lower breast cancer risk (Bernstein, 2008).

In an observational study, researchers collected responses from registered female nurses diagnosed with stage I, II, or III breast cancer. The main outcome measure was to evaluate breast cancer mortality risk according to physical activity levels measured in metabolic equivalent task (MET) hours per week (Holmes, 2005). Compared with women who engaged in less than 3 MET-hours per week of physical activity, the adjusted relative risk of death from breast cancer was 0.80 (95% CI, 0.60-1.06) for 3 to 8.9 MET-hours per week of physical activity (Holmes, 2005). The relative risk of breast cancer death for women with hormone-responsive tumors who engaged in 9 or more MET-hours per week of activity compared with women with hormone-responsive tumors who engaged in less than 9 MET-hours per week was 0.50 (95% CI, 0.34-0.74). Compared with women who engaged in less than 3 MET-hours per week of activity, the absolute unadjusted mortality risk reduction was 6% at 10 years for women who engaged in 9 or more MET-hours per week (Holmes, 2005). This study concluded that women with existing breast cancer reduced their relative risk of death by participating in moderate to vigorous levels of physical activity.

These results have been confirmed in more than 30 studies, such as Carpenter et al. (2003), who found breast cancer was reduced among women who, on average, maintained 17.6 MET-hour of activity per week from menarche forward (OR= 0.66, 95% CI, 0.48-0.90) (Carpenter, Ross, Paganini-Hill, & Bernstein, 2003). These results have also been observed in different demographics of the population, identifying potential differences in race. A multicenter of African-American and Caucasian women aged 34-64 years participated in a case-control study called The Women's Contraceptive and Reproductive Experiences Study to determine potential racial differences in physical activity effects on newly diagnosed invasive breast cancer (Bernstein et al., 2005). Detailed histories of lifetime recreational physical activity were collected during in-person interviews with 4,538 case patients with breast cancer (1,605 African American; 2,933 Caucasian) and 4,649 control subjects (1,646 African American; 3,033 Caucasian) (Bernstein et al., 2005). The control subjects were frequency-matched to case patients on age, race and study site to examine associations between physical activity measures (MET-hours per week per year) and overall breast cancer risk (Bernstein et al., 2005). Results from the study showed a decrease in breast cancer risk was associated with increased levels of lifetime physical activity (p=0.002) (Bernstein et al., 2005). Average annual lifetime physical activity that was greater than the median level for active control subjects was associated with approximately 20% lower risk of breast cancer when compared to inactivity (6.7-15.1 MET-hr/wk/yr, OR= 0.82; 95% CI, 0.71-0.93; ≥15.1 MET-hr/wk/yr, OR= 0.80; 95% CI, 0.70-0.92) (Bernstein et al., 2005). The inverse association did not differ between African-American and Caucasian women (*p*=0.003 and *p*=0.09, respectively) concluding that risk of breast cancer and physical activity provide an inverse association among both African-American and Caucasian women (Bernstein, et al., 2005). A 10-week intervention study consisted of 45 women receiving chemotherapy for treatment of Stage II breast cancer using a cycle ergometer to measure functional capacity (VO2max) (MacVicar, Winningham, & Nickel, 1989). The subjects were stratified by baseline function capacity (+/- 1 MET) then randomized into experimental, placebo and control groups (MacVicar, et al., 1989). The experimental subjects completed a 10-week, 3x/wk exercise training program, placebo subjects participated in 10 wk of non-aerobic stretching and flexibility, and the control group maintained normal activities of daily life (MacVicar et al., 1989). The results from the experimental group showed significant improvement (*p*=<0.05) on pre- to- posttest VO2max as well as workload and test time when compared to the placebo and control groups (MacVicar et al., 1989). The results from this intervention conclude that exercise intervention is effective in improving functional capacity of Stage II breast cancer patients on chemotherapy (MacVicar et al., 1989). More recently, 52 women with breast cancer were randomly assigned to a walking program or to usual care during adjuvant chemotherapy or radiation therapy to explore the effects of a walking intervention on fatigue, physical functioning, emotional distress, and quality of life treatment (Mock et al., 2001). Mock et al (2001) concluded that women who exercise at least 90 minutes per week on 3+

days reported significantly less fatigue and emotional distress, as well as higher functional ability and quality of life than women who were less active during treatments (Mock et al., 2001).

There is continued epidemiological literature suggesting that increased physical activity is protective for colon cancer; however, this result has been more consistently observed in men than in women (Bernstein, 2008). Among men, reductions in colon cancer risk associated with increased physical activity have been observed in a number of high quality studies (Bernstein, 2008). The mixed results of studies on physical activity and colon cancer risk among older women could be due to the use of hormone therapy. This weaker association is due to the fact that hormone therapy masks the impact of physical activity on colon cancer risk among postmenopausal women (Bernstein, 2008).

In an observational study, the researchers collected data from 832 patients with stage III colon cancer. The patients were asked to report on various recreational physical activities approximately 6 months after chemotherapy. Compared with patients engaging in less than 3 METs- hours per week of physical activity, the ratio for disease-free survival was 0.51 (95% CI, 0.26-0.97) for 18 to 26.9 MET- hours per week. For more than 27 MET-hours per week, the ratio increased to 0.55 (95% CI, 0.33-0.91; p=0.01) from the previous 0.51 when participating in 18 to 26.9 MET- hours per week. The conclusion was patients who survive and are recurrence free approximately 6 months after chemotherapy, physical activity appeared to reduce the risk of cancer reoccurrence and mortality (Meyerhardt, 2006).

A prospective cohort study in California identified females, age 22-84 years with no prior history of colon cancer to determine the relative risks associated with lifetime (high school through age 54 years or current age) and recent (past 3 years) strenuous and moderate physical activity with colon cancer (Mai et al., 2007). Combined lifetime moderate and strenuous recreational physical activity was not associated with colon cancer risk (RR=0.75; 95% CI, 0.57-1.00; *p*=0.23) (Mai et al., 2007). For postmenopausal women who had never taken hormone therapy, lifetime physical activity reduced colon cancer risk (RR=0.51; 95% CI, 0.31-0.85; *p*=0.02) (Mai et al., 2007). The likelihood for interaction between hormone use and lifetime moderate and/or strenuous physical activity was borderline statistical significance (*p*=0.05) concluding that lifetime physical activity may protect postmenopausal women who have never used hormone therapy. However, among hormone therapy users, recreational physical activity does not seem to provide any additional benefits (Mai et al., 2007).

In regards to prostate cancer, Bernstein (2008) reviewed that more than twenty studies have assessed a potential association between physical activity and prostate cancer (Bernstein, 2008), with the majority of these studies suggesting a modest reduction in risk with an increase in physical activity level, regardless or varied methods, population bases and sample sizes (Bernstein, 2008). In Canada, a population-based case-control study of advanced prostate cancer assessing lifetime physical activity history during adolescence and overall lifetime strenuous activity moderately related to lower prostate cancer risk (Giovannucci, Liu, Leitzmann, Stampfer, & Willett, 2005). This particular study observed men 65 years or older had a lower risk in the highest category of vigorous activity for advanced prostate cancer (multivariable RR=0.33; 95% CI, 0.17-0.62), but failed to observe any associations in younger men (Giovannucci et al., 2005). Cohort studies have essentially observed no overall increase in prostate cancer with levels of physical activity, but have shown reduced risk for advancing the disease (Bernstein, 2008). Like most cancer treatments, the androgen deprivation therapy commonly used to treat men with prostate cancer is known is cause fatigue, functional decline, increased body fatness, and loss of lean body tissue (Segal et al., 2003). Many of the side effects associated with cancer treatments negatively affect health-related quality of life (Segal et al., 2003). Segal et al. (2003) developed a resistance training program for a two-site intervention study, recruiting 155 men who were scheduled to receive androgen deprivation therapy. Participants randomly assigned to the intervention group (n=82) participated in the resistance training program 3x/wk for 12 weeks (Segal et al., 2003). The results concluded that men assigned to the intervention group had less interference from fatigue on activities of daily living (p=0.002) and higher quality of life (p=0.001) than men in the control group (Segal et al., 2003). This conclusion indicates a positive relationship between increased physical activity and prostate cancer.

Although lung cancer is a highly prevalent type of cancer, the effects of increased physical activity on pulmonary function, exercise capacity and overall quality of life have rarely been studied. Bernstein (2008) addresses the controversy between physical activity and lung cancer risk relationship (Bernstein, 2008; Olsen et al., 2007). This controversy lies on the fact that the treatment of lung cancer tends to effect exercise tolerance. A meta-analysis of nine studies published between 1966 and 2003 reported a 13% decreased risk for lung cancer associated with moderate physical activity and a 30% decreased risk associated with strenuous activity (Spruit, Janssen, Willemsen, Hochstenbag, & Wouters, 2006). A non-randomized, clinical pilot study was designed to determine the effects of a multidisciplinary inpatient rehabilitation program on pulmonary function, 6-min walking distance and peak cycling load (Spruit et al., 2006). The exercise training consisted of daily ergometer cycling, treadmill walking, weight training and gymnastics (Spruit et al., 2006). Eight weeks after the start of the program, pulmonary function did not change. However, significant improvements were found in 6-min walking distance (median change: 145 m; p=0.002) and peak cycling load (median change: 26 W; p=0.0078) (Spruit et al., 2006). Although dyspnea and fatigue scores remained unchanged, the positive results seen in patient exercise capacity conclude that lung cancer patients can indeed benefit from increased physical activity upon receiving diagnosis. Further studies are necessary to determine physical activity effects on prognosis.

Literature on risk of ovarian cancer in relation to physical activity has been inconclusive. Bernstein (2008) acknowledges more than 12 studies that have assessed the impact of physical activity on risk, with several of the studies showing a reduction in risk of ovarian cancer with increasing activity (Bernstein, 2008; Olsen et al., 2007). The American Cancer Society cohort showed no evidence of increased physical activity associated with lower ovarian cancer risk (Olsen et al., 2007). However, they did suggest that a history of substantial sedentary behavior (sitting $\geq$ 6 hours a day versus $<$ 3 hours a day) is associated with more than a 50% increase in risk (Olsen et al., 2007).

In summary, the most evidence regarding physical activity and cancer risk is found for breast cancer and colon cancer. The relationship between increased physical activity and breast cancer and colon cancer risk is quite strong. Evidence supporting a physical activity influence prostate cancer risk is increasing, but still requires more research and results for ovarian cancer are still mixed. Like Bernstein (2008) mentioned, the association with lung cancer requires careful assessment, since smoking patterns may account for differences in initial activity level (Bernstein, 2008). Additionally, while cohort studies, case studies, and observational studies are all abundant on this particular topic, future research into exercise and physical activity intervention with cancer patients should be made a priority.

D. Obesity

The obesity epidemic in the United States is one of the biggest health concerns of the 21st century. More than one-third (34.9% or 78.6 million) of U.S. adults are obese (Centers for Disease Control, 2015f). With obesity numbers on the rise, healthcare providers and health officials are concerned about the all-cause mortality rates associated with the disease. Obesity is a major cause of death attributable to heart disease, cancer, and diabetes (Centers for Disease Control, 2015g). Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health (World Health Organization, 2015). The term "obesity" is often referred to as body weight greater than what is considered healthy for a certain height (National Heart, Lung, and Blood Institute, 2012). Although this disease is very complex and there are a lot of contributing factors to the onset of developing this disease, one modifiable factor contributing to the onset of this disease is physical inactivity. A recent study covered the transition period from adolescence to young adult, showing that the risk of developing obesity was significantly increased in physically inactive adolescents (Pietiläinen et al., 2008). These findings support previous studies that show a sedentary lifestyle in adolescence triggers the development of obesity (Fox & Hillsdon, 2007; Sothern, Loftin, Suskind, Udall, & Blecker, 1999). The key to preventing the onset of obesity is teaching the importance of physical activity to our youth, as studies have shown the behavior developed at a young age transfer over into your adult life (Pietiläinen et al., 2008; Sothern et al., 1999). By teaching the importance of physical activity at a young age, it is possible we can prevent obesity rates from rising. The overall goal of preaching this importance of an active lifestyle is to end the vicious cycle of less activity, low energy expenditure and increasing adipose fat tissue (Epstein et al., 1995; Sothern et al., 1999).

The rising prevalence of overweight and obesity all over the world has been described as a global pandemic as rates of obesity seem to be increasing in both developed and developing countries (Ng et al., 2014). According to Ng et al (2014), in 2010 overweight and obesity was estimated to cause 3.4 million deaths and 4% of life years lost (Ng et al., 2014). Worldwide, prevalence of overweight and obesity combined rose by 27.5% for adults and 47.1% for children between 1980 and 2013. The number of overweight and obese individuals increased from 857 million in 1980 to 2.1 billion in 2013 (Ng et al., 2014). This increased rate of overweight and obesity prevalence was greatest between 1992 and 2002 but has slowed down in the past decade, especially in developed countries (Ng et al., 2014). When comparing the United States obesity prevalence to other countries, the US has the highest prevalence of industrialized/developed countries (33.9%) and ranks ninth among developing countries around the world (Ng et al., 2014).

The National Health and Nutrition Examination Survey (NHANES) most recently surveyed the prevalence of United States adults aged 20 years and older that are overweight or obese in 2010. More than one-third of (35.7%) of adults are considered to be obese and more than 1 in 20 (6.3%) have extreme obesity (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). NHANES further investigated these statistics by looking at race and gender indicating that 74% of men and 64% of women were overweight or obese (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). Equal amounts (36%) of men and women had obesity and among men, 4% had extreme obesity; the percentage among women was double that (8%) (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). In regards to race, Hispanics had the highest prevalence of obesity (39.1%) and extreme obesity (78.8%) followed by African-Americans (obesity 49.5%; extreme obesity 76.7%) and

Caucasians (obesity 34.3%; extreme obesity 66.7%) (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). There is also an increasing obesity trend among children and adolescents aged 2 to 19 years. Just like adults, children and adolescent boys (18.6%) had a higher incidence of obesity than girls (15%) (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). According to the survey, children ages 2-5 had the lowest prevalence of obesity (12.1%) but this percentage steadily increased with age. Among people aged 6-11 years, 18% were obese and people aged 12-19, 18.4% were obese (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). In regards to race/ethnicity, only data from ages 6-19 years was provided. Results were similar to that of adults, but African-American youth had the highest prevalence of obesity (25.7%) followed by Hispanic youth (22.9%) and Caucasian youth (15.2%) (National Institute of Diabetes and Digestive and Kidney Diseases, 2012).

Within the United States, adult obesity rates are at or above 30% in twenty states, forty-three states have rates of at least 25%, and every state in the U.S. is above 20% (Centers for Disease Control, 2015e). In 2007, Mississippi was the only state in the US that was above 30% (Centers for Disease Control, 2015e). When looking specifically at North Carolina, the 2013 obesity prevalence in adults was 29.4% ranking North Carolina 25 out of 50 states (Levi et al., 2014). When looking at gender, there is not a significant difference between men (29.6%) and women (29.8%) (Levi et al., 2014). Among NC adults, ages 45-64 years had the highest prevalence of 34.6%, followed by ages 26-44 years (30.4%), ages 65+ years (25.9%), and ages 18-25 years (19.1%) (Levi et al., 2014). In regards to race, African-Americans had the highest incidence (40.4%) then Hispanics (27.0%) and Caucasians (26.6%) (Levi et al., 2014).

Obesity and lack of physical activity are associated with several health condition previously discussed such as type II diabetes and CVD. Obesity has increased rapidly during the past few decades; however, more recent studies are reporting a decline in the rate of increase due to a small increase in physical activity (Dwyer-Lindgren et al., 2013). Using the Behavioral Risk Factor Surveillance System (BRFSS) to target 3.7 million adults aged 20 years or older from 2000 to 2011 and the National Health and Nutrition Examination Survey (NHANES) to target 30,000 adults aged 20 years or older from 1999 to 2010 (Dwyer-Lindgren et al., 2013), BMI was calculated from self-reported weight and height in the BRFSS, adjusting for self-reporting bias using NHANES. Self-reported physical activity was also measured in the BRFSS and validated small area estimation methods were used to generate estimates of obesity and physical activity prevalence for each county annually from 2001 to 2011 (Dwyer-Lindgren et al., 2013). The results showed an increase in the prevalence of sufficient physical activity from 2001 to 2009, with levels generally higher in men than in women; however higher increases were greater in women than men. The prevalence of obesity varied widely by counties. In 2011, the highest rates for men were observed in Owsley County, Kentucky (46.9%) and for women, Issaquena County, Mississippi (59.3%) (Dwyer-Lindgren et al., 2013). The lowest obesity rates for men were observed in San Francisco County, California (18.3%) and for women in Falls Church City, Virginia (17.6%) (Dwyer-Lindgren et al., 2013). The greatest decrease in obesity prevalence for women was observed in Keweenaw County, Michigan with a −1.4 (95% CI, −6.8-7.1) percentage point change. For men, the greatest decrease in obesity prevalence was observed in Buffalo County, South Dakota, with a −2.9 (95% CI, −11.4-5.3) percentage point change (Dwyer-Lindgren et al., 2013). There was a low correlation between change in the level of physical activity and obesity. From 2001 to 2009, for every 1% point increase in physical activity, obesity prevalence decreased 0.11% points (Dwyer-Lindgren et al., 2013). The US Burden of Diseases, Injuries, and Risk Factors study suggests that in 2010 physical inactivity and low physical activity accounted for 234,000 deaths and 5.2% of disability-adjusted life years independent of BMI (Dwyer-Lindgren et al., 2013). The results from this study suggest a new study to focus on the importance of physical activity for health related purposes, versus a focus weight reduction.

Although there has been progress elucidating the effects of physical activity as a strategy for reducing obesity and related cardiometabolic risk factors, the specific exposures of physical activity required to achieve optimal benefits continue to be met with considerable amounts of uncertainty and debate (Ross, Hudson, Day, & Lam, 2013). Despite the inference of a dose-dependent relationship between physical activity and health benefits, without alteration in caloric intake, most data do not examine the separate effects of physical activity dose and intensity on obesity associated with cardiometabolic risk (Ross, Hudson, Stotz, & Lam, 2015). Ross et al. (2015) performed a randomized, controlled trial in Canada designed to study the separate effects of habitual physical activity differing in dose (energy expenditure, kcal/session) and intensity (relative to peak) VO_2 peak) on abdominal obesity (Ross et al., 2013). There were 217 participants (72.3%) that completed the intervention. The study randomly placed participants to one of 4 conditions: a) no exercise control (n=75), b) 5 weekly sessions of low-volume, low-intensity exercise (n=73), c) high-volume, low-intensity (n=76), d) high volume, high intensity (n=76), with treatment lasting 6 months (24wk) (Ross et al., 2015). Mean exercise time in minutes per session was 31 (SD, 4.4) for low-volume, low-intensity, 58 (SD, 7.6) for high-volume, low-intensity, and 40 (SD, 6.2) for high-volume, high-intensity. Daily unsupervised physical activity and sedentary time did not change in any exercise group versus control (p>0.33) (Ross et al., 2015). Adjusting for age and sex, reductions in waist circumference were greater in all three intervention groups, low-volume, low-intensity (−3.9 cm; 95% CI, −5.6- −2.3 cm; p<

0.001), high-volume, low-intensity (−4.6 cm; CI, −6.2- −3.0 cm; $p<0.001$), and high-volume, high-intensity (−4.6 cm; CI, −6.3- −2.9 cm; $p<0.001$) than the control group but did not differ among the exercise intervention groups ($p>0.43$) (Ross et al., 2015). Reductions in 2-hour glucose level were greater in the high-volume, high-intensity group (−0.7 mmol/L; −12.5 mg/dL; 95% CI, −1.3 to −0.1 mmol/L; −23.5 to −1.5 mg/dL; $p=0.027$) than the control group, after adjusting for covariates (Ross et al., 2015). All exercise groups showed greater weight loss improvements than the control group ($p<0.001$); however, body weight reductions did not differ amongst exercise groups ($p>0.182$) (Ross et al., 2015). These results provide scientific evidence to support the belief that fixed amounts of exercise independent of exercise intensity will result in reductions in abdominal obesity. In other words, exercise and physical activity frequency and duration alone are effective in weight loss results.

E. Mental Health

There is a growing body of literature on the positive effects of physical activity on mental health. The evidence for psychological benefits in mentally healthy individuals is impressive; the benefits are even stronger for psychiatric populations (Daley, 2002). Mental health as defined by the World Health Organization is defined as a state of well-being in which an individual realizes their potential, can cope with the normal stressors of life, can work productively and fruitfully and is able to make a contribution to the community (World Health Organization, 2014). A mental illness is a medical condition that disrupts a person’s thinking, feeling, mood, ability to relate to others and daily functioning. Serious mental illnesses include major depression, schizophrenia, bipolar disorder, obsessive-compulsive disorder, panic disorder, posttraumatic stress disorder and borderline personality disorder. Just like diabetes is a disorder of the pancreas, mental illnesses are medical conditions that often result in a diminished capacity for coping with the ordinary demands of life (National Alliance on Mental Illness, 2015).

According to the CDC more than 1 out of 20 Americans (5.4%) ages 12 years and older reported current depression in 2005–2006 (Centers for Disease Control, 2013c). Females are more likely to be faced with depression (6.7%) when compared to males (4.0%) and African-Americans were more likely to depressed (8.0%) compared to Hispanics (6.3%) and Caucasians (4.8%) (Centers for Disease Control, 2013c). When comparing different ages, adults aged 40-59 years had the highest prevalence of depression (7.3%) followed by ages 18-39 years (4.7%), ages 12-17 (4.3%), and ages 60+ (4.0%) (Centers for Disease Control, 2013c).

Exercise improves mental health by reducing anxiety, depression, and negative mood and by improving self-esteem and cognitive function (Callaghan, 2004). Previous studies have consistently associated high self-reported level of habitual physical activity with better mental health and have shown a correlation of habitual exercise level with low levels of depression. In an ongoing longitudinal study of depression, 424 patients entering one of five facilities for the treatment of depression were asked to answer questions using The Physical Activity Index and an Exercise Coping questionnaire (Harris, Cronkite, & Moos, 2006). The purpose of the study was to evaluate physical activity as a predictor of concurrent depression. During this study, controlling for physical activity estimates the initial depression status at the mean value of physical activity. The effect of physical activity on global depression was -2.24 (SE 0.64, $p<0.001$). This indicates that higher levels of physical activity were concurrently associated with lower levels of depression (Harris et al., 2006). The possibility of a dose response relationship between exercise and the treatment of depression was further investigated by Dunn et al. (2005) concluding that aerobic exercise at a dose consistent with public health recommendations is an effective treatment for mild to moderate major depression. The main effect of energy expenditure in reducing patients' Hamilton Rating Scale for Depression was significant at 12 weeks. The adjusted mean HRSD scores at 12 weeks were reduced 47% from baseline (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005). The results of this study further support the dose response relationship between physical activity level and depression.

Older adults, specifically, have a higher prevalence of depression signs/symptoms. Bridle et al. (2012) conducted a study using seven meta-analysis trials. The purpose of the study was to estimate the effect of exercise on depressive symptoms in older adults and to assess whether different treatment effects varied. The results from the study concluded that exercise is associated with significantly lower depression severity amongst older adults (SMD –0.34, 95% CI –0.52- –0.17), suggesting that older adults who present signs/symptoms of depression should participate in structured exercise or physical activity (Bridle, Spanjers, Patel, Atherton, & Lamb, 2012).

Compared to the wide range of research on the positive effects of exercise in major depression, anxiety disorders have been less frequently studied. Additionally, the wide range of anxiety disorders makes it hard for researchers to generalize one specific anxiety disorder to other disorders. Daley (2002) conducted a study investigating the physiological, psychological and social effects of exercise in outpatients with schizophrenia. The study used a typical exercise program, cycling on an ergometer 4 days a week for 30 minutes per session. These results indicated reduced depression, increased general well-being and improved aerobic fitness (Daley, 2002). Another study in the review written by Daley investigated patients with various anxiety disorders. Patients participated in an 8-week aerobic exercise program. During the study, anxiety scores fell significantly in the most diagnostic groups (Daley, 2002).

There is a dire need for further optimization and research of physical activity benefits for patients suffering from mental health disorders. However, the information that is available proves a strong argument supporting physical activity treatments for patients that are mentally ill.

The studies related to chronic disease and physical activity outlined previously has shown indications of a dose-response relationship. Physical activity is a modifiable risk factor that needs to be addressed by healthcare providers. According to the CDC among the top ten causes of death in the United States are heart disease, cancer, type II diabetes, stroke, and Alzheimer's disease (a form of mental health) (Centers for Disease Control, 2015d). The current literature available on these five diseases suggests a fascinating association, that physical activity has the potential to positively affect these diseases. Knowing that physical activity is a strong vindication for improving health, there becomes a dire need to have healthcare provider support. Currently, little is known about healthcare providers support for physical activity counseling; however, there is literature available on other forms of healthcare provider counseling (e.g., smoking cessation) that could impact the future of physical activity counseling.

Healthcare Providers Counseling

Physicians and healthcare providers have the potential to impact health behaviors, especially those related to diet, nutrition, smoking, and alcohol use (Anis et al., 2004). Studies have shown that individuals can reduce their risk of chronic disease by making lifestyle changes such as quitting smoking, losing weight, changing diet, and becoming more active. Healthcare providers can be extremely influential in promoting health behavior simply by counseling their patients to abide by certain health behaviors (Anis et al., 2004; Nawaz, Adams, & Katz, 2000).

A. Smoking

Physicians have contact with 70% of all smokers each year, including 60% of those smokers who consider themselves to be in excellent health (Wells, Ware, & Lewis, 1984). Behavioral counseling has been demonstrated to be an effective smoking intervention modality when used by healthcare professionals. A telephone interview conducted by Nawaz et al. (2000) addressed whether their physician asked about diet, physical activity, and/or smoking and if they lost weight, increased exercise or modified fat intake in the past year due to the influence of physician counseling. Questions about smoking were reported by 77% of respondents, including those who said their physician already knew whether they smoked. The results from the phone interview concluded that smokers who were asked about their smoking habits were not more likely to either report quitting smoking or wanted to quit smoking in the last 6 months (Nawaz et al., 2000). However, the survey did not address whether counseling or advice occurred. About 85% of current smokers were asked about their smoking habits, but without the knowledge of physician counseling, it is unclear if simply being asked about the status is beneficial (Nawaz et al., 2000; Wells et al., 1984).

The purpose of a telephone survey of a population-based sample consisting of adult cigarette smokes (n=3,037) was to examine associations between characteristics of smokers and the delivery of 5 types of smoking cessation counseling (Goldstein et al., 1997). Goldstein et al. (1997) wanted to know whether a physician or other health care provider had (a) talked about smoking, (b) advised them to quit, (c) offered help to quit, (d) arranged a follow-up contact, and (e) prescribed nicotine gum or other medication. The study concluded that 51% of smokers were talked to about smoking, 45.5% were advised to quit, 14.9% were offered help, 3% had a follow-up appointment arranged, and 8.5% were prescribed medication.

Several studies have reported higher rates of tobacco dependence among individuals with mental illness, and while smoking cessation counseling is an effective treatment for tobacco dependence, little is known about what influences a psychiatrist's likelihood of offering smoking cessation counseling (Himelhoch & Daumit, 2003). Previous research suggests that primary care physicians offer smoking-cessation counseling to about one-fifth of their patients who smoke and with respect to those with psychiatric illness, the current study suggest that smoking-cessation counseling could be beneficial (Himelhoch & Daumit, 2003). Using the National Ambulatory Medical Care Survey, 1,610 psychiatric office visits were identified for patients who smoke. Investigating relationships between patient and visit characteristics and smoking cessation counseling (Himelhoch & Daumit, 2003). The results found that psychiatrists offered cessation counseling at 12.4% (n=200) of the visits for smoking patients. The adjusted probability of receiving smoking-cessation counseling was significantly higher ($p<0.05$) for those with the following characteristics compared to those without: age greater than 50 years (14.8% vs 8.7%); a medical diagnosis of obesity, hypertension, or diabetes mellitus (16.8% vs 9.2%); and having an initial visit (16.1% vs 9.1%) (Himelhoch & Daumit, 2003). With only 12.4% of patients being counseling on smoking cessation, psychiatrists, along with other healthcare providers, are missing prime opportunities to offer counseling to patients that smoke.

In a more recent meta-analysis, Aveyard et al. (2012) aimed to examine the outcome of physician's brief advice encouraging patients to stop smoking, offering assistance on decreasing frequency of quitting attempts in non-motivated smokers (Aveyard, Begh, Parsons, & West, 2012). Relevant trials from the Cochrane Reviews of physician advice for smoking cessation, nicotine replacement therapy, varenicline and bupropion were all included and data was extracted in quit attempts/quit success (Aveyard et al., 2012). Thirteen studies were included.

Compared to no intervention, advice to quit on medical grounds increased the frequency of quit attempts (RR 1.24; 95% CI, 1.16-1.33), but not as much as behavioral support for cessation (RR 2.17; 95% CI, 1.52-3.11) or offering nicotine replacement therapy (RR 1.68; 95% CI, 1.48-1.89) (Aveyard et al., 2012). More importantly, in a direct comparison, offering assistance generated more quit attempts than giving advice to quit (RR 1.69; 95% CI 1.24-2.31 for behavioral support and 1.39; 95% CI 1.25-1.54 for offering medication) (Aveyard et al., 2012). The results from this study provide evidence that medical advice increased the success of quit attempts and inconclusive evidence that when offered assistance, success was increased (Aveyard et al., 2012). Concluding that healthcare providers may be more effective in their attempts to stop smoking by offering assistance to all smokers instead of advising smokers to quit and only offering assistance to those who express an interest in doing so (Aveyard et al., 2012).

While the results from the Aveyard et al. study are meaningful, further investigation on how often smoking cessation counseling occurs during patient visits is warranted. Nelson et al. (2015) conducted a study describing primary care physician (PCP) smoking cessation treatment during patient visits for chronic cardiopulmonary smoking-sensitive diseases. The study used the National Ambulatory Medical Care Survey to capture PCP visits, examining smoking screening and counseling time trends for smokers with chronic diseases (Nelson et al., 2015). Sadly, from 2001-2009 smoking screening and counseling for smokers with chronic smoking-sensitive cardiopulmonary diseases were unchanged. Among smokers with chronic smoking-sensitive diseases, 50%–72% received no counseling (Nelson et al., 2015). Smokers with chronic obstructive pulmonary disease (OR 6.54; 95% CI, 4.85–8.83) and peripheral vascular disease (OR 4.50; 95% CI, 1.72–11.75) were more likely to receive smoking counseling at chronic/preventive care visits, compared with patients without smoking-sensitive diseases

(Nelson et al., 2015). This study concludes that smoking cessation counseling is not only failing to occur, but it is not even occurring in individuals who are already at an increased risk for cardiopulmonary health diseases.

The current studies available indicate that physicians and other health care providers are not meeting the standards of smoking intervention outlined by the National Cancer Institute and the Agency for Health Care Policy and Research (Goldstein et al., 1997). These two accredited organizations both support and encourage more counseling from healthcare providers to promote patients to quit smoking. Unfortunately, when the Surgeon General's Health Report came out in 1964 indicating how harmful cigarette smoking was to your health, the amount of research and literature on the topic dwindled down as the years passed. Not being able to find adequate scientific literature on recent healthcare provider counseling for cigarette smoking is a limitation to the current study.

B. Nutrition

Nutrition counseling has the potential to play an important role in the nation's health promotion and disease prevention efforts in the 21st century (Eaton, Goodwin, & Stange, 2002). According to Healthy People 2020, an estimated 300,000 to 800,000 deaths per year are due to preventable nutrition-related diseases such as CHD, stroke, hypertension, type II diabetes, obesity, and certain cancers (Anis et al., 2004; Healthy People 2020, 2015). Previous research has shown that the majority (72%) of primary care physicians consider nutrition counseling to be their responsibility (Kushner, 1995). In a recent study conducted by Eaton et al. (2002) it was found to be rare that a healthcare provider provide no nutrition counseling (only 2%). However, it is rare that only a minority of healthcare providers incorporate nutrition counseling into the majority (>50%) of patient visits. The overall prevalence was 24% (C. B. Eaton et al., 2002).

Previously mentioned, Nawaz et al. (2000) determined the rate of physician to patient discussions regarding diet, aiming to assess the effect of such discussions on behavior change. In a Connecticut telephone survey, 433 adults that had a routine check-up in the past year were asked whether their physicians had asked them about their dietary habits and about any efforts to modify these behaviors during the preceding year (Nawaz et al., 2000). Diet was addressed with 50% of the subjects. Results from this study found that respondents who were asked about their diet were more likely to have changed their fat or fiber intake in the past year than those not asked (64 vs 48%; p=0.002) and were somewhat more likely to have lost weight (46 vs 37%; p=0.061). Even greater differences were seen among 94 overweight subjects (64 vs 47%; p=0.099) (Nawaz et al., 2000). The current study results conclude physicians have the potential to impact patients' health behaviors, especially those related to diet, through simple discussions during routine checkups; however, only half are using this opportunity.

Ockene et al. (1999) conducted a study to evaluate the effectiveness of a training program for physician-delivered nutrition counseling on dietary fat intake, weight, and blood low-density lipoprotein cholesterol levels in patients with hyperlipidemia. The purpose of the study was to determine if physician-based counseling provided benefits for patients suffering from hyperlipidemia. The participants were divided into three groups (a) usual care; (b) physician nutrition counseling training; (c) physician nutrition counseling training plus office-support program. The study resulted in improvement for all three primary outcome measures, but was limited to patients' in group three. Compared with group 1, patients' in-group 3 had average reductions of 1.1 percentage points in percent of energy from saturated fat (a 10.3% decrease) (p=0.01); a reduction in weight of 2.3 kg (p<0.001); and a decrease of 0.10 mmol/L (3.8 mg/dL) in low-density lipoprotein cholesterol level (p=0.10). These results conclude that brief supported physician nutrition counseling can produce beneficial changes in diet, weight, and blood lipids (Ockene et al., 1999).

More recently, (Wynn, Trudeau, Taunton, Gowans, & Scott, 2010) conducted a Canadian study to investigate the role family physicians played with management of patients having nutrition-related issues. The study examined whether implementation of current nutrition counseling guidelines was feasible in primary care practices(Wynn et al., 2010). The study response rate was 59.6% after surveying 757 physicians (Wynn et al., 2010). The overall results concluded that 58.1% of respondents had positive attitudes about the role of nutrition in patient health, believing that more than 60% of their current patients would benefit from nutrition counseling (Wynn et al., 2010). However, a considerable gap between the proportion of patients who respondents thought would benefit from nutrition counseling and the proportion of patients who actually received such counseling remained with only 19.1% reporting that more than 60% of their patients actually received such counseling (Wynn et al., 2010). Nearly all physicians responding reported dietitian referrals to patients (95.2%); however, this frequency was not associated with the proportion of patients physicians believed would benefit from nutrition counseling ($p=0.460$) or with the proportion of patients receiving nutrition counseling ($p=0.494$) (Wynn et al., 2010). Physician comfort level with and attitude toward nutrition were both strong predictors of a physician's nutrition counseling. Physicians that were more comfortable providing nutrition counseling thought that more of their patients would benefit from said counseling ($p=0.034$), were more likely to provide nutrition counseling to patients in their offices ($p<0.0005$), and were more likely to spend more time discussing nutrition per visit ($p<0.0005$) (Wynn et al., 2010). Physicians' attitude scores toward nutrition were strongly associated with providing nutrition counseling ($p<0.0005$) (Wynn et al., 2010).

When identifying physician barriers to nutrition counseling, lack of time and compensation were the strongest barriers to nearly all physicians when providing nutrition guidance (Wynn et al., 2010). Although 82.3% of family physicians reported their formal nutrition training in medical school inadequate, training was not considered to be a strong barrier to counseling (Wynn et al., 2010). Despite the perceived need for nutrition counseling further supported by this study, no association was seen in the frequency of dietitian referrals and/or counseling from their physician, suggesting that many patients who may benefit from nutritional counseling do not have access to it, either from their primary care provider or dietitians (Wynn et al., 2010). This study shows positive attitudes from family physicians on the effects of nutrition counseling on patient behaviors, with the majority believing that patients would benefit from such counseling. However, there is still a considerable gap between the number of patients physicians' felt would benefit and the number of patients actually receiving nutrition counseling (Wynn et al., 2010).

Unfortunately the data on nutrition counseling is scarce and the literature that is available is limited and dated. This could be an important observation to make in regards to the current study. It is possible that healthcare provider counseling is lacking in all aspects of patient health. It is also possible that primary healthcare providers understand the importance of such counseling, but the disassociation between knowing the importance and implementing the information is still unknown.

C. Substance Use

Alcohol misuse, risky and harmful drinking, alcohol abuse, and alcohol dependence are all associated with numerous health and social problems, resulting in 100,000 deaths per year (Whitlock, 2004). Primary care providers commonly see patients with a range of alcohol-related risks and problems. A study interested in the efficacy and benefit-cost analysis of Project TrEAT (Trial for Early Alcohol Treatment) observed the effectiveness of brief physician advice for the treatment of problem drinking. Men and women ages 18-65 years were randomly assigned to a control (n=382) or intervention (n=392) group. The intervention group consisted of two healthcare provider visits and two nurse follow-up phone calls. Intervention components included counseling techniques such as a review of normative drinking, patient-specific alcohol effects, a worksheet on drinking cues, drinking diary cards, and a drinking agreement form of a prescription. Subjects in the treatment group exhibited significant reductions ($p<0.01$) in alcohol use. This report of Project TrEAT provides direct evidence that even brief healthcare provider counseling is associated with reduced use of alcohol, suggesting that patient's personal healthcare provider can successfully treat alcohol problems (Fleming et al., 2002).

As previously stated, the lack of literature available on substance abuse counseling could be an important observation. Looking through the literature, there is very little knowledge on the counseling done by primary healthcare providers. With little evidence of primary providers counseling occurring, barriers to counseling patients would make for an interesting study. Based on the information we were able to find, it is possible that there is a dissociation between knowing the importance of counseling patients on health related issues and actually taking the time to do the counseling. More information is necessary.

D. Weight loss

Obesity is an epidemic in the United States that contributes significantly to population morbidity and mortality (Hurt, Kulisek, Buchanan, & McClave, 2010; Scott et al., 2004). Primary healthcare providers see a substantial portion of the obese population, yet rarely counsel patients on how to lose weight (Scott et al., 2004). Many of the same barriers acknowledged in other health related counseling topics exist when it comes to weight loss counseling such as lack of time, training, confidence, and reimbursement (Briscoe & Berry, 2009). Primary healthcare providers have the opportunity to have a huge influential impact on the obesity epidemic. It is estimated that primary care doctors see 11.3% of the United States population every month, and overweight patients are overrepresented in this population (Briscoe & Berry, 2009; Scott et al., 2004). A recent study found that talking about excess weight occurred in 17% of 376 healthcare provider encounters with overweight or obese patients and counseling was done in 11% of 327 encounters with overweight adults and 8% of 49 encounters with overweight children (Scott et al., 2004). This study provides results that show the majority of healthcare providers are not counseling their patients on the important of weight loss for the benefit of overall health.

The majority of scientific information on primary care provider counseling in regards to weight loss is similar in the findings. While most weight loss counseling has significant effects on patients' understanding of the importance of weight loss, the information they are providing is insufficient on weight management strategies. This could be due to the lack of counseling skill and confidence on the matter. In 2001, physicians were asked to identify barriers in regards to weight loss counseling. Huang et al. (2004) conducted a study in two primary care clinics with 30,000 annual outpatient visits at Louisiana State University Health Sciences Center. The researchers recruited a sample of patients age 18 years or older and each with a BMI greater than or equal to 25 for study participation. Seventy-five percent of the patients recalled being counseled by the physician to lose weight; yet only 28% recalled being given specific weight loss recommendations (Huang et al., 2004). Patients with a BMI of 35 or higher or with type II diabetes mellitus were more likely to report being counseled to lose weight than patients who were not ($p<0.03$). Patient-physicians weight loss counseling, although limited, had a significant impact on patients' understanding of obesity and their motivation for weight loss. The findings from this study further confirm previous findings that physicians are not counseling patients on weight loss. Similarly, in Nawaz et al. (2000) where diet was addressed with 50% of subjects (n=433), patients who were asked about their diet were more likely to have changed their fat intake in the past year than those not asked (64 vs. 48%, p=0.002) and were somewhat more likely to have lost weight (46 vs. 37%; p=0.061) (Nawaz et al., 2000). The differences were even greater among 94 overweight subjects (64 vs. 47%; p=0.099) (Nawaz et al., 2000). Again, concluding that physicians have the potential to impact health behaviors, especially those related to diet, resulting in weight loss, through simple discussions during routine checkups.

More recently, (Kraschnewski, Sciamanna, Pollak, Stuckey, & Sherwood, 2013) performed a cross-sectional study using 21, 220 US adult outpatient primary-care visits in 2007-2008, using data from the National Ambulatory Medical Care Survey. Most primary care providers (58%) performed no weight counseling during any patient visits Kraschnewski et al. (2013). Additionally, 8.9% of primary care providers provided 52% of all weight counseling, categorizing them as positive deviant physicians. The patients seeing physicians were older, more likely to be male, have hypertension, diabetes and/or obesity (Kraschnewski et al., 2013). By adjusting for patient characteristics, the association between physician status and receipt of weight counseling during visits was significantly strengthened (adjusted OR=13.2; 95% CI, 11.5–15.7) (Kraschnewski et al., 2013). Concluding that this study further supports the notion that very few primary care providers are providing weight counseling in the United States. Studies such as these could be helpful in identifying a practical method to increase counseling performed by primary care providers in primary-care settings.

Physical Activity and Exercise Is Medicine Campaign

Healthcare is one of eight sectors listed in the United States National Physical Activity Plan that aims to influence physical activity (National Physical Activity Plan Alliance, 2010). Healthcare providers need to contribute to this movement by prescribing physical activity as medicine to help prevent the onset of chronic disease and illness. By prescribing physical activity to patients that are at risk for developing disease, healthcare providers could eliminate the onset of disease, reduce the risk of developing disease, or alleviate preexisting disease in some, if not all, patients (Blair et al., 2012; Sallis, 2009). Physical activity should also be used as prescription when determining how to treat certain chronic disease and illness. Khan et al. (2011) believes physical activity counseling in clinical settings provides “exceptional value for money”. Healthcare providers should assess the exercise habits of every patient they see; making sure each patient understands the health risks associated with inactivity. Unfortunately, healthcare providers have previously adopted another habit of prescribing pharmaceutical drugs to diseases that are caused by modifiable lifestyle changes. The direction healthcare systems have taken allows primary healthcare providers to refer obese patients to bariatric surgeons, completely disregarding the impact a fitness professional could make on their health condition. The influence of fitness professionals early on could provide patients with valuable information on how to modify lifestyle choices that could prevent them from needing bariatric surgery all together.

In 2007, American College of Sports Medicine’s (ACSM) Exercise Is Medicine (EIM) campaign was initiated to promote exercise as a health strategy for the general public (Exercise Is Medicine, 2015b). The campaign hoped to promote a partnership with the American Medical Association that would require healthcare providers and fitness professionals to work together to effectively endorse physical activity to patients as a way to increase their overall health. Exercise

Is Medicine focused on encouraging primary care physicians and other health care providers to include physical activity with designed treatment plans for patients (Exercise Is Medicine, 2015a). The initiative is committed to the belief that physical activity is integral in the prevention and treatment of diseases and should be regularly assessed and treated as part of all routine medical care. If there was one pill that could prevent and/or treat the dozens of diseases we are faced with today, there is no doubt that healthcare providers everywhere would prescribe this pharmaceutical drug to their patients. This miracle pill is also known as exercise or physical activity; however, mainstream medicine has chosen to ignore research on exercise prescription. The overall EIM goal to encourage healthcare providers to take the pledge to assess and record physical activity levels as a vital sign during patient visits (Exercise Is Medicine, 2015a). In order to make the EIM initiative effective, healthcare professionals must identify the barriers to prescribing physical activity to patients and establish ways to overcome those identified barriers.

Many primary healthcare providers are not asking about, counseling about, or prescribing exercise for their patients (Sallis, 2011; Wee, 1999). Since primary healthcare providers are in the best position to provide individualized physical activity prescriptions for their patients, physical activity levels should be assessed as the fifth vital sign during route clinical exams and appointments. In a survey conducted by Walsh et al. (1999) 66% of physicians reported asked more than half of their patients about exercise, 43% counseled more than half of their patients about exercise, but only 14% prescribed exercise for more than half of their patients. The EIM initiative hopes that a new generations of doctors will avoid the knee jerk reaction of prescribing “preventative” drugs as a first response to diseases of inactivity (Exercise Is Medicine, 2015a; Sallis, 2009). When physicians actually address exercise during routine checkups, successful results have varied. In the Nawaz et al. (2000) study, exercise was addressed with 56% of the participants (n=433); however, there was no behavior change associated with discussions of exercise among the participants when physicians brought up simple discussions during routine checkups.

Since physician counseling is a potential avenue to decrease inactivity, potentially increasing overall health, it is important to explore all settings of physician to patient inquiries, including differences in behavior change seen amongst gender and race. Whitt and Kumanyika (2002) published a short review highlighting different studies that aimed to suggest practical approaches for physicians who are interested in increasing patients' physical activity. In the first section of this review, Whitt and Kumanyika (2002) highlighted an article were authors were interested in the high prevalence of morbidity and mortality from diseases that can be reduced with an increase in physical activity. This study used 214 low-income, African-American women and randomly assigned participants to either the home-based physical activity intervention (self-help print materials, five print materials, two telephone counseling sessions) or an attention control condition, which promoted healthy diet (Whitt & Kumanyika, 2002). Due to the high prevalence of physical inactivity among this particular group, there is a significant need for profitable strategies to eliminate physical inactivity for the betterment of their health (Whitt & Kumanyika, 2002). This article emphasized the healthcare providers' role in physical activity counseling, summarizes current recommendations, discusses common barriers to regular physical activity, and suggests potentially effective strategies for activity counseling. African-American women are at an increased risk for developed chronic diseases that often times lead to disability or death; however, many of these health-related issues could be ameliorated with an increase in physical activity (Whitt & Kumanyika, 2002). In the NHANES I Epidemiologic follow-up study, the age-adjusted relative risk for developing CHD among African-American women, ages 25-54 years was 1.8 times that of Caucasian women (Whitt & Kumanyika, 2002). Furthermore, African-American women, ages 45-69 years have death rates from heart failure that are approximately 3.7-4.3 times those of Caucasian women, this is also higher than those found in Caucasian men (Whitt & Kumanyika, 2002). When examining at the age-adjusted relative risk for developing hypertension over a 10-year period, African-American women were at a 2.33 greater risk compared to Caucasian women, with this disparity even more pronounced among African-American women less than 35 years (Whitt & Kumanyika, 2002). Additionally, the years of potential life lost to diabetes before age 75 was three times higher in African-American women than Caucasian women (314 vs 104 per 10,000) (Whitt & Kumanyika, 2002). The differences in these health statistics are suggestively due to the lack of physical activity performed by African-Americans and women, with African-American women being most physically inactive. In the 1992 BFRSS, African-American women reported sedentary behavior (no participation in leisure-time physical activity) more often than Caucasian women (42.7% vs 28.2%, respectively) (Whitt & Kumanyika, 2002). In a telephone survey including 745 African-American women over 40 years, 57% of African-American women compared to 47% of Caucasian women were classified as inactive (Whitt & Kumanyika, 2002). Among African-American women enrolled in the Black Women's Health Study, a cohort of 64,000 African-American women who completed a mailed survey, 57% reported walking for exercise less than one hour per week, 18% reported less than one hour per week of moderate activity, and 61% reported less than one hour per week of strenuous activity (Whitt & Kumanyika, 2002). Additionally, 19% reported no walking for exercise during the week, 2% reported no moderate activity during the week, and 34% reported no strenuous weekly activity (Whitt & Kumanyika, 2002).

Healthcare providers, including physicians, physician's assistants, nurses, and nurse practitioners, have the opportunity to play an important role in encouraging increased physical activity among all adults. In 1999, 756,700,000 annual office visits were made to physicians; an average of 2.8 visits per person annually (Whitt & Kumanyika, 2002). Therefore, on average, healthcare providers potentially have 3 occasions per year to counsel a given individual about the importance of increasing physical activity levels. Despite all of these statistics, data from the CDC National Ambulatory Medical Care Survey indicated that in 1995, only 19.1% of 29,273 routine office visits among individuals 20 years and older included physical activity counseling from physicians, indicating that African-Americans and women were less likely to be counseled than any other group (Whitt & Kumanyika, 2002). However, in 1998, three years later, the National Health Interview Survey reported 52% (n=6,154) being asked about physical activity or exercise by their physician during a routine checkup (Whitt & Kumanyika, 2002). Those who were asked about physical activity or exercise by their physician were 1.7 (95% CI, 1.5-2.0) times more likely to engage in recommended amounts of physical activity than those who were not asked about physical activity at all (Whitt & Kumanyika, 2002). This suggests that physicians counseling behavior has an important influence on their patients' health.

Studies of this issue have established that healthcare provider counseling is effective in increasing physical activity participation, predominantly among previously sedentary individuals. Another study highlighted by Whitt and Kumanyika (2002) was the Provider-Based Assessment and counseling for Exercise (PACE) study. The PACE study was designed to promote adoption and maintenance of physical activity through 3- to 5-minute structured physician counseling sessions is an example of how physician counseling can be most effective for previously sedentary individuals (Whitt & Kumanyika, 2002). Patients who received physician counseling increased their walking by an average of 37 minutes per week, while patients who did not receive counseling increased their walking by only 7 minutes per week (Whitt & Kumanyika, 2002).

Another study, based in Australia, tested the effectiveness of 2 to 3 minute verbal advice about exercise importance by family physicians to sedentary patients (Bull & Jamrozik, 1998). There was a combined intervention group receiving either a tailored or standard pamphlet in the mail as a follow-up to the verbal advice, and a control group receiving neither advice nor a pamphlet (Bull & Jamrozik, 1998). There were significantly more patients who received the tailored pamphlet reporting doing some activity at one and 6 months after the physician consultation when compared to the participants who received the standard pamphlet (Bull & Jamrozik, 1998). Follow-up at 1 month revealed a significant difference between the control (31%) and the combined intervention group (40%) in the extent of those patients that were "now active" (Bull & Jamrozik, 1998). This significant difference was still apparent at 6 months (30% vs 38%); however, at a 12-month follow-up to the study, although more subjects in the combined intervention group (36%) reported being physically active compared with the control group (31%), the difference was no longer significant (Bull & Jamrozik, 1998). This particular study further concludes what many know to be true, a simple intervention in general practice aimed at the promotion of increased physical activity in sedentary patients can help reduce inactivity.

The review continues to touch on personal barriers African-American women face to physical activity, tailored approaches to physical activity counseling, current physical activity recommendations, educating patients properly, and desired outcomes (Whitt & Kumanyika, 2002). Addressing all of these issues is important in furthering our understanding of healthcare provider counseling successes and failures. However, despite the apparent success seen in the literature provided by this review, much more emphasis on this issue during routine clinical encounters is strongly encouraged by the authors. It is important we investigate all scenarios based on race and gender, with socioeconomic status and environment potentially providing additional barriers to be further researched.

Of course, the lack of knowledge on racial, gender, socioeconomic status, and environmental behavior differences are not the only barriers healthcare providers and researchers are faced with when attempting to implement physical activity counseling and prescription for their patients. As previously stated, benefits of physical activity are well established but research indicates that Americans are not heeding the message, and new strategies are necessary to bring about change in this field. Phillips and Kennedy (2012) addresses the importance of adopting new strategies that will resonate with Americans, moving them towards achieving the physical activity recommendations as people continue to suffer from diseases related to inadequate levels of physical activity. The evidence base describing the benefits of exercise and physical activity continues to mount, and it is time we subscribe to the significance of these findings. As we well know, the healthcare community can and should play a key role in this Exercise Is Medicine movement. Physicians have a reputation with patients as credible sources of information and look to them for health-related guidance (Phillips & Kennedy, 2012). Unfortunately, many physicians are not talking to their patients about physical activity and are missing an exclusive opportunity to raise awareness about its health benefits (Phillips & Kennedy, 2012).

The possibility of lack of exercise prescription in the United States could be due to lack of sufficient results as of date. Countries outside the United States have been more interested and showed more progress in Exercise Is Medicine since the start of the initiative. These countries have produced more literature using scientific data to determine the effectiveness of EIM. A two-year intervention study in the Netherlands assessed the impact of personalized exercise prescription on habitual physical activity and glycemic control in sedentary, insulin treated type II diabetic patients (Wisse et al., 2010). There were 74 patients, randomized to the intervention (n=38) or the control (n=36) group. The intervention group was encouraged to increase daily physical activity through personalized exercise prescription using a physical therapist. The results from this study were not good for EIM activists (Wisse et al., 2010). Total PA levels increased over the two-year period in both groups, with no differences between groups, the latter increases are attributed to more leisure time activities (from 23± 5 and 15 ± 3 towards 39 ± 6 and 33 ± 4 MET/week, respectively) (Wisse et al., 2010). Furthermore, no significant changes were observed in reported physical activity levels at work for either group and in accordance, neither fasting blood glucose nor HbA1c contents had changed significantly (Wisse et al., 2010). There were also no significant effects observed in exogenous insulin, metformin, and/or other medication use (Wisse et al., 2010). In regards to the effects of physical activity on type II diabetes, this study concluded that providing individualized exercise prescription is not sufficient to change sedentary behavior and/or improve glycemic control in insulin treated, type 2 diabetes patients (Wisse et al., 2010).

Some studies suggest that healthcare providers' personal health habits influence the counseling they give to their patients. Stevenson and McKenzie sent a one-page survey to a random sample of 176 primary care physicians. The survey addressed physicians' exercise profiles and counseling behavior (Stevenson & McKenzie, 1992). Only 39.1% of these primary care providers met the ACSM guidelines for adequate amounts of exercise with more than 80% citing barriers to exercise regimens. Only 28.9% of providers thought they exercised enough (Stevenson & McKenzie, 1992). Despite the proven benefits of exercise, healthcare providers are not exercising enough; however, healthcare providers' own exercise habits did not appear to influence counseling behavior. A surprising 92.9% of providers said they asked patients some or all of the time about their physical activity habits and 84.3% believe physical activity is very important to overall health. Healthcare providers were not, however, optimistic about changing their patient's physical activity behavior (Stevenson & McKenzie, 1992).

Contrary to the results from Stevenson and McKenzie (1992), (Karvinen, DuBose, Carney, & Allison, 2010) found that oncologists who were more physically active increased talking to patients about physical activity. Karvinen et al. (2010) mailed 702 questionnaires to medical and radiation oncologists throughout the United States, 199 oncologists returned the questionnaires. The highest rated benefits by participating oncologists were that physical activity might improve a patients' mental health and their ability to perform daily tasks. The biggest barriers to promotion among physical activity with participating oncologists were lack of time and belief that patients were not interested Karvinen et al. (2010). Results from this study indicated that oncologists who were physically active were more likely to promote physical activity than those that were inactive (70.2% vs 54.6%; p=0.037) (Karvinen et al., 2010). Additionally, Abramson et al. (2000) concluded that providers with higher levels of physical activity are more likely to counsel their patients to increase their physical activity levels. Primary care providers who performed aerobic and strength training exercises were more likely to counsel patients about these exercises than those who did not (Abramson, Stein, Schaufele, Frates, & Rogan, 2000).

It has already been noted that non-communicable chronic disease are the leading causes of death in the world and according to a 2004 report from the World Health Organization there were 58.8 million deaths worldwide due to non-communicable diseases (Joy, Blair, McBride, &

Sallis, 2013). The top five risk factors and corresponding number of deaths attributed to each were high blood pressure (7.5 million), tobacco use (5.1 million), high blood glucose (3.4 million), physical inactivity (3.2 million) and overweight and obesity (2.8 million) (Joy et al., 2013). However, recent reviews have reported even higher numbers of non-communicable diseases are attributable to physical inactivity, with recent calculations estimating 5.3 million deaths/year due to inactivity (Joy et al., 2013). If the prevalence of inactivity was decreased by 25%, 1.3 million deaths/year could be prevented (Joy et al., 2013). With the prevalence of inactivity rising, and healthcare providers' counseling frequency staying the same or decreasing, researchers need to further explore an important barrier to this dissociation. The potential of healthcare providers' personal physical activity level and their likeliness to prescribe exercise to patients drawing a direct correlation needs to be addressed, and hopefully will be further explored in this current study. Joy et al. (2013) further investigated the importance of physical activity counseling, benefits of physical activity on health, addressed barriers to physical activity counseling, and initiated a call to action. One of the most influential calls to action this article suggest is encouraging healthcare providers to be active.

Studies have consistently demonstrated a positive association between personal physical activity habits of both medical students and practicing physicians and physical activity counseling behaviors (Joy et al., 2013). A prospective survey of a representative sample of US medical students from 16 schools (n=2316) was designed to determine health-related attitudes and practices (Frank, Tong, Lobelo, Carrera, & Duperly, 2008). The students' physical activity levels were assessed using a Godin exercise questionnaire and an 80.3% (n=1658) response rate was achieved during the 4-year study (Frank et al., 2008). The results from the study showed that 61% of US medical students adhered to CDC Physical Activity Recommendations, and that this rate was relatively stable during the 4-years of medical school (Frank et al., 2008). Frequency of physical activity counseling of patients was consistently related to personal physical activity practices ($p<0.0001$) (Frank et al., 2008). However, medical students that perceived physical activity counseling would be highly relevant to their practices decreased physical activity during the 4-years of medical school, from 69% to 53% ($p<0.01$) (Frank et al., 2008). Physicians are in a critical position to help patients develop a healthier lifestyle by actively counseling on physical activity (Joy et al., 2013). This study focused on sports medicine physicians, who focus on sports and exercise medicine, and are uniquely trained to provide exercise to patients, students, and colleagues (Joy et al., 2013). In order to succeed in decreasing physical inactivity among patients, physicians need clinical tools and processes that support physical activity assessment and counseling, like Phillips and Kennedy (2012) previously outlined (Joy et al., 2013). A key strategy is linking patients to community resources, specifically to health and fitness professionals. Neither the Joy et al. (2013) article nor the Frank et al. (2008) article further investigated the association between healthcare provider physical activity counseling and healthcare provider physical activity levels. Further investigation on this relationship could be a key component in determining why there is a lack of physical activity counseling and exercise prescriptions despite ample knowledge supporting increased physical activity leading to increased overall health.

Healthcare providers advice has consistently been shown to lead to attempts in improving lifestyle (Phillips & Kennedy, 2012). More specifically, a physician’s advice has been cited as a powerful motivator to increase physical activity, mainly due to perceived physician credibility and authority (Phillips & Kennedy, 2012). According to a paper published in the Annals of Internal Medicine, 92% of patients agreed or strongly agreed with this statement: “If my doctor advised me to exercise, I would follow his or her advice" (Phillips & Kennedy, 2012). Physical activity should be discussed as a serious form of treatment, like medication is so frequently, and should be attentively prescribed to every patient for his or her benefit (Phillips & Kennedy, 2012). Given that 70% of adults report at least one physician visit a year, it is unfortunate that healthcare providers are not taking advantage of the opportunity to counsel patients on the importance of physical activity (Phillips & Kennedy, 2012). Only 1 in 3 patients indicated that they have been received simple advice on increasing physical activity participation (Phillips & Kennedy, 2012). The percentage of adults advised to exercise increased from 22.6% in 2000 to 32.4% in 2010, almost a 10% increase over the decades time (Barnes & Schoenborn, 2012). When observing trends in receiving a recommendation for exercise or other physical activity from a physician or other health professional based on gender, both males and females saw a significant increase. In 2010, 30.3 % of male adults aged 18 years and older were recommended exercise or physical activity by their physician, which is a significant increase since 2000 (22.6%) (Barnes & Schoenborn, 2012). Females also saw a significant increase in physical activity counseling from physicians from 2000 (23.9%) to 2010 (34.1%) (Barnes & Schoenborn, 2012). In fact, when looking at age, race/ethnicity, and chronic health condition the percentage of adults aged 18 years and older whose physician or other health professional recommended exercise or physical activity all rose significantly. Ages 18-24 years increased occurrence of physical activity counseling from a physician from 10.4% (2000) to 16.1% (2010), ages 25-44 years increased from 20.9% (2000) to 28.8% (2010), ages 45-64 years increased from 28.9% (2000) to 41.6% (2010), ages 65-74 years increased from 29.2% (2000) to 41.9% (2010), ages 75-84 years increased from 21.6% (2000) to 32.9% (2010), and ages 85 years and older increased from 15.3% (2000) to 28.9% (2010) (Barnes & Schoenborn, 2012). Moving on to trends based on race/ethnicity, Hispanics saw an increase from 20.8% (2000) to 35.8% (2010), Non-Hispanic white increased from 22.8% (2000) to 31.5% (2010), Non-Hispanic black increased from 21.9% (2000) to 34.0% (2010), and Non-Hispanic Asian increased from 21.2% (2000) to 32.7% (2010) (Barnes & Schoenborn, 2012). Receiving advice to exercise increased for adults with hypertension (34.1% to 44.2%), CVD (32.5% to 41.2%), cancer (25.5% to 35.8%), type II diabetes (47.7% to 56.3%), and obesity (34.8% to 46.9%) (Barnes & Schoenborn, 2012). Although increases were noted for every population and health condition group studied, these increases were larger for some groups than others. The increases in these trends over the past 10 years suggest that the medical community is making an effort to increase recommendations in participation of exercise and other physical activity that has shown health benefits. Still, the prevalence of receiving advice or prescription referrals remains well below one-half of U.S. adults and substantially varies across population subgroups (Barnes & Schoenborn, 2012).

Phillips and Kennedy (2012) stated that physicians concern for patient safety is one of the leading barriers to exercise prescription; however, the benefits of physical activity are clear and far outweigh the inherent risk of adverse events. The most common type of adverse event in regards to physical activity is a musculoskeletal injury; however, most of these injuries prove to be mild (Phillips & Kennedy, 2012). There are more serious adverse events related to physical activity and/or exercise such as sudden cardiac death and myocardial infarction; but, these events are extremely rare and are usually related to inappropriate intensity levels (Phillips & Kennedy, 2012). Of course these risks are significantly minimized if the patient is regularly active and there is consistent evidence signifying a 25% to 50% reduction in adverse cardiovascular events in individuals who routinely participate in physical activity (Phillips & Kennedy, 2012).

The importance of this article is that the authors indicate how physicians could effectively prescribe physical activity and/or exercise to their patients in a safe, effective manner. Since the risks of remaining sedentary are greater than the risks of becoming active, the initial screening process should not allow for patient hesitation in initiating in low- or moderate-physical activity (Phillips & Kennedy, 2012). Although physician's already have access to patients medical history, it could be helpful to use a screening tool such as the Physical Activity Readiness Questionnaire (PARQ) to help further identify those at an increased risk (Phillips & Kennedy, 2012). In addition to the PARQ, a self-guided, 7-question survey considered to be the international standard pre-participation screening instrument, patient's level of risk should be carefully assessed with a focus on cardiovascular, pulmonary, and metabolic health (Phillips & Kennedy, 2012). Identifying this patient information will allow the identification of personal level of risk for exercise and/or physical activity and the final step in the screening process should be to understand patients current level of physical activity (Phillips & Kennedy, 2012). Phillips and Kennedy (2012) addresses this process as the "physical activity vital sign," indicating that these issues should be incorporated into all physician visits just as blood pressure, heart rate, pulse rate, etc. are.

Phillips and Kennedy (2012) continues stating, "An exercise prescription should follow a format similar to that of a medication prescription," including type of activity, frequency, intensity, and duration of participation, and any precautions to consider. The FITT principle (Frequency, Intensity, Time, and Type) serves as a brilliant template physicians could use to write individualized exercise prescriptions (Phillips & Kennedy, 2012). The articles goes on to address each of these components in detail, addressing how physicians should use them to their maximize benefit for individualized patients. These authors advocate and guide healthcare providers in expanding their skill set to prescribe exercise for the broader population and address the pandemic of sedentary behavior (Phillips & Kennedy, 2012). It is necessary that physicians be familiar with the level of exercise necessary to achieve health benefits as defined by the Physical Activity Guidelines for Americans and, at minimum, assessing physical activity as a vital sign (Phillips & Kennedy, 2012). By assessing physical activity as a vital sign, patients begin to process and think about their own activity level, guiding the initial conciliation for exercise prescription (Phillips & Kennedy, 2012). Furthermore, healthcare providers should be capable of identifying patient's level of risk for starting or increasing exercise, allowing for guidance on FITT recommendations available for the patient that will safely elicit maximum health benefits (Phillips & Kennedy, 2012). There is no excuse for these basic competencies to be understood by physicians and incorporated into their practice, as they are well-versed professionals and resources have been established to help support healthcare providers adopt this process (Phillips & Kennedy, 2012). This is a skill-set that should be used for every patient, in an effort to reduce the widespread prevalence of chronic diseases associated with physical inactivity (Phillips & Kennedy, 2012). Additional research is needed to identify why healthcare providers are not adopting physical activity as a vital sign during routine checkups. Looking into healthcare providers barriers to this exercise prescription could be beneficial to answering lingering questions on this controversial matter.

Conclusion

The rate of counseling by healthcare providers is nationally low (Wee, 1999). The use of physical activity prescriptions needs to be improved in order to support chronic disease management and all-cause mortality among our population (Calfas et al., 1996; Khan et al., 2011). A study examined and identified factors associated with physical activity counseling by

United States healthcare providers (Wee, 1999). Out of 9,299 respondents, 34% reported being counseled about physical activity at their last visit. Older patients (>30 years) were counseling more often than younger patients and those aged 40 to 49 years were counseled most often (OR 1.71; 95% CI, 1.34-2.20) (Wee, 1999). This review of literature provides scientific evidence that, although physical activity is beneficial to our physical and mental health, the majority of our healthcare providers are not counseling and prescribing physical activity to their patients. The current literature is limited in determining what barriers prevent healthcare providers from counseling and prescribing physical activity. There is also diminutive literature acknowledging if healthcare providers' personal physical activity levels are playing a key role in the present or absence of physical activity prescription.

Chapter III- Methods

Participants

The participants in this study were healthy male and female volunteers with an occupation falling under those considered primary healthcare provider. This included and was limited to physicians, physician assistants, and nurse practitioners. Requirements of the participants included the ability to directly prescribe medicine to patients and at least 22 years of age. Participants were excluded from study enrollment, if they were under the age of 22 years old, and if they did not have the ability to prescription medication to patients (i.e., nurses). There were 30 participants enrolled in the study; 16 physicians, 6 physician assistants, and 8 nurse practitioners.

Procedure

Flyers, word of mouth, social media and healthcare provider promotion at local offices, clinics, and hospitals were used to recruit study participants. Since the current study was interested in identifying a relationship among variables, healthcare providers' barriers and healthcare providers' physical activity level, we used correlation research as our research method. An informed consent document, a demographics questionnaire, and the short version of IPAQ and were completed before the start of the physical activity data collection. Upon completion of the initial questionnaires, participants were given a pedometer, pedometer instructions, and a pedometer wear log. Participants' physical activity levels were measured over the course of one week (7 days). Once the week's physical activity monitoring period was completed, participants were asked a series of questions regarding their barriers to prescribing physical activity as medication to their patients. The online barriers questionnaire aimed to identify barriers primary healthcare providers have to prescribing physical activity as medicine.

Below is a table outlining what occurred at each visit:

Visit 1:	Visit 2:
•Present informed consent document to participant (get document signed) •Take participant's height, weight, and waist/hip circumferences •Have participant complete online demographic/health history questionnaire •Provide information on Pedometer and wear log •Remind participant to maintain his/her regular, everyday lifestyle & activity level •Set up time/location for 2nd visit	•Collect pedometer and pedometer log •Explain barriers to physical activity questionnaire •Have participate complete barriers to physical activity questionnaire •Have participants sign for gift card

Physical Activity Measurement Protocol

Physical activity as defined by ACSM (Pescatello, Arena, Riebe, & Thompson, 2013) as any bodily movement produced by the contraction of skeletal muscles that result in a substantial increase over resting energy expenditure. Healthcare providers' physical activity level will be assessed using a New Lifestyles NL-1000 activity monitor pedometer which utilizes a piezoelectric accelerometer strain gauge to measure step counts and compute moderate-to-vigorous physical activity time. Validity of step counts obtained by NL-series pedometers has been demonstrated with middle aged and older populations (Kowalski, Rhodes, Naylor, Tuokko, & MacDonald, 2012). To establish participants average daily physical activity level, all subjects were instructed to wear a pedometer at the waist on either a belt or elastic band for 7-consecutive days, during all waking hours. This pedometer is the best option for the study because it is a medical-grade accelerometer and is more tolerant of where it is worn, so it is more versatile for different body shapes. Healthcare providers will wear the pedometer for one full week (7 days) to determine if minimum physical activity guidelines are being obtained. The NL-1000 activity monitor pedometer counts steps, estimates walking distance, and records moderate-to-vigorous activity in minutes. The average activity in minutes per day and the total MET-minutes per week were obtained using a pedometer and IPAQ short results. This pedometer is capable of recording steps per day and total activity minutes per day. Total MET-min per week was calculated using the IPAQ short guidelines. We were interested in the moderate-to-vigorous activity minutes per week healthcare providers are achieving. We set the one-week duration based on the automatic seven-day memory that the NL-1000 activity monitor pedometer has. The duration was also set because data from a one-week time span is easily comparable to the 2008 Physical Activity Guidelines which is set total number of minutes over one week.

Questionnaires

The International Physical Activity Questionnaire (IPAQ) was established in August 2002. We used the English short last seven days self-administered format (Sjöström et al., 2004) (Appendix B). This questionnaire is for use with young and middle-aged adults (15-69 years), which fits the criteria for this study. The reliability of the IPAQ short self-administered version is 0.75 and the validity is 0.30 (Craig et al., 2003).The IPAQ short asks about three specific types of activity undertaken in the following four domains: a) leisure time physical activity, b) domestic and gardening (yard) activities, c) work-related physical activity, and d) transport-related physical activity (Craig et al., 2003). The Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) explains that the items in the Short IPAQ form are structured to provide separate scores on walking, moderate-intensity and vigorous-intensity activity (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire, 2005). (Pate et al., 2005) For this study, per the guidelines, computation of the total score for the Short form used the summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire, 2005). In order to calculate participants' Total MET-min per week the IPAQ short version guidelines were used. There are three formulas used to determine walking MET-min/week, moderate MET-min/week, and vigorous MET-min/week. To get the total MET-min/week the sum of these three scores at work is calculated. To determine the categorical score of the Short IPAQ form, three levels of physical activity are used to classify populations, low, moderate, and high (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire, 2005). The high category is computed using higher levels of participation. There are two criteria for classification as "high:" a) vigorous-intensity activity on at least 3 days achieving a minimum total physical activity of at least 1500 MET-min/week or b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-min/week (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire, 2005). The participants classified as moderate followed any of the following criteria: a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day or b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day or c) 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities (Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire, 2005). Those participants classified as low achieved the lowest level of physical activity possible and did not meet any of the above criteria described under moderate or high categories.

The physical activity counseling barriers questionnaire was modified using a questionnaire found in the literature by Karvinen et al. (2010) (Appendix E). This questionnaire was modified to fit the current study, since Karvinen et al. (2010) aimed to identify oncologist barriers to recommending physical activity to patients with breast cancer as the current study aimed to identify barriers healthcare providers face when prescribing to any patient. The original questionnaire did not use the questionnaire responses as a scoring mechanism, instead identified correlations of Oncologists' Physical Activity Promotion Practices. There were two major questions assessed and each of these questions contained 8 subgroups. The first four sub questions in the table assess the level of importance in which participants hold viewpoints towards physical activity The next four questions addressed the healthcare providers barriers to counseling and prescribing patients on physical activity. In order to score the barriers to prescribing physical activity to patients' total score was obtained by taking the sum of the total score, consisting of 8 questions ranging from 0-4. The highest possible score was a 32, indicating a lot of barriers to prescribing or counseling patients about their physical activity levels.

Statistical Analysis

Means and standard deviations were calculated for demographic variables, such as age and physical activity levels. Demographics data was also used to determine frequencies and percentages of marital status, gender, income, education level, # of children, occupation, occupational setting, obesity status, and physical activity classification from the IPAQ. This study used correlation research, as it explores relationships among variables that may predict a criterion variable. The following analyses were completed: a) frequency of healthcare providers inquiry about patient PA levels week, b) frequency of patient PA inquires based on health care providers PA level from the IPAQ, c) correlation between health care providers' total PA counseling barriers score and the healthcare providers PA levels from the IPAQ (average minutes/day and total MET-minutes/week), and d) frequency of healthcare providers barriers for PA counseling. To determine correlation results, Cohen's guidelines of r= 0.1, 0.3, and 0.5 for small, moderate, and large relationships were used (Valentine & Cooper, 2003). The statistical significance level was set at $p<.05$.

Chapter IV- Results

Participants

A total of 30 participants were used in this study. A total of 32 participants were screened prior to data collection and a total of 30 participants completed the study. Two participants were excluded from the study post screening because they were nurses, holding a bachelor's of science, and were unable to directly prescription medication to patients. Of the 30 participants, all data was used from 28 participants, partially excluding two participants that left answers blank on the IPAQ questionnaire, making it impossible to score. This information is displayed in the cohort table below (Figure 1).

Descriptive Statistics on Demographics

Details of descriptive statistics on demographic and personal information are displayed in Table 1. The participants' average age was 49.9 ± 9.8 years and consisted of pediatricians (n=6), physician's assistants (n=6), and nurse practitioners (n=6). Other participants included general practitioner (n=5), radiologist (n=2), registered nurse (n=2), occupational medicine (n=1), obstetrician gynecologist (n=1), and urologist (n=1). Occupational location varied greatly among participants. When looking at the different occupation settings, most participants worked in a hospital or a clinic (26.7%). Fifty percent of participants completed professional/doctoral education, 46.7% completed graduate school, and only 3.3% completed only undergraduate school. The majority of participants were female (70%), married and had two or more children (73%). Fifty-three percent of the sample was white, 86% had an income of $100,000 or greater, and half had a normal BMI classification and half were either overweight or obese (Table 2). Table 3 shows the physical activity levels of the participants. Overall the participants were active as they achieved over 10,000 steps per day. Based off the IPAQ the health care providers were physically active as 55.2% were considered highly active where only 3.4% were considered low active.

Frequency of Healthcare Providers' Prescribing/Addressing Physical Activity

There was a pivotal question included on the barriers questionnaire that did not serve to address the type of barriers providers' were faced with, but instead it aimed to determine how often healthcare providers' were already inquired about patients physical activity levels. This question asked healthcare providers' how often they inquire their patients about their physical activity level. The response choices ranged from never, on some visits, on most visits, and on every visit. The results from this question are seen in Table 4. More than half of the participants in the current study said they inquired about patients' personal physical activity level on most visits.

The Relationship between Physical Activity and Healthcare Providers Barriers

Table 5 displays the healthcare providers' physical activity level relative to how frequently they inquire about patients' physical activity levels. In short, healthcare providers with low physical activity levels only inquired about their patent's physical activity levels 3.4% of all visits, those with moderate physical activity levels inquired 34.5% of visits, and those with high physical activity levels inquired 55.2% of visits. Thus, healthcare providers who are more active asked about their patient's physical activity habits more than healthcare providers with low physical activity levels.

Table 6 shows the correlations between healthcare providers' physical activity levels and the total physical activity counseling barriers score. The correlation between healthcare providers' physical activity counseling barriers and personal physical activity level was weak and not statistically significant. There was no statistically significant relationship between total amount of barriers and average activity level min/week or total MET-min/week.

Frequencies of Healthcare Provider Personal Barriers to Prescribing Physical Activity

Looking at the results in Table 7 and Table 7a, it is interesting to note that for the first four questions, more than 50% of the healthcare providers believed physical activity “very much” influenced each of the following: attenuating physical declines, improving ability to do daily tasks (e.g., carry groceries), helping patients cope with daily stressors, and reducing the risk of reoccurring illness or disease. There were 33.3% of participants that felt lack of time during office visit was “somewhat” the reason for lack of prescription/counseling and 33.3% felt that lack of time during office visit was “very much” the reason. Thirty percent of participants felt that “not at all” unsure what to recommend was a barrier to lack of prescription and only 3% felt that “very much” in terms of the same thing. On the last barrier, not sure physical activity can help, 66.7% of respondents felt this was “not at all”, 23.3% felt this was “a little bit”, 3% felt this was “somewhat”, and 6.7% felt this was “quite a bit” the reason(s) for lack of counseling/prescription when in terms of physical activity. It is believe there was an error in the wording of this question, making participants unsure what it was really asking.

Chapter V: Discussion

Previous research has identified despite common knowledge that physical activity is beneficial for physical and mental health, over 60% of American adults are not regularly active with 25% of the adult population being completely sedentary (Centers for Disease Control, 2014). It is well known that healthcare providers have the potential to impact health behaviors, with research showing the effects they have had related to diet, smoking, and alcohol use (Anis et al., 2004). With the lack of physical activity prescription from physicians and other healthcare providers given the rate of chronic disease and obesity, it is important to understand why healthcare providers are struggling to prescribe and counsel patients on physical activity promotion. The purpose of the study was to examine healthcare providers' barriers to prescribing physical activity to patients. This was done using a self-constructed barriers questionnaire and assessing healthcare providers' physical activity levels over the course of 7 days using self-reported physical activity levels.

In terms of what barriers healthcare providers are faced with when it comes to lack of counseling, lack of time was identified as the most prominent barrier. Following by lack of time was the healthcare providers' perception that the patients were not interested. These findings are similar to those of Karvinen et al. (2010) that also found lack of time during office visits and belief that patients were not interested as the most prominent PA counseling barriers. The current study concludes that there was no association between more physically active providers' and number of barriers. It also concludes that even providers' that are physically active are struggling to prescribe physical activity to their patients.

Highly active healthcare providers inquire about their patient's physical activity levels 55% of the time, but only about seven percent of all healthcare providers ask about physical activity at every visit. This finding is similar to what was reported by the National Health Interview Survey (Whitt & Kumanyika, 2002). They reported 52% of patients reporting being asked about physical activity or exercise by their physician during a routine check-up (Whitt & Kumanyika, 2002). The relationship between health care providers' physical activity and PA counseling barriers was examined. The results indicated that there was no relationship between healthcare provider's physical activity level and barriers for PA counseling. With no correlation, this strikes an interesting conclusion that even healthcare providers that are physically active struggle to prescribe or counsel patients on physical activity. These study results are in contrast to a study by Abramson et al. (2000). These authors found that physicians who performed aerobic exercise regularly themselves were more 5 times more likely to counsel their patients about aerobic exercise than those who did not perform aerobic exercise (OR 5.72; 95% CI 2.41–13.54) (Abramson et al., 2000). Moreover, the National Health Interview study reported that patients who were asked about physical activity or exercise by their physician were 1.7 (CI 95%, 1.5-2.0) times more likely to engage in recommended amounts of physical activity than those not asked about physical activity (Whitt & Kumanyika, 2002).

The findings of the present study reveal some insights into physical activity counseling barriers of healthcare providers. Although many healthcare providers recommend physical activity to most patients there is still a substantial percentage that do not. Findings from this study indicate that the hypothesis cannot be fully answered due to the results of no correlation. However, generally healthcare providers that are more physically active are more likely to inquire about patients' physical activity level. Further investigation on the effects of specific barriers influencing physical activity counseling may be an appropriate topic for future research.

This study was limited to the geographic location of Greenville, North Carolina. A physically active graduate student recruited participants for this study, it is plausible that mainly active healthcare providers' were interested in participating in the study. Thus, it is possible that a recruitment and/or participation bias occurred. Other limitations included low sample size and possibly homogenous PA levels. Additionally, the primary variables of interest were subjective; meaning participants were trusted to respond with accurate and honest answers. Participants could have over or under exaggerated answers. A major strength of this study is its variety. A total of 30 participants were used, ranging from pediatricians, physician's assistants, and nurse practitioners', general practitioner, radiologist, registered nurse, occupational medicine, obstetrician gynecologist, and an urologist. There was also great variability in occupational setting ranging from hospital, to clinic, to private practice. Using the IPAQ allowed the current study results to be compared the findings with previous research. Having pedometer data confirmed the PA levels reported in the IPAQ.

Conclusion

The current findings provide novel discoveries within the topic of physical activity prescription and counseling among primary healthcare providers. While there is still huge disconnect between healthcare providers and patients receiving physical activity information, whether it be counseling, prescription, or education, the current study concluded that even active, seemingly healthy providers are not participating in physical activity prescription. Lack of physical activity is a growing public health concern. There is clear scientific evidence proving that physical activity is beneficial for an individual's physical and mental health. Regular physical activity can prevent the onset of chronic diseases such as type II diabetes, hypertension, and osteoporosis, just to name a few (Samitz et al., 2011; Warburton et al., 2006). Physical activity can be used as to manage certain chronic diseases, such as depression, diabetes, and obesity (Blair et al., 1996; Warburton et al., 2006).With no relationship between provider barriers for PA counseling and their personal physical activity levels, there is a dire need to determine why healthcare providers are still falling short of physical activity promotion. While some barriers to physical activity counseling were identified, further research is needed to determine why even those providers that are active, and understand physical activity as a benefit, are still not counseling patients to be physically active.

Tables and Figures

Figure 1

Figure 1. Cohort Table of Participant Inclusion/Exclusion

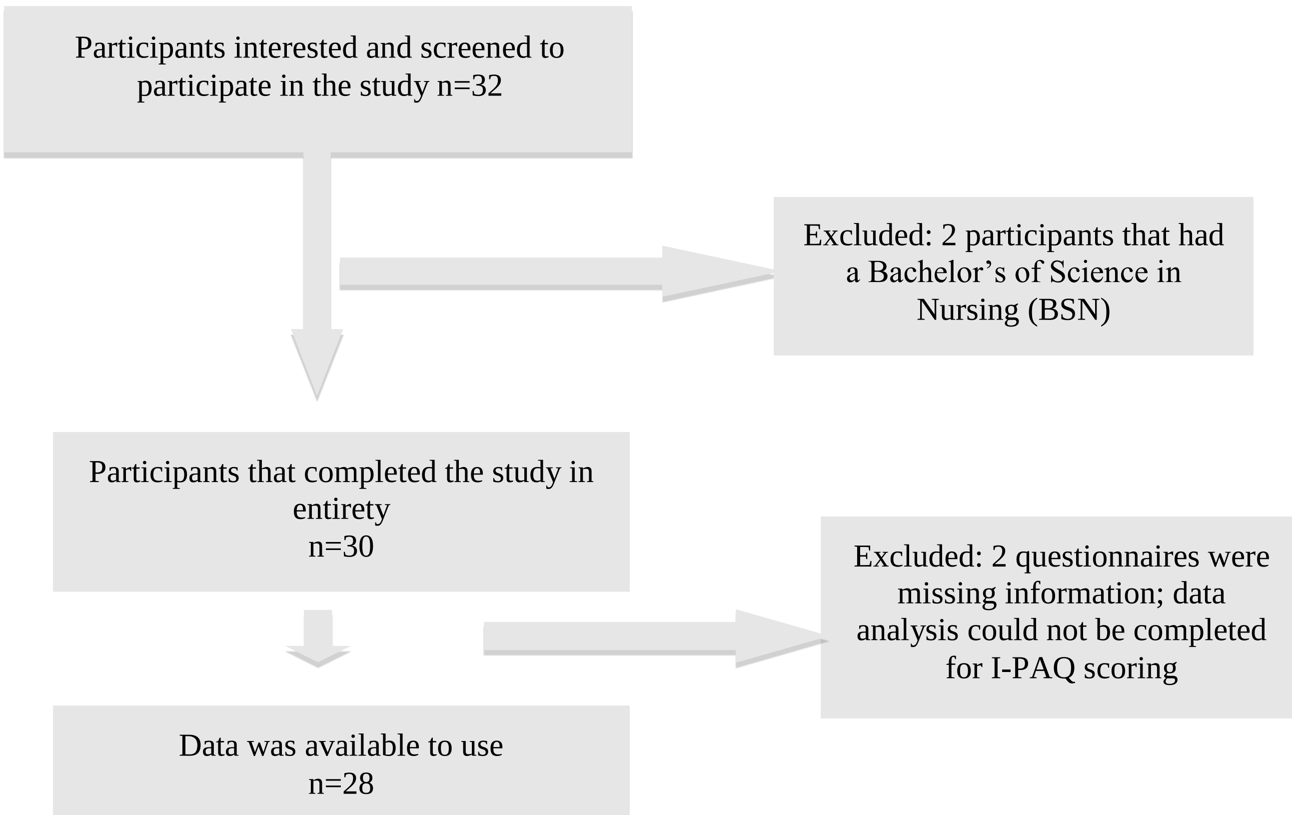

Table 1

Table 1. Demographics			
N=30		*N*	%
Race	Black or African American	4	13.3
	Asian	3	10.0
	White	16	53.3
	Hispanic	1	3.3
Gender	Male	9	30.0
	Female	21	70.0
Income	Under $50,000	0	0
	$50,000-$74,999	1	3.3
	$75,000-$99,000	3	10.0
	$100,000 or greater	26	86.7
Occupation	General Practitioner	5	16.7
	Pediatrician	6	20.0
	Radiologist	2	6.7
	Physician's Assistant	6	20.0
	Nurse Practitioner	6	20.0
	Registered Nurse	2	6.7
	Occupation Medicine	1	3.3
	OBGYN	1	3.3
	Urologist	1	3.3
Occupation Setting	Clinic	8	26.7
	Hospital	8	26.7
	Doctor’s Office	6	20.0
	Clinic and Hospital	5	16.7
	Doctor’s Office and Hospital	2	6.7
	Clinic, Hospital, Doctor’s Office	1	3.3
Marital Status	Married	22	73.3
	Never married	3	10.0
	Living with partner	1	3.3
	Divorced/Separated	4	13.3
	Widow	0	0
# of children (n=28)	0	5	16.7
	1	1	3.3
	2	16	53.3
	3	5	16.7
	4	1	3.3
Education	Completed undergraduate school	1	3.3
	Completed graduate school	14	46.7
	Professional/doctoral education	15	50.0

Table 2

Table 2. Body Mass Index Classifications			
		N	*%*
Below 18.5 kg/m^2	Underweight	0	0
18.5-24.9 kg/m^2	Normal	15	50
25.0-29.9 kg/m^2	Overweight	10	33.3
30.0 kg/m^{2}and above	Obese	5	16.7

Table 3

Table 3. Physical Activity Levels of Participants	
Physical Activity	Mean ± SD
Pedometer (steps/day)	10,938.8 ± 3072.7
IPAQ	
Total Activity (min/day)	119.3±59.4
MET-min/week	2788.6± 1601.1
Low PA (%)	3.4%
Moderate PA (%)	34.5%
High PA (%)	55.2%

Table 4

Table 4. How often Healthcare Providers' inquire about patients PA level		
	N	*%*
Never	1	3.3
On some visits	11	36.7
On most visits	16	53.3
On every visit	2	6.7

Table 5

Table 5. Frequency of Patient PA Inquires based on Provider PA Level	
Healthcare provider's PA Category	% within How often do you inquire about your patients' physical activity levels?
Low PA	3.4%
Mod PA	34.5%
High PA	55.2%

Table 6

Table 6. Correlations between total barriers and health care providers' physical activity			
IPAQ Physical Activity	*N*	*Sig. (2-tailed)*	*Pearson r*
Average Activity in minutes per day	30	0.333	-0.183
Total MET-min/week	30	0.865	-0.032

Table 7

Table 7. Healthcare Providers Barriers to Prescribing/Counseling on PA		
How much do the following factors make it difficult for you to recommend physical activity to your patients:		
	N	%
Lack of time during office visit		
1 (a little bit)	5	16.7
2 (somewhat)	10	33.3
3 (quite a bit)	5	16.7
4 (very much)	10	33.3
Unsure what to recommend		
0 (not at all)	9	30
1 (a little bit)	7	23.3
2 (somewhat)	10	33.3
3 (quite a bit)	3	10
4 (very much)	1	3
Unsure that physical activity is safe (in general)		
0 (not at all)	12	40
1 (a little bit)	9	30
2 (somewhat)	6	20
3 (quite a bit)	3	10
Not sure physical activity can help		
0 (not at all)	20	66.7
1 (a little bit)	7	23.3
2 (somewhat)	1	3
3 (quite a bit)	2	6.7

Table 7a 1

Table 7a1. Healthcare Providers Barriers to Prescribing/Counseling on PA		
How beneficial do you feel physical activity is for patients in terms of:		
	N	%
Maintaining overall health		
3 (quite a bit)	2	6.7
4 (very much)	28	93.3
Reducing risk of diseases		
3 (quite a bit)	3	10.0
4 (very much)	27	90.0
Worsening the current disease or illness		
0 (not at all)	9	30.0
1 (a little bit)	3	10.0
2 (somewhat)	1	3.3
3 (quite a bit)	5	16.7
4 (very much)	12	40.0
Improving mental health (e.g., depression, anxiety)		
2 (somewhat)	1	3.3
3 (quite a bit)	4	13.3
4 (very much)	25	83.3

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Appendix A

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · www.ecu.edu/irb

Notification of Amendment Approval

From: Social/Behavioral IRB
To: Bhibha Das
CC:

Date: 10/12/2015
Re: Ame2_UMCIRB 14-000845
UMCIRB 14-000845
Assessing Health Care Providers' Perceptions of Physical Activity Prescription

Your Amendment has been reviewed and approved using expedited review for the period of 10/12/2015 to 4/19/2016 . It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. A continuing or final review must be submitted to the UMCIRB prior to the date of study expiration.The investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
Assessing Health Care Providers' Perceptions of PA Prescription_Demographics_October 2015.docx(0.01)	Surveys and Questionnaires
Assessing Health Care Providers' Perceptions of PA Prescription_Informed Consent Document_October 2015.doc(0.01)	Consent Forms
Assessing Health Care Providers' Perceptions of PA Prescription_Interview Questions_October 2015.docx(0.01)	Interview/Focus Group Scripts/Questions
Assessing Health Care Providers' Perceptions of PA Prescription_Pedometer Log_October 2015.doc(0.01)	Surveys and Questionnaires
Assessing Health Care Providers' Perceptions of PA Prescription_Protocol_October 2015.docx(0.01)	Study Protocol or Grant Application
Assessing Health Care Providers' Perceptions of PA_Email Recruitment_October 2015.doc(0.01)	Recruitment Documents/Scripts
Assessing Health Care Providers' Perceptions of PA_Flyer Recruitment_October 2015.doc(0.01)	Recruitment Documents/Scripts
Barriers to Prescribing Physical Activity Questionnaire_October 2015.doc(0.01)	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

Appendix B

East Carolina University

Informed Consent to Participate in Research
Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Health Care Providers' Perceptions of Prescribing Physical Activity
Principal Investigator: Bhibha M. Das, PhD, MPH
Institution/Department or Division: Kinesiology
Address: 172 Minges Coliseum, 500 Ficklen Drive, East Carolina University, Greenville NC 27858
Telephone #: 252-328-0009
Study Sponsor/Funding Source: Das Start-up Funds

Researchers at East Carolina University (ECU) study problems in society, health problems, environmental problems, behavior problems and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research.

Why is this research being done?

The purpose of this research is to obtain information from health care providers' about their perceptions and barriers to prescribing physical activity to their patients. We will also measure if your own physical activity habits influence your barriers to physical activity prescription. The decision to take part in this research is yours to make. By doing this research, we hope to learn what barriers health care providers face to prescribe physical activity to their patients. We will use these findings to work with professional schools and organizations to integrate physical activity education into their professional training.

Why am I being invited to take part in this research?

You are being invited to take part in this research because you a health care provider. If you volunteer to take part in this research, you will be one of about 30 people to do so.

Are there reasons I should not take part in this research?

You will also not be eligible for participation if 1) are not a health care provider, and 2) you are not over the age of 18 years.

What other choices do I have if I do not take part in this research?
You can choose not to participate.

Where is the research going to take place and how long will it last?
The research procedures will be conducted at Minges Coliseum. You will need to come to 177 Minges Coliseum 2 times during the study. The total amount of time you will be asked to volunteer for this study is approximately 2.5 hours.

What will I be asked to do?
You are being asked to visit Minges Coliseum do several things. First, we will ask your demographic information, including sex, age, occupational category, race/ethnicity, marital status, educational level, income level, self-reported health status, self-reported physical activity status, and barriers to physical activity prescription. Next, we will ask you to wear a pedometer, a physical activity tracking device, for a week. On the 8th day, we will ask you to come back to Minges to complete an in-person interview. The interview will be audiotaped. Only the research team will have access to the audiotapes, which will be transcribed. As part of the transcription process, participants will not be identified but rather have code names used. Audiotapes will be kept for 7 years in a locked file cabinet in 172 Minges.

What possible harms or discomforts might I experience if I take part in the research?
It has been determined that the risks associated with this research are no more than what you would experience in everyday life.

What are the possible benefits I may experience from taking part in this research?

Other people who have participated in this type of research have experienced an increase in awareness in their barriers to prescribing physical activity to patients. By participating in this research study, participants may also experience this benefit.

Will I be paid for taking part in this research?
We will not pay you for taking part in this research. You will, however, be entered into a drawing to win a $100 gift card.

What will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff who oversee this research.

How will you keep the information you collect about me secure? How long will you keep it?
Information collected will be kept for 7 years in a locked filing cabinet in 172 Minges. Since we will be recording the interviews those recordings will be kept for 7 years and will be destroyed after. These recordings will not be used for other purposes than this research. Information obtained from the audio recordings will be de-identified and code names will be used in transcripts.

What if I decide I do not want to continue in this research?

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 252-328-0009 (days, between 9 am and 3 pm).

If you have questions about your rights as someone taking part in research, you may call the Office for Human Research Integrity (OHRI) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the OHRI, at 252-744-1971.

I have decided I want to take part in this research. What should I do now?
The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.

- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT) **Signature** **Date**

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT) **Signature** **Date**

Bhibha M. Das, PhD, MPH

Principal Investigator (PRINT) ***Signature*** ***Date***
(If other than person obtaining informed consent)

Appendix C

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (August 2002)

SHORT LAST 7 DAYS SELF-ADMINISTERED FORMAT

FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health–related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is supported to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

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

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

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

   _____ **days per week**

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

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

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

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

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

   _____ **days per week**

   ☐

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

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

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

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

_____ **days per week**

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

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

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

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

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

Appendix D

Demographics & Health History Questionnaire **Date: __________**

Demographics	
Date of Birth: [ ][ ] **MM** [ ][ ] **DD** [ ][ ][ ][ ] **YYYY**	Age: [ ][ ]
Are you currently married?	1☐Yes 0☐No *If no, please specify:* 2☐Never married 3☐Living with partner 4☐Divorced/Separated 5☐Widow 6 ☐Other ____________
What is your race? *(Please specify all categories that apply.)*	1☐Asian 2☐Black or African American 3☐Native Hawaiian or Other Pacific Islander 4☐American Indian or Alaskan Native 5☐White 6☐ Other ____________
What is your ethnicity?	1☐Hispanic or Latino 2☐Not Hispanic or Latino
What is your sex?	1☐Male 2☐ Female
What is your current employment status?	1☐ Full time – at least 35 hours/week at a paid job 2☐ Part time –less than 35 hours/week at a paid job 3☐ Other, *please specify:* ____________________
Do you have any children?	1☐Yes 0☐ No *If yes, please specify how many:* [ ][ ]

Please select the highest level of education completed by you.	1☐ Completed Associate's degree 2☐ Completed undergraduate degree 3☐ Completed undergraduate degree, some graduate coursework 4☐ Completed graduate school 5☐ Professional/doctoral level education 6☐ Other, *please specify:* ____________________
What is **your** total gross household annual income (before taxes and deductions)	1☐ $0-$14,999 2☐$15,000-$24,999 3☐ $25,000-$34,999 4☐ $35,000-$49,999 5☐ $50,000-74,9999 6☐ $75,000-99,999 7☐ $100,000 or greater 8☐ I choose not to answer
What is **your family's** total gross household annual income (before taxes and deductions)	1☐ $0-$14,999 2☐$15,000-$24,999 3☐ $25,000-$34,999 4☐ $35,000-$49,999 5☐ $50,000-74,9999 6☐ $75,000-99,999 7☐ $100,000 or greater 8☐ I choose not to answer
How many children (under 18 years) live in your household?	__________ Children
How many children (under 5 years) live in your household?	__________ Children
How many adult dependents (over 65 years) live in your household?	__________ Adults
Where do you currently work?	1☐ Hospital 2☐ Clinic 3☐ Doctor's Office 4☐ Other, *please specify:* ____________________
If you work in a hospital, select the type of unit.	1☐ General 2☐ Step down or intermediate care 3☐ Intensive care 4☐ Surgical (pre-op or recovery)
What type of medical license do you practice with?	1☐General Practitioner 2☐ Internal Medicine 3☐ Cardiologist 4☐ OBGYN 5☐ Physician's Assistant 6☐ Orthopedics

	7☐ Registered Nurse 8☐ Other, *please specify:* ____________________
Do you currently work directly with patients?	1☐Yes 2☐ No
If no, have you worked directly with patients within the last year?	1☐Yes 2☐ No
How long have you been in your current unit?	1☐ <1 year 2☐ 1-5 years 3☐ 6-10 years 4☐ 11-15 years 5☐ 16+ years
How many years have you been in the medical profession?	1☐ <1 year 2☐ 1-5 years 3☐ 6-10 years 4☐ 11-15 years 5☐ 16-20 years 6☐ 21-26 years 7☐ 26+ years
What are your regular work hours?	1☐ Day Shift (7a-7p) 2☐ Night Shift (7p-7a) 3☐ Other, *please specify:* ____________________
Do you do shift work?	1☐Yes 2☐ No
Do you switch shifts?	1☐Yes 2☐ No
What shift do you <u>currently</u> work?	1☐ Day Shift (7a-7p) 2☐ Night Shift (7p-7a) 3☐ Other, *please specify:* ____________________

Are you <u>required</u> to work overtime?	1☐Yes 2☐ No
How many overtime hours do you typically work <u>each week</u>?	_________________
What zip code do you live in?	_________________
What zip code do you work in?	_________________
Are there policies in place at your work that promote physical activity? (e.g. ability to use an active desk, access to a workout facility, ability to take breaks)	1☐Yes 2☐ No
Does your facility ask patients about their physical activity habits?	1☐Yes 2☐ No
Does the physician's office you go to as a patient ask about your physical activity habits?	1☐Yes 2☐ No

Health History

Of the following conditions, please check the ones you have:

Cardiovascular disease (including high blood pressure & high cholesterol) $_1$☐
Pulmonary disease such as asthma or COPD $_1$☐Yes
Arthritis $_1$☐Yes
Type 1 Diabetes $_1$☐Yes
Type 2 Diabetes $_1$☐Yes
Cancer $_1$☐Yes What kind ___________________________
Have you been diagnosed with another disease you would like to mention?
____

Have you ever used tobacco products? If yes, How many years did you use it? What tobacco product do you use? If you quit using tobacco, how long ago did you quit?	$_1$☐Yes $_0$☐ No ☐☐ Years _____________________________ ☐☐ Years ago
How many cups of caffeinated coffee do you have daily? *(If none, please write "0")*	☐☐ cups of caffeinated coffee/day
How many caffeinated soft drinks do you have daily?	☐☐ soft drinks/day
How many cups of tea do you have daily?	☐☐ cups of tea/week
How many cans of beer do you have weekly?	☐☐ cans of beer/week
How many glasses of wine do you have weekly?	☐☐ glasses/week
How many ounces of liquor do you have weekly?	☐☐ ounces/week
How would you rate your overall health status?	$_1$☐ Poor $_2$☐ Bad $_3$☐ Average $_4$☐ Good $_5$☐ Excellent
On average, how many servings of fruits and vegetables do you eat per day?	$_1$☐ 0 $_2$☐ 1-3 $_3$☐ 4-6 $_4$☐ 7-9 $_5$☐ More than 9

Appendix E

Pedometer Log

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Date							
Time of day you put on the unit							
Time of day you took off the unit							
Any time you did not wear the unit?							
Pedometer Steps							
Distance							
Activity Minutes							

In the space provided below, please provide comments about problems that occurred while you were wearing the pedometer.

Appendix F

ID: _________ Date: ________________

Barriers to Prescribing Physical Activity Questionnaire

Please answer the following questions as honestly as possible. There are no right or wrong answers.

In this study, physical activity refers to formal exercise (e.g., jogging, cycling, lifting weights), walking, and lifestyle activities (e.g., gardening, taking the stairs instead of the elevator).

1. **Are you aware of the National Physical Activity Guidelines for adults?** (check one)

   Not at all ____ A little bit____ Somewhat____ Definitely yes ____

2. **Have you had any formal training in exercise prescription (e.g. University degree in a related area, Vocational training, In-service)?** (circle one)

   Yes/No

3. **How would you rate your knowledge of exercise prescription?**

   Very poor ____ Poor ____ Average ____ Good ____ Excellent_____

4. **How often do you inquire about your patients' physical activity levels?** (check one)

   On every visit ____ On most visits ____ On some visits ____ Rarely ____ Never _____

5. **What percentage of patients do you provide physical activity recommendations to when it is appropriate to do so? (0% = none, 100% = all):** (check one)

   <10% ____ 10-45% ____ About 50% ____ 70-85% ____ More than 85% _____

6. **When recommending physical activity, what kind of activities do you most often recommend to your patients:** (check all that apply)

Aerobic activities (e.g., walking, cycling) ______ Resistance activities (e.g., weight lifting, sit-ups) ______

Lifestyle activities (e.g., gardening, taking the stairs) ______

Use the following scale for the questions below. Please *circle* the most appropriate response for each question.

0	1	2	3	4
not at all	a little bit	somewhat	quite a bit	very much

7. How beneficial do you feel physical activity is for patients in terms of: (circle one)

a. Maintaining overall health 0 1 2 3 4

b. Reducing risk of diseases 0 1 2 3 4

c. Worsening the current disease or illness
0 1 2 3 4

d. Improving mental health (e.g., depression, anxiety)
0 1 2 3 4

e. Attenuating physical declines 0 1 2 3 4

f. Improving ability to do daily tasks (e.g., carry groceries)
0 1 2 3 4

g. Helping patients cope with daily stressors
0 1 2 3 4

h. Reducing the risk of reoccurring illness or disease
0 1 2 3 4

8. How much do the following factors make it difficult for you to recommend physical activity to your patients? (Circle one)

a. Lack of time during office visit 0 1 2 3 4

b. Unsure what to recommend 0 1 2 3 4

c. Unsure that physical activity is safe (in general)0 1 2 3 4

d. Not sure physical activity can help 0 1 2 3 4

e. Patients are not interested 0 1 2 3 4

f. Physical activity counseling is not reimbursed0 1 2 3 4

g. Unsure who to refer a patient to for help 0 1 2 3 4

h. Other ____________________ 0 1 2 3 4

6. To what extent does your own engagement in physical activity influence whether or not you recommend physical activity to your patients? (circle one)

0 1 2 3 4

Appendix G

Research Study Examining
Health Care Providers' Perceptions of Prescribing Physical Activity

We are seeking health care providers to participate in a study examining perceptions of physical activity prescription, barriers to physical activity prescription, and their relationship to their own physical activity levels.

To be eligible to participate, you must meet the following criteria:
1) Be either a physician, nurse, nurse practitioner, or physician's assistant
2) Be over the age of 18

The study will be performed by the Department of Kinesiology at East Carolina University.

Participants will be asked to 1) complete an in-person interview assessing their perceptions of prescribing physical activity to patients, 2) complete a questionnaire regarding barriers to physical activity prescription, and 3) wear a pedometer for one week.
Participants will be entered to win a $100 gift card!

If you are interested in participating or want more information, please contact Allie Sneed at SNEEDA10@students.ecu.edu.

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Identifying Healthcare Providers' Barriers to Prescribing PA Research Study

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