8-9-2014

Understanding the Relationship Between Health Locus of Control and God Locus of Health Control and Health Behaviors in College Students Through Mediation Analysis

Joni DeAnn Marr
University of South Carolina - Columbia

UNDERSTANDING THE RELATIONSHIP BETWEEN HEALTH LOCUS OF CONTROL AND GOD LOCUS OF HEALTH CONTROL AND HEALTH BEHAVIORS IN COLLEGE STUDENTS THROUGH MEDIATION ANALYSIS

by

Joni DeAnn Marr

Bachelor of Arts
University of North Carolina at Wilmington, 2001

Master of Science
Winthrop University, 2007

Submitted in Partial fulfillment of the requirements

For the Degree of Doctor of Philosophy in

Exercise Science

The Norman J. Arnold School of Public Health

University of South Carolina

2014

Accepted by:

Sara Wilcox, Major Professor

Michael Beets, Committee Member

Larry Durstine, Committee Member

Ken Watkins, Committee Member

Lacy Ford, Vice Provost and Dean of Graduate Studies

DEDICATION

O give thanks unto the Lord; for he is good; for his mercy endureth for ever.[1] In everything give thanks: for this is the will of God in Christ Jesus concerning you.[2] Be careful for nothing; but in everything by prayer and supplication let your requests be made known to God.[3]

Every second devoted to completion of this project is dedicated to my Lord and Savior, Jesus Christ. Without his love, sacrifice, and mercy, fulfilling my own dreams would be impossible.

In memory of my father, JDM, the one that I credit for my desire to begin this journey. In honor of my mother, JSM, the one that I credit for the determination to finish it.

[1] 1 Chronicles 16:34. Holy Bible. King James Version.
[2] 1 Thessalonians 5: 18. Holy Bible. King James Version.
[3] Philippians 4:6. Holy Bible. King James Version.

ACKNOWLEDGEMENTS

First and foremost, thank you to my mentor, advisor, and friend, Dr. Sara Wilcox. Thank you for guidance, support, and most of all, your patience. You are a mentor in every definition of the word. Thank you to the members of my committee, Dr. Michael Beets, Dr. Larry Durstine, and Dr. Ken Watkins. Your guidance and support is greatly appreciated.

Thank you to Dr. Janet Wojcik for your advice, support, and resources. I am blessed to work with you and look forward to our partnership of research and education. To the rest of my Winthrop family members that provided your encouragement and support, thank you.

Thank you to my family: June, Lisa, and Courtney (Missy). I know how integral you were in completion of this project, and I am in debt to your service. To my beautiful daughters, JohnieMae and Grace, thank you for reminding me of my most important job, and thank you for making it so much fun. Being your mom is my greatest blessing. To my rock, my support, my partner, Timothy, thank you. Your love and dedication to me and my dreams is unfaltering, and I count you my strongest asset.

ABSTRACT

Background: Similar to the general population, college students have high rates of overweight/obesity and low rates of physical activity (PA) and healthy nutrition habits. Internal health locus of control (LOC) and religiosity/spirituality have been associated with positive health behaviors in various populations, but the mechanisms explaining these associations are still unclear. **Purpose:** The goals of this study were to understand the relationship between both health LOC and God locus of health control (independent variables) and PA, fruit and vegetable intake (FVI) and dietary fat intake (dependent variables) of college students through mediation analysis. Self-efficacy, social support, congregational social support and divine support were tested as potential mediators. **Methods:** This study used a cross-sectional design that used online surveys for data collection. Participants were 838 college students from two Southeastern universities (72% female; 64% white, 23% black; 21.4 ± 4.8 years). Linear regression analyses were used to determine relationships between variables, and the PRODCLIN program was used to assess for mediation. **Results:** Self-efficacy and social support mediated the relationship between health LOC and PA and FVI, and self-efficacy was a mediator between LOC and dietary fat intake. Only congregational social support mediated the relationship between God locus of health control and PA. **Conclusion:** PA and dietary behavior change interventions that target increasing LOC should also include self-efficacy and social support for optimal outcomes. Additionally, for those that utilize God as a health LOC source, congregational social support may influence PA behaviors.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Despite the overwhelming evidence of certain health behaviors reducing the risk of disease and premature death in all populations, the majority of the American population remains unhealthy, unfit, and overweight or obese. According to data from the 2009 - 2012 National Health and Nutritional Examination Survey (NHANES), 69% of adults ($\geq$ 20 years of age) were classified as overweight and 35% were classified as obese (Flegal, Carroll, Kit, & Ogden, 2012). The same survey showed that among those 12 to 19 years of age, at least 18% were considered obese (as measured by the definition for childhood obesity), and of these, 13.9% met the adult classification of obesity with a body mass index (BMI) of 30 kg/m^2 or greater (Ogden, Carroll, Kit, Flegal, 2012). Overweight and obesity increases the risk of many diseases and conditions including hypertension, heart disease, some cancers, arthritis-related disabilities, and type II diabetes (CDC, 2008). Additionally, the prevalence of overweight and obesity is costly, estimated to be around $254 billion in 2009 - 2010 (Roger et al., 2012). Unhealthy behaviors, such as a lack of physical activity and diets high in fat, have been linked with higher risks of being overweight or obese.

According to the National College Health Assessment (NCHA) by the American College Health Association (ACHA) (2012), at least 34.1% of college students have a

BMI, based on self-reported data that would categorize them as overweight or obese. Additionally, of the 27,774 students surveyed, 40.5% reported that they do not participate in any type of vigorous intensity aerobic physical activity, and 23.6% said the same for even moderate intensity aerobic physical activity. The dietary habits of college students are consistent with the prevalence of overweight and obesity within the general population. In a review of studies of nutritional behaviors among college students, a high prevalence of unhealthy diets was found to exist within this population (Huang, et al., 2003). The typical college student diet is high in fat and sodium (Dinger, 1999; Galore, Walker, & Chandler, 1993; Liedman, Cameron, Carson, Brown, & Meyer, 2001). In fact, Schuette, Song, & Hoerr (1996) reported that only 4% of 2,489 college students consumed less than 30% of energy from fat, and 10% or less from sugar per day. Driskell, Kim, & Goebel (2005) found that college students reported eating six to eight meals per week at fast-food restaurants. Also, most college students do not consume the recommended number of fruits and vegetables per day (Galore et al., 1993).

In the college student population, several studies have focused on health behaviors and their relationship with health outcomes (Keating, Guan, Pinero, & Bridges, 2005; Huang, et al., 2003; Kwan, Cairney, Faulker, & Pullenayegum, 2012), and others have focused on religious preferences and spiritual beliefs and their association with health behaviors (Denton, Pearce, & Smith, 2008; Myers & Kyle, 2008). In addition, several studies have investigated college students with regard to their health locus of control and various health constructs, such as risk for HIV/AIDS (White et al., 2011) and stress levels (Abouserie, 1994; Gadzella, 1994; Oaten and Cheng, 2005). Locus of control (LOC) relates to an individual's sense of control over their internal psychological

environment, and has been associated with well-being (Shapiro, Schwartz, & Astin, 1996). Studies have also found that health-related LOC beliefs are related to health outcomes and health behaviors in the general adult population (Wallston, Wallston, DeVellis, 1978; Murphy, Thompson, & Morris, 1997).

Over the last several decades, research in health psychology has explored the potential influence that religion may have on health (Koenig, King, & Carson, 2012), and generally, positive relationships have been established between religion and health (Williams and Sternthal, 2007). Additionally, religiosity and spirituality have been found to have extensive influence on an individual's behaviors, as well as cognitions and emotions, and this relationship has been supported within the college population (Harcrow, 2010). However, observational studies among the college population regarding the relationship of health outcomes and behaviors, LOC and religiosity/spirituality are scarce. At a time where an individual's behaviors and choices can greatly impact the future, it is important to understand motivations of health-related behaviors among college students in order to develop comprehensive health education and promotion interventions.

Purpose of Study

The purpose of this study was to examine the relationship of multidimensional health locus of control (MHLC) and God locus of health control (GLHC) with the health behaviors of physical activity and dietary habits among college students. This study will also examine possible mediators of these health behaviors. Specifically, this study will examine whether self-efficacy and social support mediate the relationship between

MHLC and physical activity and dietary habits and whether self-efficacy, social support, congregational social support, and divine support mediate the relationship between GLHC and physical activity and dietary habits.

Significance of the Study

Significance for the College Population

Adolescents (ages 10 – 19) and young adults (ages 21 – 24) make up around 21% of the population. Associations of behavior patterns during these age ranges for both short and long term health effects are powerful. Adolescents who are overweight have a 70% chance of becoming overweight adults (Roger et al., 2012). Additionally, adolescence and young adulthood is a critical time where health concerns can be introduced or intensified, based on the individual's environment and behaviors. Healthy People 2020, a multidimensional approach to improving the health of Americans with specific objectives developed every 10 years, introduced a new objective of improving adolescent and young adult health in 2010 (USDHHS, 2010).

Adolescents and young adults are highly susceptible to influences in their immediate surroundings, such as family, peers, neighborhoods, policies, and cultural beliefs. Health behaviors continued or adopted during this time precede future long-term health outcomes. The typical age of college students is 18 to 23 years old. This age range spans adolescence to young adulthood. Not only is this age range already susceptible to such powerful influences, the college experience can create additional challenges for healthy behaviors. Newly found independence, complex stressors, financial hardships,

and transportation limitations are some additional concerns that college students face when making day-to-day decisions that affect their health.

Developing and implementing health education and behavior change programs within the college population is critical to address the current health status of college and young adult populations. Individuals in charge of designing and implementing such programs must understand beliefs, barriers, enablers, and motivations of the students and how they drive the decision making process. Utilizing research tools of surveys, questionnaires, and needs analyses can assist in coordinating the best program for each individual school.

Health Locus of Control & God Locus of Health Control

Health LOC is the belief that individuals have of how much they control the health events that happen in their lives. Research centered on this concept is based on the development of the MHLC Scale by Wallston et al. (1978). The MHLC Scale measures how much individuals believe they have control over their own health outcomes, and categorizes the individual's beliefs to either an internal or external LOC. Individuals with internal health LOC have a stronger belief that they are in control of their health outcomes, whereas individuals with an external health LOC feel that their health outcomes are controlled by outside forces, or are inevitable. Psychological adjustment, health behaviors, and better health have been associated with internal health LOC (Smith, Dobbins, & Wallston, 1998).

Research on LOC is in no means limited to health, in fact, there are many different LOC measures in areas such as: education, parenting behavior, economics, and

even driving behavior during high traffic. Throughout the research on different LOC measures, much of the focus was on the influence of internal LOC, and very little attention was devoted towards understanding external LOC. Shapiro et al. (1996) suggested that a direction for future research was to focus on the powerful external sources of LOC. The power of religion and spirituality in health has been established, so it seemed necessary to include this concept within the LOC framework. Koenig (1995) recommended specific measures to be developed to identify religious cognitions and schemas that affect psychological adaptation.

In response to this need, Wallston and colleagues (1999) developed the GLHC scale to expand the MHLC to include a fourth subscale of "God control." Wallston et al. (1999) examined the GLHC in three samples of predominately Caucasian females, all with a chronic health condition, and found the GLHC was not associated with internal health LOC. The distinction of God or spiritual control from 'Powerful Others' (external LOC) has been supported by Furnham (1982) and Jackson & Coursey (1988); however other studies have proposed God control to be more of an internal than external LOC source (Spilka, Shaver, & Kirkpatrick, 1985). The GLHC measures a level of God control through the participants' responses. It is important to understand the associations between GLHC and health behaviors and beliefs in behavior change programs. Health-related beliefs are important modifiable factors that influence health behaviors and are integral in many theories and models of health behavior change.

A very similar scale to the GLHC was developed independently. Holt and colleagues (Holt, Clark, Holt, Clark, & Klem, 2007; Holt, Clark, Kreuter, & Rubio, 2003a; Holt, Lukwago, & Kreuter, 2003b) developed the Spiritual Health Locus of

Control Scale (SHLC) to include the role of religion and spirituality (although it measures specifically God control) in determining health outcomes, specifically within the African American population. Individuals with a spiritual health LOC have a strong belief in God having some or all control over the health events in their lives. According to Holt et al. (2003b), individuals with a spiritual health LOC can be classified as more passive or active in relation to God and health. Passive individuals believe God has ultimate control over health outcomes, and they are less likely to engage in preventive behaviors. Active individuals believe both themselves and God control their health outcomes, and are more likely to be proactive towards health concerns.

Hathaway and Pargament (1991) provide possible mechanisms of the GLHC and/or SHLC effect to include: (1) a deferring style, where self is passive and all control and responsibility of health is given to God; (2) a self-directing style, where self is active and retains responsibility of health; and (3) a collaborative style, where both God and self are active towards responsibility of health.

Distinct from Religiosity/Spirituality

Although the constructs of religiosity and spirituality overlap, they are defined and measured differently, and neither is measured by the GLHC or SHLC. Religiosity has been defined as a specific organization of beliefs, rituals, symbols, and certain formal practices, including: fellowship, prayer, worship, and a social support structure (Thoreson, 1998). Spirituality has been defined as a relationship transcendent to a higher power and a connection to a greater structure of faith and beliefs that may or may not include religion (Thoreson, 1998). Both the GLHC and SHLC are related to, but distinct

from both religiosity and spirituality. The two scales are neither a measure of religion or spirituality, but a measure how much an individual believes that God is a source of control over his/her health status, hence, a specific locus of control. The GLHC and SHLC measure an individual's belief that a being with greater power has a level of control over his/her health, but does not measure whether or not an individual worships or has a relationship with that being. Both GLHC and SHLC use the term "God" in the assessment items, and relate to "God" as a higher power (Holt et al., 2003b) or "God" as God, Allah, or other spiritual being (Debnam et al., 2012).

Mediator Effects

Baron and Kenny (1986**)** identified a mediator as a variable that accounts for a relation between two variables, a predictor (independent variable) and a criterion (dependent variable). Mediators can help explain why certain effects occur and are considered the mechanisms for how independent variables exert influence on dependent variables. Understanding the effects of mediators is important since they can identify targets for intervention. Figure 1 illustrates the mediator effect.

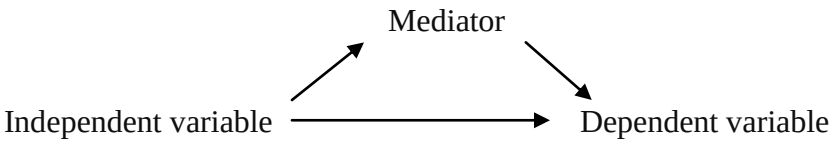

Figure 1.1.
Graphic illustration of the function of a mediating variable.

Self-efficacy and social support have been shown to be a mediator of a variety of different outcomes. Investigating the mediation effects of self-efficacy on health behaviors has been an integral piece of behavior change literature. A review of physical activity interventions among adolescent girls showed that self-efficacy was positively

associated with increases in physical activity (Biddle, Whitehead, O'Donovan, & Nevill, 2005). Other studies conducted within various populations have since concurred with these findings, specifically stating that self-efficacy has been found to mediate changes in physical activity (Haerens et al., 2008; Lewis, Marcus, Pate, & Dunn, 2002; Lubans, Foster, & Biddle, 2008; Lubans and Sylva, 2007; Taymoori and Lubans, 2008).

Additionally, research has established that social support can have powerful protective effects on health and health behaviors (House, Landis, & Umberson, 1988). Through support networks, social interaction, instrumental assistance, and/or amount of support (subjective social support), health and behaviors are influenced. Consistently, subjective social support has shown to be a powerful predictor of health outcomes (George, Ellison, & Larson, 2002).

In order to understand the influence of spirituality and religiosity on health, several studies have investigated the role of mediators, including self-efficacy and social support. Additional mediators such as optimism, sanctification, and congregational social support (or religious social support) have all been linked to health related outcomes, such as life satisfaction and effects on mental health (Fabricatore, Handal, Rubio, & Gilner, 2004; Salsman, Brown, Bretching, & Carlson, 2005; Tix & Frazier, 2005).

The current study focused on self-efficacy and social support as mediators of health LOC (independent variable) and physical activity, dietary fat intake, and fruit and vegetable consumption (dependent variables). Previous research has shown that self-efficacy, social support and LOC are related (Widenfeld et al., 1990). Both self-efficacy

and social support are instrumental constructs of Bandura's Social Learning Theory (1977), which was an offspring of the LOC idea proposed by Rotter in 1954.

Additional analyses examined self-efficacy, social support, congregational social support, and divine support as mediators of the GLHC (independent variable) and physical activity, dietary fat intake, and fruit and vegetable consumption (dependent variables) relationship. Congregational social support and divine support have been shown to be powerful mediators in career decision self-efficacy among college students (Duffy & Lent, 2008). Assumptions of mediating relationship between college students and health behaviors were predicted to be similar.

Research Questions

In order to examine the relationship between MHLC and GLHC, mediation effects of self-efficacy, social support, congregational social support (also known as religious social support), and divine support and their influence on health behaviors of college students, the following research questions were addressed:

Health Locus of Control:

1. Does physical activity self-efficacy and physical activity social support mediate the relationship between internal MHLC and physical activity participation among college students?

2. Does dietary self-efficacy and dietary social support mediate the relationship between internal MHLC and dietary fat intake and fruit and vegetable consumption among college students?

God Locus of Health Control:

1. Does physical activity self-efficacy and physical activity social support mediate the relationship between GLHC and physical activity participation among college students?

2. Does congregational social support and divine support mediate the relationship between GLHC and physical activity participation among college students?

3. Does dietary self-efficacy and dietary social support mediate the relationship between GLHC and dietary fat intake and fruit and vegetable consumption among college students?

4. Does congregational social support and divine support mediate the relationship between GLHC and dietary fat intakes and fruit and vegetable consumption among college students?

Limitations

Limitations of this study included the use of self-report data, and the possibility that these reports may be biased by social desirability. Self-report of exercise and physical activity has been shown to include a bias of over-reporting, although under-reporting actual physical activity is also possible (Prince et al., 2008). Responses may have been influenced by the setting and environment in which the responses were collected since the surveys were completed online. Students that may have perceived the GLHC was a measure of religion or spirituality may not have answered such questions if they were neither religious nor spiritual. Since this survey was completely voluntary, limitations extend to those who chose to participate in the study.

Another limitation of this study was the instruments used to collect the data. Additionally, the variables of interest could be considered subjective, and individuals

may have chosen to answer questions based on their personal definition, rather than those explicitly designed by the researcher.

Using a cross-sectional study approach to the current research presents limitations. A cross-sectional design is carried out at one specific time point, and gives no order of the sequence of events. Therefore, cross-sectional design studies are unable to infer causality.

Delimitations

Delimitations of this study included the use of college students in the southeastern part of the United States. These results may not reflect beliefs of other age groups, or even of other college students in other geographical locations of the United States. This study is also limited to those students who may have felt comfortable using internet technology for survey completion.

Definition of Terms

Divine Coping. *Divine support* or *divine coping* refers to the support an individual receives through a relationship with a higher power, and in research cases of Christian religion, God (Duffy & Lent, 2008).

Divine Support. *Divine support* or *divine coping* refers to the support an individual receives through a relationship with a higher power, and in research cases of Christian religion, God (Duffy & Lent, 2008).

God control. *God control* refers to the belief that an individual has on how much God is in control of the health events that happen in his/her life (Wallston, et al., 1999).

Health Locus of Control. *Health locus of control* is the perception individuals have of how much control they have over the health events that happen in their lives (Wallston, Wallston, Kaplan & Maides, 1976).

Locus of Control. *Locus of control* is a theory of perceived control about the source, or locus, of reinforcement for a particular behavior or life event (Rotter, 1954).

Mediator. *Mediator* is a variable that accounts for a relation between two variables, a predictor (independent variable) and a criterion (dependent variable) (Baron & Kenny, 1986).

Religiosity. *Religiosity* refers to a system of beliefs, practices, rituals, and symbols that has specific organization (Thoreson, 1998)

Religious Social Support. *Religious social support or religious support* or *congregational social support* refers to the support that an individual receives through a relationship or relationships with others within his/her religious community (Duffy & Lent, 2008).

Self-efficacy. *Self-efficacy* refers to an individual's belief in his/her ability to succeed in specific situations (Bandura, 1977).

Social-support. *Social support* can be classified as perceived or received and can be related to any of the following: emotional support (love, affection); informational (guidance); or instrumental (tangible outcome) (Sagrestano, Feldman, Rini, Woo, & Dunkel-Schetter, 1999).

Spiritual Health Locus of Control. *Spiritual health locus of control* refers to an individual's belief in God to have some or all of the control over his/her health (Holt et al. 2003b).

Spirituality. *Spirituality* refers to a relationship transcendent to a higher power (Thoreson, 1998).

CHAPTER II

LITERATURE REVIEW

Introduction

The purpose of this chapter is to demonstrate the need and potential benefit of investigating the relationships between possible mediators of health LOC and God locus of health control and health behaviors. This chapter also seeks to review previous literature and provide a foundation of knowledge related to the overall purpose of the current study. This chapter includes information on the following topics: (1) current health concerns of the college population; (2) physical activity behaviors of college students; (3) nutrition behaviors of college students; (4) physical activity and nutrition interventions for the college population; (5) locus of control; (6) health locus of control; (7) the role of spirituality and religiosity and overall health; (8) God and spiritual health locus of control; (9) locus of control and mediating variables; (10) self-efficacy, social support, congregational social support, and divine support as mediating variables among in health behavior and (11) spirituality and religiosity of college students.

Health Concerns of the College Population

It is clear that health behaviors are major causes of disease, disability, and death within the population (Mokdad, Marks, Stroup, & Gerberding, 2004). There is also overwhelming evidence for healthy lifestyles, such as physical activity and good

nutrition, as protective factors against many types of diseases, disability and death. Even with the vast knowledge of benefits of healthy behaviors, statistics from the Centers for Disease Control (CDC) showed that in 2011, at least 79% of adults did not engage in the recommended amounts of aerobic or muscular strengthening physical activities (USDHHS, 2011). The US Department of Health and Human Services (USDHHS) reported that 35.7 % of adults (Flegal et al., 2012) and 16.9 % of children and adolescents (Ogden et al., 2012) were classified as obese in 2009 – 2010. Similar alarming statistics extend to younger populations. The American Heart Association reports that overweight adolescents are 70% more likely to become overweight adults, and the prevalence of BMI-for-age greater than 95% of 2000 CDC growth charts is 18% for those aged 12 to 19 years (Roger et al., 2012).

Health behaviors, health concerns, and areas of health interventions are not very different in the college population as those in the general population. According to a 2011 ACHA-NCHA report, at least 34.1% of college students have a BMI that would categorize them as overweight or obese, and the rate of obesity is increasing (ACHA, 2012). From 2000 to 2009, the number of college students classified as overweight or obese increased from 29% to 32.5%, which is lower than the national statistics for adults, but higher than that of children and adolescents. In fact, data from the Behavioral Risk Factor Surveillance System (BRFSS) show ages 18 to 29 as the age group with the greatest increase of overweight and obesity, indicating a dramatic spike in prevalence of overweight and obesity as these individuals enter adulthood (Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). In 2009, only 5.9% of college students reported consuming 5 or more fruits or vegetables daily, and only 26.4% had exercised vigorously

for at least 20 minutes a day (ACHA, 2010). Even among college students, obesity has been linked to many health concerns such as high blood pressure, type II diabetes, heart disease, and certain types of cancer (Desai, Miller, Staples, & Bravender, 2008). Other health concerns related to college students and obesity include an increase in the risk for depression and lower academic achievement (Adams & Colner, 2008).

Two of the 42 topic areas that Healthy People 2020 has designated as specific health concerns are behaviors that will be examined in this study (physical activity and nutrition) (USDHHS, 2010). Another 35 topic areas include diseases and/or disabilities that have direct associations to the aforementioned behaviors, including cancer, diabetes, heart disease and stroke, chronic kidney disease, and respiratory diseases. Additionally, other conditions such as arthritis, osteoporosis, low back pain, and physical disability are health topics that have been associated with the same behaviors. Unlike Healthy People 2010, Healthy People 2020 introduced a new objective to specifically improve adolescent and young adult health (USDHHS, 2000; 2010).

Healthy Campus 2020 is an offshoot of the Healthy People 2020 initiatives, with attempts to meet specific health needs of the college population. Healthy Campus 2020 seeks to improve the health in areas of major concern by working with individual institutions to develop a framework to identify priorities and mobilize action. For the student population, there are a total of 11 topic areas with 54 objectives. Two topic areas of Healthy Campus 2020 are physical activity and nutrition, both of which are a focus of health behaviors in the current study (ACHA, 2012).

Physical Activity Behaviors of College Students

Participation in regular physical activity can reduce the risk of heart attacks, cancers, diabetes, strokes, and high blood pressure. Engaging in regular physical activity not only provides protection against many diseases and disorders, it can improve bone, muscle, and joint health, maintain healthy body weight, and reduce symptoms of stress, anxiety, and depression. Even low to moderate levels of physical activity are associated with improved health status, including reduced hospital visits, sick physician visits, and medications (CDC, 2008). Currently, the physical activity guidelines recommended by the USDHHS (2008) are 150 minutes of moderate intensity physical activity per week, 75 minutes of vigorous intensity physical activity per week, or a combination of the two.

Probably the most cited review paper of the benefits and importance of engaging in regular physical activity is that of Pate et al. (1995), and this review is considered a landmark in establishing physical activity guidelines for Americans. In this review, associations of physical activity and health were well documented, with support for physically active individuals to experience lower risks of many diseases, including: coronary heart disease, hypertension, non-insulin-dependent diabetes mellitus, osteoporosis, colon cancer, and anxiety and depression. Increases in physical activity were also associated with decreased risk of mortality, especially when measured in midlife adult ages. Additionally, regular physical activity was shown to improve many risk factors for chronic diseases, including blood lipid profile, resting blood pressures, body composition, glucose tolerance and insulin sensitivity, bone density, immune function, and psychological function (Pate et al., 1995). These associations were also

generally supported within the updated review of evidence and recommendations of physical activity guidelines (USDHHS, 2008).

Later research has concurred with the conclusions of Pate et al. (1995). Katzmarzyk, Gledhill, & Shephard (2000) showed that regular physical activity can reduce premature death by up to 20% of population-attributable risk estimates. Ford et al. (2009) showed that even small changes in physical activity can improve overall health, and individuals that achieve at least 30 minutes of physical activity most days of the week can see risk reductions of up to 30% (Williams et al., 2003). Within the Danish population, Sorensen, Skovgaard, & Puggaard (2006) found that by just changing physical activity behaviors from the age of 30 to 80 years, life expectancy increased by 2.8 – 7.8 years in both men and women.

There is also strong evidence for the benefits of physical activity on psychological well-being. In a review of 70 interventions of physical activity on depressive symptoms in the general population (those not clinically diagnosed with depression), Conn (2010) showed that physical activity significantly reduced depressive symptoms among healthy adults of diverse weights. Other activities such as weight training have also been associated with reduced depressive symptoms in various age groups and populations (Greer & Trivedi, 2009). Even among those chronically ill, physical activity has been effective on depressive symptoms. In a systematic review of 90 studies containing over 10,000 subjects diagnosed with a chronic illness (including cardiovascular disease, cancer, multiple sclerosis, and chronic obstructive pulmonary disease), exercise training significantly reduced depressive symptoms (Herring, Puetz, O'Connor, & Dishman, 2012). In a separate review, Herring, O'Connor, and Dishman (2010) analyzed 40

articles that included an exercise intervention and an anxiety measure on subjects diagnosed with a chronic illness. The authors found substantial evidence for exercise training to significantly reduce anxiety symptoms when compared to no treatment conditions. Physical activity has been shown to reduce anxiety and stress, among the general adult population (Bhui, 2002; Byrne & Byrne, 1993; Dunn, Trivedi, & O'Neal, 2001; Salmon, 2000) and among the college population (Brown, 1991; Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006).

Among the young adult populations, physical activity has been shown to promote positive emotional well-being (Salmon, 2000), and improve self-esteem and self-image (Fox, 2000). Simon, Powell, and Swann (2004) found a strong protective association for physical activity and suicide attempts in those ages 13 to 34. Similarly, Taliaferro, Rienzo, Pigg, Miller, and Dodd found protective effects of aerobic exercise against suicide risk in a college student population (2009). In another study among those ages 15 to 20, findings suggest that individuals with the highest frequency of physical activity experienced higher psychological well-being (Ferron, Narring, Cauderay, & Michaud, 1999). Additionally, college athletes have reported less perceived stress and psychological symptoms (Skirka, 2000) than non-athletes.

According to data from the 2011ACHA-NCHA, 40.5% of the 27,774 students surveyed reported that they do not participate in any type of vigorous intensity aerobic physical activity, and 23.6% said the same for even moderate intensity aerobic activity. Less than half (47.4%) of students surveyed are meeting the current guidelines for physical activity. Based on these results, there is a significant percentage of the collegiate population that participates in little-to-no physical activity, and a significant

portion that is considered overweight and obese according to their BMI, as previously mentioned (ACHA, 2012). Several research efforts have concluded similar findings, specifically noting that there are drastic decreases in physical activity during the transition from adolescence to early adulthood (Gorden-Larsen, Nelson, & Popkin, 2004; Telama & Yang, 2000; Telama, Yang, & Vlikari, 2005; Zick, Smith, Brow, Fan, & Kowaleski-Jones, 2007).

Suminski, Petosa, Utter, and Zhang (2002) found alarming rates of physical inactivity among certain groups within the college student population. Comparing the physical activity habits of 874 Asian, 332 African, 1101 White, and 529 Hispanic American college students, the authors found that nearly 47% did not participate in any vigorous intensity physical activity. Female minority students had the highest rates of inactivity, with 28.1% Asian American female students not engaging in any physical activity for the month preceding the study. Other studies have also shown specific groups of college students to be inactive. Butler, Black, Blue, & Gretebeck (2004) noted that freshman females significantly decrease their physical activity during the transition from high school to college.

Dietary Habits of College Students

In addition to the health benefits of physical activity, good nutrition has also been shown to lower the risk for diseases such as: heart disease, stroke, some cancers, diabetes, and osteoporosis, among others (CDC, 2008). Conversely, a poor diet, combined with physical inactivity, is associated with major causes of morbidity and mortality in the United States (Mokdad et al., 2004). Key recommendations from the Dietary Guidelines

for Americans include: healthy caloric balance during each stage of life, consume less than 10 percent of calories from saturated fatty acids, reduce intake of solid fats, reduce Trans fats consumption as much as possible, and fill half of the plate for each meal with fruits and vegetables (USDA, 2013).

Many college students experience significant weight gain upon entering college (Racette, et al., 2005). Poor nutritional habits and lack of physical activity are believed to be primary causes of the weight increase. College students have low intakes of fruits and vegetables, and high caloric intake, including high levels of saturated fats, alcohol, and added sugars (Mokdad et al., 2001; Betts, Amos, Keim, Peters, & Steward, 1997; Horacek & Betts, 1988). Less than 6% of college students reported eating five or more servings of fruits and vegetables daily, and 62% reported consuming one to two servings daily (ACHA, 2012). Another study found 21.8% of college students' surveyed reported eating three or more high-fat food items a day (CDC, 2009).

Fast food consumption has been associated with poor dietary practices, including higher intakes of energy, fat, saturated fat, (Paeratakul, Ferdinand, Champagne, & Bray, 2003) and even obesity (Dinger & Waigandt, 1997; Satia, Galanko, & Siega-Riz, 2004). College students have been reported to frequently consume fast food (Driskell et al., 2005; Nickolas, Baranowki, Cullen, & Berenson, 2001), and they consider fast food a part of the college lifestyle (Driskell, Meckna & Scales, 2006). Driskell and colleagues (2005) found that some college students reported consuming fast food six to eight times per week. Morse and Driskell (2009) provided further support for frequent fast food consumption among 259 college students, with the majority reporting that they ate fast food at least 1-3 times weekly. Males frequented fast food more often than females, and

males had significantly higher BMI scores than the females. This finding is consistent with other studies that found that college students do not meet the dietary recommendations for most of the food groups (Dinger & Waigandt, 1997), and diets of college students are high in fat and sodium and low in fruits and vegetables (Dinger, 1999; Liedman et al., 2001; Galore et al., 1993).

Despite these unhealthy dietary practices, college students report that nutrition is important. Morse and Driskell (2009) found that 51% of college women and 24% of college men agreed that the nutrition content of food was important to them. At least 75% of the students agreed with the statement, "I eat a healthy diet," (pg. 176), but within the same sample, more than half reported that they did not eat enough fruits and vegetables, and 36% agreed that they consume too many processed carbohydrates, too much sugar, too much fat, too much saturated fat, and too much trans fat.

Understanding the motives, enablers, and barriers of dietary habits among this population is precedent. College students are more motivated by the convenience, cost, and taste of foods than by the health or weight implications when making their nutritional choices (Marquis, 2005). Studies conducted on reasons for high consumption of fast food among college students found those reasons to be: menu choices, cost, convenience, taste, socialization, location, lack of cooking skills, and advertisement (Driskell et al., 2005; Driskell et al., 2006; Sneed & Holt, 1991; Hertzler & Frary, 1996). Findings from Morse and Driskell (2009) were in agreement with former studies, with students reporting inexpensive, economical, and time with family and friends as major reasons for fast food consumption.

In a qualitative study of focus groups and on-line assessments, Greaney and colleagues (2009) found that students were more sensitive to barriers than enablers for healthy weight management. Specifically, temptations, lack of discipline, time constraints, and easy access to unhealthy food were major barriers to healthy weight management. Knowledge, beliefs, and behaviors practiced in college have a high likelihood of continuing once college years are over (Dinger & Waigandt, 1997). College students that have poor nutritional habits and do not engage in regular physical activities are more likely to be overweight once they are no longer in college (Sparling & Snow, 2002), so addressing the issues of poor dietary practices and physical inactivity is paramount in designing intervention programs.

Physical Activity and Dietary Interventions in the College Population

Sparling and Snow (2002) emphasized the importance of health behavior change intervention programs among college students by showing that those students with poor physical activity and nutrition habits were significantly more likely to be overweight after college. Unfortunately, however, interventions to date have not had a large impact on the health lifestyles of college students. A two year intervention of nutritional knowledge, health risks, and benefits of physical activity in the college population resulted in an average of three pounds of weight loss (which was statistically significant), but resulted in no change in physical activity or nutrition habits (Hivert, Langlois, Berard, Cuerrier, & Carpentier, 2007).

My Student Body – Nutrition, an interactive, internet based nutritional and physical education program for college students (My Studentbody.com), was shown to be

effective in changing students eating habits by significantly increasing both self-efficacy to consume fruits and vegetables and the actual consumption of fruit and vegetables, as well as significantly lowering perceived stress. Unaffected, however, by the My Student Body program was self-efficacy for exercise, attitudes towards exercise, frequency of aerobic exercise, or BMI (LaChausse, 2012). Gow, Trace, and Mazzeo (2010) also used the *My Student Body – Nutrition* program combined with a personalized caloric feedback intervention over a six week period and found significant reductions in BMI, but no change in physical activity or fruit and vegetable consumption.

Currently, evidence suggests that physical education programs within the college population do not promote increases in students' physical activity levels (Calfas et al., 2000). Such programs might be more effective if they were more specific and sensitive to characteristics of the student population (Chepyator-Thompson, 1994). This specificity and sensitivity could be enhanced by understanding relationships between physical activity determinants and physical activity patterns (Baranowski, Anderson, & Carmack, 1998). There is no shortage of resources for colleges and universities to have an impact on health behaviors. Wellness programs, counseling centers, recreational facilities, and activity courses are all integral and common areas of interest in the student life population. With a focus on the relationships among health determinants, student involvement and student beliefs, behavior intervention programs could have a more profound impact on health behaviors (Baranowski et al., 1998; Chepyator-Thompson, 1994). By equipping college graduates with the skills to be physically active and nutritionally sound, health professionals can take a step forward in the battle against unhealthy lifestyles (Leslie, Sparling, & Owen, 2001; Sparling & Snow, 2002).

Locus of Control

In an attempt to understand the many psychological processes underlying behaviors, researchers have investigated the role of LOC for decades. LOC is a theory of perceived control about the source, or locus, of reinforcement for a particular behavior or life event. In short, it is a theory that explains the extent to which individuals believe they can control life events (Ai, Peterson, Rogers, & Tice, 2005). LOC was first proposed by Rotter (1954), and is the framework of his social-learning theory of personality, and included concepts that were later used by Bandura (1977) in his development of Social Learning Theory. Rotter proposed that LOC is a product of past experiences that provide future expectations about a particular ideal, and he explained that the source of LOC is either external or internal. External LOC refers to an outside source of reinforcement, and the individuals believe they have no influence or control over the event or behavior in question. External LOC sources include forces such as deity, fate, luck, chance, or other people (doctors, lawyers, policymakers, close others, etc.). Internal LOC refers to one's own behaviors, perseverance, determination, or endurance as a source of the reinforcement for the behavior or event, and the individual acknowledges a level of self-control.

Many disciplines of psychology utilize LOC as a research construct, including: educational psychology, clinical psychology, industrial and organizational psychology, sports psychology, and psychology of religion. Rotter's original LOC measure has also taken on many forms through various scales of different constructs. General LOC measures include, but are not limited to: James Internal-External LOC Scale, Levenson IPC (internality, powerful others, chance) Scale, and Multidimensional Multiattributional

Causality Scale. Health LOC measures include: Multidimensional Health LOC Scale, Drinking LOC Scale, Diabetes LOC Scale, and The Depression LOC Scale, among many others. Other areas of LOC scales include: Stanford Preschool LOC Scale, Parental LOC Scale, Economic LOC Scale, Prison LOC Scale, and Traffic LOC Scale (Halbert & Hill, 2011).

Research in the multifaceted areas of LOC has yielded interesting results, and most associate internal LOC with positive outcomes and external LOC with negative outcomes. For example, Roddenberry and Renk (2010) found those with higher externality scores experienced higher stress levels. Sadowski and Wenzel (1982) reported that externals had greater hostility levels than internals. In 2010, Wang, Zhang, Zhu, Mai, and Li found that external attribution was correlated with poorer scores on a self-regulated learning scale. Burns (1985) showed that an internal attribution was correlated with successful task completion in preschoolers. Kokkinos and Panayioyou found externality among parents to be associated with less effective disciplinary measures toward their children (2007). Heaven and Furnham (1987) found that external economic LOC may be associated with prejudice, and Mewse, Lea and Wrapson (2010) found consumers with debt were more likely to exhibit economic externality. Reitzel and Harju (2000) found prisoners with high internality were less likely to be depressed, and Ozkan and Lajunen (2005) found certain external components to correlate with an individual's driving behavior.

Health Locus of Control

Research on LOC has extended into health psychology. Health LOC is the perception individuals have of how much control they have over the health events in their

lives. Health LOC research is based on the development of the Health Locus of Control Scale by Wallston et al. (1976) and the further developed Multidimensional Health Locus of Control Scale (MHLC) by Wallston et al. (1978). The latter is an adaption of the Levenson IPC Scale, which measured the influence of internality, powerful others, and chance as sources of control over health outcomes (Levenson, 1972). The MHLC Scale measures how much individuals believe they have control over their own health outcomes, and it is used to categorize the individual's beliefs to either an internal (internality) or external (which includes both powerful others and chance) LOC. The premise of the MHLC is that individuals with an internal health LOC have a stronger belief that they are in control of their health outcomes, whereas individuals with an external health LOC believe that their health outcomes are primarily controlled by outside forces, or are inevitable. Those with an external LOC are more likely to believe that if an adverse health event is going to happen to them, then it will occur to them regardless of what they do, so they may be less likely to engage in preventative behaviors.

Studies investigating health LOC have shown that individuals with greater internal LOC are more likely to believe they can control whether or not they develop a specific life-style related disease, and internal LOC was predictive of lower rates of excessive drinking (Kuwahara et al., 2004). Wallston et al. (1978) found similar results of a relationship between internal health LOC and lower rates of smoking. Chen, Action, and Jung-Hau (2010) showed that internality was associated with better nutritional behavior. Additionally, externality was associated with lower quality of life scores in individuals with chronic back pain (Sengul, Kara, & Arda, 2010).

Astin, Shapiro, Lee, and Shapiro (1999) emphasized the importance of examining perceived control in health-related connections, especially those related to the heart. Greater personal control, optimism, and self-esteem have been shown to predict fewer cardiac events after a cardiac procedure (Helgeson & Fritz, 1999). A few years later, Weinstein, Quigley, and Mordkoff (2002) found that a greater perceived control (internal) was associated with less heart and circulatory system distress. In women, a study of LOC and perceived risk for breast cancer showed that those with high internal LOC had a greater belief that they could control whether or not they developed breast cancer (Rowe, Montgomery, Duberstein, & Bovbjerg, 2005).

Several studies have investigated LOC in relation to health constructs in college students. In one study, college students placed a higher importance on internal abilities to control health status than external abilities, especially as those abilities related to attitudes towards the risk of HIV/AIDS (White, et al., 2011). Other studies have made clear associations between stress of college students and LOC (Abouserie 1994; Gadzella 1994; Oaten and Cheng 2005). Specifically, Abouserie (1994) and Gadzella (1994) found that college students with higher external LOC were more likely to report higher levels of stress than those with higher internal LOC. More recently, Oaten and Cheng (2005) associated higher levels of stress among college students with an increase in negative health behaviors and a decrease in positive health behaviors.

Research supports the idea that health and well-being can be enhanced by internal LOC and the religious aspects of the "Protestant" ethic, which are underlying components of the Western culture (Eckstein, 2000; Jones, 1997; Raven, 1999). However, research on LOC and faith has conflicting findings. Studies performed in the

1970s showed faith and internal control were positively associated (Bensen & Spilka, 1973; Shrauger & Silverman, 1971). Later studies found no association (Alton, 1999; Wong-McDonald & Gorsuch, 2000), and in fact, one study found a negative association between control and religiosity (Shaw & Krause, 2001). Ai et al. (2005) note that such conflicting evidence points to a very complex relationship between faith and LOC, one that can be judged both positively and negatively for health behaviors for different people. Specifically, Ai et al. (2005) suggested that faith may play a role in health through multiple pathways, such as: attempting to control uncontrollable health situations (adopted from Malinowski, 1925), and/or providing a divine support for those that surrender all worry and control (over health issues) to God.

Development of God Locus of Health Control Scale

Much of the past LOC-based research focused efforts more on the emphasis of internal LOC in relation to the outcomes being measured. There is strong support that those individuals with a greater internal than external LOC tend to have better outcomes on the many of the constructs that have been examined. For example (as mentioned previously), those with greater internal LOC show less stress (Roddenberry & Renk, 2010), greater task attribution (Burns, 1985), and less debt (Mewse et al., 2010). Years of LOC research demonstrated the power of a higher internal LOC for certain outcomes and behaviors, while simultaneously creating a sense that external LOC could not be as powerful for the outcomes measured. Some researchers began to challenge this idea. Shapiro et al. (1996) emphasized the lack of focusing on external LOC as a research gap, and specifically noted that a better understanding of why some tend to rely more on

external LOC sources is critical to integrate effective programs related to the desired outcomes.

The MHLC scale categorizes LOC as either internal, external (powerful others) or external (chance). The scale's reference to "powerful others" as an external source include both various individuals (i.e. - loved ones, physicians, supervisors, and lawmakers) and spiritual beings (such as God, Allah, etc.) (Wallston et al., 1978). The concept of God as only an external LOC became a source of controversy, since the presence of God in one's life can have powerful internal effects. Gabbard, Howard, and Tageson (1986) interpret God control as being similar to an external LOC, but many researchers note that a belief in God is distinct from other external sources (Furnham, 1982; Jackson & Coursey, 1988; Pargament, Sullivan, Tyler, & Steel, 1982). Welton, Adkins, Ingle and Dixon (1996) referred to "God-control" as a fourth dimension, one that is beyond the original three health LOC sources of internal, external (powerful others), or external (chance).

The complex nature of this relationship centers on the event or behavior of which "control" is in question. For example, some religious individuals will profess that unpleasant and negative events are the will of God (Kunst, Bjorck, & Tan, 2000), or they will aim to seek God when an uncontrollable health threat sparks the need of spiritual or divine support (Heckenhausen & Shulz, 1995). In general, a "deferring" style of coping has been associated with having a stronger belief that God is in control over individual outcomes (Pargament et al., 1988). A deferring coping style is one that is considered passive, where individuals give all responsibility of coping to God. Nelson (2009) found

this deferring coping style to be negatively related to psychosocial competence, self-esteem, and personal control.

Ai et al. (2005) contends that measurement of LOC and the influence of faith are best compared by a "goal-oriented spiritual coping measure rather than a general religious faith measure," (p. 472). Pargament et al. (1982) stated that,

> The view of "internal control as desirable" and "external control as undesirable" is overly simplistic. In particular, a *high* sense of control by God, while external in nature, appears to have benign psychosocial implications when integrated in certain patterns with the other loci of control, and with an intrinsic orientation toward religion. Conversely, a *low* sense of personal control when coupled with a viable external attributional framework (e. g. God and religion) also has positive psychosocial significance for the individual. It is the group apparently lacking a coherent framework of attribution, internal or external, which manifests the least favorable competence characteristics. (p. 1250)

The logical next step was to investigate the impact of God as a LOC for health outcomes, especially in those who are more religious or spiritual. Wallston, Stein, & Smith (1994) were one of the first to measure the role of God with items added as a subscale to the MHLC in a sample of individuals with rheumatoid arthritis. Following Wallston et al. (1994), Welton et al. (1996) developed a series of questions related to a person's perception of God's control over health behaviors in a stand-alone "God-control" LOC scale. Welton et al. investigated the new "God-control" scale in two samples of healthy undergraduate students, where the scale displayed high internal

consistency and was positively associated with religiosity. The scale predicted health habits in one of the two undergraduate samples (1996).

Wallston et al. (1999) constructed the God Locus of Health Control (GLHC) scale to assess religious health beliefs in those with acute or chronic health conditions. The GLHC was added to the original MHLC Form C scale. Wallston et al. (1999) administered the GLHC to three different samples, two independent samples with rheumatoid arthritis and a group with systemic sclerosis. The results showed that the scale had acceptable internal consistency, and was uncorrelated with all demographic variables, except education level. In two of the three samples, higher education level was related to lower beliefs of God-related control, which was consistent with a previous study (Hoffman & Miller, 1997). The GLHC scale was determined to be independent of the MHLC scale, but showed positive correlations with internality, powerful others, and chance externality.

Only four studies found have examined the predictive role of GLHC on health behaviors. Willis, Wallston, and Johnson (2001) found that GLHC had a negative association with alcohol use in undergraduate students, which is consistent with previous findings that most religions discourage substances that harm the body or result in mind altercation (Koenig, 2001). Franklin, Schlundt, and Wallston (2008) found that high GLHC in African American adults was associated with low physical activity levels, and Kinney, Emery, Dudley, and Croyle (2002) found that African American women with high GLHC levels were less likely to adhere to clinical breast exams and mammography recommendations than those who have lower GLHC scores. The authors suggest that a reliance on God to alleviate breast cancer morbidity may lead to decreased reliance on

screenings, treatments, and preventative options (Kinney et al., 2002), which supports a previous theory by Pargament et al. (1988).

Nearly simultaneously, but independent of Wallston and collegues, Holt and colleagues (Holt et al., 2007; Holt et al., 2003a; Holt et al., 2003b) developed the Spiritual Health Locus of Control Scale (SHLC) to include the role of religion and spirituality in determining health outcomes with LOC. Individuals with a spiritual health LOC believe that God has some or all of the control over their health. According to Holt et al. (2003b), individuals with a spiritual LOC can be classified as more passive or active in relation to God and health. Passive individuals believe God has ultimate control over health outcomes, and are less likely to engage in preventive behaviors. Active individuals believe both themselves and God control their health outcomes, and are more likely to be proactive towards health concerns.

It is important to distinguish that there is a difference between internal health LOC (as measured by the MHLC scale) and active spiritual health LOC (as measured by the SHLC scale). Holt, et al. (2003a) examined the relationship between health LOC (internal vs. external), spiritual health LOC (active vs. passive), breast cancer beliefs, and mammogram beliefs (utilization, barriers, and benefits) among African American women. The results from this study showed the distinction between internal vs. external health LOC and passive vs. active spiritual health LOC. Researchers found positive associations between internal health LOC and perceived benefits of mammogram; however negative associations between perceived mammogram benefits were found among those with an active spiritual health LOC. Additionally, a positive association between active SHLC and perceived mammogram barriers was supported.

Wells (2006) examined the relationship between reducing breast cancer risk and SHLC by randomizing overweight/obese African American women to a weight-loss / breast health intervention. Women with greater passive spiritual health LOC showed greater improvements in health behaviors such as dietary fat intake, physical activity, weight and BMI than women with greater active spiritual health LOC after the 12-week program.

Debnam et al. (2012) expanded the use of the SHLC scale within a national sample of African American adult population examining the relationship between spiritual health LOC and health-related behaviors, such as physical activity, fruit and vegetable consumption, and alcohol use. Results showed individuals with an active spiritual health LOC had higher levels of fruit and vegetable consumption and lower levels for alcohol intake. Conversely, individuals with a passive spiritual health LOC had lower fruit and vegetable consumption and higher alcohol consumption. These results partially supported the authors' hypotheses; however, they found no association between spiritual health LOC and physical activity. The authors suggest that this lack of association may be due to a greater need for social support to promote physical activity among African Americans, and that the power of spirituality may have different effects on different health behaviors.

Although the GLHC and the SHLC are essentially the same measure, with almost identical items, the GLHC will be used in this study, since the SHLC was specifically designed for the African American population and has not been used in other groups. The SHLC also scores and defines the results as passive vs. active, which complicates the issue of God control. GLHC has been used in nationally representative samples, even in

a college sample, and measures items based on how much individuals rely on God for control. Additionally, the GLHC was developed by the same authors as the MHLC, which allows for consistent wording and scoring of items.

Linking Spirituality and Religiosity to Health Outcomes

Over the last few decades, research examining the relationship between spirituality, religiosity and health among many different populations has greatly increased. A number of studies have shown that spiritual and religious behaviors can be effective coping strategies for diseases and health problems, such as cancer (Gall, 2004; Johnson et al., 2009; Ross, Ingrid, Firley, Taylor, & Howard, 2008), postpartum depression (Zittel-Palamara, Cercone, & Rockmaker, 2009), joint pain (Ang, Ibrahim, Burant, Siminoff, & Kwoh, 2002; Jones et al., 2008) and HIV/AIDS (Siegel and Schrimshaw, 2002). Additional studies have implemented a health related intervention within a faith-based setting, some with mixed results (Cambell et al., 1999; Duru, Sarkisian, Leng, & Mangione, 2010; Kumanyika and Charleston 1992; Resnicow et al. 2004; Whitt-Glover, Hogan, Lange & Heil 2008; Wilcox et al., 2013; Wilcox et al., 2007).

Other studies have shown that religiosity and spirituality are enablers of protective health behaviors and lifestyles (Ellison and Levin, 1998; Koenig, 1999, 2001; Koenig et al. 1999; Larson et al. 1992; Roff et al., 2005; Strawbridge, Cohen, Shema, & Kaplan, 1997). Decreased alcohol intake and increased physical activity may be associated with lower rates of obesity due to involvement in religious groups with doctrines that promote healthy living (Kim et al., 2008 Strawbridge et al., 1997).

Conversely, other studies have shown that participation in religious activities may actually lead to weight gain (Feinstein, Liu, Ning, Fitchett, & Lloyd-Jones, 2010; Ferraro, 1998; Lapane, Lasater, Allan, & Carleton, 1997). Feinstein et al. (2010) also found that participants were more likely to be obese, but less likely to smoke if they had a higher rate of religious attendance, daily spirituality, and practiced private prayer. Norton et al. (2008) found that within an older adult sample (those aged 65 – 100) of 2,989 participants, weekly church attendance was protective against both depressive symptoms and the risk for major depression.

Investigations of religion or spirituality on health behaviors or outcomes in youth populations are limited. Wallace and Forman (1998) examined religion's influence on health behaviors and lifestyle choices among a national sample of adolescents. Those who were more religious exercised more, ate better, used a seat belt more often, and got more sleep than those that were less religious or not religious. Varon and Riley (1999) showed that adolescents whose mothers attended religious services at least once a week demonstrated better health problem-solving skills, greater social support (from friends), and higher overall life satisfaction, even after controlling for race, gender, income, and family structure.

Within the younger populations, there is more evidence for the effect of religion on self-esteem. In a review of the literature on religion and youth, Regnerus (2003) found several studies that showed a positive relationship between religiosity and self-esteem, moral self-worth, and the ability to control personal affairs. Additionally, other studies within the review noted that religious organization and communities may promote favorable self-images among the young. Regnerus (2003) notes that adolescents and

young adults who are subjected to a religion can experience forces that can influence their behavior in the same sense that an adult can be influenced. He further notes, however, that with such limited studies, overall conclusions are not definitive, and future research is warranted.

George et al. (2002) proposed various mediators that account for the effect of religion and spirituality on health outcomes, such as health practices, social support, psychosocial resources (self-esteem and self-efficacy), and belief structures (e.g. – sense of coherence). Social support, self-efficacy, and self-esteem are constructs that will be addressed in further detail later in this chapter. Seybold (2007) suggests that religious participation encourages better health habits, and states that some religious groups proscribe or prohibit certain behaviors (i.e. – tobacco and alcohol use). Additionally, many doctrines promote that the body is a "temple," which should be respected and cared for (Holt & McClure, 2006).

In contradiction to the previously mentioned findings, a few studies have shown spirituality to have a deleterious impact to certain health outcomes. King, Speck, and Thomas (1999) studied 250 patients for nine months after being admitted to a London area hospital, and found that patients with strong spiritual beliefs were 2.3 times more likely to show no improvement or clinically deteriorate at the end of the nine months. These findings were similar to a previous study by the same authors in 1994. The impact of spirituality and religion on health is still unclear, studies differ in their findings, and associations are further blurred when research focuses on certain health conditions or certain ethnic groups.

Locus of Control and Mediating Variables

A logical next question that could advance the literature linking LOC to health is: how might MHLC and GLHC be linked to health practices and health outcomes? Mediation analyses are an attempt to explain how a variable influences an outcome. For example, a precursor (independent) variable begins an effect of a mediating variable, which produces a certain outcome (dependent variable) (MacKinnon, Fairchild, & Fritz, 2007). Mediating variables have a long history in psychological research, especially in the areas of psychological theories and cognitive psychology. In health-related fields, mediation variables are beginning to shape better applications of prevention, treatment, and intervention research areas. A mediated effect is often referred to as an 'indirect effect.' Baron and Kenny (1986) laid the foundation of studying mediation, and proposed that a variable must satisfy the following criteria in order to be considered as a mediator.

1. The independent variable must be significantly associated with the mediator.

2. The mediator is significantly associated with the outcome, after adjusting for the independent variable.

3. The significant relationship between the independent variable and the outcome variable significantly changes or is no longer significant after adjusting for the mediator.

4. The third condition implies a significant relationship between the independent variable and the outcome, represented by the *r* coefficient.

As far as mediation research in physical activity and nutritional behavior, Baron and Kenny (1986) is by far the most cited work. However, other approaches to mediation analyses have now grown in favor. Cerin and MacKinnon (2008) emphasized that the ultimate aim of a mediating variable is to establish whether an independent variable influences the outcome through its effect on a mediating variable, noting that criterion #4 listed above is not entirely necessary.

It is important to understand that the relationship of a mediator to the other two variables is a casually linked one, and is different from a confounder, a covariate, or a moderator. Further definitions on the latter topics can be found in Robins and Greenland (1992). A mediator is a third addition to an already established causal effect, as demonstrated in Figure 2. From the illustration, it is clear that an independent variable can produce an outcome on a dependent variable; however, it is possible that an "in-between" or mediating effect occurred before the dependent variable was affected. By better understanding the possible mediators and their effect on health outcomes, researchers can focus intervention, prevention, and treatment efforts towards the mediating variable in addition to the other variables of interest, increasing program efficacy and reducing time and cost on ineffective strategies. In short, an intervention designed to affect the mediator should impact the outcome; likewise, if an intervention fails to affect an existing mediator, the outcome will most likely be unaffected.

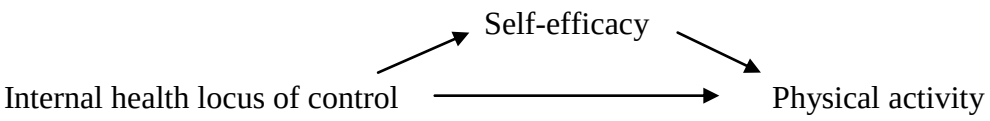

Figure 2.1.
Graphic illustration of how self-efficacy mediates the relationship between internal health locus of control and physical activity.

In behavioral research, there are no constructs that perfectly predict an outcome. For this reason, research studies on the etiology of behavior are based on probability and likelihood of an outcome occurring (Bauman, Sallis, Dzewaltowski, & Owen, 2002). Behavior change theories typically propose constructs that are purported to cause behavioral change. For example, Social Cognitive Theory (SCT) states that behavior is the result of the reciprocal interactions between environmental factors, personal factors, and characteristics of the specific behavior (Bandura, 1977). SCT includes personal and environmental constructs that serve intervention targets such as outcome expectancy, perceived barriers, self-regulation, self-efficacy, and social support, which some researchers examine for their power in the mediation of health behaviors and health outcomes. Self-efficacy and social support will be examined within this study as possible mediators between MHLC and health behaviors such as physical activity and dietary habits.

There is increasing evidence linking physical health, mental health, and longer survival with religious involvement (George, Larson, Koenig, & McCullough, 2000; Levin 1994). At least 400 studies have reported significant relationships between religion, spirituality, and health behaviors and outcomes (Koenig, 1997). In trying to identify ways that religion affects health, Fetzer Institute Working Group / National Institute on Aging (1999) has suggested four possible dimensions: public participation

(attendance at religious services and related activities), religious affiliation (religious group or specific denomination), private religious practices (prayer, mediation, and studying), and congregational social support (the extent of turning to religion when coping with problems). Studies examining these relationships tend to be positive, but vary in their levels of significance and magnitude (George et al., 2002).

In order to better explain the relationship, some researchers have turned to mediation analysis. Although support for religion, spirituality and health outcomes is strong, studies examining potential mediators of this relationship are limited. The limited efforts to explain the religion-health relationship have included four major categories of mediators: health practices, social support, psychosocial resources, and sense of coherence or meaning (George et al., 2002). Self-efficacy, social support, religious social support, and divine support will be examined within this study as possible mediators of GLHC and health behaviors of physical activity and dietary habits.

Self-efficacy as a Mediator of Health Behaviors and Outcomes

Bandura (1986) proposed that self-efficacy beliefs are driven by previous success, modeling, persuasion, and judgments. He defined self-efficacy as an individual's belief in his/her ability to succeed in specific situations (Bandura, 1977). It is important to distinguish the difference between LOC and self-efficacy. Individuals that have a high internal health LOC may or may not have a high self-efficacy towards a treatment or behavior (Roddenberry & Renk, 2010). However, it is clear that self-efficacy and LOC are related. Wiedenfel et al. (1990) demonstrated that the effect of a stressor on the immune system decreased once individuals felt efficacious over that stressor. Additional

research supports that external health LOC and self-efficacy has a moderating effect on psychological distress caused by illness (Shelley & Pakenham, 2004).

Self-efficacy is an integral component of many health behavior change theories and interventions. Few studies have examined possible mediators in effective physical activity interventions (Baranowski et al., 1998), which could be the direct result on why the majority of many interventions produce modest results (Stone, McKenzie, Welk, & Booth, 1998; Van Sluijs, McMinn, & Friffin, 2007). Lewis et al. (2002) conducted a review that revealed only two published physical activity interventions within the youth population included mediation analysis. In a more recent review, Lubans et al. (2008) found seven studies that evaluated cognitive, behavioral, and interpersonal mediators of physical activity behaviors and interventions among children and adolescence. Of the mediators examined, self-efficacy was the most commonly assessed, was measured in all seven of the intervention studies, and was found to be a mediator of significant changes in physical activity in four of the seven studies. In three of the studies reviewed, self-efficacy specifically mediated changes in physical activity (Dishman et al., 2004; Haerens et al., 2008; Taymoori & Lubans, 2008). The intervention used in Lubans and Sylvia (2007) promoted significant changes in self-efficacy, which were related to changes in physical activity. Based on the results within the adolescent population, the potential of self-efficacy as a predictor and mediator of physical activity is strong, although more research is needed.

To date, the effect of self-efficacy as a mediator of adult physical activity interventions isn't as clearly supported, more likely due to the overall lack of studies performed within the adult population. Rhodes and Pfaeffli (2010) conducted a review of

22 experimental and quasi-experimental publications that included mediators of physical activity behavior change interventions within the adult population. Of the 22 experimental studies, only 11 showed a change in physical activity, and these 11 also found that mediated constructs were changed as a result of the intervention. Nineteen of the 22 targeted self-efficacy, nine of which did not show any effects of the intervention on physical activity. In fact only one intervention (Blanchard et al., 2007) demonstrated that task self-efficacy was a significant mediator of behavior change. In the review, Rhodes and Pfaeffli determined that there is strong support for self-efficacy as a mediator for change in physical activity behaviors in the adult population, but more research is needed. Additionally, the authors call for better study design and measuring procedures when investigating the mediating variables, as they point out several problems with many of the designs of the studies that were reviewed (2010).

Within the college population, Milne, Orbell, and Sheeran (2002) used motivational and volitional interventions to promote exercise participation. Although increases in self-efficacy and response efficacy (the belief that one exercise session a week will reduce disease risk) were reported, changes in physical activity behaviors were not significant. Conversely, Sallis, Calfas, Alcaraz and Gehrman (1999) showed self-efficacy to have a mediating effect on significant physical activity changes among college students. More studies on mediation of health behaviors within the college population are warranted.

Cerin, Barnett, and Baranaowski (2009) conducted a review of dietary behavior change interventions that used a mediating variable in youth and found inconsistent results. Out of 713 potential relevant articles, only seven met the inclusionary criteria

and performed mediation analysis on dietary behavior change in children or adolescents. The interventions were not very successful in affecting theoretical mediators of dietary behavior change. Among the four studies that targeted self-efficacy as a mediator, only one showed significant intervention effects, and those effects were in the opposite direction than expected (Dzewaltowski et al., 2009). Van Stralen and colleagues (2011) found similar results in their systematic review of mediating mechanisms on energy balance behavior interventions in schools. Of the 51 interventions studied on dietary behavior change, 15 included significant mediation effects, however, 3 were in the opposite direction (perceived barriers, self-efficacy, and social norm). The authors noted that all reviewed studies that included changing self-efficacy and social support, among other mediators, were unsuccessful.

Although the findings for self-efficacy in the younger populations has not been consistently strong, Cerin and colleagues (2009) emphasize the importance of future studies that measure the impact of mediating variables in dietary interventions. First, there are not many studies that have investigated self-efficacy (and social support) as mediating variables of health behaviors and outcomes. Second, the authors note that the failed connections of dietary behavior and potential mediators in past studies point more towards a need for change in procedures of study designs. Specifically, targeted mediators should be very specific to the particular outcomes and demographic groups being tested.

In adults, Steptoe, Perkins-Porras, Rink, Hilton, and Cappuccio (2004) found self-efficacy to be a short-term predictor of 12-month changes in fruit and vegetable consumption. Other research has shown support for the powerful effect of observing

others reach success or experience failure has on an individual's self-efficacy (Biddle & Mutrie, 2001). In a 2008, Shaikh, Yaroch, Nebeling, Yeh, and Resnicow reviewed 35 studies that included 25 psychosocial constructs in an attempt to find support for psychosocial predictors of fruit and vegetable consumption in adults. Of the 25 psychosocial predictors measured, only knowledge, self-efficacy (perceived control), and social support (including encouragement and influence) showed strong evidence of success as predictors of fruit and vegetable consumption. Of the 14 prospective studies, six of them conducted mediation analysis, with five of those measuring self-efficacy as a potential mediator. Three of the five found self-efficacy to be a significant mediator of fruit and vegetable intake, and the other two studies showed that self-efficacy was a significant predictor, but was not a significant mediator. Shaikh et al. (2008) also explain that the evidence for self-efficacy, social support and knowledge of studies using a robust framework presented the best evidence for potential effectiveness and generalizability of findings. Based on all the available evidence, it is clear that self-efficacy can impact health behaviors and outcomes, as both predictors and mediators. Further support on these relationships is crucial.

In religious settings, Fuemmeler et al. (2006) investigated various psychosocial variables as mediators of fruit and vegetable consumption in 14 churches (eight intervention and six control) and a total of 750 participants in the Body and Soul intervention. This intervention was developed to influence dietary behaviors in African Americans, and proposed theory-based research with psychosocial variable associated with health behaviors. The authors specifically measured autonomous and controlled motivation, social support, and self-efficacy as mediating variables of the impact of the

Body and Soul intervention to increase fruit and vegetable intake. The results showed that the intervention improved fruit and vegetable intake. Although the four variables analyzed did have a mediating effect on fruit and vegetable consumption, only social support and self-efficacy were significant mediators in a multiple-mediator model, and partial mediators when analyzed separately. Support for self-efficacy as a mediating variable of an intervention effect is in agreement with the idea that an individual's belief that he/she can perform a behavior is predictive of behavior change, as outlined in the Social Cognitive Theory (Bandura, 1986).

Social Support as a Mediator of Health Behaviors and Outcomes

There is a vast amount of evidence from past research that social support can enact powerful effects on health outcomes (House et al., 1988). In fact, there is evidence that individuals who interact with divers social networks, such as friends, family, neighbors, coworkers, religious groups, live longer than those with fewer types of social ties (Berkman and Syme, 1979; House et al., 1988; Vogt, Mullooly, Ernst, Pope, & Hollis, 1992). Cohen and Willis (1985) also found that individuals with greater network diversity reported less anxiety, depression, and nonspecific psychological distress. The theory behind the power of social support lies in the idea that participation in a more diverse social network influences the motivation for individuals to care for themselves. For example, social networks can promote feelings of self-worth, responsibility, control, and meaning in life, which some suggest may also carry over to an increase in health promoting behaviors such as abstaining from smoking, moderating alcohol consumption, and improving diet, physical activity and sleep habits (Berkman & Breslow, 1983; Cohen, 1988; Thoits, 1983).

Studies have shown social support to be a mediating variable of health behaviors, although results have been mixed. Cohen, Doyle, Skoner, Rabin, and Gwaltney (1997) found that those with more types of social ties were less susceptible to common colds, produced less mucus, were more effective in ciliary clearance of their nasal passages, and shed fewer viruses. In fact, the susceptibility to colds decreased in a dose-response manner when the diversity of the social network increased, even after controlling for several different variables. Sallis et al. (1999) and Neumark-Sztainer, Story, Hannan, Tharp and Rex (2003) showed that social support impacts physical activity interventions among adolescents. Lubans and Sylva (2007) demonstrated that although social support satisfied a partial criterion as a mediator of physical activity; it was not related to any physical activity changes among adolescent females. In 2012, Kegler, Swan, Alcantar, Wrensford, and Glanz demonstrated the powerful predictor of social support, when combined with exercise equipment at home, and higher levels of vigorous, moderate, and total physical activity. Cerin, Taylor, Leslie, and Owen (2006) also showed social support as a mediator of physical activity behavior change among adults, while Fahrenwald, Atwood, Noble Walker, Johnson, and Berg (2004) did not. Therefore, social support has limited support for mediation of physical activity behavior change.

As far as mediation analysis on dietary behaviors, published literature is scarce. In a review of seven dietary behavior change interventions that used mediating variables in youth, no significant relationship was found for changes in social support and changes in dietary behavior (Cerin et al., 2009). In adults, Steptoe et al. (2004) examined the psychological and social factors predicting 12-month changes in fruit and vegetable

consumption in a low-income population, and found that increases were predicted by baseline social support.

As mentioned previously, Shaikh et al. (2008) found strong evidence for social support as a predictor of fruit and vegetable consumption in adults in a review of 35 studies examining 25 possible psychosocial constructs. Of the six studies that performed mediation analysis, three studies measured social support and found it to be a significant mediator of fruit and vegetable consumption. Although self-efficacy was the most commonly measured construct, social support and knowledge were assessed across multiple studies, which strong support as both predictors and mediators of fruit and vegetable consumption in adults.

Congregational Social Support as a Mediator of Health Behaviors and Outcomes

One possible mediator of religious involvement is religious support, an element of both the religious affiliation and congregational social support dimension mentioned previously. *Congregational social support (or religious support)* refers to the social support that an individual receives through relationships with others within his/her religious community (Duffy & Lent, 2008). Within religious denominations, there is an existing structure of social networks and support systems that can increase the power of religious support (often referred to as social support within a religious community) as a mediator of health outcomes, which may be associated with better health and longer life. It is possible that religious involvement creates opportunities for social ties with others that share common views and opinions, more so than those available to nonreligious individuals (George et al., 2002).

Testing the impact of religious support is difficult, since it is a multidimensional construct across the four dimensions of religious involvement. For this reason, many investigators endorse four aspects of religious support: social network size, social interaction, instrumental assistance, and subjective social support. George et al. (2002) stated that subjective social support (an individual's perception of the quality and availability of support that he/she is subjected to) is the most powerful predictor of health outcomes, and this is consistent with the broader research on social support and health.

Of these four constructs, social interaction is the most frequently examined mediator of the relationship between religious involvement and health. Most of the previous research has generally focused on social interaction and mortality. Support for social interaction as an independent predictor of mortality was strong in several studies, although these studies showed no mediating effects of social interaction on mortality (Bryant & Rakowski, 1992; Goldman, Korenman, & Weinstein 1995; Koenig et al., 1999). Other studies support the effect of social interaction as a partial mediator between attending religious services and mortality (Rogers, 1996; Strawbridge et al, 1997). Other than mortality, very little research has focused on social support as a mediating effect for health outcomes within religious or spiritual populations, and the findings have been inconsistent. Studies that examined the relationship between social support and physical disability (Idler & Kasl, 1992) and social support and depression (Musick, Koenig, Hays, & Cohen, 1998) showed no support for a mediating relationship; however evidence was clear for social support as an independent predictor in both. Studies investigating religious participation on physical health found similar results (Koenig et al., 1997). Ferraro and Koch (1994) showed that social support partially mediated the relationship

between religious participation and physical health in African Americans, but not in whites. Another study found that in relation to life satisfaction, the variables of intrinsic religiousness and prayer fulfillment were mediated by social support and optimism (Salsman et al., 2005).

As mentioned previously, Fuemmeler et al. (2006) found support for both self-efficacy and social support to be significant multiple-mediators of changes in fruit and vegetable consumption among 14 churches and 750 African American church members. Individually, they partially mediated the change, but the authors note that only the emotional support domain of social support was measured (i.e., encouragement from others to eat a healthy diet including more fruits and vegetables), and not instrumental (i.e., tangible items) or informational support. So, although strong support does exist for social support to mediate dietary changes, further research is needed.

It is important to note that although the research for religious social support is limited, and the findings are inconsistent, that does not mean that social support is irrelevant to the relationship of religion and health. Social support proved to be a statistically significant predictor of health outcomes in all of the cited studies, even those that failed to show social support as a mediator of the relationship (George et al., 2002). This is evidence that social support is related to health, and concurrently, plays a role in the relationship of religion to health. Based on the lack of research, and the seemingly obvious association of social support with religion and health, it is clear that more research is warranted before firm conclusions can be determined.

Divine Support as a Mediator of Health Behaviors and Outcomes

Divine support or *divine coping* refers to the support an individual receives through a relationship with a higher power, and in research cases of Christian religion, God (Duffy & Lent, 2008). Although congregational social support and divine support are separate constructs, they are often combined together in research efforts that investigate their mediating effects on various outcomes.

In a unique study, Duffy and Lent (2008) examined the relationship of both religious support social and divine support in career decision self-efficacy among college students. Their results showed that individuals with greater support from close others had greater confidence levels when dealing with challenges within a career or major. Divine support was significant in predicting career decision self-efficacy among college students.

Pargament (1997) explained that religion and coping can be independent of or completely integrated within one another, depending of course, on the individual. Prayer provides one avenue of a divine coping strategy, and can be particularly important in times of distress and need. Blaine and Crocker (1995) found an effect of religious beliefs on psychological well-being in African American adults, and substantiated these findings with a mediator effect of religious beliefs on the meaning of life and identification with a particular religious group, which provides an outlet for coping strategies.

Among college students, Fabricatore et al. (2004) found that collaborative congregational social support (considered active; sharing problem solving and responsibility with God) mediated the relationship of religiousness with well-being and

distress. The same study found no support for deferring congregational social support (considered passive; giving all problem-solving responsibility to God) as a mediator.

Reeves, Adams, Dubbert, Hickson, and Wyatt (2012) examined associations between spirituality and religiosity, health behaviors, and weight among African Americans in the Jackson Heart Study cohort. They found religiosity and/or spirituality did not relate to obesity, nor was the association moderated by demographics, psychosocial variables, or health behaviors. However, there were positive associations between religiosity and spirituality and health behaviors. Participants who more often utilized prayer (a divine support strategy), also reported consuming fewer calories. Those who reported higher religious attendance (a congregational social support strategy), prayer and daily spiritual experiences also reported lower amounts of alcohol use within the past year. Religious attendance was also associated with a lower likelihood of a smoking history. Additionally, religious attendance, private prayer, and daily spirituality were also associated with lower depression and greater social support (Reeves et al., 2012).

Spirituality, Religiosity, and Locus of Control among College Students

The life of college students entails much more than just classrooms and grades. The social networks and bonds created in college can enhance the experience for many students and assist with coping during difficult situations that students face (Kuh, 1995; Pascarella and Terenzini 2005). College can be a spiritual seeking moment for many students (Ma 2003), and for others it may be a time to redefine their idea of spirituality and religiosity (Cherry, DeBerg, & Porterfield 2001). Some studies show that individuals

who have spiritual involvement with campus groups experience increased leadership roles (Posner, Slater, & Boone 2006), student growth and development (Astin 1993), and out-of-class satisfaction (Kuh and Gonyea 2005), contributing to a positive college experience. Kuh and Gonyea (2005) also found that students involved with spiritual campus groups spend more time exercising, attend more cultural events, and participate in more community service.

Research among college students has established that spirituality may play a role in the health, grades, and involvement in student activities. Nelms, Hutchins, Hutchins, and Pursley (2007) examined spirituality and the health of 221 college students, and found that students who integrated spirituality in their lives experienced better outcomes. Specifically, students who reported a higher level of spirituality were more likely to report better health, greater participation in physical activity, and greater life satisfaction than those reporting a lower level of spirituality.

In addition, ongoing research has shown an increase of spirituality during the time students spend in college. A longitudinal study of over 14,000 students in 136 colleges, conducted by UCLA's Higher Education Research Institute, found that over the four years spent in college, students reported experiencing significant spiritual changes (Spirituality in Higher Education, 2007). As juniors and seniors, students were more likely to invoke on a spiritual quest, were more caring, and showed increased levels of equanimity and ecumenical worldview as their underclassman counterparts. Interestingly, these changes were not influenced greatly by professors or university leaders. Close to 60% reported that their professors never encouraged discussion of religious or spiritual matters. Religious constructs also changed over the years measured,

with small declines in the percentage of those who believed in God from their first year to their fourth year of college (77% to 74%) and in the percentage of those who prayed (69% to 67%). While there has been a small decline in these variables, it is important to note that the majority of the students surveyed believed in a God and prayed. Increases in religious constructs were seen in a belief in some sort of life after death (85% to 86%) and in those seeking to follow religious teachings in their own life (39% to 40%). The same study also found declines in the psychological well-being of students during their four years within the study while in college, with increases in the percent of students that feel depressed (9% to 12%), overwhelmed (31% to 46%), and filled with stress and anxiety (26% to 41%). Declines were also seen in the percentage of students that engaged in physical activity for at least five hours each week (52% to 28%). Alcohol consumption greatly increased in the student sample. Fifty-two percent of the students reported becoming beer drinkers upon entering college, and occasional liquor drinkers increased from 52% to 81% (Spirituality in Higher Education, 2007).

It is clear that college is a time of growth and reflection, at least spiritually, for most students. Yet, important questions are raised. If the majority (74%) of those students surveyed demonstrated a belief in God, why are the majority of students increasing damaging health habits, such as lower physical activity and increased alcohol consumption? Are the associations of health LOC, God-control, and health behaviors among college students mediated by self-efficacy, social support, congregational social support and diving support?

CHAPTER III

METHOD

This study was designed to examine the relationship between health and spiritual health LOC with physical activity and dietary habits, as well as to examine whether self-efficacy, social support, congregational social support, and divine support mediate these relationships. This study used internet based surveys from a volunteer sample of college students in two southeastern universities in the United States. Questionnaires assessed LOC (health and God control), self-efficacy, social support, congregational social support and divine support. Additionally, questionnaires measured physical activity behaviors, dietary behaviors, and demographic information, including age, gender, race, year in school, height, weight, marital status, on/off campus living arrangement, affiliation with a specific religion, frequency of attendance at worship service, and involvement with a religious student organization.

Purpose

The purpose of this study was to examine the relationship of MHLC and GLHC with physical activity and dietary health behaviors, as well as possible mediators of these relationships in college students. This study examined the following potential mediators: self-efficacy and social support for analyses involving MHLC and self-efficacy, social support, congregational social support, and divine support for analyses involving GLHC. In accordance with The University of South Carolina and Winthrop University

policies, the study was submitted to and approved by the Institutional Review Board for the use of human subjects prior to data collection.

Research Questions

In order to examine the relationship between MHLC and GLHC, mediation effects of self-efficacy, social support, congregational social support, and divine support and their influence on health behaviors of college students, the following research questions were addressed:

Health Locus of Control:

1. Does physical activity self-efficacy and physical activity social support mediate the relationship between internal MHLC and physical activity participation among college students?

2. Does dietary self-efficacy and dietary social support mediate the relationship between internal MHLC and dietary fat intake and fruit and vegetable consumption among college students?

God Locus of Health Control:

1. Does physical activity self-efficacy and physical activity social support mediate the relationship between GLHC and physical activity participation among college students?

2. Does congregational social support and divine support mediate the relationship between GLHC and physical activity participation among college students?

3. Does dietary self-efficacy and dietary social support mediate the relationship between GLHC and dietary fat intake and fruit and vegetable consumption among college students?

4. Does congregational social support and divine support mediate the relationship between GLHC and dietary fat intake and fruit and vegetable consumption among college students?

Participants

Data was collected from students attending the University of South Carolina and Winthrop University during the summer and fall of 2013 (July 15, 2013 to September 15, 2013) via internet based surveys. Questionnaires assessed LOC (health and God-control), self-efficacy, social support, congregational social support and divine support. Additionally, questionnaires measured physical activity behaviors, dietary behaviors, and demographic information, including age, gender, race, year in school, height, weight, marital status, on/off campus living arrangement, number of credit hours completed, current GPA, affiliation with a specific religion, frequency of worship attendance, and involvement with a religious student organization.

Inclusionary and exclusionary criteria for this study are listed next:

Inclusion criteria:

1. College students who attended either University of South Carolina or Winthrop University during the summer and fall of 2013.

2. College students who were at least 18 years of age.

3. College students who agreed to complete the surveys.

Exclusion:

1. Students who were not attending either University of South Carolina or Winthrop University in the summer or fall of 2013.

2. College students who were not at least 18 years of age.

3. College students who did not agree to take the survey.

Instrumentation

Assessments for this study were conducted through a popular online survey and assessment tool, SurveyMonkey (www.surveymonkey.com). SurveyMonkey allows researchers to create questions based on type and customize the survey to meet the needs of the project. SurveyMonkey also allows the researcher to define rules for skip logic patterns, which is a feature that changes what question or page a respondent sees next based on how he/she answers a previous question, and is also known as "conditional branching" or "branch logic." Since this research includes elements of religiosity and spirituality that may not apply to all respondents, this feature strengthens the use of this tool, however loss of data can affect statistical power. Data was downloaded into a spreadsheet to allow for immediate statistical analysis (SurveyMonkey, 2013).

Demographic information was assessed with questions from the ACHA-NCHA II, a national survey of college students' current health behaviors and perceptions (ACHA, 2012). The ACHA-NCHA II is a public domain scale that is widely used among 40 colleges and universities, and collected health related information from over 26,000 U.S. college students in 2008, which is the largest health information data set on college students. This study used nine self-report items from the ACHA-NCHA II including: age, gender, height and weight, year in school, enrollment status, ethnicity, marital status, and on/off campus residence. The ACHA-NCHA II is a public domain scale (ACHA, 2012).

Additionally, four items pertaining to religious involvement, denomination, attendance, and affiliation with a student religious organizations was used. Three of these items have been previously used within the college population (Harcrow, 2010). Religious involvement was assessed with the following items: 'yes' (1) or 'no' (0), do you have a religious preference/denomination? If yes, what is your religious preference/denomination? (open-ended). Religious denomination was grouped into the following categories: 'Non-Denominational Christian' (0); 'Anglican' (1); 'Catholic' (2); 'Jehovah's Witness' (3); 'Orthodox' (4); 'Protestant' (5); 'Judaism' (6); 'Islam' (7); 'Buddhism' (8); 'Hinduism' (9); 'Confucianism' (10); and 'Other' (11). Religious attendance was assessed through a single item measure: how often do you usually attend religious/spiritual services? Responses options were: 'never' (0); 'less than once a month' (1); 'about once a month' (2);' two or three times a month' (3); 'about once a week' (4); 'several times a week' (5). Scores for religious attendance range from 0 to 5, with higher scores indicating a higher level of religious attendance. Religious affiliation with student religious organizations was assessed with the following items: 'yes' (1) or 'no' (0), do you participate in campus-related student religious groups?

Locus of Control

Health LOC was measured with the MHLC by Wallston et al. (1978). MHLC assesses the perception individuals have of how much control they have over the health events that happen in their lives. The MHLC attempts to identify how much individuals believe they have control over their own health outcomes, and categorizes the individual's beliefs to either an internal or external LOC. Examples of items from the MHLC include: "I am directly responsible for my health" (internal), "When I stay healthy

I am just plain lucky" (chance), and "Following doctor's orders to the letter is the best way for me to stay healthy" (powerful others).

The MHLC replaced the original unidimensional Health Locus of Control Scale (Wallston et al., 1976), and is believed to be a more accurate measure. There are three forms of the MHLC, Forms A, B, & C. Forms A & B are equivalent forms with 18 total items and six item subscales of internality, powerful others externality, and chance externality. Forms A & B and are used as more general health locus of control scales; they only differ with the wording of each item, not the content or order of items. Wallston (1993) noted that there is no strong rationale for either Form A or B in healthy populations, and ultimately, the decision is up to the researcher. Form C is designed for specific health conditions, which is not applicable to this current study. For this study, Form B was administered. The MHLC is in the public domain (Wallston, 2007).

To score the MHLC, each subscale was summed, and the subscales are independent of each other (there is no "total" MHLC score). The scores from the subscales of internal, chance, and powerful others can range from 6 to 36, with higher scores demonstrating higher health LOC for that dimension. Internal consistency values for the three subscales in this study were $\alpha = 0.69$; $\alpha = 0.64$ and $\alpha = 0.69$ for internal, chance, and powerful others, respectively. Other studies reported similar reliability and high current, construct, and discriminant validity (Furnham & Steele, 1993).

God Locus of Health Control was assessed through the GLHC scale developed by Wallston et al. (1999). The GLHC scale was constructed to assess religious health beliefs in those with acute or chronic health conditions or to measure general health in

healthy populations. The GLHC is composed of six items that follow the same six-point Likert scale as the MHLC mentioned previously, ranging from 1 (strongly disagree) to 6 (strong agree). Examples of items include: "Whatever happens to my health is God's will" and "God is in control of my health." Scoring of the GLHC is similar to the MHLC, with all items keyed in the same direction. Scores can range from 6 to 36, with higher score representing a greater belief in God as a LOC. Internal consistency for the GLHC was high in this study ($\alpha = 0.96$), which is comparable to a previous study that also showed acceptable convergent validity and high alpha reliability (Wallston et al., 1999).

Health Behaviors

Physical activity was measured using the International Physical Activity Questionnaire (IPAQ) developed by Craig, Marshall, and Siostrom, 2003. Respondents included the frequency (times per week), intensity (low, medium, and high), duration (minutes per session), and type of exercises or sports that were completed within the last seven days. This information was used to calculate metabolic equivalent (METmin/week) by the following formula (IPAQ, 2004): Total METmin/week = (Walk METs*min*days) + (Mod METs*min*days) + (VigMETs*min*days). MET values were calculated using the following values: walking = 3.3 METs; moderate intensity = 4.0 METs; and vigorous intensity = 8.0 METs. Nigg, Maddock, Barnett, and Yamauchi reported the IPAQ as a valid and reliable PA assessment scale in 2003, and Craig et al. demonstrated criterion validity of the IPAQ (rho = 0.30) in 2003. The IPAQ is in the public domain (IPAQ, 2004).

Dietary fat intake was measured using a 17-item Quick Food Scan (QFS) for the National Cancer Institute (NCI) (National Cancer Institute, 2009). Participants were

asked to rate 15 foods on how often they were consumed over the last 12 months. Ranges of scores were from 0-7, with a score of 0 meaning that food was never consumed to 7 meaning that food was consumed two or more times per day. The NCI scoring algorithm was used to convert scores to estimates of a percentage of calories from fat. Higher scores represented higher intakes of fat. Reliability of the NCI QFS for this study was shown to be acceptable with an internal consistency of $\alpha = .70$, which is similar to that reported by Thompson et al. (2008). The Quick Food Scan is in the public domain (NCI, 2009).

Fruit and vegetable consumption was measured by two items used previously by Reniscow et al. (2000; 2001). Items include the following questions: "how many servings of fruit do you usually eat each day?" and "how many servings of vegetables do you usually eat each day?" Rensicow et al. (2000) demonstrated the validity and reliability of the two item measure by comparing the self-report results to serum carotenoid levels. A score of average fruit and vegetable servings consumed per day was derived by adding the two items. The two item measure is in the public domain.

Mediating Variables

Physical activity self-efficacy was assessed using a five-item scale by Marcus, Selby, Niaura, and Rossi (1992). This instrument is used to measure an individual's ability to overcome common barriers to exercise by using internal resources, such as self-efficacy and self-confidence. The scale is composed of statements such as: "I am confident I can participate in regular exercise when….. "I am in a bad mood," "It is raining or snowing," "I feel I don't have the time." Responses to each item are answered

on a Likert scale, and range from a 1 (not at all confident) to 7 (very confident). Responses of items were summed for a total score, which can range from 5 to 35, with higher scores representing greater self-efficacy to participate in physical activity. Internal consistency for the measure was high in this study ($\alpha = 0.89$), which is comparable to previous reliability reports (McAuley and Mihalko, 1998).

Physical activity social support was assessed with the nine-item abbreviated version of a scale developed by Sallis, Grossman, Pinksi, Patterson, and Nader (1987) to assess physical activity social support from family and friends. A five-point Likert scale was used to rate items, ranging from never/rarely (1) to very often (5). Total scores for perceived social support were calculated by summing all items. Scores can range from 9 to 45, with higher scores indicating greater social support. Internal consistency for the measure was high in this study ($\alpha = .93$) for this scale. Previous research reported similar reliability (Kegler et al., 2012), and the scale has been validated in adult populations (Sallis et al., 1987; Treiber, et al., 1991).

Dietary self-efficacy was measured by two assessments. Self-efficacy for consuming fruits and vegetables (six items) and self-efficacy for consuming low-fat foods (five items), adapted and modified by Norman et al. (2010) from longer versions of self-efficacy scales. The scales asked how confident participants were that they can consume fruits and vegetables and low-fat foods. Items for self-efficacy for fruits and vegetables include statements such as: "….eat five servings of fruits and vegetables every day" and "…eat fruits and vegetables for a snack instead of chips or candy." Items for self-efficacy to consume low-fat foods include statements such as: "…..when others around you are eating high fat foods" and "….when you are out at a restaurant."

Responses for items range from not at all confident (1) to extremely confident (5). Scores were summed for the individual scales. Total scores can range from 5 to 30 for self-efficacy to consume fruits and vegetables, and 5 to 25 for self-efficacy to consume low-fat foods, with higher scores indicating greater self-efficacy. In this study, internal consistency of self-efficacy for consuming fruits and vegetables was $\alpha = .86$, and the internal consistency of self-efficacy for low-fat intake was $\alpha = .89$, which is similar to a previous report (Norman et al., 2010).

Dietary social support to consume low-fat foods and fruits and vegetables was measured with six-items adapted and modified by Norman et al. (2010) from an original scale by Prochaska, Rogers, and Sallis (2002). The scale assessed how often, in the past 30 days, family or friends did the following: "….remind you to choose healthy foods," and "….eat healthy meals with you." The scale consisted of five positive items and one negative item, with responses ranging from almost never (1), to almost always (5). Total scores can range from 6 to 30, with higher scores indicating greater social support. In this study, this scale showed strong internal consistency ($\alpha = .86$), which was comparable to that reported by Norman et al. (2010).

Congregational social support was assessed through the Congregational Support Subscale, a seven-item subscale of the Religious Support Scale developed by Fiala, Bjorck, & Gorsuch in 2002. Participants rated each item on a five-point scale, with responses ranging from strongly disagree (1) to strongly agree (5). Items include statements such as: "Others in my congregation give me the sense that I belong," "I have worth in the eyes of others in my congregation," and "I can turn to others in my congregation for advice when I have problems." Items were summed for a total score.

Total scores could range from 5 to 35, with higher scores indicating greater congregational support. In this study the subscale showed strong internal consistency (α = .97). Previous studies have shown similar reliability and strong validity (Fiala et al., 2002).

Divine support was assessed through the God Support Subscale, a seven-item (six positive; one negative) subscale of the Religious Support Scale (Fiala et al., 2002). Participants rated each item on a five-point scale, with responses ranging from strongly disagree (1) to strongly agree (5). Items included statements such as: "I have worth in the eyes of God," "I can turn to God for advice when I have problems," and "God cares about my life and situation." Items were summed for a total score. Total scores can range from 5 to 35, with higher scores indicating greater divine support. In this study the subscales showed strong internal consistency (α = .94), which is similar to a previous study (Fiala et al, 2002). A significant effect was detected for the set of independent subscales from the Religious Support Scale, supporting individual subscale use (Fiala et al., 2002).

Study Design

The purpose of this study was to examine the relationship of MHLC and GLHC with physical activity and dietary behaviors of college students as well as to examine possible mediators of this relationship. This information is beneficial to health researchers, program planners and educators in order to understand how specific mediators can impact an individual's health behavior.

A web-based survey was used to collect data from students at University of South Carolina and Winthrop University. The survey consisted of 14 different scales, with 106 total items. Time to complete the survey was approximately 20 - 30 minutes.

Participants and Recruitment

Participants were recruited for this study via the following methods: student listserv emails, flyers, and announcements in classes and organizations. Willing participants completed the survey through a link in emails, flyers, and handouts to class and organization members. Participants were informed that their participation was anonymous and no identifiers were collected, and their information was used for research purposes only.

In order to increase the participation for the study, the researcher offered a reward of an IPAD mini to one randomly selected participant (approximately $300). At the end of the survey, participants were asked to enter their first name and email if they wished to be considered for the reward. Drawing for the reward took place after the data collection period ended.

The survey consisted of a combination of existing scales, all with established reliability and validity.

Table 3.1.

A summary of the measures used.

References	Scale	Purpose	Reliability in this study	# of Items
ACHA, 2011	Demographic Information	Descriptive		9
Harcrow, 2010	Religious Information	Descriptive		4
Wallston et al., 1978	Health Locus of Control	Independent Variable	α = .69	18
Wallston et al., 1999	God Locus of Health Control	Independent Variable	α = .96	6
Craig et al., 2003	International Physical Activity Questionnaire	Dependent Variable		7
National Cancer Institute, 2010	National Cancer Institute's Quick Food Scan	Dependent Variable	α = .70	17
Resincow et al., 2000; 2001	Daily Fruit & Vegetable intake	Dependent Variable	α = .67	2
Marcus et al., 1992	Exercise Self-Efficacy	Mediator of PA behaviors	α = .89	5
Sallis et al., 1987	Social Support and Exercise Survey	Mediator of PA behaviors	α = .93	9
Norman et al., 2010	Self-Efficacy to consume fruits and vegetables	Mediator of dietary behaviors	α = .86	6
Norman et al., 2010	Self-Efficacy to consume low-fat foods	Mediator of dietary behaviors	α = .89	5
Norman et al., 2010	Dietary social support to consume healthy foods	Mediator of dietary behaviors	α = .86	12
Fiala, et al., 2002	Religious Social Support Subscale	Mediator of nutritional / PA behaviors	α = .97	7
Fiala, et al., 2002	Divine Support Subscale	Mediator of nutritional / PA behaviors	α = .94	7

Statistical Analysis

Statistical Packages for the Social Sciences (SPSS) was used for all statistical analyses. Analyses conducted included descriptive analyses and regression models. Initial analyses were conducted in order to screen data for relationships, and to test for normality of distributions. If distributions did not show normality, square root transformations were conducted to normalize distributions. Demographic control variables were examined in relation to the outcome variables (physical activity, dietary fat intake, and fruit and vegetable consumption) and again in relation to the independent variables (MHLC and GLHC).

The product of coefficients approaches to statistical mediation analysis was used, which is represented by the following regression equations (MacKinnon, 2000):

1. $Y = i_1 + cX + e_1$
2. $M = i_3 + aX + e_3$
3. $Y = i_2 + c'X + bM + e_2$

where i_1 and i_2 are intercepts, Y is the dependent variable, X is the independent variable, M is the mediator, c is the coefficient relating the independent variable and the dependent variable, c' is the coefficient relating to the independent variable to the dependent variable adjusted for the mediator, b is the coefficient relating the mediator to the dependent variable adjusted for the independent variable, a is the coefficient relating the independent variable to the mediator, and e_1, e_2, and e_3 are residuals (MacKinnon, Fairchild, et al., 2007).

First, a regression was performed in order to predict Y (physical activity, dietary fat intake, or fruit and vegetable consumption) from X (MHLC or GLHC). This step

provided information useful to evaluate the strength of the association between X and Y, although significance between X and Y is not a requirement for mediation analysis.

Second, a regression was performed to predict M from X. The results of this calculation provided the *a* path, which is the path coefficient for the relationship between M and X.

Thirdly, a regression was performed to predict Y from both X and M. This regression provided the coefficient for path *b,* which represents the relationship between M and Y, controlling for X.

Following these regression models, the product of coefficients was determined by multiplying *a* times *b* (which represents the indirect or mediated effect), and constructing asymmetric confidence limits base on the distribution of the product using the PRODCLIN program (MacKinnon, Fritz, Williams, & Lockwood, 2007; Tofighi & MacKinnon, 2011).

In an attempt to reduce the impact of confounding variables or covariates, model analyses controlled for BMI, since education level and nutrition and dietary habits have been shown to be predictors of BMI (Ashley & Kannel, 1974).

In order to rule out multicollinearity, a single-mediator model was tested first. Following, a multiple-mediator model was used to 1) test the independent effects of the variables that are found to be significant in the single-mediator model, and to 2) test for suppression effects in the single-mediator models. All potential mediators was entered simultaneously to investigate suppression from one mediator on the effects of any others. Linear regression was used to conduct all mediation analyses (IBM, 2012).

CHAPTER IV

SELF-EFFICACY AND SOCIAL SUPPORT MEDIATE THE RELATIONSHIP BETWEEN INTERNAL HEALTH LOCUS OF CONTROL AND HEALTH BEHAVIORS IN COLLEGE STUDENTS[4]

[4] Marr, J. D. and S. Wilcox. Submitted to *Journal of American College Health*, 3/17/2014.

ABSTRACT

Objectives: To examine whether self-efficacy and social support mediate the relationship between college students' health locus of control and health behaviors of physical activity, fruit and vegetable intake, and dietary fat intake.

Participants: 838 college students at two public universities in the southeastern United States.

Methods: Online surveys of health locus of control, physical activity, fruit and vegetable intake, and dietary fat and self-efficacy and social support of those behaviors were completed from July to September 2013. Mediation was tested with product of coefficients approach.

Results: Self-efficacy and social support mediated the relationship between health locus of control and physical activity behaviors and fruit and vegetable intake. Only self-efficacy was a mediator for dietary fat intake.

Conclusions: Physical activity and dietary behavior change interventions among the college population should target internal health LOC through the inclusion of increasing self-efficacy and social support for these behaviors.

INTRODUCTION

The American College Health Association's (ACHA) [1] has reported that many college students are obese (34.1%) and sedentary (47.4%). The typical college student consumes high amounts of fat and sodium,[2-4] sugar,[5] fast food,[6-7] and low amounts of healthy foods.[3] Adolescents who are overweight have a 70% chance of becoming overweight adults[8] and even among college students, obesity has been linked to many health concerns.[9]

Health Locus of Control

Health locus of control (HLOC) refers to how much individuals believe they are in control of their current and future health.[10] Individuals with a higher internal HLOC have a stronger belief that they are in control of their health outcomes. [10-11] High internal HLOC has been shown to be predictive of lower rates of excessive drinking[12] and smoking[10] and has been associated with better dietary habits,[13] and a greater belief of controlling the risk of breast cancer[14] and HIV/AIDS.[15] Those with a higher external HLOC are more likely to believe that they can do little to influence their health outcomes, and have been shown to be less likely to engage in preventive behaviors. College students with higher external HLOC were more likely to report higher levels of stress, [16-17]and higher levels of stress were associated with more negative health behaviors within the same population.[18]

Mediator Effects

A mediator is a variable that accounts for a relation between a predictor and a criterion, and can help explain the mechanisms for how independent variables exert influence on dependent variables. [19]

Although Baron and Kenny's work is the most commonly cited in the area of mediation and health behaviors, other approaches have grown in favor. In current mediation analysis, it has been noted that significant mediation effects can occur even in the absence of Baron and Kenny's criterion #4, that the independent variable be significantly related to the dependent variable.[20]

Mediators of Health Behaviors

Self-efficacy and social support are being studied more as potential mediators of health behaviors and outcomes. There is evidence that self-efficacy and social support mediated changes in PA in the context of an intervention.[21-26] Evidence for self-efficacy and social support as mediators of FVI in adults was found in a review of over 35 studies[27] and future mediation research for both PA and dietary outcomes is necessary.[23-31]

A logical next question that could advance the literature on internal HLOC is: how is internal HLOC linked to health practices and health outcomes? Internal HLOC has shown to be positively related to engagement in beneficial health behaviors, [32] and understanding the mechanisms of this relationship could possibly help identify groups that may benefit from targeting certain mediators. We believe that the relationship between internal HLOC and health behaviors, such as PA and dietary practices, could be

mediated by self-efficacy and social support. LOC was first proposed by Rotter and Bandura included concepts from LOC in the development of the Social Learning Theory.[34] He defined self-efficacy as an individual's belief in his/her ability to succeed in specific situations,[35] and there is evidence that self-efficacy and LOC are related strictly based on the power of an individual's beliefs.[36]

Social support can enact powerful effects on health outcomes,[37]and individuals who interact with diverse social networks live longer than those with fewer types of social ties.[38-40] Participation in a more diverse social network influences the motivation for individuals to care for themselves and promote health behaviors.[41-43] Those who report more social support may also be more able to elicit support for health behaviors, and this tendency may be enabled if one feels in greater control of their health.

It is possible that a greater belief of control over current and future health also increases the self-efficacy and social support for positive health behaviors. The purpose of this study was to examine whether self-efficacy and social support mediated the relationship between internal HLOC and three health behaviors of PA, FVI, and dietary fat consumption (%FAT) among college students.

METHOD

Procedure

This study used internet based surveys from a volunteer sample of college students in two southeastern universities in the United States, conducted between July 2013 and September 2013. The surveys consisted of 14 different scales, with 106 total items. Time to complete the survey was approximately 20 - 30 minutes. The study was

approved by each university's Institutional Review Board, and participants were given a written statement at the beginning of the surveys and directed to complete the survey if they consented to be in the study.

Participants

Participants were recruited for this study via the following methods: student listserv emails, flyers, and announcements in classes and organizations. Willing participants completed the survey through a link in these emails, flyers, and handouts. The sample used for any analysis included 838 students (see Table 1). The majority of the sample was female (n = 614; 73.4%), and white (n = 543; 64.1%) or black/ African American (n = 195; 23.0%).

Instrumentation

All assessments for this study were conducted through an online survey tool, SurveyMonkey.[44]

Demographic information was assessed with questions from the American College Health Association (ACHA) – National College Health Assessment (NCHA) II: age, gender, height and weight, year in school, enrollment status, race/ethnicity, marital status, and on/off campus residence.[1]

HLOC was measured with the 18-item Multidimensional Health Locus of Control (MHLC) scale.[10] Examples of MHLC items include: "I am directly responsible for my health" and "When I stay healthy I am just plain lucky." For this study, MHLC Form B was administered. Items within each subscale showed moderately high internal consistencies for internal ($\alpha = 0.70$), chance ($\alpha = 0.64$), and powerful others ($\alpha = 0.69$).

For this study, only the internal HLOC score was used in analysis. Items for internal HLOC were summed for a total score, and scores ranged from 6 to 36, with higher scores demonstrating higher internal HLOC. Similar reliability of the MHLC has been reported as $\alpha = .64 - .78$, as well as strong concurrent, construct, and discriminant validity.[45]

PA was measured using the International Physical Activity Questionnaire (IPAQ) Short Form.[46] Participants were asked to recall the number of days (frequency) in the last seven that they completed vigorous, moderate, walking, or sitting activities, and the amount of time they usually spent doing each (duration). Metabolic equivalent (MET) minutes (min)/week was calculated by the following formula (IPAQ, 2004): Total MET min/week = [Walk METs (3.3)*min*days] + [Mod METs (4.0)*min*days] + [VigMETs (8.0)*min*days]. Criterion validity of the IPAQ has been shown.[46] Daily activity values beyond 240 minutes for each level of intensity were considered outliers and were set to missing.[47]

%FAT was measured using a 17-item Quick Food Scan for the National Cancer Institute (NCI).[48] Participants were asked to rate the frequency with which they consumed 15 foods over the last 12 months, ranging from never (0) to two or more times per day (7). The NCI scoring algorithm was used to convert scores to estimates of a percentage of calories from fat. Internal consistency for this study was shown to be $\alpha = .70$, comparable with a previous study that also established acceptable validity.[49] Percentages of dietary fat higher than 60% were considered outliers and were set to missing.

FVI was measured by two items used previously, "how many servings of fruit do you usually eat each day?" and "how many servings of vegetables do you usually eat each day?"[50-51] Validity (r =.35) and reliability of the two item measure by has been

established by comparing the self-report scores to serum carotenoid levels.[50] A score of average fruit and vegetable servings consumed per day was derived by adding the two items. Scores over 10 were considered outliers and were set to missing.

PA self-efficacy was assessed using a five-item scale.[52] Participants reported their confidence to be regularly active when faced with common barriers. Responses to each item were answered on a Likert scale, and range from not at all confident (1) to very confident (7), and summed for a total score, which could range from 5 to 35 Higher scores indicated greater self-efficacy to participate in PA. In this study, this scale showed high reliability ($\alpha = 0.89$), which was comparable to a previous study.[53]

PA social support was assessed with a nine-item scale.[54] Participants reported how often they received support from their family and friends for being physically active. The original scale was modified for this study to rate family and friends together, rather than separately. Each item was answered on a Likert scale, and responses ranged from never/rarely (1) to very often (5). Items were summed for a total score, which could range from 9 to 45. Higher scores indicated greater social support for PA. For this study, this scale showed high internal consistency of $\alpha = 0.93$, which is similar to a previous study, [55] and the scale has been validated in adult populations.[54, 56]

Dietary self-efficacy was measured with two scales: self-efficacy for FVI (six items) and self-efficacy for consuming low-fat foods (five items).[57] Participants reported their confidence to choose low-fat foods when faced with common barriers. Responses were answered on a Likert scale, and ranged from not at all confident (1) to extremely confident (5), and the individual scales were summed for total scores, which could range

from 5 to 30 for self-efficacy for FVI, and 5 to 25 for self-efficacy to consume low-fat foods. Higher scores indicated greater self-efficacy. The internal consistencies of self-efficacy for FVI ($\alpha = .86$), and self-efficacy for low-fat intake ($\alpha = .89$) for this study were acceptable, and similar to that reported.[57]

Dietary social support to consume low-fat foods was measured with a six-item scale.[57] Participants reported how often they received support from their family and friends for choosing low-fat foods. Responses were answered on a Likert scale, and ranged from almost never (1) to almost always (5), and summed for a total score, which could range from 6 to 30. Higher scores indicated greater social support. In this study, internal consistency for this scale was $\alpha = .86$, similar to a previous report.[57]

Statistical Analysis

Statistical Packages for the Social Sciences (SPSS) was used for all statistical analyses. Initial analyses were conducted to describe the variables and to examine the normality of distributions.[58]

Mediation was tested with the product of coefficients approach .[59] First, a separate regression analysis was performed in order to predict each dependent variable Y (PA, %FAT, or FVI) from the independent variable X (internal HLOC), which indicates the strength of the association between the independent and dependent variables. Second, a regression analysis was performed to predict each mediator M (social support, self-efficacy) from the independent variable X (HLOC). The results of these models provided the coefficient for the *a* path, which is the path coefficient for the relationship between the independent variable and the mediator. Thirdly, a regression analysis was performed to predict each dependent variable Y from both the independent variable X and the

mediator M. The results of this model provided the coefficient for the *b* path, which represents the relationship between the mediator and the dependent variable, controlling for the independent variable. The product of coefficients was then determined by multiplying *a* times *b* (which represents the indirect or mediated effect), and constructing asymmetric confidence limits based on the distribution of the product using the PRODCLIN program.[60-61] Confidence intervals that did not include zero were considered statistically significant. These proposed relationships are shown in Figure 1. In an attempt to reduce the impact of confounding variables or covariates, all model analyses controlled for BMI.

Single-mediator models were tested first. A multiple-mediator model was then used to 1) test the independent effects of the variables that were found to be significant in the single-mediator model, and to 2) test for suppression effects in the single-mediator models. Lastly, the percentage of the total effect mediated was calculated for each significant mediator by the following equation: $\alpha\beta/(\alpha\beta + c)$, where c was the direct effect of the independent variable on the dependent variable.

RESULTS

Of the 1055 people that began the survey, 208 were excluded. Seventeen individuals were under the age of 18, 11 were not attending one of the two universities examined in the study, and 181 had a high amount of missing data (> 20%). Sample sizes vary for each dependent variable due to exclusion of outliers for specific outcomes (described earlier). Table 1 describes the sample characteristics, and Table 2 describes the sample values on independent, dependent, and mediating variables.

Mediators of Physical Activity

Table 3 shows the correlation of all variables used within the study, including independent, dependent, mediator, and demographic variables. Table 4 shows the α and β coefficients (a and b paths), their standard errors, the αβ estimate, and the asymmetric confidence limits for tests of mediation for PA.

Self-efficacy

In Step 1, internal HLOC (X) was significantly and positively associated with PA (Y) ($p = .007$). In Step 2, internal HLOC (X) was significantly and positively associated with self-efficacy for PA (M), ($p < .0001$). In Step 3, self-efficacy for PA (M) was significantly and positively associated with PA (Y), after controlling for internal HLOC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients *aβ* revealed that self-efficacy for PA mediated the relationship between internal HLOC (X) and PA (Y) in the single mediator model.

Social Support

In Step 2, internal HLOC (X) was significantly and positively associated with social support for PA (M) ($p = .042$). In Step 3, social support for PA (M) was significantly and positively associated with PA (Y) after controlling for internal HLOC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients αβ revealed that social support for PA mediated the relationship between internal HLOC (X) and PA (Y) in the single mediator model.

Multiple Mediator Model

Within the multiple-mediator model, self-efficacy and social support for PA remained significant mediators, and there was no evidence for suppression. Self-efficacy

for PA mediated 48.7% and social support mediated 12.4% of the total effect of the relationship between internal HLOC and PA.

Mediators of Dietary Behaviors

Table 5 shows the α and β coefficients (paths a and b), their standard errors, the αβ estimate, and the asymmetric confidence limits for effects of the mediators on health behaviors.

Self-efficacy

FVI. In Step 1, internal HLOC (X) was significantly and positively associated with FVI (Y) ($p = .01$). In Step 2, internal HLOC (X) was significantly and positively associated with self-efficacy for FVI (M) ($p < .0001$). In Step 3, self-efficacy for FVI (M) was significantly and positively associated with FVI (Y), after controlling for internal HLOC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients αβ revealed that self-efficacy for FVI mediated the relationship between internal HLOC (X) and FVI (Y) in the single mediator model.

Dietary Fat Intake. In Step 1, internal HLOC (X) was not significantly associated with %FAT (Y). In Step 2, internal HLOC (X) was significantly and positively associated with self-efficacy to consume low-fat foods (M) ($p = .015$). In Step 3, self-efficacy for low-fat foods (M) was significantly and negatively associated with %FAT (Y), after controlling for internal HLOC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients αβ revealed that self-efficacy for consuming low-fat foods mediated the relationship between internal HLOC (X) and %FAT (Y) in the single mediator model.

Social Support

FVI. In Step 2, internal HLOC (X) was significantly and positively associated with social support for consuming low-fat foods (M) ($p = .005$). In Step 3, social support for consuming low-fat foods (M) was significantly and positively associated with FVI (Y) after controlling for internal HLOC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients $\alpha\beta$ revealed that social support for consuming healthy foods mediated the relationship between internal HLOC (X) and FVI (Y) in the single mediator model.

Dietary Fat Intake. In Step 3, social support for consuming low-fat foods (M) was not associated with %FAT (Y) after controlling for internal HLOC (X). The asymmetric confidence limits for the product of the coefficients $\alpha\beta$ revealed that social support for consuming low-fat foods did not mediate the relationship between internal HLOC (X) and %FAT (Y) in the single mediator model.

Multiple Mediator Model

FVI. Self-efficacy for FVI (M) and social support for low-fat foods (M) remained mediators of FVI in the multiple mediator models. Self-efficacy for FVI (M) mediated 54% and social support for low-fat foods (M) mediated 12% of the total effect of the relationship between internal HLOC (X) and FVI (Y).

Dietary Fat Intake. In the multiple-mediator model, self-efficacy to consume low-fat foods (M) remained a mediator of internal HLOC (X) and %FAT (Y), but social support to consume low-fat foods (M) was not a mediator. No evidence for suppression effects was found.

DISCUSSION

The purpose of this study was to investigate the role of self-efficacy and social support as possible mediators of internal HLOC and health behaviors in a sample of college students. We found that self-efficacy and social support mediated the relationship between internal HLOC and both PA and FVI. This finding is consistent with previous literature that found self-efficacy and social support to be mediators of interventions related to PA[24] and FVI.[62] We also found that self-efficacy mediated the relationship between internal HLOC and %FAT. There were no previous studies found that analyzed mediators of dietary fat intake among any population, since published literature of mediators of dietary behaviors have focused primarily on FVI.

Research suggests that HLOC beliefs predict health behaviors.[10] Specifically, those with higher internal HLOC tend to practice greater preventive health behaviors than those with higher external HLOC,[32] but the mechanisms for this relationship is unclear. Our study supports the theory that higher internal HLOC is related to better health behaviors. This study shows that although internal HLOC was significantly and positively associated with health behaviors of PA and FVI, both self-efficacy and social support mediated these relationships. Self-efficacy also mediated the relationship between internal HLOC and %FAT, even without a significant relationship between the predictor and the outcome. These results show that high internal HLOC may impact PA and dietary behaviors by the amount of self-efficacy an individual has to participate in those behaviors. Additionally, high internal HLOC relates to better health behaviors through the mediating effect of social support. The persuasion and motivation of those around individuals with higher internal HLOC positively affected their ability to engage

in certain health behaviors (PA and FVI). While this statement may be true, another possible explanation of this mechanism is those with higher internal HLOC may feel more in charge of their social network, thus surrounding themselves more with individuals that may share similar beliefs and habits. The belief one has in his/her abilities to engage in preventive health behaviors, along with the support one receives to engage in these behaviors may be a possible mechanistic link between why internal HLOC is predictive of positive health behaviors and outcomes.

Limitations and Strengths

It is important to address the limitations of this research. First, we relied entirely on self-report measures of PA and diet. Self-report of PA and FVI have been shown to include a bias of over-reporting,[63-64] and under-reporting has been shown for %FAT.[64] A 24 hour dietary recall is a preferred approach to dietary assessment, but was not feasible for this study due to the cost and participant burden. Responses may have been influenced by the setting and environment as the surveys were completed online. This research also had a much higher percentage of females (72.9%) than males which could limit generalization. Additionally, the use of a cross-sectional design limits the ability of this research to infer causation. We are unable to claim that internal HLOC caused changes in the mediators and the health behaviors. We can only state that our results are consistent with mediation.

There are several notable strengths of this study. First, mediating variables between HLOC and health behaviors were addressed, a topic that has received very little study. In particular, no previous studies were identified that examined this relationship for %FAT. Other strengths include the large sample size and diversity of participants.

The total sample of 838 ensured adequate power to detect mediation. The sample was majority Caucasian (65%), but representation among the sample within the Black/African American population was strong (22%), and was representative of the student body populations at each university. Undergraduate (all classes) and graduate students were equally represented within the entire sample studied.

Conclusions

In the current study, social support and self-efficacy mediated the relationship between internal HLOC and PA and FVI, and self-efficacy mediated the relationship between HLOC and %FAT. The results of this study support further investigation of mediating variables to explain, predict, and potentially improve health behaviors, specifically as they relate to an individual's belief on controlling their health status. It is suggested that longitudinal designs with mediating variable nested within behavior change programs be the focus of future research efforts.

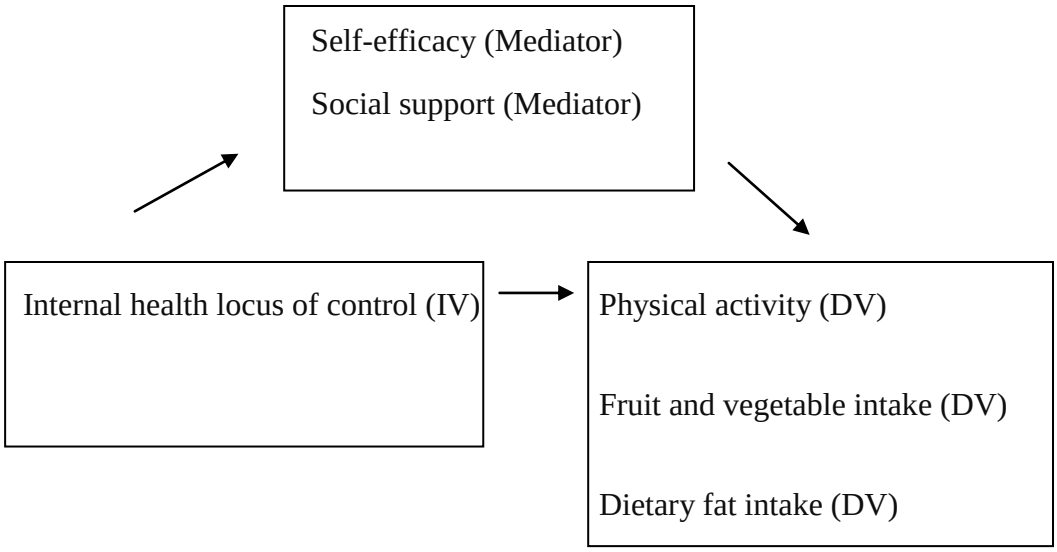

Figure 4.1.
Graphic illustration of how self-efficacy and social support mediate the relationship between internal health locus of control and health behaviors.

Table 4.1.

Sample characteristics

Characteristics	n	%	*M*	*SD*	Missing
Gender					8
Male	226	26.7			
Female	613	72.4			
Age	823		21.4	4.80	24
Body mass index, kg/m^2	836		24.3	4.71	11
University					1
University 1	594				
University 2	292				
Year in school					7
First year	157	18.5			
Second year	168	19.8			
Third year	168	19.8			
Fourth year	179	21.1			
Fifth year or more	47	5.5			
Graduate or professional	115	13.6			
Not seeking a degree	2	0.3			
Other	4	0.5			
Race/ethnicity					9
White	543	64.1			
Black	195	23.0			
Hispanic/Latino	19	2.2			
Asian/Pacific Islander	34	4.0			
American Indian/Alaskan Native/ Native Hawaiian	1	0.1			
Biracial or Multiracial	39	4.6			
Other	7	0.8			
Marital status					7
Single	774	91.4			
Married	55	6.5			
Divorced	10	1.2			
Widowed	1	0.1			
Living arrangement					7
Campus residence hall	342	40.4			
Fraternity or sorority house	8	0.9			

Other college/university housing	27	3.2
Parent/ guardian's home	86	10.2
Other off-campus housing	348	41.1
Other	29	3.4

Table 4.2.
Sample values on independent, dependent, and mediating variables.

Variable	N	Mean (SD)	Range
MHLC			
Internal	844	26.13 (3.98)	12 - 36
Chance	844	17.74 (4.52)	6 - 36
Powerful Others	844	20.23 (4.16)	9 - 36
Total FVI per day	838	3.90 (2.19)	0 - 10
MET Minutes per week	836	5369.26 (4167.37) 4395.75	0 - 25704
% of calories from fat	802	32.61 (5.03)	15.99 – 57.30
Self-Efficacy for PA	844	21.30 (8.06)	5 - 35
Social Support for PA	838	25.87 (10.15)	9 - 45
Self-Efficacy for FVI	832	21.39 (5.55)	6 - 30
Self-Efficacy for Low-Fat Foods	827	13.79 (4.79)	5 - 25
Social Support for Healthy Foods	829	19.20 (5.28)	7 - 30

Note: MHLC = Multidimensional Health Locus of Control; FVI = fruit & vegetable intake; PA = physical activity; MET = metabolic equivalent

Table 4.3.
Correlation matrix for scales used in study.

Variable	PA	FVI	%FI	SE-PA	SS-PA	SE-FVI	SE-HF	SS-HF	BMI	Sex	Age	Race
IHLOC	.125* (p =.001)	.076* (p =.034)	.021 (p = .543)	.219* (p <.001)	.083* (p =.021)	.145* (p <.001)	.085* (p =.018)	.090* (p =.013)	.030 (p = .408)	.020 (p=.150)	-.050 (p =.150)	-.019 (p=.592)
PA	----	.124* (p =.001)	.028 (p = .438)	.282* (p <.001)	.235* (p <.001)	.095* (p =.008)	.090* (p =.012)	.151* (p <.001)	-.004 (p = .921)	.200* (p<.001)	.168* (p <.001)	-.063 (p=.070)
FVI		----	-.162* (p <.001)	.230* (p <.001)	.169* (p <.001)	.390* (p <.001)	.233* (p <.001)	.177* (p <.001)	.038 (p = .270)	.066 (p=.057)	.065 (p=.061)	-.101* (p=.003)
%FI			----	-.122* (p =.001)	-.049* (p = .172)	-.132* (p <.001)	-.152* (p <.001)	-.028 (p = .431)	.054 (p = .127)	.040 (p=.252)	-.181* (p<.001)	.139* (p<.001)
SE-PA				----	.304* (p <.001)	.334* (p <.001)	.350* (p <.001)	.176* (p <.001)	-.090 (p =.009)	.208* (p<.001)	-.013 (p=.717)	-.109* (p=.002)

		.143*	.106*	.454*	-.034	.033	-.091*	-.022
SS-PA	----	(p <.001)	(p = .003)	(p <.001)	(p = .231)	(p=.333)	(p=.009)*	(p=.521)
			.599*	.217*	-.031	-.039	.035*	.033
SE-FVI		----	(p <.001)	(p <.001)	(p=.420)	(p=.257)	(p=.016)	(p=.341)
				.185*	-.074*	.070*	.070*	.016
SE-HF			----	(p <.001)	(p = .041)	(p=.043)	(p=.045)	(p=.651)
					.028	-.026	-.099*	-.093*
SS-HF				----	(p = .420)	(p=.457)	(p=.004)	(p=.007)
						.037	.147*	.080*
BMI					----	(p=.288)	(p<.001)	(p=.021)
							.070*	-.042
Sex						----	(p=.045)	(p=.246)
Age							----	-.042

(p=.236
)

*Significant correlation. IHLOC = Internal health locus of control; PA = physical activity; FVI = fruit and vegetable consumption; %FI = percent fat intake; SE = self-efficacy; SS = social support; HF = healthy foods; BMI = body mass index; Race (1 = White 2 = Non-white); Sex (1= female, 2 = male)

Table 4.4.

Summary of mediation effects for physical activity among college students.

Mediator	α coefficient (SE)	β coefficient (SE)	αβ	Asymmetric confidence limit
Self-Efficacy for PA				
Single-mediator model	0.435 (0.069)*	137.608 (17.899)*	59.860	37.432, 85.701**
Multiple-mediator model	0.435 (0.069)*	111.943 (18.510)*	48.695	28.545, 72.432**
Social Support for PA				
Single-mediator model	0.181 (0.089)*	94.428 (14.045)*	17.091	0.604, 35.515**
Multiple-mediator model	0.181 (0.089)*	68.759 (14.387)*	12.445	0.427, 27.021**

*Significant association.

**Significant mediator as indicated by the omission of 0 in the confidence interval.

Note: All models adjusted for body mass index. PA = physical activity.

Table 4.5.

Summary of mediation effects for dietary behaviors among college students.

Mediator	α coefficient (SE)	β coefficient (SE)	αβ	Asymmetric confidence limit
Self-efficacy for fruits and vegetables				
Single-mediator model	0.179 (0.049)*	0.158 (0.013)*	0.028	0.013, 0.045**
Multiple-mediator model	0.179 (0.049)*	0.158 (0.013)*	0.027	0.012, 0.043**
Self-efficacy for dietary fat				
Single-mediator model	0.106 (0.043)*	-0.187 (0.037)*	-0.002	-0.039,-0.004**
Multiple-mediator model	0.106 (0.043)*	-0.181 (0.038)*	-0.002	-0.038, -0.004**
Social support for fruits and vegetables				
Single-mediator model	0.131 (0.047)*	0.078 (0.014)*	0.010	0.003, 0.019**
Multiple-mediator model	0.131 (0.047)*	0.046 (0.013)*	0.006	0.001, 0.012**
Social support for dietary fat				
Single-mediator model	0.131 (0.047)*	-0.056 (0.034)	-0.007	-0.019, 0.001
Multiple-mediator model	0.131 (0.047)*	-0.032 (0.035)	-0.004	-0.015, 0.035

*Significant association.

**Significant mediator as indicated by the omission of 0 in the confidence interval.

Note: All models are adjusted for body mass index.

REFERENCES

1. American College Health Association. *American College Health Association-National College Health Assessment II: Reference Group Data Report Fall 2011*. Baltimore, MD: American College Health Association, 2012.

2. Dinger M. Physical activity and dietary intake among college students. *American Journal of Health Studies*. 1999; 15*:* 139 – 149.

3. Galore S, Walker C, & Chandler A. Brief communication: Dietary habits of first-year medical students as determined by computer software analysis of three-day food records. *J Am Coll Nutr*. 1993; 12: 517 – 520.

4. Liedman M., Cameron B, Carson D, Brown D, Meyer S. Dietary fat reduction behaviors in college students: Relationship to dieting status, gender and key psychosocial variables. *Appetite*. 2001; 36: 51 – 56.

5. Schuette L, Song W, Hoerr S. Quantitative use of the Food Guide Pyramid to evaluate dietary intake of college students. *J Am Diet Assoc*. 1996; 96: 453 – 457.

6. Driskell J, Kim Y, & Goebel K. Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. *J Am Diet Assoc.* 2005; 105: 798 – 801.

7. Nickolas T, Baranowki T, Cullen K, Berenson, G. Eating patterns, dietary quality and obesity. *J Am Coll Nutr*. 2001; 20: 599 – 608.

8. Roger V, Go A, Lloyd-Jones D, et al. Executive summary: heart disease and stroke statistics--2012 update: a report from the American Heart Association. *Circulation.* Jan 3 2012;125:188-197.

9. Desai M, Miller W, Staples B, Bravender T. Risk factors associated with overweight and obesity in college students. *J Am Coll Health.* 2008; 57: 109 – 114.

10. Wallston K, Wallston B, DeVellis, R. Development of the multidimensional health locus of control (MHLC) scales. *Health Educ Behav.* 1978; 6: 160-170.

11. Murphy L, Thompson J, Morris M. Adherence behavior among adolescents with type I insulin-dependent diabetes mellitus: The role of cognitive appraisal processes. *J Pediatr Psychol.* 1997; 22: 811 – 925.

12. Kuwahara A, Nishino Y, Ohkubo T, Tsuji I, Hisamichi S, Hosokawa T. (). Reliability and validity of the Multidimensional Health Locus of Control Scale in Japan: Relationship with demographic factors and health-related behavior. *Tohoku J Exp Med.* 2004; 203: 37–45.

13. Chen S, Action G, Jung-Hau S. Relationship among nutritional self-efficacy, health locus of control and nutritional status in older Taiwanese adults. *Journal of Clinical Nursing*. 2010; 19: 2117 – 2127.

14. Rowe J, Montgomery G, Duberstein P, Bovbjerg D. Health locus of control and perceived risk for breast cancer in healthy women. *Behav Med*. 2005; 31: 33-40.

15. White J, Puckett F, Dutta A, Hayes S, Kundu M, Johnson E. The relationship of Multidimensional Health Locus of Control and attitude toward HIV/AIDS: College students' perspectives. *Journal of Rehabilitation.* 2011; 77: 12 – 18.

16. Abouserie, R. Sources and levels of stress in relation to locus of control and self-esteem in university students. *Educational Psychology*. 1994; 14: 323-330.

17. Gadzella B. Student-life stress inventory: Identification of and reactions to stressors. *Psychol Rep*. 1994; 74: 395-402.

18. Oaten M, Cheng K. Academic examination stress impairs self-control. *Journal of Social and Clinical Psychology.* 2005; 24: 254-279.

19. Baron R, Kenny D. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J Pers Soc Psychol.* 1986; *51*: 1173-1182.

20. Cerin E, MacKinnon D. A commentary on current practice in mediating variable analyses in behavioral nutrition and physical activity. *Public Health Nutrition.* 2008; 12: 1182 – 1188.

21. Cerin E, Taylor L, Leslie E, Owen N. Small-scale randomized controlled trials need more powerful methods of mediational analysis than the Baron-Kenny method. *J Clin Epidemiol.* 2006; 59: 457 – 464.

22. Haerens L, Cerin E, Maes L, Cardon G, Deforche B, De Bourdeaudhuij I. Explaining the effect of a 1-year intervention promoting physical activity in middle schools: A mediation analysis. *Public Health Nutrition.* 2008; 11: 501-512.

23. Lewis B, Marcus B, Pate R, Dunn A. Psychosocial mediators of physical activity behavior among adults and children. *Am J Prev Med.* 2002; 23: 26 – 35.

24. Lubans D, Foster C, Biddle, S. A review of mediators of behavior in interventions to promote physical activity among children and adolescents. *Prev Med.* 2008; 47: 463 – 470.

25. Lubans D, Sylva K. Mediators of change following a senior school physical activity intervention. *Journal of Science and Medicine in Sport.* 2007; *12:* 134-140.

26. Taymoori P, Lubans D. Mediators of behavior change in two tailored physical activity interventions for adolescent girls. *Psychology of Sport & Exercise.* 2008; 9: 605-619.

27. Shaikh A, Yaroch A, Nebeling L, Yeh, M, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults. *Am J Prev Med.* 2008; 34: 535 – 543.

28. Rhodes R, Pfaeffli L. Mediators of physical activity behavior change among adult non-clinical populations: A review update. *International Journal of Behavioral Nutrition and Physical Activity.* 2010; 7: 37 – 48.

29. Cerin E, Barnett A, Baranowski T. Testing theories of dietary behavior change in youth using the mediating variable model with intervention programs. *Journal of Nutrition Education and Behavior.* 2009; 41: 309 – 318.

30. Dzewaltowski D, Esatbrooks P, Welk G, Hill J, Milliken G, Konstantinos K, Johnston J. Healthy Youth Places: A randomized controlled trial to determine the effectiveness of facilitating adult and youth leaders to promote physical activity and fruit and vegetable intake in middle schools. *Health Educ Behav.* 2009; 36: 583 – 600.

31. Van Stralen M, Yildirim M, te Velde S, Brug J, van Mechelen W, Chinapaw M. What works in school-based energy balance behavior interventions and what does not? A systematic review of mediating mechanisms. *Int J Obes.* 2011; 35: 1251 – 1265.

32. Masters K, Wallston K. Canonical correlation reveals important relations between health locus of control, coping, affect and values. *Journal of Health Psychology.* 2005; 10: 719 – 731.

33. Rotter J. *Social Learning and Clinical Psychology*. NY: Prentice-Hall; 1954.

34. Bandura A. Self-efficacy: Toward a unifying theory of behavior chance. *Psychol Rev.* 1977; 84: 191 – 215.

35. Bandura A. *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall; 1986.

36. Wiedenfeld S, Bandura A, Levine S, O'Leary A, Brown S, Raska K. Impact of perceived self-efficacy in coping with stressors on components of the immune system. *Journal of Personal Social Psychology.* 1990; 59: 1082 – 1094.

37. House J, Landis K, Umberson D. Social relationships and health. *Science*. 1988; 241: 540– 545.

38. Berkman L, Syme S. Social networks, host resistance, and mortality. *Am J Epidemiol.* 1979; 109: 186 – 204.

39. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. *PLoS Med.* 2010;7:e1000316.

40. Vogt T, Mullooly J, Ernst D, Pope C, Hollis J. Social networks as predictors of ischemic heart disease, cancer, stroke and hypertension: Incidence, survival and mortality. *JCE.* 1992; 45: 659–666.

41. Berkman L, Breslow L. *Health and Ways of Living: The Alameda County Study*. New York, NY: Oxford University Press; 1983.

42. Cohen S. Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology.* 1988; 7: 269 – 297.

43. Thoits P. Multiple identities and psychological well-being. *American Social Revolution.* 1983; 48: 174 – 187.

44. Survey Monkey. Retrieved May 15, 2013 from www.surveymonkey.com

45. Furnham A, Steele H. Measuring locus of control: A critique of general, children's, and health-and-work-related locus of control questionnaires. *Br J Psychol.* 1993; 84: 443-479.

46. Craig C, Marshall A, Sjostrom M, Bauman A, Booth M, Ainsworth B, Pratt M, Ekelund U, Yngve A, Sallis J, Oja, P. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc.* 2003; 35, 1381 – 1395.

47. IPAQ. 2004 Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short Form, Version 2.0. Available at: www.ipaq.ki.se

48. National Cancer Institute. 2009 U.S. National Institutes of Health. Risk Factor Monitoring and Methods. Percentage Energy from Fat Screener: Overview & Scoring Procedures. Available at: http://riskfactor.cancer.gob/diet/screeners/fat/ Accessed: May 13, 2013.

49. Thompson F, Midthune D, Subar A, Kipnis V, Kahle L, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *J Am Diet Assoc.* 2007; 107: 760 – 767.

50. Resincow K, Odom E, Wang T, Dudley W, Mitchell D, Vaughan R, Jackson A, Baronowski T. Validation of three food frequency questionnaires and 24-hour recalls with serum carotenoid levels in a sample of African-American adults. *Am J Epidemiol.* 2000; 152: 1072 – 1080.

51. Resnicow K, Jackson A, Wang T, De A, McCarty F, Dudley W. Baronowski T. A motivational interviewing intervention to increase FVI through Black churches: Results of the Eat for Life trial. *Am J Public Health.* 2001; 91: 686 – 693.

52. Marcus B, Selby V, Niaura R, Rossi J. Self-efficacy and the stages of exercise behavior change. *Res Q Exer Sport.* 1992; 63: 60-66.

53. McAuley E, Mihalko S. Measuring exercise-related self-efficacy. In J. L. Duda (Ed.) *Advances in sport and exercise psychology measurement.* Morgantown, WV: Fitness Information Technology; 1998.

54. Sallis J, Grossman R, Pinski R, Patterson T, Nader P. The development of scales to measure social support for diet and exercise behaviors. *Prev Med.* 1987; 16: 825-836.

55. Kegler M, Swan D, Alcantara I, Wrensford L, Glanz K. Environmental influences on physical activity in rural adults: the relative contributions of home, church, and work settings. *Journal of Physical Activity and Health.* 2012; 9: 996-1003.

56. Treiber F, Baranowski T, Braden D, Strong W, Levy M, Knox, W. Social support for exercise: relationship to physical activity in young adults. *Prev Med.* 1991; 20: 737-750.

57. Norman G, Carlson J, Sallis J, Wagner N, Calfas K, Patrick K. Reliability and validity of brief psychosocial measures related to dietary behaviors. *International Journal of Behavioral Nutrition and Physical Activity.* 2010; 7: 56 – 65.

58. IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

59. MacKinnon D. Contrasts in multiple mediator models. In: Rose, J. S., Chassin, L., Presson, C. C., Sherman, S. J., (Eds.) *Multivariate Applications in Substance Use Research: New Methods for New Questions.* Mahwah, NJ: Erlbaum. p. 141 – 160; 2000.

60. MacKinnon D, Fritz M, Williams J, Lockwood C. Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. *Behavioral Research Methods.* 2007; 39: 384 – 389.

61. Tofighi D, MacKinnon D. RMediation: An R package for mediation analysis confidence intervals. *Behavior Research Methods.* 2011; 43: 692-700.

62. Steptoe A, Perkins-Porras L, Rink E, Hilton S, Cappuccio F. Psychological and social predictors of changes in fruit and vegetable consumption over 12 months following behavioral and nutrition education counseling. *Health Psychology.* 2004; 23: 574-581.

63. Prince S, Adamo K, Hamel M, Hardt J, Gorber S, Tremblay M. A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity.* 2008; 5: 5-56.

64. Kim D, Holowaty E. Brief, validated survey instruments for the measurement of fruit and vegetable intakes in adults: A review. *Prev Med.* 2003; 37: 72.

CHAPTER V

AN EXAMINATION OF MEDIATING RELATIONSHIPS BETWEEN GOD LOCUS OF HEALTH CONTROL AND HEALTH BEHAVIORS IN COLLEGE STUDENTS[5]

[5] Marr, J. D. and S. Wilcox.

ABSTRACT

Objectives: To examine whether self-efficacy, social support, congregational social support, or divine support mediate the relationship between college students' religious/spiritual health locus of control and health behaviors of physical activity, fruit and vegetable intake, and dietary fat intake.

Participants: 838 college students at two public universities in the southeastern United States.

Methods: Online surveys of God locus of health control, physical activity, fruit and vegetable intake, and dietary fat and self-efficacy, social support, congregational social support, and divine support of those behaviors were completed from July to September 2013. Mediation was tested with product of coefficients approach.

Results: Congregational social support mediated the relationship between God locus of health control and physical activity behaviors. There was no evidence of mediation for any of the other health behaviors or mediators.

Conclusions: Individuals that utilize God as a health LOC source have higher perceived religious social coping and support, which relates to their PA behaviors.

INTRODUCTION

Despite the overwhelming evidence of certain health behaviors reducing the risk of disease and premature death in all populations, the majority of the American population remains unhealthy and unfit. Unhealthy behaviors, such as a lack of physical activity and diets high in fat, have been linked with higher risks of being overweight or obese. According to the National College Health Assessment (NCHA) by the American College Health Association (ACHA) (2012), at least a third of college students are obese, sedentary, and have poor nutritional habits (Huang, et al., 2003; Dinger, 1999; Galore, Walker, & Chandler, 1993; Liedman, Cameron, Carson, Brown, & Meyer, 2001; Schuette, Song, & Hoerr, 1996).

In an attempt to understand the many psychological processes underlying behaviors, researchers have investigated the role of locus of control (LOC) for decades. LOC is a theory of perceived control about the source, or locus, of reinforcement for a particular behavior or life event, and the source is classified as internal or external. In short, it is a theory that explains the extent to which individuals believe they can control life events (Ai, Peterson, Rogers, & Tice, 2005). In an attempt to understand health behaviors through various LOC constructs, most research has focused on the power of internal LOC, which refers to one's own behaviors as a level of self-control regarding a health concern. Internal health LOC has been associated with lower stress levels (including among college students) (Roddenberry & Renk, 2010), lower rates of smoking (Wallston et al., 1978) and drinking (Kuwahara et al., 2004), higher quality of life among those with chronic pain (Sengul, Kara, & Arda, 2010), and better nutritional behavior (Chen, Action, & Jung-Hau, 2010).

Over the last few decades, research examining the relationship between spirituality, religiosity and health has greatly increased. A number of studies have shown that spiritual and religious behaviors can be effective coping strategies for diseases and health problems (Ang, Ibrahim, Burant, Siminoff, & Kwoh, 2002; Gall, 2004; Johnson et al., 2009; Ross, Ingrid, Firley, Taylor, & Howard, 2008; Zittel-Palamara, Cercone, & Rockmaker, 2009). Other studies have shown that religiosity and spirituality are enablers of protective health behaviors and lifestyles (Ellison and Levin, 1998; Koenig, 1999, 2001; Koenig et al. 1999; Larson et al. 1992; Roff et al., 2005; Strawbridge, Cohen, Shema, & Kaplan, 1997). Involvement in religious groups with doctrines that promote healthy living may explain decreased alcohol intake, increased physical activity and healthier dietary habits and in turn, lower rates of obesity (Kim et al., 2008; Strawbridge et al., 1997). Norton et al. (2008) found that weekly church attendance was protective against both depressive symptoms and the risk for major depression within an older sample. Among adolescents, those who were more religious exercised more, ate better, used a seat belt more often, and got more sleep than those that were less religious or not religious (Wallace & Forman, 1998).

Traditionally, any spiritual being, such as "God," was believed to be an external source of LOC. However, the concept of God as only an external LOC became a source of controversy, since the presence of God in one's life can have powerful internal effects. Some researchers believe God control is similar to an external LOC, but note that a belief in God is distinct from other external sources (Gabbard, Howard, and Tageson, 1986; Furnham, 1982; Jackson & Coursey, 1988; Pargament, Sullivan, Tyler, & Steel, 1982). In fact, "God-control" has been referred to as a fourth dimension, one that is beyond the

original health LOC sources of internal or external (Welton, Adkins, Ingle and Dixon, 1996). Literature on the impact of religion or "God" on health LOC is scarce, especially among younger, disease-free populations.

In order to understand the influence of spirituality and religiosity on health, several studies have investigated the role of mediators. Baron and Kenny (1986**)** identified a mediator as a variable that accounts for a relation between two variables, a predictor (independent variable) and a criterion (dependent variable). Mediators can help explain why certain effects occur and are considered the mechanisms for how independent variables exert influence on dependent variables. Examples of mediators in religion and health research include: self-efficacy, social support, congregational social support (or congregational social support) and divine support (connection to God, including prayer and intercession), all of which have been linked to life satisfaction and better mental health (Fabricatore, Handal, Rubio, & Gilner, 2004; Salsman, Brown, Bretching, & Carlson, 2005; Tix & Frazier, 2005). Studies investigating religious participation on physical health found similar results (Koenig et al., 1997). Ferraro and Koch (1994) demonstrated that social support partially mediated the relationship between religious participation and physical health in African Americans, but not in whites.

There is support for self-efficacy and social support as mediators of change in physical activity behaviors (Haerens et al., 2008; Lewis, Marcus, Pate, & Dunn, 2002; Lubans, Foster, & Biddle, 2008; Lubans and Sylva, 2007; Taymoori and Lubans, 2008) and fruit and vegetable consumption (Fuemmeler et al., 2006). Additionally, congregational social support and divine support have been shown to be powerful mediators in career decision self-efficacy (Duffy & Lent, 2008) and well-being

(Fabricatore et al., 2004) among college students. Although mediation in this context has not been studied for college students, similar patterns are likely.

Research among college students has established that spirituality may play a role in health, grades, and involvement in student activities. In one study, students who integrated spirituality in their lives had more participation in physical activity and experienced greater life satisfaction than those reporting a lower level of spirituality (Nelms, Hutchins, Hutchins, and Pursley, 2007). Recent research has shown that a large percentage of college students believe in God (74%) and pray (67%) (Spirituality in Higher Education, 2007), which raises additional questions. If the majority of those students surveyed demonstrated a belief in God, why are the majority of students engaging in unhealthy habits, such as sedentary lifestyles and poor nutritional habits? Are the relationships between spiritual/religious beliefs of control and health behaviors mediated by variables such as self-efficacy, social support, or congregational social support and divine support? The purpose of this study was to examine if self-efficacy, social support, congregational social support, or divine support mediated the relationship between God locus of health control (GLHC) and the health behaviors of physical activity and dietary habits among college students.

METHOD

Procedure

This study used internet based surveys from a volunteer sample of college students in two southeastern universities in the United States between July 2013 and September 2013. The surveys consisted of 14 different scales, with 106 total items.

Time to complete the survey was approximately 20 - 30 minutes. Permission was obtained through each university's Institutional Review Board, and participants were given a written statement at the beginning of the surveys and directed to complete the survey if they consented to be in the study.

Participants

Participants were recruited for this study via the following methods: student listserv emails, flyers, and announcements in classes and organizations. Willing participants completed the survey through a link in these emails, flyers, and handouts. The sample used for any analysis included 838 students (see Table 5.1). The majority of the sample was female (n = 614; 73.4%), and predominately white (n = 543; 64.1%) or black (n = 195; 23.0%).

Instrumentation

All assessments for this study were conducted through an online survey tool, SurveyMonkey (www.surveymonkey.com).

Demographic information was assessed with questions from the American College Health Association (ACHA) – National College Health Assessment (NCHA) II (2012) including: age, gender, height and weight, year in school, enrollment status, ethnicity, marital status, and on/off campus residence. Additionally, four items pertaining to religious involvement, denomination, attendance, and affiliation with a student religious organizations were used. Three of these items have been used within the college population before (Harcrow, 2010).

God Locus of Health Control (GLHC) was assessed through a six-item scale to measure the influence individuals believe that God has over their health and included statements such as, "Whatever happens to my health is God's will" (Wallston et al. 1999). Responses for items were answered on a six-point Likert scale, ranging from strongly disagree (1) to strongly agree (6). Total scores were summed and ranged from 6 to 36, with higher score representing a greater belief in God as a LOC. Internal consistency for the GLHC was high in this study ($\alpha = 0.96$), which is comparable to a previous study that also showed acceptable convergent validity and high alpha reliability (Wallston et al., 1999).

PA was measured using the International Physical Activity Questionnaire (IPAQ) Short Form (Craig, Marshall, and Siostrom, 2003). Participants were asked to recall the number of days (frequency) in the last seven that they completed vigorous, moderate, walking, or sitting activities, and the amount of time they usually spent doing each (duration). Metabolic equivalent (METmin/week) was calculated by the following formula (IPAQ, 2004): Total METmin/week = [Walk METs (3.3)*min*days] + [Mod METs (4.0)*min*days] + [VigMETs (8.0)*min*days]. Craig et al. (2003) demonstrated criterion validity of the IPAQ. Median MET values (instead of mean values) were used in the analyses, as recommended by IPAQ short form scoring guidelines (2004). Daily activity values beyond 240 minutes for each level of intensity were considered outliers and were set to missing (IPAQ, 2004).

Dietary fat intake was measured using a 17-item Quick Food Scan (QFS) for the National Cancer Institute (NCI) (National Cancer Institute, 2009). Participants were asked to rate the frequency with which they consumed 15 foods over the last 12 months,

ranging from never (0) to two or more times per day (7). The NCI scoring algorithm was used to convert scores to estimates of a percentage of calories from fat. Internal consistency for this study was shown to be $\alpha = .70$, comparable with that reported by Thompson et al. (2007), who also established acceptable validity. Percentages of dietary fat higher than 60% were considered outliers and were set to missing.

FVI was measured by two items used previously by Reniscow et al. (2000; 2001), "how many servings of fruit do you usually eat each day?" and "how many servings of vegetables do you usually eat each day?" Rensicow et al. (2000) demonstrated the validity (r =.35) and reliability of the two item measure by comparing the self-report results to serum carotenoid levels. A score of average fruit and vegetable servings consumed per day was derived by adding the two items. Scores over 10 were considered outliers and were set to missing.

PA self-efficacy was assessed using a five-item scale by Marcus, Selby, Niaura, and Rossi (1992). Participants reported their confidence to be regularly active when faced with common barriers. Responses to each item were answered on a Likert scale, and range from not at all confident (1) to very confident (7), and summed for a total score, which could range from 5 to 35 Higher scores indicated greater self-efficacy to participate in PA. In this study, this scale showed high reliability ($\alpha = 0.89$), which was comparable to a previous study (McAuley and Mihalko, 1998).

PA social support was assessed with the nine-item scale to assess PA social support (Sallis, Grossman, Pinksi, Patterson, and Nader, 1987). Participants reported how often they received support from their family and friends for being physically active.

The original scale was modified for this study to rate family and friends together, rather than separately. Each item was answered on a Likert scale, and responses ranged from never/rarely (1) to very often (5). Items were summed for a total score, which could range from 9 to 45. Higher scores indicated greater social support for PA. For this study, this scale showed high internal consistency of $\alpha = 0.93$, which is similar to a previous study (Kegler, Swan, Alcantara, Wrensford, & Glanz, 2012), and the scale has been validated in adult populations (Sallis et al., 1987; Treiber, et al., 1991).

Dietary self-efficacy was measured with two scales. Self-efficacy for consuming fruits and vegetables (six items) and self-efficacy for consuming low-fat foods (five items) by Norman et al. (2010). Participants reported their confidence to choose healthy foods when faced with common barriers. Responses were answered on a Likert scale, and ranged from not at all confident (1) to extremely confident (5), and the individual scales were summed for total scores, which could range from 5 to 30 for self-efficacy to consume fruits and vegetables, and 5 to 25 for self-efficacy to consume low-fat foods. Higher scores indicated greater self-efficacy. The internal consistencies of self-efficacy for consuming fruits and vegetables ($\alpha = .86$), and self-efficacy for low-fat intake ($\alpha = .89$) for this study were acceptable, and similar to that reported by Norman et al. (2010).

Dietary social support to consume healthy foods was measured with a six-item scale (Norman et al., 2010). Participants reported how often they received support from their family and friends for choosing healthy foods. Responses were answered on a Likert scale, and ranged from almost never (1) to almost always (5), and summed for a total score, which could range from 6 to 30. Higher scores indicated greater social

support. In this study, internal consistency for this scale was α = .86, similar to that reported by Norman et al. (2010).

Congregational social support and divine support were assessed through two seven-item subscales of the Religious Support Scale (Fiala, Bjorck, & Gorsuch in 2002). Responses were answered on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). Individual subscales were summed for a total score, which can range from 5 to 35, with higher scores indicating greater congregational social support or divine support. Each subscale showed acceptable internal consistency for this study (α = .97; α = .94), and a previous study has shown adequate convergent validity (Fiala et al., 2002).

Statistical Analysis

Statistical Packages for the Social Sciences (SPSS) was used for all statistical analyses. Initial analyses were conducted to describe the variables and to examine the normality of distributions (IBM, 2012).

Mediation was tested with the product of coefficients approach (MacKinnon, 2000). First, a separate regression analysis was performed in order to predict each dependent variable Y (PA, dietary fat intake, or FVI) from the independent variable X (GLHC). This model indicates the strength of the association between the independent and dependent variables, but significance is not required for mediation. Second, a regression analysis was performed to predict each mediator M (social support, self-efficacy, religious support, divine support) from each independent variable X. The results of these models provided the coefficient for the *a* path, which is the path coefficient for the relationship between the independent variable and the mediator.

Thirdly, a regression analysis was performed to predict each dependent variable Y from both the independent variable X and the mediator M. The results of this model provided the coefficient for the *b* path, which represents the relationship between the mediator and the dependent variable, controlling for the independent variable. The product of coefficients was then determined by multiplying *a* times *b* (which represents the indirect or mediated effect), and constructing asymmetric confidence limits base on the distribution of the product using the PRODCLIN program (MacKinnon, Fritz, Williams, & Lockwood, 2007; Tofighi & MacKinnon, 2011). Confidence intervals that did not include zero were considered statistically significant. These proposed relationships are shown in Figure 5.1. In an attempt to reduce the impact of confounding variables or covariates, all model analyses controlled for BMI.

Single-mediator models were tested first. A multiple-mediator model was then used to 1) test the independent effects of the variables that were found to be significant in the single-mediator model, and to 2) test for suppression effects in the single-mediator models. Lastly, the percentage of the total effect mediated was calculated for each significant mediator by the following equation: $\alpha\beta/(\alpha\beta + c)$, where c was the direct effect of the independent variable on the dependent variable.

RESULTS

Of the 1055 people that began the survey, 208 were excluded. Twenty-eight individuals were excluded because they were under the age of 18 or they were not attending one of the two universities examined in the study. The remainder (n = 181) was excluded due to a high amount of missing data (greater than 20% of data missing). Sample sizes vary for each dependent variable due to outliers that were excluded

(described earlier). Table 5.1 describes sample characteristics and Table 5.2 reports sample values on independent, dependent, and mediating variables. Table 5.3 shows correlations of independent, dependent, mediating, and demographic variables.

Mediators of Physical Activity

Table 5.4 shows the α and β coefficients (a and b paths), their standard errors, the αβ estimate, and the asymmetric confidence limits for tests of mediation for PA.

In Step 1, GLHC (X) was not significantly associated with PA (Y) ($p = .645$).

Self-efficacy. In Step 2, GLHC (X) was not significantly associated with self-efficacy for PA (M) ($p = .072$). In Step 3, self-efficacy for PA (M) was significantly and positively associated with PA (Y), after controlling for internal GLHC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients *aβ* revealed that self-efficacy for PA did not mediate the relationship between GLHC (X) and PA (Y) in the single or multiple mediator models.

Social support. In Step 2, GLHC (X) was not associated with social support for PA (M) ($p = .131$). In Step 3, social support for PA (M) was significantly and positively associated with PA (Y) after controlling for GLHC (X) ($p < .0001$). The asymmetric confidence limits for the product of the coefficients αβ revealed that social support for PA did not mediate the relationship between GLHC (X) and PA (Y) in the single or multiple mediator models.

Congregational social support. In Step 2, GLHC (X) was significantly and positively associated with congregational social support (M) ($p < .00001$). In Step 3, congregational social support (M) was significantly and positively associated with PA (Y) after controlling for GLHC (X) ($p = .039$). The asymmetric confidence limits for the

product of the coefficients αβ revealed that congregational social support mediated the relationship between GLHC (X) and PA (Y) in the single mediator model.

Divine support. In Step 2, GLHC (X) was significantly and positively associated with divine support (M) ($p < .00001$). In Step 3, divine support (M) was not associated with PA (Y) after controlling for GLHC (X) ($p = .811$). The asymmetric confidence limits for the product of the coefficients αβ revealed that divine support did not mediate the relationship between GLHC (X) and PA (Y) in the single mediator models.

In the multiple mediator model of congregational social support and divine support, congregational social support remained a mediator of the relationship between GLHC (X) and PA (Y). Divine support did not mediate the relationship between GLHC (X) and PA (Y) in the multiple mediator model.

Mediators of Dietary Behaviors

Table 5.5 shows the α and β coefficients (paths a and b), their standard errors, the αβ estimate, and the asymmetric confidence limits for effects of the mediators on FVI.

Fruit & Vegetable Intake

In Step 1, internal GLHC (X) was not associated with FVI (Y) ($p = .294$).

Self-efficacy. In Step 2, GLHC (X) was not associated with self-efficacy for FVI (M) ($p = .332$). In Step 3, self-efficacy for FVI (M) was significantly and positively associated with FVI (Y), after controlling for GLHC (X) ($p < .00001$). The asymmetric confidence limits for the product of the coefficients αβ revealed that self-efficacy for FVI did not mediate the relationship between GLHC (X) and FVI (Y) in the single or multiple mediator models.

Social support. In Step 2, GLHC (X) was not associated with social support for healthy foods (M) ($p = .804$). In Step 3, social support for healthy foods (M) was significantly and positively associated with FVI (Y) after controlling for GLHC (X) ($p < .00001$). The asymmetric confidence limits for the product of the coefficients $\alpha\beta$ revealed that social support for healthy foods did not mediate the relationship between GLHC (X) and FVI (Y) in the single or multiple mediator models.

Congregational social support. In Step 2, GLHC (X) was significantly and positively associated with congregational social support (M) ($p < .00001$). In Step 3, congregational social support (M) was not associated with FVI (Y) after controlling for GLHC (X) ($p = .688$). The asymmetric confidence limits for the product of the coefficients $\alpha\beta$ revealed that congregational social support did not mediate the relationship between GLHC (X) and FVI (Y) in the single or multiple mediator models.

Divine support. In Step 2, GLHC (X) was significantly and positively associated with divine support (M) ($p < .00001$). In Step 3, divine support (M) was not associated with FVI (Y) after controlling for GLHC (X) ($p = .968$). The asymmetric confidence limits for the product of the coefficients $\alpha\beta$ revealed that divine support did not mediate the relationship between GLHC (X) and FVI (Y) in the single or multiple mediator models.

Dietary Fat Intake

Table 5.6 shows the α and β coefficients (paths a and b), their standard errors, the $\alpha\beta$ estimate, and the asymmetric confidence limits for effects of the mediators on dietary fat intake.

In Step 1, GLHC (X) was significantly and positively associated with dietary fat intake (Y) (p=.006).

Self-efficacy. In Step 2, GLHC (X) was not associated with self-efficacy to consume low-fat foods (M) (p = .770). In Step 3, self-efficacy for low-fat foods (M) was significantly and negatively associated with dietary fat intake (Y), after controlling for internal GLHC (X) (p < .00001). The asymmetric confidence limits for the product of the coefficients αβ revealed that self-efficacy for consuming low-fat foods did not mediate the relationship between GLHC (X) and percent fat intake (Y) in the single or multiple mediator models.

Social support. In Step 3, social support for consuming healthy foods (M) was not associated with dietary fat intake (Y) after controlling for GLHC (X) (p = .055). The asymmetric confidence limits for the product of the coefficients αβ revealed that social support for consuming healthy foods did not mediate the relationship between GLHC (X) and dietary fat intake (Y) in the single or multiple mediator models.

Congregational social support. In Step 3, congregational social support (M) was not associated with dietary fat intake (Y) after controlling for GLHC (X) (p = .782). The asymmetric confidence limits for the product of the coefficients αβ revealed that congregational social support did not mediate the relationship between GLHC (X) and dietary fat intake (Y) in the single or multiple mediator models.

Divine support. In Step 3, divine support (M) was not associated with dietary fat intake (Y) after controlling for GLHC (X) (p = .589). The asymmetric confidence limits for the product of the coefficients αβ revealed that divine support did not mediate the

relationship between GLHC (X) and dietary fat intake (Y) in the single or multiple mediator models.

DISCUSSION

The purpose of this study was to investigate the role of self-efficacy, social support, congregational social support, and divine support as possible mediators of the relationship between GLHC and health behaviors in a sample of college students. Only congregational social support mediated the relationship between GLHC and physical activity. Other mediating relationships between GLHC and PA and dietary behaviors were not supported. No previous literature has examined variables that might mediate religious or spiritual LOC and health behaviors, although another paper describing the same sample found self-efficacy and social support to be mediators of multidimensional LOC and PA, dietary fat intake, and FVI (Marr, 2014).

Our findings add to the limited literature on mediating variables of religious beliefs and health outcomes. Previous research showed support for social support to mediate the relationship between attending religious services and mortality (Rogers, 1996; Strawbridge et al, 1997), but research on other outcomes is limited. Regarding physical health, social support mediated the relationship between religious participation and physical health in African Americans, but not in whites (Ferraro & Koch, 1994). Our results support that social support through congregational social support (or social ties and interactions) within a congregation mediate the relationship between religious beliefs and certain health outcomes.

Our other proposed mediation models of GLHC and health behaviors were not supported. Examining the specific paths in a mediation analysis can identify

shortcomings in the proposed conceptual model. Although GLHC was not significantly associated with any of the health behaviors (PA, FVI, or dietary fat intake), GLHC was significantly and positively associated with both congregational social support and divine support. These results are not surprising and provided support for our conceptual mediation model. However, the lack of associations between congregational social support and divine support and the health behaviors of study suggest a breakdown in the action model. Subjective (or perceived) social support has been shown to be a powerful predictor of health outcomes in several studies, even in those that failed to show social support as a mediator of the relationship (George et al., 2002; Idler & Kasl, 1992; Koenig et al., 1997; Musick, Koenig, Hays, & Cohen, 1998). Prayer provides one avenue of a divine coping strategy, and can be particularly important in times of distress and need (Pargament, 1997). Among college students, Fabricatore et al. (2004) found that collaborative congregational social support (considered active; sharing problem solving and responsibility with God) mediated the relationship between religiosity and both well-being and distress. Additional research suggests that religious participation encourages better health habits (Seybold, 2007).

God locus of health control has been shown to be predictive of health habits in undergraduate samples (Welton, et al., 1996). Additional research in the college aged population showed a negative association between GLHC and alcohol use (Willis, Wallston, & Johnson, 2001). It is important to distinguish the difference between internal health LOC (as measured by the Multidimensional Health Locus of Control scale) and GLHC. Hathaway and Pargament (1991) provide possible mechanisms of the GLHC effect to include: (1) a deferring style, where self is passive and all control and

responsibility of health is given to God; (2) a self-directing style, where self is active and retains responsibility of health; and (3) a collaborative style, where both God and self are viewed as responsible for health. It is possible other variables act as mediators between an individual's perception of God control and health outcomes. George et al. (2002) proposed various mediators that account for the effect of religion and spirituality on health outcomes, such as psychosocial resources (e.g., self-esteem), and belief structures (e.g., sense of coherence).

Self-efficacy and social support (not religious social support) was not found to be associated with GLHC or to mediate the relationship between GLHC and health behaviors. Our conceptual model was based on the theory that God/religion may be a source of "internal" control, as recent research supports that self-efficacy and social support mediates the relationship between internal health LOC and health behaviors. But, as mentioned previously, debate abounds as to whether God/religion is an internal or external source of control (Furnham, 1982; Jackson & Coursey, 1988; Gabbard, Howard, and Tageson, 1986; Pargament et al., 1982), so further research is necessary.

This research has implications for researchers and health professionals that promote, create, or implement programs for prevention of chronic disease, especially within the college-aged, faith-based population. Congregational social support mediated the relationship between GLHC and PA, which may strengthen the impact of intervention programs designed for this population.

Limitations and Strengths

It is important to address the limitations of this research. First, we relied entirely on self-report measures of PA and diet. Self-report of exercise and PA has been shown to

include a bias of over-reporting (Prince et al., 2008). For dietary self-report, under-reporting has been shown for dietary fat, and over-reporting has been shown in the single items for FVI (Kim & Holowaty, 2003). Responses may have been influenced by the setting and environment the surveys were completed online. A 24 hour dietary recall is a preferred approach to dietary assessment, but was not feasible for this study due to the cost and participant burden. This research also had a much higher percentage of females (72.9%) than males. Additionally, the use of a cross-sectional design limits the ability of this research to infer causation and to establish temporal relationships between the independent variables, mediators, and dependent variables.

Strengths of this study include addressing mediating variables of religious or spiritual health LOC and health behaviors since no previous studies that examined these relationships were found. Other strengths include the sample size and diversity of participants. The total sample of 838 ensured adequate power to detect mediation. The sample was majority Caucasian (64%), but representation of Black students within the sample (23%) was representative of the student body populations at each university. Undergraduate (all classes) and graduate students were equally represented within the entire sample studied.

Conclusions

We found support for congregational social support to mediate the relationship between GLHC and PA. Despite the limitations of self-report and selection bias, our results show that a faith structure that includes God influences the perceived congregational social support that individuals receive, which in turn may influence their PA behaviors. Although there was no support for the other proposed mediation models,

future research is warranted to understand the impact of religion on health. Longitudinal designs with mediating variables nested within behavior change programs should be the focus of future research efforts.

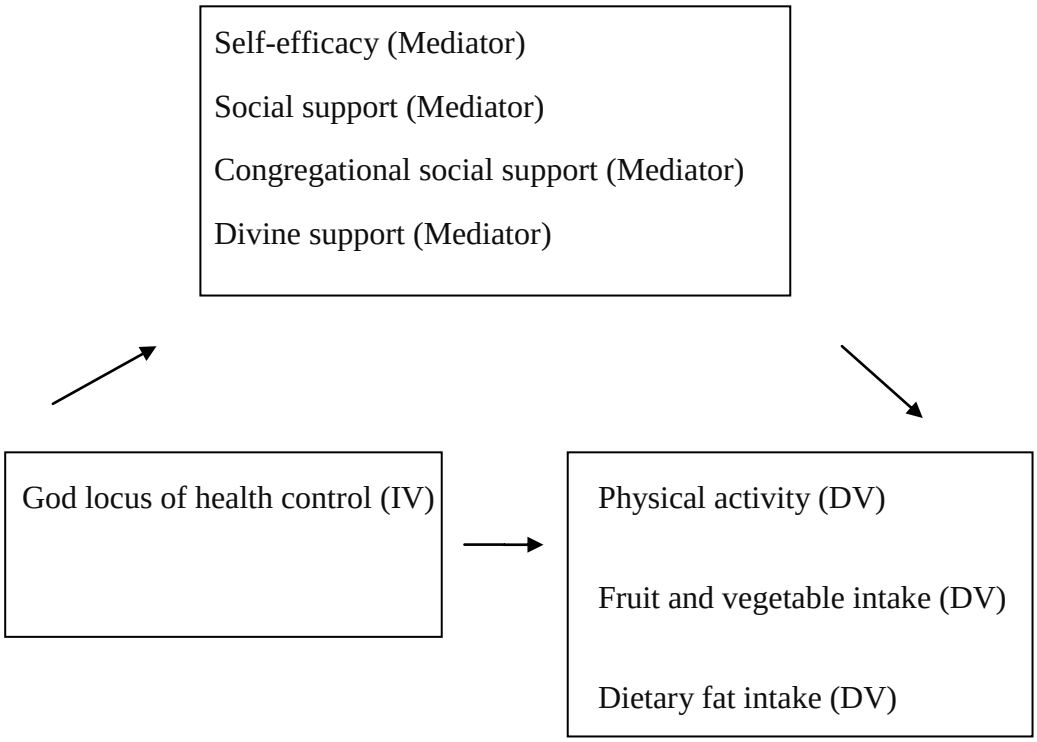

Figure 5.1.
Graphic illustration of how self-efficacy, social support, divine support and congregational social support mediate the relationship between God locus of health control and health behaviors.

Table 5.1.

Sample characteristics

Characteristics	n	%	*M*	*SD*	Missing
Gender					8
Male	226	26.7			
Female	613	72.4			
Age	823		21.4	4.805	24
Body mass index, kg/m^2	836		24.31	4.71	11
University					1
University 1	594				
University 2	292				
Year in School					7
First year	157	18.5			
Second year	168	19.8			
Third year	168	19.8			
Fourth year	179	21.1			
Fifth year or more	47	5.5			
Graduate or professional	115	13.6			
Not seeking a degree	2	0.3			
Other	4	0.5			
Race/ethnicity					9
White	543	64.1			
Black	195	23.0			
Hispanic/Latino	19	2.2			
Asian/Pacific Islander	34	4.0			
American Indian/Alaskan Native/ Native Hawaiian	1	0.1			
Biracial or Multiracial	39	4.6			
Other	7	0.8			
Consider themselves religious					21
Yes	628	74.1			
No	198	23.4			
Religious preference / denomination					218
Non-Denominational Christian	298	35.2			
Protestant	182	21.5			
Catholic	98	11.6			
Anglican	10	1.2			
Islam	6	0.7			
Jehovah’s Witness	5	0.6			
Hinduism	5	0.6			
Orthodox	3	0.4			
Judaism	2	0.2			
Buddhism	2	0.2			

Other	18	2.1	
Frequency of attendance at religious services (per week)			19
Several times a week	56	6.6	
About once a week	207	24.4	
2-3 times a month	131	15.5	
About once a month	104	12.3	
Less than once a month	149	17.6	
Never	181	21.4	
Participation in student religious groups			22
Yes	144	17.0	
No	681	80.4	

Table 5.2.

Sample values on independent, dependent, and mediating variables.

Variable	N	Mean (SD)	Range
GLHC	*815*	17.71 (9.17)	6 - 36
Total FVI per day	838	3.90 (2.19)	0 - 10
MET Minutes per week	836	5369.26 (4167.37) 4395.75 (Median)	0 - 25704
% of calories from fat	802	32.61 (5.03)	15.99 – 57.30
Self-Efficacy for PA	844	21.30 (8.06)	5 - 35
Social Support for PA	838	25.87 (10.15)	9 - 45
Self-Efficacy for FVI	832	21.39 (5.55)	6 - 30
Self-Efficacy for Low-Fat Foods	*827*	13.79 (4.79)	5 - 25
Social Support for Healthy Foods	829	19.20 (5.28)	7 - 30
Congregational Social Support	815	22.65 (9.92)	7 - 35
Divine Support	815	25.25 (9.94)	7 - 35

Note: GLHC = God locus of health control; FVI = fruit and vegetable intake; MET = metabolic equivalent; PA = physical activity

Table 5.3.

Correlation matrix for scales used in study.

Variable	PA	FVI	%FI	SE-PA	SS-PA	SE-FVI	SE-HF	SS-HF	CSS	DS	BMI	Sex	Age	Race
GLHC	-.020 (p=.590)	-.047 (p=.197)	.101* (p=.005)	-.077* (p=.035)	.060 (p=.097)	-.068 (p=.061)	-.045 (p=.221)	-.003 (p=.937)	.504* (p<.001)	.479* (p<.001)	.096* (p=.008)	-.046 (p=.179)	-.009 (p=.804)	.216* (p<.001)
PA	----	.113* (p=002)	.028 (p=.451)	.291* (p<.001)	.241* (p<.001)	.108* (p=.003)	.106* (p<.004)	.143* (p<.001)	.047 (p=.195)	-.009 (p=.810)	.002 (p=.956)	.200* (p<.001)	.168* (p<.001)	-.063 (p=.070)
FVI		----	-.184* (p<.001)	.226* (p<.001)	.175* (p<.001)	.394* (p<.001)	.237* (p<.001)	.181* (p<.001)	-.004 (p=.903)	-.004 (p=.913)	.046 (p=.211)	.066 (p=.057)	.065 (p=.061)	-.101* (p=.003)
%FI			----	-.126* (p=.001)	-.036 (p=.327)	-.170* (p<.001)	-.188* (p<.001)	-.082* (p=.025)	.059 (p=.107)	.033 (p=.359)	.055 (p=.131)	.040 (p=.252)	-.181* (p<.001)	.139* (p<.001)
SE-PA				----	.310* (p<.001)	.333* (p<.001)	.352* (p<.000)	.175* (p<.000)	.057 (p=.114)	.020 (p=.579)	-.086* (p=.018)	.208* (p<.001)	-.013 (p=.717)	-.109* (p=.002)
SS-PA					----	.148* (p<.000)	.107* (p=.003)	.455* (p<.001)	.157* (p<.001)	.109* (p=.003)	-.037 (p=.308)	.033 (p=.333)	-.091* (p=.009)	-.022 (p=.521)

SE-FVI	----	.594* (p<.001)	.217* (p<.001)	.047 (p=.196)	-.006 (p=.859)	-.030 (p=.420)	-.039 (p=.257)	.035 (p=.016)	.033 (p=.341)
SE-HF		----	.182* (p<.001)	.019 (p=.605)	-.002 (p=.950)	-.074* (p=.042)	.070* (p=.043)	.070* (p=.045)	.016 (p=.651)
SS-HF			----	.104* (p=.004)	.044 (p=.230)	.040 (p=.272)	-.026 (p=.457)	-.099* (p=.004)	-.093* (p=.007)
CSS				----	.648* (p<.001)	.051 (p=.162)	-.042 (p=.224)	-.081* (p=.021)	.146* (p<.001)
DS					----	.042 (p=.255)	-.043 (p=.218)	-.024 (p=.492)	.119 (p=.001)
BMI						----	.037 (p=.288)	.147* (p<.001)	.080* (p=.021)
Sex							----	.070* (p=.045)	-.042 (p=.246)
Age								----	-.042 (p=.236)

*Significant correlation. GLHC = God locus of health control; PA = physical activity; FVI = fruit and vegetable consumption; %FI = percent fat intake; SE = self-efficacy; SS = social support; HF = healthy foods; CSS = congregational social support; DS = divine support; BMI = body mass index. For race 1 = White 2 = Non-white. For sex 1= female, 2 = male.

Table 5.4.

Summary of mediation effects for physical activity among college students.

Mediator	α coefficient (SE)	B coefficient (SE)	αβ	Asymmetric confidence limit
Self-Efficacy				
Single-mediator model	-0.056 (0.031)	143.921 (17.509)*	-8.060	-17.434, 0.676
Multiple-mediator model	-0.056 (0.031)	116.412 (18.139)*	-6.519	-14.397, 0.542
Social Support				
Single-mediator model	0.059 (0.039)	99.223 (14.014)*	5.854	-1.711, 14.042
Multiple-mediator model	0.059 (0.039)	70.852 (14.371)*	4.180	-1.207, 10.425
Congregational social support				
Single-mediator model	0.551 (0.033)*	35.484 (17.161)*	19.552	1.015, 38.48**
Multiple-mediator model	0.551 (0.033)*	47.246 (20.456)*	26.033	3.922, 48.67**
Divine Support				
Single-mediator model	0.519 (0.034)*	4.015 (16.825)	2.084	-15.076, 19.294
Multiple-mediator model	0.519 (0.034)*	-21.130 (20.002)	-10.966	-31.574, 9.376

*Significant association.

**Significant mediator as indicated by the omission of 0 in the confidence interval.

Note: All models adjusted for body mass index.

Table 5.5.

Summary of mediation effects for fruit and vegetable intake (FVI) among college students.

Mediator	α coefficient (SE)	B coefficient (SE)	αβ	Asymmetric confidence limit
Self-Efficacy for FVI				
Single-mediator model	-0.021 (0.022)	0.161 (0.013)	-.003	-0.010, 0.004
Multiple-mediator model	-0.021 (0.022)	0.153 (0.013)	-.003	-0.010, 0.003
Social Support for FVI				
Single-mediator model	-0.005 (0.020)	0.081 (0.014)	.000	-0.004, 0.003
Multiple-mediator model	-0.005 (0.020)	0.046 (0.013)	.000	-0.002, 0.002
Congregational social support for FVI				
Single-mediator model	0.551 (0.033)	0.004 (0.009)	.002	-0.008, 0.012
Multiple-mediator model	0.551 (0.033)	0.005 (0.011)	.003	-0.009, 0.015
Divine support for FVI				
Single-mediator model	0.519 (0.034)	0.000 (0.009)	-.004	-0.009, 0.009
Multiple-mediator model	0.519 (0.034)	-0.002 (0.011)	-.001	-0.012, 0.010

*Significant association.

**Significant mediator as indicated by the omission of 0 in the confidence interval.

Note: All models adjusted for body mass index. FVI = fruit and vegetable intake

Table 5.6.

Summary of mediation effects for percent fat intake among college students.

Mediator	α coefficient (SE)	B coefficient (SE)	αβ	Asymmetric confidence limit
Self-Efficacy for dietary fat				
Single-mediator model	-0.005 (0.019)*	-0.182 (0.037)	.000	-0.006, 0.008
Multiple-mediator model	-0.005 (0.019)*	-0.173 (0.038)	.001	-0.006, 0.008
Social Support for dietary fat				
Single-mediator model	-0.006 (0.020)*	-0.065 (0.034)	.000	-0.003, 0.004
Multiple-mediator model	-0.006 (0.020)*	-0.042 (0.034)	.000	-0.002, 0.003
Congregational social support for dietary fat				
Single-mediator model	0.551 (0.033)	0.006 (0.021)*	.003	-0.019, 0.026
Multiple-mediator model	0.551 (0.033)	0.017 (0.025)*	.009	-0.018, 0.037
Divine Support for dietary fat				
Single-mediator model	0.519 (0.034)	-0.011 (0.021)*	-.006	-0.027, 0.016
Multiple-mediator model	0.519 (0.034)	-0.042 (0.034)*	-.022	-0.057, 0.013

*Significant association.

**Significant mediator as indicated by the omission of 0 in the confidence interval.

Note: All models adjusted for body mass index.

REFERENCES

Ai, A. L., Peterson, C., Rodgers, W. L., & Tice, T. N. (2005). Faith factors and internal health locus of control in patients prior to open-heart surgery. *Journal of Health Psychology, 10,* 669 – 676.

American College Health Association. (2012). *American College Health Association-National College Health Assessment II: Reference Group Data Report Fall 2011*. Baltimore, MD: American College Health Association.

Ang, D. C., Ibrahim, S. A., Burant, C. J., Siminoff, L. A., & Kwoh, C. K. (2002). Ethnic differences in the perception of prayer and consideration of joint arthroplasty. *Medical Care, 40*(6), 471-476.

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.

Chen, S., Action, G. & Jung-Hau, S. (2010). Relationship among nutritionals self-efficacy, health locus of control and nutritional status in older Taiwanese adults. *Journal of Clinical Nursing, 19*, 2117 – 2127.

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F. & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise, 35,* 1381 – 1395.

Dinger, M. K. (1999). Physical activity and dietary intake among college students. *American Journal of Health Studies, 15,* 139 – 149.

Duffy, R. D. & Lent, R. W. (2008). Relation of religious support to career decision self-efficacy in college students. *Journal of Career Assessment, 16,* 360 – 369.

Ellison, C. G. & Levin, J. S. (1998). The religion-health connection: Evidence, theory, and future directions. *Health Education and Behavior, 25,* 700 – 720, 93 – 103.

Ellison, G. W. (1983). Spiritual well-being: Conceptualization and measurement. *Journal of Psychology and Theology, 11,* 330 – 40.

Fabricatore, A. N., Randal, P. J., Rubio, D. M., & Gilner, F. H. (2004). Stress, religion, and mental health: Congregational social support in mediating and moderating roles. *International Journal for the Psychology of Religion, 14*(2), 97–108.

Ferraro, K. F. & Koch, J. R. (1994). Religion and health among black and white adults: Examining social support and consolation. *Journal for the Scientific Study of Religion, 33,* 362 – 375.

Fiala, W. E., Bjorck, J. P., & Gorsuch, R. (2002). The religious support scale: Construction, validation, and cross-validation. *American Journal of Community Psychology, 30*(6), 761-786.

Fuemmeler, B. F., Masse, L. C, Yaroch, A. L., Resnicow, K., Campbell, M. K., Carr, C., & Wang, T. (2006). Psychosocial mediation of fruit and vegetable consumption in the Body and Soul Effectiveness Trial. *Health Psychology, 25,* 474 – 483.

Furnham, A. F. (1982). Locus of control and theological beliefs. *Journal of Psychology and Theology, 10,* 130 – 136.

Gabbard, C. E., Howard, G. S. & Tageson, C. W. (1986). Assessing locus of control with religious populations. *Journal of Research in Personality, 20,* 292 – 308.

Galore, S. R., Walker, C., & Chandler, A. (1993).Brief communication: Dietary habits of first-year medical students as determined by computer software analysis of three-day food records. *Journal of American College Nutrition, 12,* 517 – 520.

George. L. K., Ellison. C. G. & Larson. D. B. (2002). Explaining the relationships between religious involvement and health. *Psychological Inquiry, 13,* 190-200.

Haerens, L., Cerin, E., Maes, L., Cardon, G., Deforche, B., & De Bourdeaudhuij, I. (2008). Explaining the effect of a 1-year intervention promoting physical activity in middle schools: A mediation analysis. *Public Health Nutrition, 11,* 501-512.

Harcrow, M. S. (2010) *Relationships between religiosity, spirituality, and health behaviors among college students.* (Unpublished doctoral dissertation.) University of Alabama, Tuscaloosa, AL.

Hathaway, W. L. & Pargament, K. I. (1991). The religious dimensions of coping: Implications for prevention and promotion. *Religion and Prevention in Mental health: Conceptual and Empirical Foundations, 9,* 65 – 92.

Huang, T. T.-K., Harris, K. J., Lee, R. E., Nazir, N., Born, W., & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health, 52*(2), 83-86.

IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

Idler, E. L. & Kasl, S. V. (1992). Religion, disability, and the timing of death. *American Journal of Sociology, 97,* 1052 – 1079.

IPAQ. (2004). Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short Form, Version 2.0. Retrieved May 17, 2013 from: www.ipaq.ki.se

Jackson, L. E. & Coursey, R. D. (1988). The relationship of God control and internal locus of control to intrinsic religious motivation, coping, and purpose in life. *Journal for the Scientific Study of Religion, 27,* 399 – 410.

Johnson, M. E., Dose, A. M., Pipe, T. B., Petersen, W. O., Huschka, M., Gallenberg, M. M., Peethambaram, P., Sloan, J., & Frost, M. H. (2009). Centering prayer for women receiving chemotherapy for recurrent ovarian cancer: A pilot study. *Oncology Nursing Forum, 36*(4). 421-428.

Kegler, M. C., Swan, D. W., Alcantara, I., Wrensford, L., & Glanz, K. (2012). Environmental influences on physical activity in rural adults: The relative contributions of home, church, and work settings. *Journal of Physical Activity and Health, 9*, 996-1003.

Kim, D. & Holowaty, E. (2003). Brief, validated survey instruments for the measurement of fruit and vegetable intakes in adults: A review. *Preventive Medicine, 37*, 72.

Kim, K. H., Linnan, L., Campbell, M. K., Brooks, C., Koenig, H. G., & Wiesen, C. (2008). The WORD (wholeness, oneness, righteousness, deliverance): A faith-based weight-loss program utilizing a community-based participatory research approach. *Health Education and Behavior, 35,* 634 – 650.

Koenig, H. G. (1999). *The health power of faith.* New York: Simon and Schuster.

Koenig, H. G. (2001). Religion and medicine III: Developing a theoretical model. *International Journal of Psychiatry in Medicine, 31*, 199 – 216.

Koenig, H. G., Hays, J. C., George, L. K., Blazer, D. G., Larson, D. B., & Landerman, L. R. (1997). Modeling the cross-sectional relationships between religion, physical health, social support, and depressive symptoms. *American Journal of Geriatric Psychiatry, 5,* 131 – 144.

Koenig, H. G., Hays, J. C., Larson, D. B, George, L. K., Cohen, H. J., McCullough, M. E., et al. (1999). Does religious attendance prolong survival? A six-year follow-up study of 3.968 older adults. *Journal of Gerontology: Medical Sciences, 54A,* M370 – M376.

Kuwahara, A., Nishino, Y., Ohkubo, T., Tsuji, I., Hisamichi, S., Hosokawa, T. (2004). Reliability and validity of the Multidimensional Health Locus of Control Scale in Japan: Relationship with demographic factors and health-related behavior. *Tohoku Journal of Experimental Medicine, 203*(1), 37–45.

Larson, D. B., Sherrill, K. A., Lyons, J. S., Craigie, F. C., Jr., Thielman, S. B., Greenwold, B. A., et al. (1992). Associations between dimensions of religious commitment and mental health reported in the American Journal of Psychiatry and Archives of General Psychiatry: 1978 – 1989. *American Journal of Psychiatry, 149,* 557 – 559.

Lewis, B. A., Marcus, B. H., Pate, R. R. & Dunn, A. L. (2002). Psychosocial mediators of physical activity behavior among adults and children. *American Journal of Preventive Medicine, 23,* 26 – 35.

Liedman, M., Cameron, B. A., Carson, D. K., Brown, D. M., & Meyer, S. S. (2001). Dietary fat reduction behaviors in college students: Relationship to dieting status, gender and key psychosocial variables. *Appetite, 36,* 51 – 56.

Lubans, D. R., Foster, C., & Biddle, S. J. H. (2008). A review of mediators of behavior in interventions to promote physical activity among children and adolescents. *Preventive Medicine, 47,* 463 – 470.

Lubans, D. R. & Sylva, K. (2007). Mediators of change following a senior school physical activity intervention. *Journal of Science and Medicine in Sport, 12*(1), 134-140

MacKinnon, D. P. (2000). Contrasts in multiple mediator models. In: Rose, J. S., Chassin, L., Presson, C. C., Sherman, S. J., editors. Multivariate Applications in Substance Use Research: new Methods for New Questions. Mahwah, NJ: Erlbaum. p. 141 – 160.

MacKinnon, D. P., Fritz, M. S., Williams, J., & Lockwood, C. M. (2007). Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. *Behavioral Research Methods, 39,* 384 – 389.

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport, 63*(1), 60-66.

Marr, J. (2014). *Understanding the relationship between health locus of control and God locus of health control and health behaviors in college students through mediation analysis.* (Unpublished doctoral dissertation.) Unive3rsity of South Carolina, Columbia, SC.

McAuley, E. & Mihalko, S. L. (1998). Measuring exercise-related self-efficacy. In J. L. Duda (Ed.) *Advances in sport and exercise psychology measurement.* Morgantown, WV: Fitness Information Technology.

Musick, M. A., Koenig, H. G., Hays, J. C. & Cohen, H. J. (1998). Religious activity and depression among community-dwelling elderly persons with cancer: The moderating effect of race. *Journal of Gerontology: Social Sciences, 53B,* S218 – S227.

National Cancer Institute. (2009). U.S. National Institutes of Health. Risk Factor Monitoring and Methods. Percentage Energy from Fat Screener: Overview & Scoring Procedures. Retrieved May 13, 2013 from: http://riskfactor.cancer.gob/diet/screeners/fat/

Nelms, L. W., Hutchins, E., Hutchins, D., & Pursley, R. J. (2007). Spirituality and the health of college students. *Journal of Religion and Health, 46,* 249 – 265.

Norman, G. J., Carlson, J. A., Sallis, J. F., Wagner, N., Calfas, K. J., & Patrick, K. (2010). Reliability and validity of brief psychosocial measures related to dietary

behaviors. *International Journal of Behavioral Nutrition and Physical Activity, 7,* 56 – 65.

Norton, M. C., Singh, A., Skoog, I., Corcoran, C., Tschanz,, J. T., Zandi, P. P. Breitner, J. C., Welsh-Bohmer, K. A., & Steffens, D. C. (2008). Church attendance and new episodes of major depression in a community study of older adults: The Cache County Study. *Journal of Gerontology Series B Psychological Sciences and Social Science, 63,* 129 – 137.

Pargament, K. I. (1997). *The psychology of religion and coping.* New York: Guilford.

Pargament, K. I., Sullivan, M., Tyler, F., & Steele, R. (1982). Patterns of attribution of control and individual psychosocial competence. *Psychological Reports, 51*, 1243 – 1252.

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Gorber, S. C. & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 5*. doi: 10.1186/1479-5868-5-56

Resnicow, K., Jackson, A., Wang, T., De, A. K, McCarty, F., Dudley, W. N. et al. (2001). A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: results of the Eat for Life trial. *American Journal of Public Health, 91,* 686 – 693.

Resincow, K., Odom, E., Wang, T., Dudley, W. N., Mitchell, D., Vaughan, R. et al. (2000). Validation of three food frequency questionnaires and 24-hour recalls with serum carotenoid levels in a sample of African-American adults. *American Journal of Epidemiology, 152,* 1072 – 1080.

Roddenberry, A. & Renk, K. (2010). Locus of Control and self-efficacy: Potentials mediators of stress, illness, and utilization of health services in college students. *Child Psychology and Human Development, 41*, 353 – 370.

Roff, L. L., Klemmack, D. L., Parker, M., Koenig, H. G., Sawyer-Baker, P., & Allman, R. M. (2005). Religiosity, smoking, exercises, and obesity, among southern, community-dwelling older adults. *Journal of Applied Gerontology, 24*, 337 – 354.

Rogers, R. G. (1996). The effects of family composition, health, and social support linkages on mortality. *Journal of Health and Social Behavior, 37*, 326 – 338.

Ross, L. E., Ingrid, J. H., Firley, T. L., Taylor, Y. J., & Howard, D. L. (2008). Prayer and self-reported health among cancer survivors in the United States, national health interview survey, 2002. *The Journal of Alternative and Complementary Medicine, 14*(8). 931-938.

Sallis, J. F., Grossman, R. M., Pinski, R. B., Patterson, T. L., & Nader, P. R. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine, 16*(6), 825-836.

Salsman, J.M., Brown, T.L., Brechting, E.H., & Carlson, C.R. (2005). The link between religion and spirituality and psychological adjustment: The mediating role of optimism and social support. *Personality and Social Psychology Bulletin, 31*, 522-535.

Schuette, L. KI., Song, W. O. & Hoerr, S. L. (1996). Quantitative use of the Food Guide Pyramid to evaluate dietary intake of college students. *Journal of the American Dietetic Association, 96,* 453 – 457.

Sengul, Y., Kara, B. & Arda, M. N. (2010). The relationship between Health Locus of Control and quality of life in patients with chronic back pain. *Turkish Neurosurgery, 20,* 180 – 185.

Spirituality in Higher Education. (2007). Spiritual changes in students during the undergraduate years. A National Study of College Students' Search for Meaning and Purpose. Retrieved at: http://www.spirituality.ucla.edu/docs/news/report_backup_dec07release_12.18.07.pdf

Strawbridge, W. J., Cohen, R. D., Shema, S. J., & Kaplan, G. A. (1997). Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health, 87,* 957 – 961.

Survey Monkey. Retrieved May 15, 2013 from www.surveymonkey.com

Taymoori, P. and Lubans, D. R. (2008). Mediators of behavior change in two tailored physical activity interventions for adolescent girls. *Psychology of Sport & Exercise*, *9*(5), 605-619.

Thompson, F. E., Midthune, D., Subar, A. F., Kipnis, V., Kahle, L. L., & Schatzkin, A. (2007). Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *Journal of American Dietetic Association, 107,* 760 – 767.

Tix, A. P. & Frazier, P. A. (2005). Mediation and moderation of the relationship between intrinsic religiousness and mental health. *Personality and Social Psychology Bulletin, 31,* 295- 306.

Tofighi, D. & MacKinnon, D. (2011). RMediation: An R package for mediation analysis confidence intervals. *Behavior Research Methods, 43*, 692-700.

Treiber, F. A., Baranowski, T., Braden, D. S., Strong, W. B., Levy, M., & Knox, W. (1991). Social support for exercise: Relationship to physical activity in young adults. *Preventive Medicine, 20*(6), 737-750.

Wallace, J. M. & Forman, T. A. (1998). Religion's role in promoting health and reducing risk among American youth. *Health Education and Behavior, 25,* 721 – 741.

Wallston, K. A., Malcarne, V. L., Flores, L., Hansdottir, I., Smith, C. A., Stein, M. J., Weisman, M. H., & Clements, P. J. (1999). Does God determine your health? The God Locus of Health Control scale. *Cognitive Therapy and Research, 23*(2), 131 – 142.

Wallston, K. A, Wallston, B. S., & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education & Behavior, 6,* 160-170.

Welton, G. L., Adkins, A. G., Ingle, S. L. & Dixon, W. A. (1996). God control: The fourth dimension. *Journal of Psychology and Theology, 21,* 13 – 25.

Willis, A. S., Wallston, K., & Johnson, K. (2001). Tobacco and alcohol use among young adults: Exploring religious faith, locus of control, and coping strategies as predictors. In T. Plante & A. Sherman (Eds.), Faith & health: Psychological perspectives (pp. 213 – 239). New York: Guilford.

Zittel-Palamara, E., Cercone, S. A., & Rockmaker, J. R., (2009). Spiritual support for women with postpartum depression. *Journal of Psychology and Christianity, 28*(3), 213-223.

CHAPTER VI

OVERALL SUMMARY AND CONCLUSIONS

AIMS

The first aim of this dissertation was to examine whether self-efficacy and social support mediated the relationship between health locus of control (MHLC) and three health behaviors (physical activity, fruit and vegetable intake, and dietary fat consumption) among college students. The second aim of this relationship was to examine if self-efficacy, social support, congregational social support, or divine support mediated the relationship between God locus of health control (GLHC) and the health behaviors of physical activity and dietary habits among college students. Both aims were accomplished through administering online surveys and questionnaires through the Survey Monkey website.

METHOD

A web-based survey was used to collect data from students at University of South Carolina and Winthrop University between July and September 2013. The survey consists of 14 different scales, with 106 total items. The following constructs were measured: health locus of control (LOC); God locus of health control (GLHC); physical activity (PA); dietary fat intake; fruit and vegetable intake (FVI); self-efficacy for physical activity, dietary fat intake, and fruit and vegetable intake; social support for physical activity and dietary

behaviors; divine support; congregational support; sociodemographics; and religious participation.

Participants were recruited for this study via student listserv emails, flyers, and announcements in classes and organizations. Willing participants completed the survey through a link in these emails, flyers, and handouts. The sample used for any analysis included 838 students. The study was approved by each university's Institutional Review Board, and participants were given a written statement at the beginning of the surveys and directed to complete the survey if they consented to be in the study.

Statistical Packages for the Social Sciences (SPSS) was used for all statistical analyses. The PRODCLIN program was used to assess for mediation (MacKinnon et al., 2007; Tofighi & MacKinnon, 2011).

MAJOR FINDINGS

Regarding aim #1, self-efficacy and social support mediated the relationship between internal health LOC and PA and FVI. This finding is consistent with previous literature that found self-efficacy and social support to be mediators of interventions related to PA (Lubans et al., 2008) and FVI (Steptoe et al., 2004). Self-efficacy also mediated the relationship between internal health LOC and dietary fat intake. There were no previous studies found that analyzed mediators of daily fat intake among any population, since published literature of mediators of dietary behaviors have focused primarily on FVI.

Research suggests that internal health LOC beliefs relate to health behaviors (Wallston et al., 1978), and specifically, those with higher internal health LOC tend to

practice greater preventive health behaviors than those with higher external LOC (Masters & Wallston, 2005), but little research exists on understanding the mechanisms for this relationship. The results of this study support the theory that higher internal health LOC is related to better health behaviors. This study shows that internal LOC was significantly and positively associated with the health behaviors of PA and FVI, and that both self-efficacy and social support mediated these relationships. Self-efficacy also mediated the relationship between internal LOC and dietary fat intake, even without a significant relationship between the predictor and the outcome. These results suggest that high internal LOC impacts PA and dietary behaviors by the amount of self-efficacy an individual has to participate in those behaviors. Additionally, high internal health LOC predicts better health behaviors through the mediating effect of social support.

Regarding aim #2, only congregational social support mediated the relationship between GLHC and physical activity. Other mediating relationships between GLHC and PA and dietary behaviors, including self-efficacy, social support, and divine support were not supported. No previous literature has examined variables that might mediate relationships between religious or spiritual LOC and health behaviors. These findings add to the limited literature on mediating variables of religious beliefs and health outcomes. Previous research showed support for social interaction to mediate the relationship between attending religious services and mortality (Rogers, 1996; Strawbridge et al, 1997), but research on other outcomes is limited. Regarding physical health, another study found that social support mediated the relationship between religious participation and physical health in African Americans, but not in whites (Ferraro & Koch, 1994). These results support the idea that social support through

congregational social support (or social ties and interactions) within a congregation may explain the relationship between religious beliefs and certain health outcomes.

Other proposed mediation models of GLHC and health behaviors were not supported. The examination of path coefficients in mediation analyses can identify shortcomings in the proposed conceptual model. Although GLHC was not significantly associated with any of the health behaviors (PA, FVI, or dietary fat intake), GLHC was significantly and positively associated with both congregational social support and divine support. These results are not surprising and provided support for the conceptual (but not action) mediation model. God-control of health has been shown to be predictive of health habits in undergraduate samples (Welton, et al., 1996). Additional research in the college aged population showed a negative association between GLHC and alcohol use (Willis, Wallston, & Johnson, 2001). It is possible other variables act as mediators between an individual's perception of God control and health outcomes. George et al. (2002) proposed several mediators that may account for the effect of religion and spirituality on health outcomes, such as psychosocial resources (e.g., self-esteem), and belief structures (e.g., sense of coherence).

LIMITATIONS AND STRENGTHS

This dissertation has several limitations. First, only self-report measures of PA and diet were used. Self-report of exercise and PA has been shown to include a bias of over-reporting (Prince et al., 2008). For dietary self-report, under-reporting has been shown for dietary fat, and over-reporting has been shown in the single items for FVI (Kim & Holowaty, 2003). Responses may have been influenced by the setting and

environment as the surveys were completed online. A 24-hour dietary recall is the preferred approach to assessment, but was not feasible for this study due to the cost and participant burden. Second, this research had a much higher percentage of females (72.9%) than males which could limit generalization. Additionally, the use of a cross-sectional design limits the ability of this research to infer causation and to establish temporal relationships between the independent variables, mediating variables, and dependent variables.

There are several notable strengths of this study. The study addressed mediating variables between health LOC, religious/spiritual health LOC, and health behaviors, topics that have received very little study. In particular, no previous studies were identified that examined these relationships for dietary fat intake. Other strengths include the large sample size and diversity of participants. The total sample of 838 ensured adequate power to detect mediation. The sample was majority Caucasian (65%), but representation among the sample within the Black population was also strong (22%), which is representative of the student body populations at each university. Undergraduate (all classes) and graduate students were equally represented within the sample.

This research adds to the literature in several ways. First, it examines internal health LOC and spiritual/religious LOC in relation to health behaviors, adds to the literature on mediating variables of health behaviors, and includes an understudied college student population in health behavior research. It is suggested that longitudinal designs with planned analyses of potential mediating variables be nested within behavior change programs be the focus of future research efforts.

CONCLUSION

In this dissertation, results from aim #1 showed that social support and self-efficacy mediated the relationship between internal health LOC and PA and FVI, and self-efficacy mediated the relationship between internal health LOC and dietary fat intake. These results support further investigation of mediating variables to explain, predict, and potentially improve health behaviors, specifically as they relate to an individual's belief regarding controlling his/her health status. Significant mediating relationships were identified for PA, FVI, and dietary fat intake which encourages future mechanistic research to include LOC constructs (using self-efficacy and social support) within designs aimed to change these behaviors. PA and dietary interventions among the college population should target internal health LOC, which will propose increases in self-efficacy and social support for these behaviors.

Results from aim #2 found support for congregational social support to mediate the relationship between GLHC and PA. Despite the limitations of self-report and selection biases, these results show that a faith structure that includes God influences the perceived congregational social support that an individual receives, which in turn can affect the PA behaviors of individuals. The implications of this research are targeted for researchers and health professionals that promote, create, or implement programs for prevention of chronic disease, especially within the college-aged, faith-based population. Significant associations were identified for congregational social support as a mediating variable between GLHC and PA, which may strengthen the impact of intervention programs designed for this population. In conclusion, incorporating social religious relationships with the strength in a belief in God may encourage positive changes in health behaviors in the religious/spiritual community.

BIBLIOGRAPHY

Abouserie, R. (1994). Sources and levels of stress in relation to locus of control and self-esteem in university students. *Educational Psychology, 14*(3), 323-330.

Adams, T. B. & Colner, W. (2008). The association of multiple risk factors with fruit and vegetable intake among a nationwide sample of college students. *Journal of American College Health, 56,* 455 – 461.

Ai, A. L., Peterson, C., Rodgers, W. L., & Tice, T. N. (2005). Faith factors and internal health locus of control in patients prior to open-heart surgery. *Journal of Health Psychology, 10,* 669 – 676.

Alton, K. A. (1999). Religion, depression, and locus of control: A cross-sectional approach. Dissertation Abstracts International: Section B: The Sciences & Engineering; 59 (12-B). US: Univ. Microfilms International.

American College Health Association. (2010). American College Health Association-National College Health Assessment II: Reference Group Data Report Fall 2009. Baltimore, MD: American College Health Association.

American College Health Association. (2012). American College Health Association-National College Health Assessment II: Reference Group Data Report Fall 2011. Baltimore, MD: American College Health Association.

American College Health Association. (2012, June). *Healthy Campus 2020.* Retrieved December 11, 2012, from http://www.acha.org/HealthyCampus/index.cfm.

Ang, D. C., Ibrahim, S. A., Burant, C. J., Siminoff, L. A., & Kwoh, C. K. (2002). Ethnic differences in the perception of prayer and consideration of joint arthroplasty. *Medical Care, 40*(6), 471-476.

Ashley, F. W. & Kannel, W. B. (1974). Relation of weight change to changes in atheogenetic traits: the Framingham study. *Journal of Chronic Disease, 27,* 103 – 114.

Astin, A. W. (1993). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

Astin, J. A., Shapiro, S. L., Lee, R. A., & Shapiro, D. H., Jr. (1999). The construct of control in mind-body medicine: Implications for healthcare. *Alternative Therapies, 5,* 42 – 47.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior chance. *Psychological Review, 84,* 191 – 215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Baranowski, T., Anderson, C., & Caramack, C. (1998). Mediating variable framework in physical activity interventions. How are we doing? How might we do better? *American Journal of Preventative Medicine, 15,* 266 – 297.

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

Bauman, A. E., Sallis, J. F., Dzewaltowski, D. A., & Owen, N. (2002). Toward a better understanding of the influences of physical activity – the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American Journal of Preventative Medicine, 23,* 5 – 14.

Bensen, P. & Spilka, B. (1973). God image as a function of self-esteem and locus of control. *Journal for the Scientific Study of Religion, 12,* 297 – 310.

Berkman, L. F. & Breslow, L. (1983). *Health and Ways of Living: The Alameda County Study*. New York, NY: Oxford University Press.

Berkman, L. F. & Syme, S. L. (1979). Social networks, host resistance, and mortality. *American Journal of Epidemiology, 109,* 186 – 204.

Betts, N. M., Amos, R. J., Keim, K., Peter, P., & Steward, B. (1997). Ways young adults view foods. *Journal of Nutrition Education and Behavior, 29,* 73 – 79.

Bhui, K. (2002). Physical activity and stress. In S. A. Stansfeld, & M. G. Marmot (Eds.), *Stress and the heart: Psychosocial pathways to coronary heart disease* (pp. 158 – 167). Williston, VT: BMJ Books.

Biddle, S. & Mutrie, N. *Psychology of physical activity: Determinants, well-being, and interventions*. London: Routledge; 2001.

Biddle, S. J., Whitehead, S. H., O'Donovan, T. M., & Nevill, M. E. (2005). Correlates of participation in physical activity for adolescent girls: A systematic review of recent literature. *Journal of Physical Activity and Health, 2,* 423-434.

Blaine, B. & Crocker, J. (1995). Religiousness, race, and psychological well-being: Exploring social psychological mediators. *Personality and Social Psychology Bulletin, 21,* 1031-1041.

Blanchard, C. M., Kupperman, J., Sparling, P., Nehl, E., Rhodes, R. E., Courney, K. S….Hunt, T. (2007). Ethnicity as a moderator of the theory of planned behavior and physical activity in college students. *Research Quarterly for Exercise and Sport, 78,* 531 – 541.

Brown, J. D. (1991). Staying fit and staying well: Physical fitness as a moderator of life stress. *Journal of Personality & Social Psychology, 60,* 555 – 561.

Bryant, S. & Rakowski, W. (1992). Predictors of mortality among elderly African Americans. *Research on Aging, 14,* 50 – 67.

Burns, J. L. (1985). Attribution of causality for successful performance by kindergarten children. Proceedings from the Annual Meeting of the Eastern Psychological Association, Baltimore: MD.

Butler, S. M., Black, D. R., Blue, C. L., & Gretebeck, R. J. (2004). Change in diet, physical activity, and body weight in female college freshman. *American Journal of Health Behavior, 28,* 24 – 32.

Byrne, A. & Byrne, D. G. (1993). The effect of exercise on depression, anxiety, and other mood states: A review. *Journal of Psychomotor Research, 37,* 565 – 574.

Calfas, K. J., Sallis, J. F., Nichols, J. F., Sarkin, J. A., Johnson, M. F., Caparosa, S., Thompson, S., Gehrman, C. A., Alcaraz, J. E. (2000). Project GRAD: Two-year outcomes of a randomized controlled physical activity intervention among young adults. *American Journal of Preventative Medicine, 18,* 28 – 37.

Campbell, M. K., Demark-Wahnefried, W., Symons, M., Kalsbeek, W. D., Dodds, J., Cowan, A., et al. (1999). Fruit and vegetable consumption and prevention of cancer: The Black Churches United for Better Health project. *American Journal of Public Health, 89*(9), 1390-1396.

Centers for Disease Control and Prevention (2001). Physical Activity Trends – United States, 1990 – 1998. *Journal of American Medical Association, 285,* 1835.

Centers for Disease Control and Prevention. Physical activity and good nutrition: essential elements to prevent chronic diseases and obesity. Available at: http://www.cdc.gov/nccdphp/publications/aag/pdf/dnpa.pdf. Published February 2008.

Centers for Disease Control and Prevention. Youth Risk Behavior Survey (2009). Available at: http://www.cdc.gov/yrbs.

Cerin, E. & MacKinnon, D. P. (2008). A commentary on current practice in mediating variable analyses in behavioral nutrition and physical activity. *Public Health Nutrition, 12,* 1182 – 1188.

Cerin, E., Barnett, A., & Baranowski, T. (2009). Testing theories of dietary behavior change in youth using the mediating variable model with intervention programs. *Journal of Nutrition Education and Behavior, 41,* 309 – 318.

Cerin, E., Taylor, L., Leslie, E., & Owen, N. (2006). Small-scale randomized controlled trials need more powerful methods of mediational analysis than the Baron-Kenny method. *Journal of Clinical Epidemiology, 59,* 457 – 464.

Chen, S., Action, G. & Jung-Hau, S. (2010). Relationship among nutritionals self-efficacy, health locus of control and nutritional status in older Taiwanese adults. *Journal of Clinical Nursing, 19,* 2117 – 2127.

Chepyator-Thompason, J. R. (1994). Multicultural education: Culturally responsive teaching. *Journal of Physical Education, Recreation & Dance, 65,* 31.

Cherry, C., DeBerg, B. A., & Porterfield, A. (2001). *Religion on campus.* Chapel Hill, NC: University of North Carolina Press.

Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology, 7,* 269 – 297.

Cohen, S., Doyle, W. J., Skoner, D. P., Rabin, B. S., & Gwaltney, J. M. (1997). Social ties and susceptibility to the common cold. *Journal of the American Medical Association, 24,* 1941 – 1944.

Cohen, S. & Willis, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98,* 310 – 357.

Conn, V. S. (2010). Depressive symptom outcomes of physical activity interventions: Meta-analysis findings. *Annals of Behavioral Medicine, 39,* 128 – 138.

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F. & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise, 35,* 1381 – 1395.

Debnam, K. J, Holt, C. L., Clark, E. M., Roth, D. L., Foushee, H. R., Crowther, M., Fouad, M., & Southward, P. L. (2012). Spiritual health locus of control and health behaviors in African Americans. *American Journal of Health Behavior 36*(3), 360-372.

Denton, M. L., Pearce, L. D., & Smith, C. (2008). Religion and Spirituality on the Path through Adolescence, Research Report Number 8. National Study of Youth and Religion. Retrieved August 11, 2012 from http://www.youthandreligion.org/sites/youthandreligion.org/files/imported/publications/docs/w2_pub_report_final.pdf

Desai, M. N., Miller, W. C., Staples, B., & Bravender, T. (2008). Risk factors associated with overweight and obesity in college students. *Journal of American College Health, 57,* 109 – 114.

Dinger, M. K. (1999). Physical activity and dietary intake among college students. *American Journal of Health Studies, 15,* 139 – 149.

Dinger, M. K. & Waigandt, A. (1997). Dietary intake and physical activity behaviors of male and female college students. *American Journal of Health Promotion, 11,* 360 – 362.

Dishman, R. K., Motl, R. W., Saunders, R., Felton, G., Ward, D. S., Dowda, M., & Pate, R. R. (2004). Self-efficacy partially mediates the effect of a school-based physical activity intervention among adolescent girls. *Preventive Medicine, 38,* 628 – 636.

Driskell, J. A., Kim, Y. N., & Goebel, K. J. (2005). Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. *Journal of American Dietetic Association, 105,* 798 – 801.

Driskell, J. A., Meckna, B. R., & Scales, N. E. (2006). Differences exist in the eating habits of university men and women at fast-food restaurants. *Nutrition Research, 26,* 524 – 530.

Duffy, R. D. & Lent, R. W. (2008). Relation of religious support to career decision self-efficacy in college students. *Journal of Career Assessment, 16,* 360 – 369.

Dunn, A. L., Trivedi, M. H., & O'Neal, H. A. (2001). Physical activity dose-response effects on outcomes of depression and anxiety. *Medicine & Science in Sports & Exercise, 33*(6 Suppl.), S587 – S597; discussion 609 – 510.

Duru, O. K., Sarkisian, C. A., Leng, M., & Mangione, C. M. (2010). Sisters in motion: A randomized controlled trial of a faith-based physical activity intervention. *Journal of American Geriatrics Society, 58,* 1863 – 1869.

Dzewaltowski, D. A, Esatbrooks, P. A., Welk, G., Hill, J., Milliken, G., Karteroliotis, K., & Johnston, J. A. (2009). Healthy Youth Places: A randomized controlled trial to determine the effectiveness of facilitating adult and youth leaders to promote physical activity and fruit and vegetable consumption in middle schools. *Health Education Behavior, 36,* 583 – 600.

Eckstein, Rabbi Y. (2000). The role of faith in shaping optimism. In J. E. Gillham (Ed.), *The science of optimism and hope: Research essays in honor of Martin E. P. Seligman* (pp. 341 – 345). Philadelphia, PA: Templeton Foundation Press.

Ellison, C. G. & Levin, J. S. (1998). The religion-health connection: Evidence, theory, and future directions. *Health Education and Behavior, 25,* 700 – 720.

Fabricatore, A. N., Randal, P. J., Rubio, D. M., & Gilner, F. H. (2004). Stress, religion, and mental health: Congregational social support in mediating and moderating roles. *International Journal for the Psychology of Religion, 14*(2), 97–108.

Fahrenwald, N. L., Atwood, J. R., Noble Walker, S., Johnson, D. R., & Berg, K. (2004). A randomized pilot test of "moms on the move": A physical activity intervention for WIC mothers. *Annals of Behavioral Medicine, 27,* 82 – 90.

Feinstein, M., Liu, K., Ning, H., Fitchett, G., & Lloyd-Jones, D. M. (2010). Burden of cardiovascular risk factors, subclinical atherosclerosis, and incident cardiovascular events across dimensions of religiosity: The multi-ethnic study of atherosclerosis. *Circulation, 121,* 659 – 666.

Ferraro, K. F. (1998). Firm believers? Religion, body weight, and well-being. *Review of Religious Research, 39,* 222 – 244.

Ferraro, K. F. & Koch, J. R. (1994). Religion and health among black and white adults: Examining social support and consolation. *Journal for the Scientific Study of Religion, 33,* 362 – 375.

Ferron, C., Narring, F., Cauderay, M. & Michaud, P. (1999). Sport activity in adolescence: Associations with health perceptions and experimental behaviors. *Health Education Research, 14*, 225 – 233.

Fetzer Institute, National Institute on Aging Working Group: Multidimensional Measurement of Religiousness, Spirituality for Use in Health Research. A Report of the National Working Group. Supported by the Fetzer Institute in Collaboration with the National Institute on Aging. Kalamazoo, MI: Fetzer Institute (1999).

Fiala, W. E., Bjorck, J. P., & Gorsuch, R. (2002). The religious support scale: construction, validation, and cross-validation. *American Journal of Community Psychology, 30*(6), 761-786.

Flegal, K. M., Carroll, M. D., Kit, B. K., & Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999 – 2010. *Journal of the American Medical Association, 307,* 491 – 497.

Ford, E. S., Bergmann, M. M., Kroger, J., Schienbkiewitz, A., Weikert, C., & Boenig, H. (2009). Healthy living is the best revenge. *Archives of Internal Medicine, 169,* 1355 – 1362.

Fox, K. (2000). The effects of exercises on self-perceptions and self-esteem. In: Briddle, S., Fox, K., Bouthcer, S. eds. Physical activity and Psychological well-being. New York, NY: Routledge.

Franklin, M. D., Schlundt, D. G. & Wallston, K. A. (2008). Development and validation of a religious health fatalism measure for the African-American faith community. *Journal of Health Psychology, 13,* 323 – 335.

Fritz, M. S. & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18,* 233 – 239.

Fuemmeler, B. F., Masse, L. C, Yaroch, A. L., Resnicow, K., Campbell, M. K., Carr, C…. Williams, A. (2006). Psychosocial mediation of fruit and vegetable consumption in the body and soul effectiveness trial. *Health Psychology, 25,* 474 – 483.

Furnham, A. F. (1982). Locus of control and theological beliefs. *Journal of Psychology and Theology, 10,* 130 – 136.

Furnham, A. & Steele, H. (1993). Measuring locus of control: A critique of general, children's, and health-and-work-related locus of control questionnaires. *British Journal of Psychology, 84*(4), 443-479.

Gabbard, C. E., Howard, G. S. & Tageson, C. W. (1986). Assessing locus of control with religious populations. *Journal of Research in Personality, 20,* 292 – 308.

Gadzella, B. M. (1994). Student-life stress inventory: Identification of and reactions to stressors. *Psychological Reports, 74,* 395-402.

Gall, T. L. (2004). Relationship with God and the quality of life of prostate cancer survivors. *Quality of Life Research 13,* 1357-1368.

Galore, S. R., Walker, C., & Chandler, A. (1993). Brief communication: Dietary habits of first-year medical students as determined by computer software analysis of three-day food records. *Journal of American College Nutrition, 12,* 517 – 520.

George, L. K., Ellison, C. G., & Larson, D. B. (2002). Explaining the relationships between religious involvement and health. *Psychological Inquiry, 13,* 190-200.

George, L. K., Larson, D. B., Koenig, H. G., & McCullough, M. E. (2000). Spirituality and health: What we know, what we need to know. *Journal of Social and Clinical Psychology, 19,* 102 – 116.

Goldman, N., Korenman, S., & Weinstein, R. (1995). Marital status and health among the elderly. *Social Science and Medicine, 40,* 1717 – 1730.

Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends adolescence to adulthood. *American Journal of Preventative Medicine, 27,* 277 – 283.

Gow, R. W., Trace, S. E., & Mazzeo, S. E. (2010). Preventing weight gain in first year college students: An online intervention to prevent the "freshman fifteen." *Eating Behaviors, 11,* 33- 39.

Greaney, M. L., Less, F. D., White, A. A., Dayton, S. F., Riebe, D., Blissmer, B… Greene, G. W. (2009). College students' barriers and enablers for healthful weight management: A qualitative study. *Journal of Nutrition Education and Behavior, 41,* 281 – 286.

Greer, T. L. & Trivedi, M. H. (2009). Exercise in the treatment of depression. *Current Psychiatry Report, 11,* 466 – 472.

Haerens, L., Cerin, E., Maes, L., Cardon, G., Deforche, B., & De Bourdeaudhuij, I. (2008). Explaining the effect of a 1-year intervention promoting physical activity in middle schools: A mediation analysis. *Public Health Nutrition, 11,* 501-512.

Halbert, R. & Hill, R. (2011). The Locus of Control construct's various means of measurement: A researcher's guide to some of the more commonly used Locus of Control scales. Beach Haven, NJ: Will to Power Press.

Harcrow, M. S. (2010) Relationships *between religiosity, spirituality, and health behaviors among college students.* (Unpublished doctoral dissertation.) University of Alabama, Tuscaloosa, AL.

Hathaway, W. L. & Pargament, K. I. (1991). The religious dimensions of coping: Implications for prevention and promotion. *Religion and Prevention in Mental health: Conceptual and Empirical Foundations, 9,* 65 – 92.

Heaven, P. C. & Furnham, A. (1987). Race prejudice and economic beliefs. *The Journal of Social Psychology, 127,* 483 – 489.

Heckhausen, J. & Schulz, R. (1995). A life-span theory of control. *Psychological Review, 102,* 284 – 304.

Helgeson, V. S., & Fritz, H. L., (1999). Cognitive adaptation as a predictor of new coronary events after percutaneous trans luminal coronary angioplasty. *Psychosomatic Medicine, 61,* 488 – 495.

Herring, M. P., O'Connor, P. J., & Dishman, R. K. (2010). The effect of exercise training on anxiety symptoms among patients: A systematic review. *Archives of Internal Medicine, 170,* 321 – 331.

Herring, M. P., Puetz, T. W., O'Connor, P. J., & Dishman, R. K. (2012). Effect of exercise training on depressive symptoms among patients with a chronic illness: A systematic review and meta-analysis of randomized controlled trials. *Archives of Internal Medicine, 172,* 101 – 111.

Hertzler, A. A. & Frary, R. B. (1996). Family factors and fat consumption of college students. *Journal of American Dietetic Association, 96,* 711 – 714.

Hivert, M. F., Langlois, M. F., Berard, P., Cuerrier, J. P., & Carpentier, A. C. (2007). Prevention of weight gain in young adults through a seminar-based intervention program. *International Journal of Obesity, 31,* 1262 – 1269.

Hoffman, J. P. & Miller, A. S. (1997). Social and political attitudes among religious groups: Convergence and divergence over time. *Journal for the Scientific Study of Religion, 36,* 52 – 70.

Holt, C. L. & McClure, S. M. (2006). Perceptions of the religion-health connection among African American church members. *Qualitative Health Research, 16,* 268 – 281.

Holt,C.L., Clark,E. & Klem, P.R. (2007). Expansion and validation of the spiritual health locus of control scale: Factorial analysis and predictive validity. *Journal of Health Psychology, 12,* 597-612.

Holt,C.L., Clark,E.M., Kreuter, M.W., & Rubio, D.M.(2003a). Spiritual Health Locus of Control and breast cancer beliefs among urban African American women. *Health Psychology, 22*(3), 294-299.

Holt, C.L., Lukwago, S.N., & Kreuter, M.W. (2003b). Spirituality, breast cancer beliefs and mammography utilization among urban African American women. *Journal of Health Psychology, 8*(3), 383-396.

Horacek, T. M. & Betts, N. M. (1988). College students' dietary intake and quality according to their Myers Briggs type indicator personality preferences. *Journal of Nutrition Education, 30*, 387 – 395.

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, *241*, 540– 545.

Huang, T. T.-K., Harris, K. J., Lee, R. E., Nazir, N., Born, W., Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health 52*(2), 83-86.

IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

Idler, E. L. & Kasl, S. V. (1992). Religion, disability, and the timing of death. *American Journal of Sociology, 97,* 1052 – 1079.

Idler, E. L., Musick, M. A., Ellsion, C. G., George, L. K., Krause, N., Ory, M. G., et al. (2003). Measuring multiple dimensions of religion and spirituality for health research. *Research on Aging, 25,* 327-365.

IPAQ. (2004). Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short Form, Version 2.0. Retrieved May 17, 2013 from: www.ipaq.ki.se

Jackson, L. E. & Coursey, R. D. (1988). The relationship of God control and internal locus of control to intrinsic religious motivation, coping, and purpose in life. *Journal for the Scientific Study of Religion, 27,* 399 – 410.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J. & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine & Science in Sports & Exercise, 25,* 81 – 91.

Johnson, M. E., Dose, A. M., Pipe, T. B., Petersen, W. O., Huschka, M., Gallenberg, M. M., Peethambaram, P., Sloan, J., & Frost, M. H. (2009). Centering prayer for women receiving chemotherapy for recurrent ovarian cancer: A pilot study. *Oncology Nursing Forum, 36*(4). 421-428.

Jones, A. C., Kwoh, C. K., Groeneveld, P.W., Mor, M., Geng, M. & Ibrahim, S. A. (2008). Investigating racial differences in coping with chronic osteoarthritis pain. *Journal of Cross-Cultural Gerontology, 23,* 339-347.

Jones, H. B., Jr. (1997). The Protestant ethic: Weber's model and the empirical literature. *Human Relations, 50,* 757 – 778.

Katzmarzyk, P. T., Gledhill, N. & Shepard, R. J. (2000). The economic burden of physical inactivity in Canada. *Canadian Medical Association Journal, 163,* 1435 – 1440.

Keating, X. D., Guan, J., Pinero, J. C., & Bridges, D. M. (2005). A meta-analysis of college students' physical activity behaviors. *Journal of American College Health, 54*(2), 116-126.

Kegler, M. C., Swan, D. W., Alcantara, I., Wrensford, L., & Glanz, K. (2012). Environmental influences on physical activity in rural adults: the relative contributions of home, church, and work settings. *Journal of Physical Activity and Health, 9,* 996-1003.

Kim, D. & Holowaty, E. (2003). Brief, validated survey instruments for the measurement of fruit and vegetable intakes in adults: A review. *Preventive Medicine, 37,* 72.

Kim, K. H., Linnan, L., Campbell, M. K., Brooks, C., Koenig, H. G., & Wiesen, C. (2008). The WORD (wholeness, oneness, righteousness, deliverance): A faith-based weight-loss program utilizing a community-based participatory research approach. *Health Education and Behavior, 35,* 634 – 650.

King, M., Speck, P, & Thomas, A. (1999). The effect of spiritual beliefs on outcome from illness. *Social Science & Medicine, 48,* 1291 – 1299.

King, M., Speck, P, & Thomas, A. (1994). Spiritual and religious beliefs in acute illness: Is this a feasible area for study? *Social Science & Medicine, 38,* 631 – 636.

Kinney, A. Y., Emery, G., Dudley, W. N. & Croyle, R. T. (2002). Screening behaviors among African American women at high risk for breast cancer: Do beliefs about God matter? *Oncology Nursing Forum, 29,* 835 – 843.

Koenig, H. G. (1995). Religion as cognitive schema. *International Journal of the Psychology of Religion, 5,* 31 – 37.

Koenig, H. G. (1999). *The health power of faith.* New York: Simon and Schuster.

Koenig, H. G. (2001). Religion and medicine III: Developing a theoretical model. *International Journal of Psychiatry in Medicine, 31,* 199 – 216. Religious attendance prolong survival? A six-year follow-up study of 3968 older adults. *The Journals of Gerontology. Series A. Biological Sciences and Medical Sciences, 54,* M370 – M376.

Koenig, H. G., Hays, J. C., George, L. K., Blazer, D. G., Larson, D. B., & Landerman, L. R. (1997). Modeling the cross-sectional relationships between religion, physical

health, social support, and depressive symptoms. *American Journal of Geriatric Psychiatry, 5,* 131 – 144.

Koenig, H. G., Hays, J. C., Larson, D. B, George, L. K., Cohen, H. J., McCullough, M. E., et al. (1999). Does religious attendance prolong survival? A six-year follow-up study of 3.968 older adults. *Journal of Gerontology: Medical Sciences, 54A,* M370 – M376.

Koenig, H., King, D., & Carson, V. B. (2012). Handbook of Religion and Health (2nd edn). New York: Oxford University Press.

Kokkinos, C. M. & Panayiotou, G. (2007). Parental discipline practices and Locus of Control: Relationship to bullying and victimization experiences of elementary school students. *Social Psychology of Education, 10,* 281 – 301.

Kuh, G. D. (1995). The other curriculum: Out-of-class experiences associated with student learning and personal development. *Journal of Higher Education, 66,* 123 – 155.

Kuh, G. D. & Gonyea, R. M. (2005). *Exploring the relationships between spirituality, liberal learning, and college student engagement*. Bloomington, IN: Indiana University. Retrieved Dec 11, 2012 from http://www.nsse.iub.edu/pdf/research_papers/teagle.pdf

Kumanyika, S. K., & Charleston, J. B. (1992). Lose weight and win: a church-based weight loss program for blood pressure control among black women. *Patient Education and Counseling, 19*(1), 19-32.

Kunst, J., Bjorck, J. P., & Tan, S. (2000). Causal attributions for uncontrollable negative events. *Journal of Psychology & Christianity, 19,* 47 – 60.

Kuwahara, A., Nishino, Y., Ohkubo, T., Tsuji, I., Hisamichi, S., Hosokawa, T. (2004). Reliability and validity of the Multidimensional Health Locus of Control Scale in Japan: Relationship with demographic factors and health-related behavior. *Tohoku Journal of Experimental Medicine, 203*(1), 37–45.

Kwan, M. Y., Cairney, J., Faulkner, G. E., & Pullenayegum, E. E. (2012). Physical activity and other health-risk behaviors during the transition into early adulthood. *American Journal of Preventative Medicine, 42*(1) 14-20.

LaChausse, R. G. (2012). My student body: Effects of an internet-based prevention program to decrease obesity among college students. *Journal of American College Health, 60*(4), 324-330.

Lapane, K. L., Lasater, T. M., Allan, C., & Carleton, R. A. (1997). Religion and cardiovascular disease risk. *Journal of Religion and Health, 36,* 155 – 163.

Larson, D. B., Sherrill, K. A., Lyons, J. S., Craigie, F. C., Jr., Thielman, S. B., Greenwold, B. A., & Larson, S. S. (1992). Associations between dimensions of religious commitment and mental health reported in the American Journal of

Psychiatry and Archives of General Psychiatry: 1978 – 1989. *American Journal of Psychiatry, 149,* 557 – 559.

Leslie, E., Sparling, P. B., & Owen, N. (2001). University campus settings and the promotion of physical activity in young adults: Lessons from research in Australia and the US. *Health Education, 101*, 116 – 125.

Levenson, H. (1972). Distinction within the concept of internal-external control: Development of a new scale. *Proceedings of the Annual Convention of the American Psychological Association, 7,* 261 – 262.

Levin, J. S. (1994). Religion and health: Is there an association, is it valid, and is it causal? *Social Science and Medicine, 38*, 1475 – 1482.

Lewis, B. A., Marcus, B. H., Pate, R. R. & Dunn, A. L. (2002). Psychosocial mediators of physical activity behavior among adults and children. *American Journal of Preventive Medicine, 23,* 26 – 35.

Liedman, M., Cameron, B. A., Carson, D. K., Brown, D. M., & Meyer, S. S. (2001). Dietary fat reduction behaviors in college students: Relationship to dieting status, gender and key psychosocial variables. *Appetite, 36*, 51 – 56.

Lubans, D. R., Foster, C., & Biddle, S. J. H. (2008). A review of mediators of behavior in interventions to promote physical activity among children and adolescents. *Preventive Medicine, 47*, 463 – 470.

Lubans, D. R. & Sylva, K. (2007). Mediators of change following a senior school physical activity intervention. *Journal of Science and Medicine in Sport, 12*(1), 134-140

Ma, S. Y. (2003). The Christian college experience and the development of spirituality among students. *Christian Higher Education, 2*, 321 – 339.

MacKinnon, D. P. (2000). Contrasts in multiple mediator models. In: Rose, J. S., Chassin, L., Presson, C. C., Sherman, S. J., editors. Multivariate Applications in Substance Use Research: new Methods for New Questions. Mahwah, NJ: Erlbaum. p. 141 – 160.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S., (2007). Mediation analysis. *Annual Review of Psychology, 58*, 593 – 614.

MacKinnon, D. P., Fritz, M. S., Williams, J., & Lockwood, C. M. (2007). Distribution of the product confidence limits for the indirect effect: program PRODCLIN. *Behavioral Research Methods, 39,* 384 – 389.

Malinowski, B. (1925). Magic, science, and religion. In J. Needham (Ed.), Science, Religion and Relation (pp. 18 -94). New York: Macmillan.

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport, 63*(1), 60-66.

Marquis, M. (2005). Exploring convenience orientation as a food motivation for college students living in residence halls. *International Journal of Consumer Studies, 29,* 55 – 63.

Marr, J. (2014). *Understanding the relationship between health locus of control and God locus of health control and health behaviors in college students through mediation analysis.* (Unpublished doctoral dissertation.) Unive3rsity of South Carolina, Columbia, SC.

Mewse, A. J., Lea, S. E. G., & Wrapson, W. (2010). First steps out of debt: Attitudes and social identity as predictors of contact by debtors with creditors. *Journal of Economic Psychology, 31*(6), 1021-1034.

McAuley, E. & Mihalko, S. L. (1998). Measuring exercise-related self-efficacy. In J. L. Duda (Ed.) *Advances in sport and exercise psychology measurement.* Morgantown, WV: Fitness Information Technology.

Milne, S., Orbell, S., & Sheeran, P. (2002). Combining motivation and volitional interventions to promote exercise participation: Protection motivation theory and implementation intentions. *British Journal of Health Psychology, 7,* 163 -184.

Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., & Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *Journal of the American Medical Association, 286,* 1195 – 1200.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000, *Journal of the American Medical Association, 291,* 1238 – 1245.

Morse, K. L. & Driskell, J. A. (2009). Observed sex differences in fast-food consumption and nutrition self-assessments and beliefs of college students. *Nutrition Research, 29,* 173 – 179.

Musick, M. A., Koenig, H. G., Hays, J. C. & Cohen, H. J. (1998). Religious activity and depression among community-dwelling elderly persons with cancer: The moderating effect of race. *Journal of Gerontology: Social Sciences, 53B,* S218 – S227.

Myers, P. & Kyle, K. (2008, June). *Research on Spirituality, Religion and Student Health Spirituality, Religion and Student Health Coalition of ACHA.* Presented at the meeting of the American College Health Association, Orlando, FL.

Murphy, L. M. B., Thompson, J. R., Morris, M. A. (1997). Adherence behavior among adolescents with type I insulin-dependent diabetes mellitus: The role of cognitive appraisal processes. *Journal of Pediatric Psychology, 22,* 811 – 925.

My Studentbody.com. Available at: http://www.mystudentbody.com. Accessed May 9, 2012.

National Cancer Institute. (2009). U.S. National Institutes of Health. Risk Factor Monitoring and Methods. Percentage Energy from Fat Screener: Overview & Scoring Procedures. Retrieved May 13, 2013 from: http://riskfactor.cancer.gob/diet/screeners/fat/

National Institute of Health. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults – The evidence report. *Obesity Research, 6 (Supplement 2)*: 51S – 209S.

Nelms, L. W., Hutchins, E., Hutchins, D., & Pursley, R. J. (2007). Spirituality and the health of college students. *Journal of Religion and Health, 46,* 249 – 265.

Nelson, J. (2009). Psychology, religion, and spirituality. New York, NY: Springer. doi: 10.1007/978-0-387-87537-6_10

Neumark-Sztainer, D., Story, M., Hannan, P. J., Tharp, T., & Rex, J. (2003). Factors associated with changes in physical activity: A cohort study of inactive adolescent girls. *Archives Pediatric & Adolescence Medicine, 157,* 803 – 810.

Nguyen-Michel, S. T., Unger, J. B., Hamilton, J. & Spruijt-Metz, D. (2006). Associations between physical activity and perceived stress/hassles in college students. *Stress and Health, 22*, 179-188.

Nickolas, T. A., Baranowki, T., Cullen, K. W., & Berenson, G. (2001). Eating patterns, dietary quality and obesity. *Journal of American College of Nutrition, 20,* 599 – 608.

Norman, G. J., Carlson, J. A., Sallis, J. F., Wagner, N., Calfas, K. J., & Patrick, K. (2010). Reliability and validity of brief psychosocial measures related to dietary behaviors. *International Journal of Behavioral Nutrition and Physical Activity, 7,* 56 – 65.

Norton, M. C., Singh, A., Skoog, I., Corcoran, C., Tschanz,, J. T., Zandi, P. P… Steffens, D. C. (2008). Church attendance and new episodes of major depression in a community study of older adults: The Cache County Study. *Journal of Gerontology Series B Psychological Sciences and Social Science, 63,* 129 – 137.

Oaten, M. & Cheng, K. (2005). Academic examination stress impairs self-control. *Journal of Social and clinical Psychology, 24*(2), 254-279.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 2009 – 2010. *Journal of the American Medical Association, 307,* 483 - 490.

Ozkan, T. & Lajunen, T. (2005). Multidimensional traffic Locus of Control scale (T-LOC): Factor structure and relationship to risky driving. *Personality and Individual Differences, 38,* 533 – 545.l

Paeratakul, S., Ferdinand, D. P., Champagne, C. M., & Bray, G. A. (2003). Fast-food consumption among US adults and children: dietary and nutrient intake profile. *Journal of the American Dietetic Association, 103,* 1332 – 1338.

Pargament, K. I. (1997). *The psychology of religion and coping.* New York: Guilford.

Pargament, K. I., Kennell, J., Hathaway, W., Grevengoed, N., Newman, J., & Jones, W. (1988). Religion and the problem solving process: Three styles of coping. *Journal of the Scientific Study of Religion, 27,* 90 – 104.

Pargament, K. I., Sullivan, M., Tyler, F., & Steele, R. (1982). Patterns of attribution of control and individual psychosocial competence. *Psychological Reports, 51,* 1243 – 1252.

Pascarella, E. T. & Terenzini, P. T. (2005). *How college affects students: A third decade of research.* San Francisco: Jossey-Bass.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C ….Wilmore, J. H. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association, 273,* 402 – 407.

Posner, B., Slater, C., & Boone, M. (2006). Spirituality and leadership among college freshmen. *The International Journal of Servant-Leadership, 2,* 165 – 180.

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Gorber, S. C. & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 5*. doi: 10.1186/1479-5868-5-56

Prochaska, J. O., Rodgers, M. W., & Sallis, J. F. (2002). Association of parent and peer support with adolescent physical activity. *Research Quarterly for Exercise & Sport, 73,* 206 – 210.

Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2005). Weight changes, exercises, and dietary patterns during freshman and sophomore years of college. *Journal of American College Health, 53,* 245 – 251.

Raven, B. H. (1999). Influence, power, religion, and the mechanisms of social control. *Journal of Social Issues, 55,* 161 – 186.

Reeves, R. R., Adams, C. E., Dubbert, P. M., Hickson, D. A., & Wyatt, S. B. (2012). Are religiosity and spirituality associated with obesity among African Americans in the southeastern United States (the Jackson Heart Study)? *Journal of Religion and Health, 51,* 32-48.

Regnerus, M. D. (2003). Religion and positive adolescent outcomes: A review of research and theory. *Review of Religious Research, 44,* 394 – 413.

Reitzel, L. R. & Harju, B. L. (2000). Influence of Locus of Control and custody level on intake and prison-adjustment depression. *Criminal Justice and Behavior, 27,* 625 – 644.

Resnicow, K., Campbell, M. K., Carr, C., McCarty, F., Wang, T., Periasamy, S… Stables, G. (2004). Body and soul. A dietary intervention conducted through African-American churches. *American Journal Preventative Medicine, 27*(2), 97-105.

Resnicow, K., Jackson, A., Wang, T., De, A. K, McCarty, F., Dudley, W. N., & Baranowski, T. (2001). A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: Results of the Eat for Life trial. *American Journal of Public Health, 91,* 686 – 693.

Resincow, K., Odom, E., Wang, T., Dudley, W. N., Mitchell, D… Baranowski, T. (2000). Validation of three food frequency questionnaires and 24-hour recalls with serum carotenoid levels in a sample of African-American adults. *American Journal of Epidemiology, 152,* 1072 – 1080.

Rhodes, R. E. & Pfaeffli, L. A. (2010). Mediators of physical activity behavior change among adult non-clinical populations: A review update. *International Journal of Behavioral Nutrition and Physical Activity, 7,* 37 – 48.

Robins, J. M. & Greenland, S. (1992). Identifiability and exchangeability for direct and indirect effects. *Epidemiology, 3,* 143 – 155.

Roddenberry, A. & Renk, K. (2010). Locus of Control and self-efficacy: Potentials mediators of stress, illness, and utilization of health services in college students. *Child Psychology and Human Development, 41,* 353 – 370.

Roff, L. L., Klemmack, D. L., Parker, M., Koenig, H. G., Sawyer-Baker, P., & Allman, R. M. (2005). Religiosity, smoking, exercise, and obesity, among southern, community-dwelling older adults. *Journal of Applied Gerontology, 24,* 337 – 354.

Rogers, R. G. (1996). The effects of family composition, health, and social support linkages on mortality. Journal of Health and Social Behavior, 37, 326 – 338.

Roger, V. L., Go, A. S., Lloyd-Jones, D. M., Benjamin, E. J., Berry, J. D., Borden, W. B…….Turner, M. B. (2012). On behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics – 2012 update: A report from the American Heart Association. Circulation. Published online before print December 15, 2011, 10.1161/CIR.0b013e31823ac046.

Ross, L. E., Ingrid, J. H., Firley, T. L., Taylor, Y. J., & Howard, D. L. (2008). Prayer and self-reported health among cancer survivors in the United States, national health

interview survey, 2002. *The Journal of Alternative and Complementary Medicine, 14*(8), 931-938.

Rotter, J. B. (1954). *Social Learning and Clinical Psychology.* NY: Prentice-Hall.

Rowe, J.L., Montgomery, G.H., Duberstein, P.R., & Bovbjerg, D.H. (2005). Health locus of control and perceived risk for breast cancer in healthy women. *Behavior Medicine, 31*(1), 33-40.

Sadowski, C. J. & Wenzel, D. M. (1982). The relationship of Locus of Control dimensions to reported hostility and aggression. *Journal of Psychology, 112*, 227 – 230.

Sagrestano, L. M., Feldman, P., Rini, C. K., Woo, G., & Dunkel-Schetter, C. (1999). Ethnicity and social support during pregnancy. *American Journal of Community Psychology, 27*, 869 – 898.

Sallis, J. F., Calfas, K. J., Alcaraz, J. E., & Gehrman, C. (1999). Potential mediators of changed in a physical activity promotion course for university students: Project GRAD. *Annuals of Behavioral Medicine, 21,* 149 – 158.

Sallis, J. F., Grossman, R. M., Pinski, R. B., Patterson, T. L., & Nader, P. R. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine, 16*(6), 825-836.

Salmon, P. (2000). Effects of physical exercise on anxiety, depression, and sensitivity to stress: A unifying theory. *Clinical Exercise Review, 21*, 33 – 61.

Salsman, J.M., Brown, T.L., Brechting, E.H., & Carlson, C.R. (2005). The link between religion and spirituality and psychological adjustment: The mediating role of optimism and social support. *Personality and Social Psychology Bulletin, 31*, 522-535.

Satia, J. A., Galanko, J. A., & Siega-Riz, A. M. (2004). Eating at fast food restaurants in associated with dietary intake, demographic, psychosocial and behavioral factors among African-Americans in North Carolina. *Public Health Nutrition, 7*, 1089 – 1096.

Schuette, L. K., Song, W. O. & Hoerr, S. L. (1996). Quantitative use of the Food Guide Pyramid to evaluate dietary intake of college students. *Journal of the American Dietetic Association, 96,* 453 – 457.

Sengul, Y., Kara, B. & Arda, M. N. (2010). The relationship between Health Locus of Control and quality of life in patients with chronic back pain. *Turkish Neurosurgery, 20,* 180 – 185.

Seybold, K. S. (2007). Physiological mechanisms involved in religiosity/spirituality and health. *Journal of Behavioral Medicine, 30,* 303 – 309.

Shaikh, A. R, Yaroch, A. L., Nebeling, L., Yeh, M., & Resnicow, K. (2008). Psychosocial predictors of fruit and vegetable consumption in adults. *American Journal of Preventative Medicine, 34,* 535 – 543.

Shapiro, D. H., Schwartz, C. E. & Astin, J. A. (1996). Controlling ourselves, controlling our world. *American Psychology, 51,* 1213 – 1230.

Shaw, B. A. & Krause, N. (2001). Exploring race variations in aging and personal control. *Journal of Gernotology: Series B: Psychological Sciences and Social Sciences, 56B,* S119 – S124.

Shelley, M. & Pankenham, K. I. (2004). External Health Locus of Control and general self-efficacy: Moderators of emotional distress among university students. *Australian Journal of Psychology, 56,* 191 – 199.

Shrauger, J. S. & Silverman, R. E. (1971). The relationship of religious background and participation to locus of control. *Journal for the Scientific Study of Religion, 10,* 11 – 16.

Siegel, K. & Scrimshaw, E. W. (2002). The perceived benefits of religious and spiritual coping among older adults living with HIV/AIDS. *Journal for the Scientific Study of Religion 41*(1), 91-102.

Simon, T., Powell, K., & Swann, A. (2004). Involvement in physical activity and risk for nearly lethal suicide attempts. *American Journal of Preventative Medicine, 27,* 310 – 315.

Skirka, N. (2000). The relationship of hardiness, sense of coherence, sports participation, and gender to perceived stress and psychological symptoms among college students. *Journal of Sports Medicine & Physical Fitness, 40,* 63 – 70.

Smith, C. A., Dobbins, C. J., & Wallston, K. A. (1998). The meditational role of perceived competence in psychological adjustment to rheumatoid arthritis. *Journal of Applied Social Psychology, 21,* 1218 – 1247.

Sneed, J. & Holdt, C. S. (1991). Many factors influence college students' eating patterns. *Journal of American Dietetic Association, 91,* 1380.

Sorensen, J. B., Skovgaard, T., & Puggaard, L. (2006). Exercise on prescription in general practice: A systematic review. *Primary Health Care, 24,* 69 – 74.

Sparling, P. B. & Snow, T. K. (2002). Physical activity patterns in recent college alumni. *Research Quarterly for Exercise & Sport, 73,* 200 – 205.

Spilka, B., Shaver, P., & Kirkpatrick, L. A. (1985). A general attribution theory for the psychology of religion. *Journal for the Scientific Study of Religion, 24,* 1 – 20.

Spirituality in Higher Education. (2007). Spiritual changes in students during the undergraduate years. A National Study of College Students' Search for Meaning and Purpose. Retrieved at:

http://www.spirituality.ucla.edu/docs/news/report_backup_dec07release_12.18.07.pdf

Strawbridge, W. J., Cohen, R. D., Shema, S. J., & Kaplan, G. A. (1997). Frequent attendance at religious services and mortality over 28 years. *American Journal of Public Health, 87*, 957 – 961.

Steptoe, A., Perkins-Porras, L., Rink, E., Hilton, S., & Cappuccio, F. P. (2004). Psychological and social predictors of changes in fruit and vegetable consumption over 12 months following behavioral and nutrition education counseling. *Health Psychology, 23*(6), 574-581.

Stone, E. J., McKenzie, T. L., Welk, G. J., & Booth, M. L. (1998). Effects of physical activity interventions in youth: Review and synthesis. *American Journal of Preventive Medicine, 15,* 298 – 315.

Suminski, R. R., Petosa, R., Utter, A. C., & Zhang, J. J. (2002). Physical activity among ethnically diverse college students. *Journal of American College Health, 51*, 75 – 80.

Survey Monkey. Retrieved May 15, 2013 from www.surveymonkey.com

Taliaferro, L. A., Rienzo, B. A., Pigg, Jr, R. M., Miller, M. D., & Dodd, V. J. (2009). Associations between physical activity and reduced rates of hopelessness, depression, and suicidal behavior among college students. *Journal of American College Health, 57*(4), 427-436.

Taymoori, P. & Lubans, D. R. (2008). Mediators of behavior change in two tailored physical activity interventions for adolescent girls. *Psychology of Sport & Exercise, 9*(5), 605-619.

Telama, R., & Yang, X. (2000). Decline of physical activity from youth to young adulthood in Finland. *Medicine of Science in Sports and Exercise, 32*, 1617 – 1622.

Telama, R., Yang, X., & Vlikari, J. (2005). Physical activity from childhood to adulthood. *American Journal of Preventative Medicine, 28,* 267 – 273.

Thoits, P. A. (1983). Multiple identities and psychological well-being. *American Social Revolution, 48,* 174 – 187.

Thompson, F. E., Midthune, D., Subar, A. F., Kipnis, V., Kahle, L. L., & Schatzkin, A. (2007). Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *Journal of American Dietetic Association, 107,* 760 – 767.

Thoresen C. Spirituality, health, and science: The coming revival? In: Carmin CN, Robinson Kurpius SE, Roth-Roemer S, editors. The emerging role of counseling psychology in health care. W. W. Norton; New York: 1998. pp. 409–431.

Tix, A. P. & Frazier, P. A. (2005). Mediation and moderation of the relationship between intrinsic religiousness and mental health. *Personality and Social Psychology Bulletin, 31,* 295- 306.

Tofighi D. & MacKinnon D. (2011). RMediation: An R package for mediation analysis confidence intervals. *Behavior Research Methods, 43*, 692-700.

Treiber,F. A., Baranowski, T., Braden, D. S., Strong, W. B., Levy, M., & Knox, W. (1991). Social support for exercise: Relationship to physical activity in young adults. *Preventive Medicine, 20*(6), 737-750.

U. S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2010 Dietary Guidelines for Americans. (2013). Retrieved May 16, 2013, from: http://www.cnpp.usda.gov/dietaryguidelines.htm

U. S. Department of Health and Human Services, Centers for Disease Control and Prevention, Office of Surveillance, Epidemiology, and Laboratory Services, Public Health Surveillance Program Office. Behavioral Risk Factor Surveillance System, Prevalence and Trends Data Nationwide (States and DC) – 2011. Retrieved May 9, 2013 from: http://apps.nccd.cdc.gov/brfss/page.asp?cat=PA&yr=2011&state=UB#PA

U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. (2000). Healthy *People 2010: Understanding and Improving* Health. 2nd ed. Washington, DC: US Government Printing Office.

U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. (2010). Healthy *People 2020.* Retrieved May 2012, from http://www.healthypeople.gov.

U. S. Department of Health and Human Services. (2008). Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC. Retrieved on May 9, 2013 from: http://www.health.gov/PAGuidelines/

Van Sluijs, E. M. F., McMinn, A. M., & Friffin, S. J. (2007). Effectiveness of interventions to promote physical activity in children and adolescents: Systematic review of controlled trials. *British Medical Journal, 335,* 703 – 715.

Van Stralen, M. M., Yildirim, M., te Velde, S. J., Brug, J., van Mechelen, W., & Chinapaw, M. J. M. (2011). What works in school-based energy balance behavior interventions and what does not? A systematic review of mediating mechanisms. *International Journal of Obesity, 35,* 1251 – 1265.

Varon, S. R. & Riley, A. W. (1999). Relationship between maternal church attendance and adolescent mental health and social functioning, *Psychiatric Services, 50,* 799 – 805.

Vogt, T., Mullooly, J., Ernst, D., Pope, C. R., & Hollis, J. F. (1992). Social networks as predictors of ischemic heart disease, cancer, stroke and hypertension: Incidence, survival and mortality. *Journal of Clinical Epidemiology, 45,* 659 – 666.

Wallace, J. M. & Forman, T. A. (1998). Religion's role in promoting health and reducing risk among American youth. *Health Education and Behavior, 25,* 721 – 741.

Wallston, K. A. (1993). Frequently Asked Questions (FAQ), MHLC Scales. Retrieved May 1, 2013 from: www.nursing.vanderbilt.edu/faculty/kwallston/FAQMHLC.com

Wallston, B. S., Wallston, K. A., Kaplan, G. D., & Maides, S. A. (1976). Development and validation of the health locus of control (HLC) scale. *Journal of Consulting and Clinical Psychology, 44*(4), 580-585.

Wallston, K. A. Multidimensional Health Locus of Control Scales. Last updated: June 15, 2007 by Kandace Harmon. http://www.nursing.vanderbilt.edu/faculty/kwallston/mhlcscales.htm

Wallston, K. A., Malcarne, V. L., Flores, L., Hansdottir, I., Smith, C. A., Stein, M. J… Clements, P. J. (1999). Does God determine your health? The God Locus of Health Control scale. *Cognitive Therapy and Research, 23* (2), 131 – 142.

Wallston, K. A., Stein, M. J., & Smith, C. A. (1994). Form C of the MHLC scales: A condition-specific measure of locus of control. *Journal of Personality Assessment, 63,* 534 – 553.

Wallston, K. A, Wallston, B. S., & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education & Behavior, 6,* 160-170.

Wang, J., Zhang, W., Zhu, Z., Mai, Y. & Li, D. (2010). A modulating model for the impacting factors in self-regulated learning of college students. *Acta Psychologica Sinica, 42,* 262 – 270.

Weinstein, S. E., Quigley, K. S., & Mordkoff, J. T. (2002). The impact of control and effort on cardiovascular reactivity during a laboratory stress task. *Psychophysiology, 39,* 591 - 598.

Wells, A. M. (2006). Leaning on the lord: Spiritual health Locus of Control and breast cancer risk reduction in African American women. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 67,* 1721.

Welton, G. L., Adkins, A. G., Ingle, S. L. & Dixon, W. A. (1996). God control: The fourth dimension. *Journal of Psychology and Theology, 21,* 13 – 25.

White, J., Puckett, F., Dutta, A., Hayes, S., Kundu, M. M., & Johnson, E. (2011). The relationship of Multidimensional Health Locus of Control and attitude toward

HIV/AIDS: College students' perspectives. *Journal of Rehabilitation, 77,* 12 – 18.

Whitt-Glover, M. C., Hogan, P. E., Lang, W., & Heil, D. P. (2008). Pilot study of a faith-based physical activity program among sedentary blacks. *Preventing Chronic Disease, 5*(2), A51.

Wiedenfeld, S. A., Bandura, A., Levine, S., O'Leary, A., Brown, S., & Raska, K. (1990). Impact of perceived self-efficacy in coping with stressors on components of the immune system. *Journal of Personal Social Psychology, 59,* 1082 – 1094.

Wilcox, S., Laken, M., Bopp, M., Gethers, O., Huang, P., McClorin, L… Yancey, A. (2007). Increasing physical activity among church members: community-based participatory research. *American Journal of Preventive Medicine, 32,* 131 – 138.

Wilcox, S., Parrott, A., Baruth, M., Laken, M., Condrasky, M., Saunders, R… Zimmerman, L. (2013). The Faith, Activity, and Nutrition program: A randomized controlled trial in African-American churches, *American Journal of Preventive Medicine, 44,* 122 – 131.

Williams, D. R. & Sthernthal, M. J. (2007). Spirituality, religion and health: Evidence and research directions. *The Medical Journal of Australia, 186* (10 Supplement): S47 – S50.

Williams, M. A., Fleg, J. L., Ades, P. A., Chaitman, B. R., Miller, N. H., Mohiuddin, S. M… Winger, N. K. (2003). Secondary prevention of coronary heart disease in the elderly (with emphasis on patients > or = 75 years of age): An American Heart Association scientific statement from the Council on Clinical Cardiology Subcommittee on Exercise Cardiac Rehabilitation, and Prevention. *Circulation, 105,* 1735 – 1743.

Willis, A. S., Wallston, K., & Johnson, K. (2001). Tobacco and alcohol use among young adults: Exploring religious faith, locus of control, and coping strategies as predictors. In T. P. Plante & A. Sherman (Eds.), Faith & health: Psychological perspectives (pp. 213 – 239). New York: Guilford.

Wong-McDonald, A. & Gorsuch, R. L. (2000). Surrender to God: An additional coping style? *Journal of Psychology and Theology, 28,* 149 – 161.

Zick, C. D., Smith, K. R., Brown, B. B., Fan, J. S., & Kowaleski-Jones, L. (2007). Physical activity during transition from adolescence to adulthood. *Journal of Physical Activity and Health, 4,* 125 – 137.

Zittel-Palamara, E., Cercone, S. A., & Rockmaker, J. R., (2009). Spiritual support for women with postpartum depression. *Journal of Psychology and Christianity, 28*(3), 213-223.

APPENDIX A – ASSESSMENT BATTERY

DEMOGRAPHICS

1. How old are you in years? _____
2. What is your gender? *(Choose one)* Male Female
3. What is your height in feet and inches? _____
4. What is your weight in pounds? _____
5. What is your year in school? (circle one)
    a. 1st year undergraduate
    b. 2nd year undergraduate
    c. 3rd year undergraduate
    d. 4th year undergraduate
    e. 5th or more year undergraduate
    f. graduate or professional
    g. not seeking a degree
    h. other _____
6. What is your enrollment status at this time? *(Choose one)*
    a. Full-time
    b. Part-time
7. How do you usually describe yourself? *(Choose one)*
    a. White
    b. Black or African American
    c. Hispanic or Latino/a
    d. Asian or Pacific Islander
    e. American Indian, Alaskan Native, or Native Hawaiian
    f. Biracial or Multiracial
    g. Other _____
8. What is your marital status? *(Choose one)*
    a. single
    b. married
    c. separated
    d. divorces
    e. other _____
9. Where do you currently live? *(Choose one)*
    a. Campus residence hall
    b. Fraternity or sorority house
    c. Other college/ university housing
    d. Parent/ guardian's home
    e. Other off-campus housing
    f. Other _____

10. Do you have a religious preference/denomination? *(Choose one)*

    No Yes

11. If yes, what is your religious preference/denomination? *(Choose one)*

    a. Non-Denominational Christian
    b. Anglican
    c. Catholic
    d. Jehovah's Witness
    e. Orthodox
    f. Protestant
    g. Judaism
    h. Islam
    i. Buddhism
    j. Hinduism
    k. Confucianism
    l. Other _____

12. Do you participate in campus-related student religious groups? *(Choose one)*

    No Yes

13. How often do you participate in religious workshops/services? *(Choose one)*

    a. Never
    b. Less than once a month
    c. About once a month
    d. Two or three times a month
    e. About once a week
    f. Several times a week

MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL SCALE

Each item below is a belief statement about your current health with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree to strongly agree. For each item we would like you to select the extent to which you agree or disagree with that statement. Please make sure that you answer EVERY ITEM and that you choose ONLY ONE choice per item. This is a measure of your personal beliefs; there are no right or wrong answers.

1=STRONGLY DISAGREE **(SD)** 2=MODERATELY DISAGREE **(MD)** 3=SLIGHTLY DISAGREE **(D)**	4=SLIGHTLY AGREE **(A)** 5=MODERATELY AGREE **(MA)** 6=STRONGLY AGREE **(SA)**

		SD	**MD**	**D**	**A**	**MA**	**SA**
1	If I become sick, I have the power to make myself well again.	1	2	3	4	5	6
2	Often I feel that no matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3	If I see an excellent doctor regularly, I am less likely to have health problems.	1	2	3	4	5	6
4	It seems that my health is greatly influenced by accidental happenings.	1	2	3	4	5	6
5	I can only maintain my health by consulting health professionals.	1	2	3	4	5	6
6	I am directly responsible for my health.	1	2	3	4	5	6
7	Other people play a big part in whether I stay healthy or become sick.	1	2	3	4	5	6
8	Whatever goes wrong with my health is my own fault.	1	2	3	4	5	6
9	When I am sick, I just have to let nature run its course.	1	2	3	4	5	6
10	Health professionals keep me healthy.	1	2	3	4	5	6
11	When I stay healthy, I'm just plain lucky.	1	2	3	4	5	6
12	My physical well-being depends on how well I take care of myself.	1	2	3	4	5	6
13	When I feel ill, I know it is because I have not been taking care of myself properly.	1	2	3	4	5	6
14	The type of care I receive from other people is what is responsible for how well I recover from an illness.	1	2	3	4	5	6
15	Even when I take care of myself, it's easy to get sick.	1	2	3	4	5	6
16	When I become ill, it's a matter of fate.	1	2	3	4	5	6

17	I can pretty much stay healthy by taking good care of myself.	1	2	3	4	5	6
18	Following doctor's orders to the letter is the best way for me to stay healthy.	1	2	3	4	5	6

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**

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

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

   _____ **days per week**

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

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

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

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

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

_____ **days per week**

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

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

_____ **hours per day**

_____ **minutes per day**

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**

NATIONAL CANCER INSTITUTE

QUICK FOOD SCAN

Think about your eating habits over the past 12 months. About how often did you eat or drink each of the following foods? Remember breakfast, lunch, dinner, snacks, and eating out. Choose only one bubble for each food.

Type of Food	Never	Less than once per month	1-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day
Cold cereal								
Skim milk, on cereal or to drink								
Eggs fried or scrambled in margarine, butter, or oil								
Sausage or bacon, regular fat								
Margarine or butter on bread, rolls, pancakes								
Orange juice or grapefruit juice								
Fruit (not juices)								
Beef or pork hot dogs, regular-fat								
Cheese or cheese spread, regular-fat								
French fries, home fries, or hash brown potatoes								
Margarine or butter on vegetables, including potatoes								

Mayonnaise, regular-fat								
Salad dressings, regular-fat								
Rice								
Margarine, butter, or oil on rice or pasta								

2. Over the past 12 months, when you prepared foods with margarine or ate margarine, how often did you use reduced-fat margarine?

☐	☐	☐	☐	☐	☐
Didn't use margarine	Almost never	About ¼ of the time	About ½ of the time	About ¾ of the time	Almost always or always

3. Overall, when you think about the foods you ate over the past 12 months, would you say your diet was high, medium, or low in fat?

☐	☐	☐
High	Medium	Low

FRUIT AND VEGETABLE CONSUMPTION

The next questions ask about fruits and vegetables.

1. How many servings of fruit do you usually eat EACH DAY? ____ servings per day
2. How many servings of vegetables to you usually eat EACH DAY? ___ servings per day

SELF-EFFICACY TO EXERCISE

This part of the survey asks you about your confidence to participate in exercise in different situations. Please rate your confidence from 1 to 7, with 1 being "not at all confident" and 7 being "very confident." You can choose any number from 1 to 7.

Not at all confident = 1
Very confident = 7

1	I am confident I can exercise when I am tired.	1	2	3	4	5	6	7
2	I am confident I can exercise when I am in a bad mood.	1	2	3	4	5	6	7
3	I am confident I can exercise when I don’t have the time.	1	2	3	4	5	6	7
4	I am confident I can exercise when I am on vacation or traveling	1	2	3	4	5	6	7
5	I am confident I can exercise when it is raining, snowing, or too hot, Or the weather is bad.	1	2	3	4	5	6	7

SOCIAL SUPPORT & EXERCISE SURVEY

Please answer the following questions relating to your family or friends support of your exercise and physical activity habits. There are no right or wrong answers.

none / does not apply = 1
rarely = 2
a few times = 3
often = 4
very often = 5

During the past three months, my family (or members of my household) or friends:

1	Exercised with me.	1	2	3	4	5
2	Offered to exercise with me.	1	2	3	4	5
3	Gave me helpful reminders to be active ("Are you going to exercise tonight?")	1	2	3	4	5
4	Gave me encouragement to stick with my exercise program.	1	2	3	4	5
5	Changed their schedule so we could exercise together.	1	2	3	4	5
6	Discussed exercise with me.	1	2	3	4	5
7	Planned for exercise on recreational outings.	1	2	3	4	5
8	Helped plan activities around my exercise.	1	2	3	4	5
9	Talked about how much they like to exercise.	1	2	3	4	5

SELF-EFFICACY TO CONSUME FRUITS & VEGETABLES

There are many things that can get in the way of choosing to eat 5 fruits and vegetables each day. Rate HOW CONFIDENT are you that you can do the following using the scale below. There are no right or wrong answers.

1=Not at All Confident
2=Somewhat Confident
3=Moderately Confident
4=Very Confident
5=Extremely Confident

1	Eat 5 servings of fruits and vegetables every day?	1	2	3	4	5
2	Drink 100% fruit juice instead of soda or fruit punch?	1	2	3	4	5
3	Eat fruits and vegetables for a snack instead of chips or candy?	1	2	3	4	5
4	Eat fruits and vegetables when eating out at a restaurant?	1	2	3	4	5
5	Eat fruits and vegetables when I am upset or having a bad day?	1	2	3	4	5
6	Eat fruits and vegetables when I am at a social event?	1	2	3	4	5

There are many things that can get in the way of choosing to eat a diet low in fat. HOW CONFIDENT are you that you can choose low fat foods in each situation? There are no right or wrong answers.

1=Not at All Confident **2**=Somewhat Confident **3**=Moderately Confident **4**=Very Confident **5**=Extremely Confident						
1	When others around you are eating high fat foods.	1	2	3	4	5
2	When you are craving high fat foods.	1	2	3	4	5
3	When you are out at a restaurant.	1	2	3	4	5
4	When you are upset or having a bad day.	1	2	3	4	5
5	When you are at a social event.	1	2	3	4	5

SOCIAL SUPPORT FOR DIETARY BEHAVIORS

Please answer the following questions relating to your family or friends support of certain dietary behaviors (eating healthy foods, such as low-fat foods and/or fruits and vegetables). There are no right or wrong answers.

How often in the last 30 days has your family or friends done the following?

1=Almost Never
2=Once in a While
3=Sometimes
4=Often
5=Almost Always

1	Encourage you to eat healthy foods.	1	2	3	4	5
2	Discuss the benefits of eating healthy foods.	1	2	3	4	5
3	Remind you to choose healthy foods.	1	2	3	4	5
4	Share ideas on eating healthy foods.	1	2	3	4	5
5	Eat healthy foods with you.	1	2	3	4	5
6	Complain about eating healthy foods.	1	2	3	4	5

THE GOD LOCUS OF HEALTH CONTROL (GLHC) SCALE

Each item below is a belief statement about your current health with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree to strongly agree. For each item we would like you to select the extent to which you agree or disagree with that statement. Please make sure that you answer EVERY ITEM and that you choose ONLY ONE number per item. This is a measure of your personal beliefs; there are no right or wrong answers.

1=STRONGLY DISAGREE **(SD)** 2=MODERATELY DISAGREE **(MD)** 3=SLIGHTLY DISAGREE **(D)**	4=SLIGHTLY AGREE **(A)** 5=MODERATELY AGREE **(MA)** 6=STRONGLY AGREE **(SA)**

		SD	**MD**	**D**	**A**	**MA**	**SA**
1	If my health worsens, it is up to God to determine whether I will feel better again.	1	2	3	4	5	6
2	Most things that affect my health happen because of God.	1	2	3	4	5	6
3	God is directly responsible for my health getting better or worse.	1	2	3	4	5	6
4	Whatever happens to my health is God's will.	1	2	3	4	5	6
5	Whether or not my health improves is up to God.	1	2	3	4	5	6
6	God is in control of my health.	1	2	3	4	5	6

RELIGIOUS SOCIAL SUPPORT SUBSCALES

CONGREGATIONAL SUPPORT

DIVINE SUPPORT

We would like to learn about people's perceptions of support, related to their life of faith.

Please rate the following items for the degree to which you feel each one applies to you in general. For these items, "congregation" refers to regular attendees of your current place of worship *or student faith organization.*

Please respond to items 1 to 14 using the following **5-point scale:**

1=STRONGLY DISAGREE **(SD)**
2=DISAGREE **(D)**
3=UNSURE **(U)**
4=AGREE **(A)**
5=STRONGLY AGREE **(SA)**

		SD	**D**	**U**	**A**	**SA**
1	I can turn to others in my congregation for advice when I have problems.	1	2	3	4	5
2	Others in my congregation care about my life and situation.	1	2	3	4	5
3	I do not feel close to others in my congregation.	1	2	3	4	5
4	Others in my congregation give me the sense that I belong.	1	2	3	4	5
5	I feel appreciated by others in my congregation.	1	2	3	4	5
6	If something went wrong, others in my congregation would give me assistance.	1	2	3	4	5
7	I have worth in the eyes of others in my congregation.	1	2	3	4	5
8	God gives me the sense that I belong.	1	2	3	4	5
9	I have worth in the eyes of God.	1	2	3	4	5
10	God cares about my life and situation.	1	2	3	4	5
11	If something went wrong, God would give me assistance.	1	2	3	4	5
12	I feel appreciated by God.	1	2	3	4	5
13	I can turn to God for advice when I have problems.	1	2	3	4	5
14	I do not feel close to God.	1	2	3	4	5

APPENDIX B – INFORMED CONSENT AND RECRUITMENT FLYER

Relationship between ***H***ealth Locus of Control and ***G***od Locus of Health Control and ***H***ealth Behaviors in ***C***ollege Students

You are being invited to participate in a research study that is examining attitudes, beliefs (some of questions pertain to religious beliefs), and behaviors (physical activity and dietary habits) of college students.

If you choose to take part in this study, you will be asked to complete a survey that will take about 20 -30 minutes. This study consists of a series of questions that are all answered online through survey monkey.

As a participant, you will not benefit directly from this study. Society will benefit by having a better understanding of college students' attitudes, beliefs, and behaviors and how they are related. This information could help to inform later health promotion efforts for college students. One participant (from a pool of approximately 500) will be selected to win an IPAD mini (approximate $300 value).

There are very few risks related to taking part in this study. The only known risk is potential discomfort in answering questions about your attitudes, beliefs, and behaviors. However, we expect this discomfort to be mild, if present at all.

The information you provide will remain private. Information obtained through this study will only be used by the research staff. All data will be stored using locked computers with a password.

Please know that your participation in this study is voluntary. If you choose not to take part in the survey, there will be no penalty. You may quit the study at any time by closing out of the survey. You may also choose not to answer a question without penalty. If you choose not to participate after beginning the survey, the information that has been told to us will be kept private. Your choice to participate or not participate in this study will not reflect on you as a student of the University.

Participation in this survey research allows you to enter a drawing for an IPAD mini (approximate $300 value). You will be eligible for the prize whether or not you complete the survey, and you provide your first name and email address, so we can inform you if you win. Your information will be used strictly for this research study only, will not be shared with anyone else, and you will not receive any spam emails related to participation in this study.

If you have any questions or concerns about this study, we encourage you to contact Ms. Joni Marr, Principal Investigator at 803.323.4822; or Dr. Sara Wilcox, study mentor at

803.777.8141. You may also call the Office of Research Compliance at the University of South Carolina at 803.777.7095 or the Office of Research Compliance at Winthrop University at 803.323.2460.

By choosing to continue, you agree to take part in the study.

Thank you for your interest in the study!

Joni D. Marr, MS
Department of Exercise Science, University of South Carolina

PARTICIPATE IN A RESEARCH STUDY

Participate in a research study and you could win an IPAD mini (approximate value - $300). This study consists of an online survey regarding your attitudes, beliefs, and behaviors (physical activity and dietary habits). The study will take approximately 20 – 30 minutes of your time.

Who is eligible: All students 18 years of age and older enrolled in classes at University of South Carolina and Winthrop University in the summer or fall of 2013.

Responses are kept confidential and will be used for research purposes only. One individual will be chosen from a pool of about 500 to receive the IPAD mini.

Visit the website below to participate. Participation is voluntary.

** Participate for a chance to win an IPAD mini **

For Questions or Concerns, Contact:
Joni Marr, MS
marrj@winthrop.edu

https://www.surveymonkey.com/s/MKKQLDL

https://www.surveymonkey.com/s/MKKQLDL