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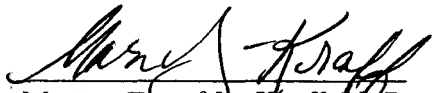

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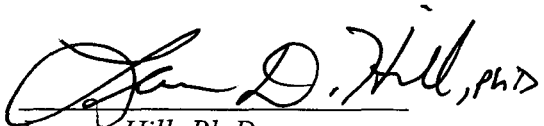

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Despite the rapid growth in the prevalence of obese African Americans, few weight loss treatments specifically designed for African Americans have been created (Brooks et al., 2008; Budd et al., 2007; Kennedy et al., 2005; Kumanyika, Shults et al. 2005). The purpose of this study was to evaluate factors that may impact adherence and weight loss among African American women. Spirituality is considered a robust variable in predicting both mental and physical health (Park, Moehl, & Fenster, 2008; Zinnbauer & Pargament, 2005). Mental and physical health benefits of spirituality may extend to positive outcomes in a behavioral weight loss program.

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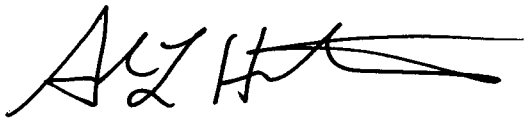

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Does Spirituality Predict Weight Loss in a Behavioral Weight Loss Program?

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Thesis submitted to the faculty of the
Department of Medical and Clinical Psychology
Graduate Program of the Uniformed Services University
of the Health Sciences in partial fulfillment
of the requirements for the degree of
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Abstract

Despite the rapid growth in the prevalence of obese African Americans, few weight loss treatments specifically designed for African Americans have been created (Brooks et al., 2008; Budd et al., 2007; Kennedy et al., 2005; Kumanyika, Shults et al., 2005). The purpose of this study was to evaluate factors that may impact adherence and weight loss among African American women. Spirituality is considered a robust variable in predicting both mental and physical health (Park, Moehl, & Fenster, 2008; Zinnbauer & Pargament, 2005). Mental and physical health benefits of spirituality may extend to positive outcomes in a behavioral weight loss program. This study included 106 overweight and obese women, 18-55 years old, in the metropolitan Washington D.C. area. A series of regression analyses were conducted to determine whether spirituality and weight loss was mediated by adherence or moderated by age and treatment location. Spirituality was not significantly related to weight loss. Rather those who had higher scores on extrinsic and intrinsic measures of spirituality lost significantly less weight and even gained weight in comparison to those with lower scores of spirituality. Intrinsic spirituality and weight loss was moderated by age. Older women who scored higher on intrinsic spirituality lost less weight than older women with lower scores of intrinsic spirituality or younger women regardless of intrinsic spirituality levels. Intrinsic spirituality and weight loss was also moderated by the interaction of age and treatment location. The older participants were less likely to lose weight at the university setting compared to the younger participants while the younger participants were less likely to lose weight at the church setting. This study is important because it provides additional details about the relation between spirituality and health outcomes. Future research is

needed to determine why increased spirituality resulted in significantly less weight loss and in some cases weight gain among African American women.

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Introduction

Obesity has been described as a public health issue in the United States. Although prevalence rates remain unchanged from 2004 to 2006 (Ogden, Carroll, McDowell, & Flegal, 2007), 36 percent of adults in the United States are obese and 73 percent are either overweight or obese (Center for Disease Control, 2007). Over a quarter of the population is obese and almost two out of three people are at least overweight. It is no surprise that the World Health Organization described obesity in the United States as an epidemic (WHO, 2005). Obesity continues to be a contributing factor to the global burden of chronic disease (Mokdad et al., 2003; Mokdad et al., 1999; World Health Organization, 2005).

The burden of chronic disease has not been shared equally among ethnic groups in the United States. Seventy-one percent of African American women are overweight with 38.8% listed as obese, compared to 50.7% and 22.0% of Caucasian women, respectively (CDC, 2005). Despite the increased prevalence of obesity in African Americans, effective culturally-based weight loss programs have not been available (Budd et al., 2007; Kennedy et al., 2005; Kumanyika, Shults et al., 2005). There have been even fewer programs that effectively addressed weight management among African American women (Brooks et al., 2008; Budd et al., 2007; Kennedy et al., 2005; Kumanyika, Shults et al., 2005).

A culturally-based weight loss program for African American women could reduce this health disparity. Kumanyika identified two cultural factors that were important for African American women in behavioral weight loss programs: body image (Kumanyika, Gary et al., 2005) and spirituality (Kumanyika & Charleston, 1992). Since

the church is a central part of the African American culture (Chatters, Taylor, Lincoln, & Schroepfer, 2002), a church-based weight loss program could improve adherence for two reasons. First, it would provide a familiar environment. Second, religious women would be more likely to live a physically and spiritually healthier lifestyle in accordance with their faith. This accountability and proximity to a church-based program could increase the likelihood of adherence.

The church serves a complex role in African American culture as it relates to both spiritual and non-spiritual factors. The church is particularly important to African American culture and is a source of support and guidance (Chatters et al., 2002). It is not uncommon for African Americans to seek help for health issues through pastoral services (Bender, 2003). The African American church was founded as a result of slavery and provided a place of safety for many, because within the church the minority became the majority. The African American church continues to assist in the development of an individual's racial identity development through spiritual teachings and providing role models within their community. The church is also a place where people learn about God and also how to live in the world outside of the church. So the church is important to African American culture by providing both spiritual and secular resources. It is a place to come for refuge from the world and also a place to learn how to become healthier, both spiritually and physically.

The purpose of this study was to examine the impact of spirituality on obesity treatment outcome. Adherence to a modified diet or exercise program has been correlated with increased weight loss (Chao et al., 2000; Dansinger, Gleason, Griffith, Selker, & Schaefer, 2005; van Gool et al., 2006). Without continued and consistent effort, weight

that is lost is inevitably regained. The ultimate goal of a weight loss program is comprehensive lifestyle change, and a church based program may be more likely to inspire a redirection of life goals and choices for certain populations.

The following sections provide an overview of (1) the definition and prevalence of overweight and obesity; (2) behavioral approaches to the management of obesity understanding and managing obesity; (3) the definition of religiousness/spirituality and their relationship to health; and (4) the definition of adherence and research examining adherence as a predictor of weight loss. These sections provide a selective review of the evidence supporting the underlying conceptual model for this thesis as presented in Figure 1. In this model, spirituality is expected to influence obesity treatment outcome. Spirituality is also expected to influence adherence to dietary restrictions and attendance at weight loss meetings. Adherence is also expected to influence obesity treatment outcomes. In this model, age and treatment site are considered factors that influence the relationship between spirituality and obesity treatment outcome.

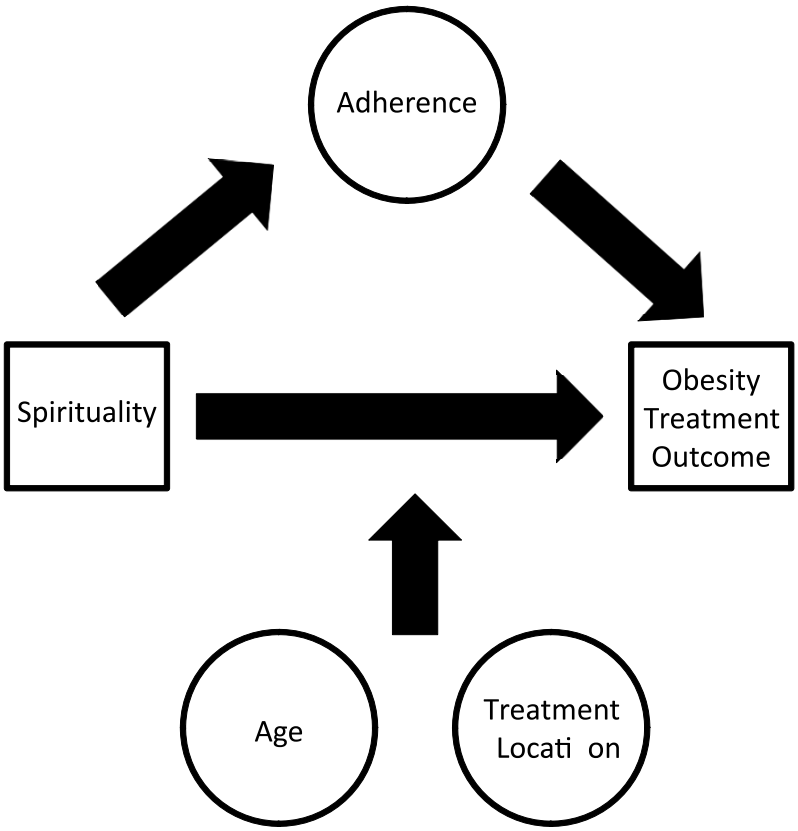

Figure 1. Conceptual Model of Relation between Spirituality & Weight Loss

Overweight and Obesity Defined

Obesity has been defined as "an excessively high amount of body fat or adipose tissue in relation to lean body mass" (CDC, 2002; Stunkard & Wadden, 1993, p. 14). Excess body fat can be assessed by a variety of methods including skinfold thickness measurements, underwater weighing, bioelectrical impedance, dual-energy x-ray absorptiometry (DEXA), and computerized tomography (CDC, 2008). However, it is most easily and commonly assessed using the Body Mass Index (BMI). BMI relates body weight to body height by calculating the weight of a person in kilograms divided by the square of their height in meters (kg/m^2). In 1998, overweight and obesity were defined as a BMI greater than or equal to 25 kg/m^2 and 30 kg/m^2, respectively (CDC, 2008). This

was based on empirical work that identified increased health risks associated with obesity including type-2 diabetes, cardiovascular disease, hypertension, stroke, and certain types of cancer (WHO, 2005). Though BMI does not take into consideration the elevated body mass associated with excess muscle (e.g., the professional athlete), it is considered ideal for epidemiological studies and for the general public (National Institutes of Health, 1998, p. 25).

Understanding and Managing Obesity and Overweight

Health risks associated with obesity such as type-2 diabetes, cardiovascular disease, hypertension, stroke, and certain types of cancer (WHO, 2005) make designing effective weight loss programs all the more urgent. Improvements that result in just five to ten percent weight loss may reduce potential health risks (Kligman, Dexter, Omer, & Park, 2008). The recent interest in the relationship between spirituality and health may be important in improving treatments for African Americans.

Religiousness/Spirituality Defined

Spirituality is defined as "a search for the sacred" and religiousness is defined as "a search for significance in ways related to the sacred" (Zinnbauer & Pargament, 2005, p. 36). For example, Spirituality can be considered the internal beliefs (Jesus died for me in order that I might be forgiven of my sins) and motivations (therefore I should model God's love to others) that drive external religious behavior (forgiving and loving others). William James was one of the first psychologists to examine the relationship between spirituality and psychology. He understood religion to be comprised of both first-hand and second-hand experiences (James, 1997). The first-hand experiences included experiential religion that was direct and immediate (e.g., self-transcendence,

connectedness, being in relationship with God). The first-hand experiences include the conforming of the individual to their search for the sacred. The second-hand experiences include inherited tradition (e.g., attending church services, church polity (or order), receiving of sacraments). Second-hand experiences also include observable aspects of the search for the sacred. Both types of experiences were encompassed into James' understanding of religion as a single construct. Over time researchers differentiated people who live their religion (intrinsically-oriented) from those who use their religion (extrinsically-oriented) (Allport & Ross, 1967). The current trend is to combine both religiousness and spirituality constructs and is similar to how William James had conceptualized religion (James, 1902/1997). In this paper, religiousness and spirituality (R/S) are used as synonymous terms unless a particular aspect is specified such as extrinsic or intrinsic spirituality.

Spirituality and Health

Religiousness/spirituality has been an understudied variable in health research (Hill & Pargament, 2003), yet it is considered a robust variable in predicting both mental and physical health-related outcomes (Park et al., 2008; Zinnbauer & Pargament, 2005). Overall, R/S is associated with improved mental health, including less anxiety, less substance abuse, less depression, faster recovery from symptoms of depression, greater well-being, increased optimism, higher social support, and greater marital satisfaction and stability (Koenig, 2001). Religiousness/spirituality is also associated with improved physical health, including less heart disease, lower blood pressure, lower cholesterol, less smoking, and better sleep (Koenig, 2004). These positive health outcomes continue to exist even after controlling for general social support effects (Hill & Pargament, 2003).

Why is R/S positively related to health outcomes? Some research suggest spirituality has positive effects on health behaviors (Koenig, 2002). If people engage in healthy behaviors, then they are more likely to have better health than people who engage in unhealthy behaviors such as smoking or drinking. Religious socialization is a fundamental part of culture that defines acceptable and unacceptable behaviors.

Mental and physical health benefits of spirituality may also extend to positive outcomes in a behavioral weight loss program. Spirituality has been both positively and negatively associated with weight loss (Hill & Pargament, 2003; VandeCreek, Pargament, Belavich, Cowell, & Friedel, 1999). The majority of the research has found spirituality to be positively related to weight loss outcomes (Fitzgibbon et al., 2005), increased support (Maton, 1989), increased motivation to lose weight (Churchill, 2006), and motivation to maintain weight loss (Tonkin, 2006). But, spirituality has also been negatively related to weight loss. For example, Shmueli and Tamir (2007) studied a community in Israel and found that the higher people rated themselves spiritually the more overweight or obese they were. An interesting finding in this study was that the women who rated themselves higher in spirituality were also more likely to be obese, but had lower blood pressure and did not have other health risk factors related to obesity. Other mechanisms by which spirituality is related to health are not understood. Researchers have proposed that, “something inherent within spirituality itself contributes to or detracts from physical and mental health” (VandeCreek et al., 1999). In a qualitative study, spirituality was reported by participants to improve adherence in a behaviorally-based weight loss program (Reicks, Mills, & Henry, 2004). This study provides a

foundation for further quantitative testing to link spirituality as a possible indicator of adherence in a behavior-based weight loss program.

Adherence Defined

Adherence is an important concept in weight loss and is defined, generally, as "the degree to which an individual follows a recommended health-related or illness-related recommendation" (Taylor, 1995). Measures of adherence can be important when evaluating treatment outcomes. If people do not adhere to a program, then either the program sets unrealistic demands of the participants, participants might not be ready to change eating or exercise behaviors, or the program design may simply not be effective. When a weight loss program is designed for a particular culture or community, it increases the likelihood of identifying a positive link with spirituality.

Adherence Predicts Success for Weight Loss Programs

Researchers and medical professionals have described numerous ways to lose weight over the last 25 years, but overweight and obesity still affects an estimated 184 million people (CDC, 2007) in the United States and is the second leading cause of preventable death (Mokdad, Marks, Stroup, & Gerberding, 2004). One reason that people fail to lose weight is that they do not adhere to weight loss programs, which may include dietary restrictions and increased physical activity (Carels et al., 2008). Dansinger and colleagues (2005) compared adherence rates of four popular diets including Atkins, Zone, Weight Watchers, and Ornish diets. Weight loss ranged from 4.8 to 7.1 pounds at one year. Although the amount of weight loss was associated with adherence levels, there was no significant difference in treatment outcome between groups (Dansinger et al., 2005). Adherence to each diet dropped considerably over the first few months of the one year

study. Thus, regardless of the weight loss program, adherence was difficult to maintain over time. Increased adherence to treatment increases the likelihood of losing and maintaining weight loss (Chao et al., 2000; van Gool et al., 2006).

Little is known about adherence of African Americans to behavioral treatment in general (Hill-Briggs et al., 2005). Traditionally, studies have reported that African Americans have low adherence to treatment (Bosworth et al., 2006; Cruz, Pincus, Harman, & Reynolds, 2008; Schoenthaler et al., 2008). Most treatments examined have been designed for Caucasian groups. It is inappropriate to define a group as non-adherent without fully examining the treatment fit. It is also possible that something outside of treatment may be related to poorer treatment outcomes in African Americans, such as the cultural message that time spent taking care of family is more important than time spent exercising. Thus, much more research is needed to determine if adherence can be improved by providing culturally appropriate treatments (Brooks et al., 2008).

The specific goal of this study was to examine whether religiousness/spirituality was associated with weight loss in overweight and obese African American women. The overarching hypothesis of this investigation was that individuals who rate themselves as more spiritual would lose more weight than those who rate themselves lower in spirituality. Also, individuals who attend a weight loss program in a church location were expected to have better adherence and weight loss than those who attended in a university location. Figure 1 provides a model of the conceptual framework for this study.

Summary

Researchers have shown that people who adhere to treatment generally lose weight (Dansinger et al., 2005). Although people often lose weight after starting a weight

loss program, maintaining weight loss is seldom accomplished. Religiousness/spirituality is associated with health behavior adherence and positive health outcomes. Identifying self-reported ratings of spirituality before initiating a behavioral weight loss treatment may allow researchers to predict adherence. Improved adherence is expected to be associated with spirituality. Different aspects of spirituality can be measured to develop a better understanding of how spirituality may predict weight loss. In particular, extrinsic and intrinsic spirituality can provide a multidimensional view of specific aspects of spirituality instead of single item measures of attendance to a religious service or frequency of prayer.

Hypotheses and Rationale

Spirituality has been found to be associated with positive health outcomes and increased adherence for many health issues. For weight loss treatment, adherence is important because it is predictive of weight loss in an obesity treatment program. However, most weight loss programs to date have been designed for Caucasians. To maximize adherence, it is important to design a culturally-based weight loss program for African Americans. African Americans often have different cultural and social perceptions of ideal weight and body shape compared to Caucasians (Demarest & Allen, 2000; Gore, 1997; Vaughan, Sacco, & Beckstead, 2008). African American women have been found to be motivated to lose weight by health concerns, weight control, stress reduction, and the influence of others (Young, Gittelsohn, Charleston, Felix-Aaron, & Appel, 2001). Spirituality is an important part of African American culture (Kumanyika & Charleston, 1992). Spirituality is also related to positive health outcomes. It is possible

that spirituality may influence African American's adherence to a weight loss program and even predict weight loss.

The present study used data from a larger weight loss study with African American women. The purpose of the parent study was to examine the efficacy of Behavioral Choice Treatment (BCT) compared to traditional behavior therapy among African American women on weight loss, exercise, and adherence. In addition, this study examined treatment outcome differences between church and university treatment sites. The present study examined factors that may impact adherence and treatment outcomes. It examined the relationship of spirituality and weight loss, focusing on whether adherence accounts for the relationship between spirituality and weight loss outcome. Spirituality often increases with age (Dalby, 2006; Heintz & Baruss, 2001; Moberg, 2005), so age is expected to strengthen the relationship of spirituality to weight loss as a woman gets older. The parent weight management study was conducted in both university and church sites, and examined the adherence rates from both treatment sites.

The hypotheses of the investigation are based on the model presented in Figure 1. It was expected that spirituality would be positively related to obesity treatment outcomes (Hypothesis 1). In addition, adherence was expected to mediate spirituality and obesity treatment outcomes (Hypothesis 2). And lastly, age and treatment site were expected to moderate spirituality and obesity treatment outcomes (Hypothesis 3).

H1: Spirituality will be positively associated with obesity treatment outcome. There was expected to be a significant positive linear relationship between spirituality (both intrinsic and extrinsic) and weight loss. Higher scores of extrinsic and intrinsic spirituality were expected to be associated with greater weight loss (Fitzgibbon et al.,

2005; Hill & Pargament, 2003; VandeCreek et al., 1999). In the current study, spirituality was measured as extrinsic spirituality (outward observable behavior associated with going to church or following sets of rules and applying them to their life) and intrinsic spirituality (internal beliefs of spirituality/God). Intrinsic spirituality was expected to provide an increased drive, motivation, or strength to lose weight. Extrinsic spirituality was also expected to lead to increased weight loss through the increased likelihood of following a prescribed set of rules.

H2: Adherence (attendance) will mediate the relationship between spirituality and weight loss. Operationalizing adherence as session attendance, it was expected that attendance would account for the relationship between spirituality and weight loss as shown in Figure 2. Spirituality is often related to increased adherence in research on health behavior and adherence is linked with success in behavioral treatments for obesity.

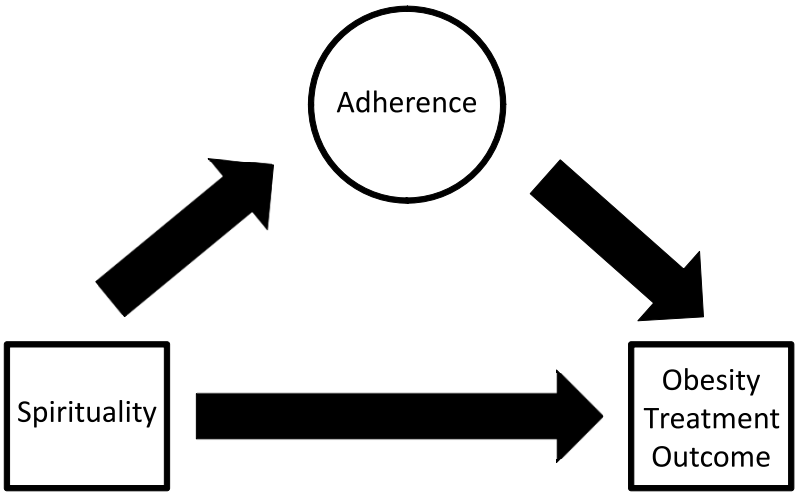

Figure 2. Mediation of Adherence to Spirituality and Obesity Treatment Outcome Conceptual Model

H3: The relationship between spirituality (extrinsic and intrinsic) and weight loss will be moderated by age, treatment site, and the interaction of age and treatment location. Age was expected to moderate the relation between spirituality and weight loss since spirituality often increases with age. Treatment site was expected to moderate the relation between spirituality and weight loss since a church location is associated more with spirituality than a university setting. The church setting is also expected to be closer to the participant's residence, recognized as part of the local community, is more culturally relevant, and is a more familiar place than the Uniformed Services University.

Research Design and Methods

General Overview

The study investigates the relationship between extrinsic spirituality, intrinsic spirituality, adherence, and weight change in a behavioral weight loss program. Adherence is operationalized as attendance (i.e., number of sessions attended) and consecutive absences (i.e., missing two or more consecutive sessions). Weight loss is calculated as a weight change from baseline to post treatment.

Participants

Participants were overweight and obese women who were primarily African American. They were recruited through newspaper advertisement and local churches in the greater Washington D.C. metropolitan area for an ongoing obesity treatment outcome study of women 18 to 55 years of age with a BMI between 25-35 kg/m^2. Potential participants completed a two-page screening form and were phone screened prior to enrollment. Exclusion criteria included: pregnancy, current smoker, diabetes,

uncontrolled hypertension, depression, thyroid disorders, recent weight loss of greater than ten pounds (4.54 kg) in the past month or twenty pounds (9.09 kg) in the past six months. Those meeting initial criteria were mailed a medical information form. The medical information form was to be completed and signed by each participant's physician before treatment began. Resources were provided to volunteers who did not meet inclusion criteria. Eligible participants were then provided a written consent for treatment. Participants were paid fifty dollars per assessment time point (baseline and post-treatment) to participate. Participation in the thirteen week weight-management program was contingent on completion of two weeks of pretreatment food diaries.

Ethical Approval

The Human Subjects Institutional Review Board at the Uniformed Services University of the Health Sciences approved the protocols of the parent study and secondary data analysis. Tracy Sbrocco was the primary investigator of the parent study (Title: Family Intervention and Health Study, protocol number HU72GF-03). Andrew Hagemaster was the primary investigator of the current study (Title: Does Spirituality Predict Weight Loss? Protocol number T072KX-01).

Procedure

African American women were over recruited in this study in order to evaluate to the efficacy of a culturally-based behavioral weight loss program. Everyone enrolled in the program received a behaviorally based weight management treatment. There were three different treatment groups: Behavior Choice Therapy (BCT), traditional Behavior Therapy based on 1200 kcal (BT1200), and traditional Behavior Therapy based on 1600 kcal (BT1600). The treatment comparison is addressed elsewhere (Sbrocco et al.,

manuscript in preparation). Since weight loss did not differ between groups and in order to maximize sample size, treatment groups were collapsed for these analyses.

This study included two phases, a two week baseline and thirteen week treatment phase. Research participants received information packets including a medical questionnaire to be signed by the participant's physician, a study description, and formal consent form. Participants attended an orientation session, were consented to participate, and began keeping two weeks of exercise and food diaries to establish a baseline of exercise and eating patterns. After the two week baseline, participants turned in their exercise and food diaries were re-weighed. Those completing phase I, began phase II, which consisted of thirteen weekly, one and a half hour treatment sessions. Weigh-in and blood pressure readings were conducted prior to each treatment session. Each treatment session included education on healthy eating and weight management. A clinical psychologist and graduate student co-leader facilitated each group.

Measures

1. Demographic Measures. Education, income, and race were self-reported during pretreatment data collection. Income was coded as a continuous variable from one to seven (1 = below $20K, 2 = $20-30K, 3 = $30-40K, 4 = $40-50K, 5 = $50-60K, 6 = $60-70K, and 7 = above $70K). Race was coded as (1 = African American, 2 = Caucasian, 3 = Other). Education was coded as a categorical variable from1 to 6 (1 = some high school, 2 = completed high school/GED, 3 = some college, 4 = completed college, 5 = partial graduate/professional school, and 6 = completed graduate school/professional school.) Treatment location was a coded as either university or church setting (1 = University, 2 = Church).

2. Anthropometric Measures. Body mass index (BMI; weight [kg] / height squared [m^2]) was calculated by dividing weight (kg) by height squared (m^2). Weight loss was calculated by subtracting post-treatment weight from pre-treatment weight. Therefore, a positive weight loss score indicates weight loss, and negative weight loss score indicates weight gain. Weight and height were measured using a Healthometer balance beam calibrated scale.

3. Food Records. Participants recorded foods eaten using a personal digital assistant (PDA). Food diaries were used to calculate participant's nutrient intake.

4. Adherence. Adherence was measured by number of sessions attended during the 13 week treatment and by number of consecutive absences (i.e., whether the participant had missed two or more consecutive sessions).

5. Spiritual Involvement and Beliefs Scale (SIBS) (Hatch, Burg, Naberehaus, & Hellnmich, 1998). The SIBS consists of 26 questions and four subscales: external, internal, existential, and humility application. In this study, only external and internal scales were used. It was beyond the scope of the study to include the other two subscales. The SIBS measures several spirituality indicators including: fulfillment from nonmaterial things, relationship with/belief in a higher power, purpose in life, identity, prayer, faith, trust, meditation, spiritual activities with others, ability to forgive, and ability to find meaning in suffering.

The SIBS external and the internal subscales were used in the current study. The external spirituality subscale measured strength of spiritual activities or rituals. External measures of spirituality may relate to a participant's adherence to a nutrition and exercise regimen. An example of an external spirituality item on the SIBS is "Spiritual activities

help me draw closer to a power greater than myself" (Hatch et al., 1998). Each participant was asked to rate their agreement on a 5-point Likert scale from "strongly agree" to "strongly disagree" (17 total Likert items were used). The internal spirituality subscale measured evolving beliefs, internal beliefs, and spiritual growth. In terms of the present study, internal measures of spirituality may relate to whether an individual believes the program may help them lose and maintain weight. An example of an internal spirituality item on the SIBS is "My spiritual life fulfills me in ways that material possessions do not" (Hatch et al., 1998). Each participant was asked to rate their agreement on a 5-point Likert scale from "strongly agree" to "strongly disagree" (15 total Likert items will be used).

Hatch et al (1998) reported internal consistency of the SIBS subscales in a sample of 83 people. Fifty of whom were rural family practice patients. The other 33 people who filled out the SIBS were family practice professionals recruited during a family practice workshop. Cronbach's alphas were excellent for the external ($\alpha = 0.98$) subscale and satisfactory for the internal ($\alpha = 0.74$) subscale. The actual reliability (external/ritual $\alpha = 0.89$, internal/fluid $\alpha = 0.77$) in the study sample of 106 women was similar to reliability analyses published by Hatch (1998).

Analytic Strategy

Pearson correlation coefficients were calculated to examine the associations among demographic variables and post treatment weight loss. Demographic variables that were significantly associated with weight loss were controlled for in the mediation and moderation analyses. The tests of mediation followed the procedure described by Baron and Kenny (1986).

Regression and Mediation Analyses

A series of regression analyses were conducted to test the first and second hypothesis to determine whether spirituality was associated with weight loss and whether the association between spirituality and weight loss was mediated by adherence. A significant positive linear relationship between spirituality (both extrinsic and intrinsic) and weight loss was predicted in the first hypothesis. To test this hypothesis, extrinsic spirituality and intrinsic spirituality were regressed on to weight change in two separate regression analyses. The relationship between spirituality (extrinsic and intrinsic) and weight loss was predicted to be mediated by treatment adherence in the second hypothesis. Treatment adherence was measured by number of sessions attended during treatment and consecutive absences. The mediation hypothesis was tested in the four steps proposed by Baron and Kenny (1986). The proposed mediator (adherence) was regressed on to the predictor variable (spirituality). The dependent variable (weight loss) was regressed on to the proposed mediator (adherence) and then on to the predictor variable (spirituality). Finally, the dependent variable (weight loss) was regressed simultaneously on to both the predictor variable (spirituality) and on to the mediator (adherence). Mediation is suggested when all of the following occur: (1) The predictor variable is significantly associated with the mediator; (2) The mediator and the predictor are significantly associated with the dependent variable; and (3) The mediator significantly predicts the dependent variable while reducing the previously significant association between the predictor and dependent variable.

Moderation Analyses

The tests of moderation were conducted to test the third hypothesis, that the relationship between spirituality (extrinsic and intrinsic) and weight loss would be moderated by age, treatment location, and the interaction of age and treatment location. The moderation tests followed the procedure described by Baron and Kenny (1986). Moderation effects are generally indicated by statistical significance of the interaction effects of the independent variable (spirituality) and the moderators (age, treatment location, extrinsic spirituality, or intrinsic spirituality) in explaining the dependent variable (weight loss). In this study, the independent variables (extrinsic, intrinsic spirituality) and moderator (age) are continuous variables. Treatment location is a categorical variable. According to Baron and Kenny (1986), the IV (spirituality) and each continuous moderator need to be centered at the sample mean. The scores on the predictors were centered prior to the analysis to eliminate nonessential collinearity produced by the calculation of the product (interaction) terms (Aiken & West, 1991).

To test the moderation hypothesis, a hierarchical multiple regression analysis was carried out with post treatment weight loss serving as the criterion. SIBS extrinsic and intrinsic subscales, age, location of treatment (0 = University, 1 = Church), and interaction of age by location served as predictors entered in three steps. The first step included initial BMI and race. The second step included the main effects (extrinsic spirituality, intrinsic spirituality, age, and treatment location). The third step entered the 2-way and 3-way interaction terms: extrinsic spirituality X age; extrinsic spirituality X treatment location; extrinsic spirituality X age X treatment location; intrinsic spirituality

X age; intrinsic spirituality X treatment location; and intrinsic spirituality X age X treatment location. The significance level was set at .05, two-tailed for all analyses.

Power Analysis

The sample size of 113 participants has been determined using a power analysis formula based on Cohen's recommendation for studies in behavioral sciences (Cohen, 1988). Power analysis tables created by Green (1991) that incorporate the number of predictor variables, effect size, power, and the alpha level for use in hierarchical regressions were used to determine the sample size for this study. The effect sizes were based on recommendations for small, medium, and large effect sizes obtained in behavioral research (Cohen, 1988).

For the first hypothesis, two covariates (initial BMI and race) and one predictor variable (either intrinsic or extrinsic spirituality) will be used. As such, the sample size required to test the hypothesis that the population multiple correlation equals zero with a power of 0.80 (Alpha = 0.05) with a medium effect size (R^2 = 0.13) is 76 subjects. To test a small effect size (R^2 = 0.02), 547 are recommended. To test a large effect size (R^2 = 0.26), 35 subjects are recommended.

For the second hypothesis testing for mediation, two covariates (initial BMI and race) and three predictor variables (attendance, consecutive absences, and either intrinsic or extrinsic spirituality) will be used. As such, the sample size required to test the hypothesis that the population multiple correlation equals zero with a power of 0.80 (Alpha = 0.05) with a medium effect size (R^2 = 0.13) is 91 subjects. To test a small effect size (R^2 = 0.02), 645 are recommended. To test a large effect size (R^2 = 0.26), 42 subjects are recommended.

For the third hypothesis testing moderation, two covariates (initial BMI and race) and seven predictor variables (intrinsic or extrinsic spirituality, age, location, age x location, spirituality x age, spirituality x location, spirituality x age x location) will be used. As such, the sample size required to test the hypothesis that the population multiple correlation equals zero with a power of 0.80 (Alpha = 0.05) with a medium effect size (R^2 = 0.13) is 113 subjects. To test a small effect size (R^2 = 0.02), 788 are recommended. To test a large effect size (R^2 = 0.26), 54 subjects are recommended.

Results

Demographics

The final sample consisted of 105 women who completed treatment and had data for all variables of interest in this study. Of the original sample of 169 women, 28 participants did not have post-treatment weight data and were dropped from the sample. One participant did not have extrinsic or intrinsic spirituality data. The pretreatment data for two extrinsic spirituality scores and three intrinsic spirituality scores were missing and post treatment data was substituted. Spirituality was expected to remain stable over the 13 week treatment. Additional analyses were also conducted to compare post-treatment and pre-treatment spirituality scores. No significant differences in extrinsic spirituality (t = 0.27, p = .79) or intrinsic spirituality (t = 0.83, p = .41) were found in the current sample. One participant was excluded because her BMI was an outlier (72 kg/m^2). This was most likely an administrative error with recording the participant's height.

Thirty-four non-treatment completers were also excluded from the final study sample. Treatment completers were defined as individuals that completed the program and attended one of the last two sessions. Demographic and baseline variables were

compared for treatment completers with non-treatment completers. One-way ANOVA and chi-square analyses revealed no significant differences in marital status, BMI, income, and spirituality between treatment completers and non completers. Only age differed across groups. Treatment non-completers (mean = 38.6 years, SD = 10.9) were younger than treatment completers (mean = 42.7 years, SD = 8.6; $F = 5.41$, $p < .05$).

Of the 105 women in the final study sample, 72 were African American with a BMI range of 25-53kg/m^2 and 27 were Caucasians with a BMI range of 28-50 kg/m^2. There were 25 women in the Behavioral Choice Treatment (BCT) at 1800 k/cal, 42 women in the Traditional Behavioral Therapy at 1800 k/cal, and 38 women in the Traditional Behavioral Therapy at 1600 k/cal.

Means and standard deviations for demographic variables did not significantly differ by race or treatment location, as presented in Table 1. The typical participant was 44 years old with an initial BMI of 36 kg/m^2, African American, unmarried, had completed some graduate school, and lost 6.39 lbs during the study, as shown in Table 1 and Table 2. Only two percent of the overall sample made less than $20,000 per year.

The associations among demographic variables and weight loss were examined by correlation analyses and one-way ANOVA to identify potential covariates. Post treatment weight loss did not significantly differ by income ($F = 1.62$, $p = 0.14$) or education level ($F = 1.72$, $p = 0.14$), as presented in Table 3. The assumptions for conducting correlations (random sample, linearity, homogeneity of variances, normality) were assessed and were found to have been met for all analyses. As such, initial BMI and race were controlled for in the subsequent regression analyses examining potential mediation and moderation. Post treatment weight loss was positively correlated with initial BMI, $r_{(104)} = 0.22$,

$p < .05$. Post treatment weight loss was negatively correlated with extrinsic spirituality $r_{(104)} = -0.39$, $p = .001$ and intrinsic spirituality $r_{(104)} = -0.27$, $p > .05$. As individuals scored higher on either spirituality scale they lost less weight and, in some cases, gained weight.

Hypothesis 1: Does spirituality predict weight loss?

A significant positive linear relationship between spirituality (both extrinsic and intrinsic) and weight loss was predicted in the first hypothesis. Higher scores on the extrinsic and intrinsic spirituality subscales were expected to be associated with greater weight loss. Covariates (initial BMI, race) were accounted for before extrinsic or intrinsic spirituality variables were regressed on to weight loss. Results for the hierarchical multiple regression analyses for extrinsic and intrinsic spirituality are depicted in Table 4 and Table 5, respectively. The results did not confirm this prediction. Higher levels of extrinsic spirituality were not associated with greater weight loss. In fact, extrinsic spirituality was significantly associated with weight gain at post treatment ($\beta = -0.31$, $t = -3.51$, $p = .001$), as shown in Table 4. Similarly, higher levels of intrinsic spirituality were significantly associated with weight gain at post treatment ($\beta = -0.23$, $t = -2.42$, $p < .05$), as shown in Table 5. Extrinsic and intrinsic spirituality were both associated with weight gain. Extrinsic spirituality was associated with greater weight gain when compared with intrinsic spirituality.

Intrinsic spirituality was divided based on the median score of 43 to examine differences between those who rate themselves high in intrinsic spirituality and those who rate themselves low in intrinsic spirituality. There were nine women in the high spirituality group that gained weight. There was only one woman in the low spirituality

group that gained weight. Also, twice as many women in the low spirituality group lost more than ten pounds (n=15) at post treatment compared to women in the high spirituality group (n=7).

Extrinsic spirituality was divided based on the median score of 54 to examine differences between those who rate themselves high in extrinsic spirituality and those who rate themselves low in extrinsic spirituality. There were seven women in the high spirituality group that gained weight compared to only two women in the low spirituality group. Also, thirteen women in the low spirituality group lost more than ten pounds at post treatment compared to nine women who scored higher in spirituality. Women who scored lower in spirituality were more likely to lose weight in this study than women who scored higher in spirituality.

Hypothesis 2: Does adherence mediate spirituality and weight loss?

The relationship between spirituality (extrinsic, intrinsic) and weight loss was predicted to be mediated by treatment adherence in the second hypothesis. After demographic covariates were entered in the model, extrinsic and intrinsic spirituality were each regressed on to weight loss. Extrinsic and intrinsic spirituality were both associated with weight gain (not weight loss) at post treatment. Next, intrinsic and extrinsic spirituality were each regressed on to the proposed mediator (adherence) in a Multivariate Analysis of Variance to test the second step of mediation. Neither extrinsic ($F = 2.24$, $p = .07$) nor intrinsic spirituality ($F = 0.93$, $p = .45$) were significantly related to adherence (attendance; consecutive absences), although extrinsic spirituality showed a trend towards significance. As people rated themselves higher in extrinsic spirituality there was a trend in higher attendance and less consecutive absences. The third step in

testing mediation included the regression of adherence on weight loss. Adherence (F= 4.39, $p < .01$) was significantly associated with post treatment weight loss. The second and third steps must be significant in establishing mediation (Baron and Kenny, 1986). Since the second step revealed non-significant relationships between the predictor and the mediator variable, the final step for mediation testing could not be conducted and the hypothesis was not supported. Thus, adherence did not mediate the relationship between spirituality and weight gain. It is possible that a larger sample size may produce significant findings whereas currently there is only a trend towards significance for adherence accounting for the relationship of extrinsic spirituality and weight loss.

Hypothesis 3: Does age or treatment location moderate spirituality and weight loss?

The relationship between spirituality (extrinsic and intrinsic) and weight loss was predicted to be moderated by age, treatment location, and the interaction of age and treatment location in the third hypothesis. Two hierarchical multiple regression analyses were conducted for both extrinsic and intrinsic spirituality with post treatment weight loss serving as the criterion.

The assumptions for normality, linearity, homoscedasticity, reliability, and independence of residuals were tested and met. Results of the hierarchical regression of spirituality, intrinsic), age, and treatment location on weight loss were presented in Tables 6 and 7. The first step of the regression model included covariates. The second step included potential main effects of spirituality, age, and treatment location. The third step included the interaction terms of spirituality, age, and treatment location.

After controlling for BMI and race in the first step, extrinsic spirituality (β = -0.30, t = -3.32, p = .001) and intrinsic spirituality (β = -0.24, t = -2.59, p = .01), were

significant predictors of weight gain at the second step as shown in Tables 6 and 7. The higher the spirituality subscale, the less weight was lost. And in some cases, higher spirituality was associated with weight gain in comparison to those who reported lower levels of spirituality. Although not significant, there were trends in significance for age when extrinsic spirituality (β = 0.16, t = 1.76, p = .08) and intrinsic spirituality (β = 0.16, t = 1.73, p = .09) were in the model such that older people tended to lose more weight than younger people in the study. This supports the research that as a person gets older they rate spirituality as more important to their lives. It is also possible that as a person gets older they have more time to devote to personal pursuits of spirituality and weight loss programs compared to younger participants who have a different set of demands focused more on work and raising a family. The main effects for treatment location was significant when intrinsic spirituality was in the model (β = -0.19, t = -1.97, p = .05) as shown in Table 6. At the third step, there was a significant two-way interaction between intrinsic spirituality and age (β = -0.55, t = -1.98, p = .05) such that older women who scored higher on intrinsic spirituality lost less weight than either older women with lower scores of intrinsic spirituality or younger women regardless of intrinsic spirituality levels, as shown in Figure 3.

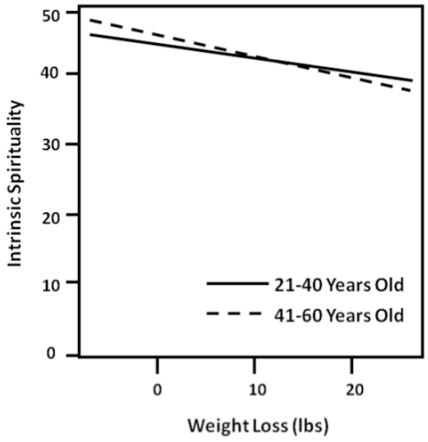

Figure 3. Graph of Two-Way Interaction of Intrinsic Spirituality and Post-Treatment Weight Loss by Age Group

There was also a significant three-way interaction between intrinsic spirituality by age by location ($\beta = 0.63$, $t = 2.26$, $p < .05$), as shown in Figure 4. Older women treated at the church and younger women treated at the university location both maintained their initial entry weight.

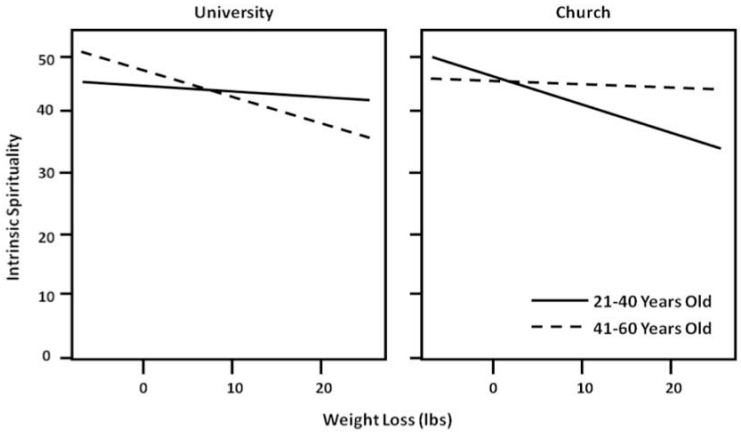

Figure 4. Graph of Three-Way Interaction of Intrinsic Spirituality and Post-Treatment Weight Loss by Treatment Site by Age Group

Hypothesis 3a: Age as a Moderator between Spirituality and Weight Outcome.

It was predicted that the relation between spirituality (extrinsic and intrinsic) and weight loss would be moderated by age. Older participants were expected to have higher scores of extrinsic and intrinsic spirituality and therefore have increased weight loss compared to younger participants. There was a trend in significance for age as a moderator between extrinsic spirituality (β = 0.16, t = 1.76, p = .08) and weight outcome such that older people tended to lose more weight than younger people in the study as presented in Table 6, Step 2. Age also showed a trend in significance as a moderator between intrinsic spirituality (β = 0.16, t = 1.73, p = .09) and weight outcome as shown in Table 7, Step 2. There was a two-way interaction between intrinsic spirituality and age (β = -0.55, t = -1.98, p = .05) as presented in Table 7, Step 3 and shown in Figure 3. Older women who had more internally motivated reasons for their spirituality lost less weight than either older women who had less internally motivated reasons for their spirituality or younger women regardless of their intrinsic spirituality levels. The two-way interaction between extrinsic spirituality and age (β = 0.26, t = -0.92, p = .36) was not significant in the model as shown in Table 6, Step 3. Therefore, age only appeared to moderate the relationship between intrinsic spirituality and weight loss.

Hypothesis 3b: Treatment Location as a Moderator between Spirituality and Weight Outcome.

The relationship between spirituality (either extrinsic or intrinsic) and weight loss was expected to be moderated by treatment location. Participants who completed the weight management program in the church setting were expected to have higher extrinsic and intrinsic spirituality subscale scores and greater weight loss compared to those who

participated in treatment in a university setting. While women in either setting could have high reported levels of spirituality, it is assumed that the women participating in a church location were recruited from that congregation and on average would have higher reported levels of spirituality. After covarying BMI and race, there was a main effect for treatment site (β = -0.19, t = -1.97, p = .05) when intrinsic spirituality was in the model, but not when extrinsic spirituality was in the model (β = -0.16, t = -1.68, p = .10). The two-way interaction for extrinsic spirituality by treatment location (β = -0.24, t = -0.82, p = .41) and intrinsic spirituality by treatment location (β = 0.11, t = 0.42, p = .68) were also not significant.

In order to determine whether the interactions were supportive of the a priori hypothesis, participants were divided into two groups based on treatment location (n = 35 at church site; n = 70 at university site). Weight loss was then regressed onto extrinsic spirituality. Results indicated that there was a negative relationship between extrinsic spirituality and weight loss for both treatment locations. Greater levels of extrinsic spirituality was significantly related to less weight loss in the university group (β = -0.30, t = -2.60, p = .01) and showed a trend toward significance in less weight loss in the church group (β = -0.31, t = -1.87, p = .07).

Hypothesis 3c: Age by Treatment Location as a Moderator between Spirituality and Weight Outcome.

It was predicted the relationship between spirituality (either extrinsic or intrinsic) and weight loss would be moderated by the interaction of age by treatment location. Older participants were expected to have higher scores of extrinsic and intrinsic spirituality and increased weight loss at the church setting versus the university setting

compared to younger participants. After covarying initial BMI and race, there was a main effect for treatment location when intrinsic spirituality was in the model (β = -0.19, t = -1.97, p = .05) but not when extrinsic spirituality was in the model (β = -0.16, t = -1.68, p = .10). While there was no main effect for age (β = 0.16, t = 1.74, p = .09), there was a trend toward older people losing more weight regardless of treatment location. So age did not contribute to significant differences in weight loss, but treatment site location did contribute to significant differences in weight loss when intrinsic spirituality was in the model. The three-way interaction for extrinsic spirituality, age, and treatment location (β = -0.34, t = -0.84, p = .41) was not significant. The three-way interaction for intrinsic spirituality, age, and treatment location (β = 0.97, t = 2.33, $p < .05$) was significant in the model as shown in Figure 4 and Table 6, Step 3.

In order to determine whether the interactions were supportive of the a priori hypothesis, age scores were divided at the median and weight loss was regressed onto the interaction of extrinsic spirituality by location. Results indicated that the negative relationship between the interaction of extrinsic spirituality by treatment location and weight loss was not confirmed for either age group. The older group did have differences of weight loss based on extrinsic spirituality scores at different treatment locations (β = -0.28, t = -2.30, $p < .05$). However, the younger group (β = 0.54, t = 0.56, p = .58) did not have significant differences of weight loss.

With the age groups split, weight loss was also regressed onto the interaction of intrinsic spirituality by location. There were weight loss differences between women who scored higher on intrinsic spirituality based on their age and treatment location. The relationship was different for the younger group (β = -0.48, t = -0.64, p = .53) than the

older group (β = -3.09, t = -3.10, $p < .01$). This data helps explain why earlier analyses of interactions with intrinsic spirituality by age and treatment location were significant. The older participants were less likely to lose weight at the university setting compared to the younger participants, while the younger participants were less likely to lose weight at the church setting. Overall, as women scored higher in spirituality measures they lost less weight. Older women lost less weight at the university setting and the younger women lost less weight at the church setting.

Discussion

This study explored the effects of spirituality on weight loss in two treatment settings, church vs. university, among African American overweight and obese women. In particular, this study examined the relationship among religiosity/spirituality, adherence, and weight loss among overweight/obese African American women. A series of mediation and moderation analyses revealed that adherence, treatment location, and age did not explain the significant relation between spirituality and weight loss.

The first hypothesis predicted a significant positive linear relationship between spirituality (both intrinsic and extrinsic) and weight loss. Higher scores of extrinsic and intrinsic spirituality were expected to be associated with greater weight loss. The results from the study showed a significant relation but in the opposite direction. As women scored higher in spirituality (either on extrinsic or intrinsic scales) they lost less weight. In fact, when intrinsic spirituality was split into two groups based on median scores, there were nine women in the high spirituality group that gained weight compared to only one in the low spirituality group. Also, twice as many women in the low spirituality group lost more than ten pounds at post treatment compared to those who scored higher in

spirituality. African Americans who rated themselves as more spiritual are likely to spend more time at church where food is usually available and people are encouraged to eat during fellowship meals, luncheons, or potlucks. The connection of food with fellowship is common in churches where people come together to “break bread” in communion with others. Another possible explanation could be that as a woman increases in spirituality they may have an increased self-acceptance and self-esteem that could decrease the desire to lose weight.

The second hypothesis predicted the relation between spirituality (extrinsic and intrinsic) and weight loss would be mediated by treatment adherence. Treatment adherence was not significantly related to weight loss. Since it was not related, a mediation model could not be supported. Initially, it was predicted that extrinsic spirituality was related to weight loss because it facilitated increased adherence to rules or programs. This hypothesis could not be tested directly in this study. Based on the results, intrinsic spirituality may be related to weight loss because it could increase adherence due to internal motivation for change and improved health outcomes. Intrinsic views may include taking care of the physical body, possibly as a vessel or testimony of God’s work in the church and world. Another possibility is that health education may increase the motivation to change the outward, or physical, representation of their intrinsic spirituality. Hill and Pargament discussed this balancing of their internal spirituality with their external behavior as a “tension that people experience between the virtues they espouse, their feelings, and their actual behavior” (Hill & Pargament, 2003). In other words, intrinsic spirituality may motivate someone to make the outside physical

self resemble their inside or internal spiritual self. This view was not supported by the data.

The third hypothesis predicted the relationship between spirituality (extrinsic or intrinsic) and weight loss would be moderated by age, treatment location, and the interaction of age and treatment location. The results of this study suggest that age did not strengthen the relationship of spirituality and weight loss. Researchers have shown that spirituality increases as people age (Dalby, 2006; Koenig, 2006; Wink & Dillon, 2003). As people enter adulthood, aspects of life including marriage, raising a family, and end of life issues bring them to view their life in a more spiritual perspective in relation to God or the world as something larger than themselves (Ironson, Stuetzle, & Fletcher, 2006; Moore, Metcalf, & Schow, 2006). In this study, age was related to intrinsic spirituality (see Table 6 and Figure 3). Older women lost significantly less weight based on their scores of intrinsic spirituality. The more spiritual the older women were the less weight they lost and in some cases they actually gained weight.

The results of this study show that treatment location is not a moderator of spirituality and weight loss. Researchers have shown that weight loss programs conducted in church locations often have better health outcomes (Kumanyika & Charleston, 1992; McNabb, Quinn, Kerver, Cook, & Karrison; Sbrocco et al., 2005). In this study, treatment location did not strengthen the relation of extrinsic or intrinsic spirituality and weight loss. Initially, treatment location was correlated with weight loss, but covariates of initial BMI and race accounted for the significant relationship.

The results of this study show that the interaction of treatment location and age is a moderator of intrinsic spirituality and weight loss. Since spirituality has been shown to

increase with age, it was thought that older women in a church setting would lose more weight than younger women in a church setting. The results did not support this hypothesis. Although older women in the church did not lose weight, they were more likely to maintain their weight in comparison to younger participants. Younger participants, who self-reported higher levels of intrinsic spirituality, lost significantly less weight and, in some cases, gained weight in comparison to older women in the study.

This study is important because it provides additional details about the relationship between spirituality and health outcomes. In this study, spirituality was not significantly related to weight loss in the direction expected. Rather, those with higher scores on extrinsic and intrinsic measures of spirituality were found to lose significantly less weight, and even gained weight, in comparison to those who had lower scores on extrinsic and intrinsic spirituality. Spirituality was not conceptualized as a single item measure, but was considered as a complex variable emphasizing either the extrinsic or intrinsic nature of spirituality. This study also identified initial BMI and race as covariates with spirituality and health outcomes. Also worth noting, was that marital status, income, and education level were not significant predictors of health outcomes in this study. This study did reveal main effects of external spirituality and intrinsic spirituality as it related to post treatment weight loss even after controlling for initial body mass index and race. This study is important because it showed that age and treatment location (church and university settings) did strengthen the relationship between spirituality and health outcomes. Adherence did not explain the significant relationship between spirituality and weight loss. After conducting post-hoc analyses on age and treatment location, older women who scored higher in intrinsic spirituality at

church settings and younger women who scored higher in intrinsic spirituality at university setting had better weight loss than those who scored lower in spirituality in either treatment location. This study is an important step forward in explaining the significant relation between spirituality and health outcomes, but more research is needed to understand why increased spirituality resulted in significantly less weight loss and in some cases weight gain. Perhaps there was less self-care concern because they were "cared for" by a higher power.

Research from the longitudinal Framingham Heart Study concluded that obesity spread through social relationships (Christakis & Fowler, 2007). A person is at a 57 percent increased risk (95% CI: 6 to 123) of becoming obese if they had a friend become obese during the same time period. Even more interesting given the findings that spirituality was related to significant decreased weight loss and some weight gain, is that the increased risk for becoming obese through social circles extended out to three degrees of separation. More research is needed to determine if spending more time at religious meetings or services where food is available results in less weight loss and if it accounts for weight gain in church-based weight loss programs.

Study Limitations

There were several limitations in this study. Simply defining spirituality and religiousness is a limitation when individuals are asked to complete a spirituality assessment. By defining spirituality, particularly when a spirituality measure is used in research, it narrowly describes a single aspect of spirituality that may not encompass the larger portion or cross-section of spirituality that is linked to improved health outcomes. The selection of a spirituality measure was a limiting factor in this study, because the

SIBS measure had already been selected prior to the analysis of data. While the spirituality measures were not simple one-item measures of church affiliation or church attendance, additional measures of spirituality including spiritual struggle, religious coping, and body sanctification may be more relevant to the relation of spirituality and weight loss, particularly with women who struggle to lose weight due to thoughts of self-worth, self-efficacy, and self-control (Hill & Pargament, 2003).

The power analysis conducted for this study estimated that 113 participants would be needed to detect a medium effect size in the third hypothesis. Only 105 participants were included in this study. While 105 participants were above the estimated sample size to detect a medium effect in the other hypotheses, the third hypothesis is slightly underpowered by eight participants. Including non-completers in the analyses by substituting the mean was considered, but most participants who did not complete treatment dropped out early in the treatment cycle and not towards the end where substituting the mean or imputing weight loss would be practical.

Other limitations in this study include possible measurement error and reliance on self-report data for the assessment of spirituality. The perceived need to appear spiritual or religious may have contributed to inflated scores on spirituality measures, especially with groups conducted in a church site. Also, recruitment of participants in church settings occurred after church services and may have increased the risk of “snowballing” (Goodman, 1961). Snowballing occurs when participants who are already enrolled in the study recruit friends they know to join the study. This sampling technique is used to gain access to populations that typically do not participate in research studies. In this case, the recruiting of African American participants at a worship service or a health meeting may

have resulted in a different sample composition than if the study relied on individuals responding to a newspaper ad for a weight loss program at a university setting.

Other limitations include the use of attendance and consecutive absences for adherence variables. Even though the adherence variables were significantly correlated with weight loss, it may not be the only meaningful way to operationalize adherence. More robust adherence variables are needed in future studies besides attendance or consecutive absences. For example measures of adherence that calculate actual calories consumed and calories expended could provide additional measures of adherence in future studies. Also a pedometer could provide a way to measure adherence to exercise regimens. Physiological measures of adherence would be ideal to measure biobehavioral pathways through which spirituality affects health outcomes (Seybold, 2007). Seybold goes on to describe how meditation "produces increases in GABA, melatonin, and serotonin levels" (Seybold, 2007, p. 305). Positive affect although "not limited to religious practice but certainly a part of religious reflection, lowers the neuroendocrine stress response (e.g., cortisol levels) and acts as a buffer for psychological stress" (Creswell et al., 2005; Seybold, 2007, p. 305).

Future Directions

In future research, special attention could be paid to the selection of appropriate measures of spirituality. Measures of spirituality including spiritual struggle, religious coping, and body sanctification may provide more insight into the relation of spirituality and weight loss. Adding a measure of negative religious coping, such as the Negative Religious Coping Scale including appraisals of obesity, diabetes, or other illness perceived as a punishment from God may also be helpful in future studies (Pargament et

al., 1998). Negative religious views are important to identify and could explain why people in the current study, who scored higher on self-reported scales of spirituality, had significantly less weight loss. Interpersonal religious discontent may also be useful in exploring the significant relation between spirituality and health outcomes (Pargament, Koenig, Tarakeshwar, & Hahn, 2001; Park, 2007).

Although this study examined whether an individual's spirituality increased weight loss, the study did not include a large percentage of spiritual aspects in the weight loss program. Future studies could investigate whether incorporating spirituality into the weight loss program curriculum increases weight loss when taught in a church location.

In this study, it was assumed that the church locations would be closer to the community where the participants lived than the university location. Given it is true in general, future studies should verify the distance of travel from the treatment location and the home of record for the participants. Proximity may contribute to increased attendance to a weight loss program.

Future studies could include more diverse geographical locations outside of the metropolitan D.C. area. Only two percent of participant's income was below 20 thousand dollars in this study and therefore, this sample may not be reflective of the population in most geographical areas. Although 70 percent of the sample identified as African American, future studies could focus on only African Americans or other minorities to examine the link between spirituality and health outcomes, particularly weight loss in different cultures. These additional studies into specific cultures could allow for comparison and insight into how weight loss programs may be tailored to specific cultures.

Future studies could also focus on specific age groups in order to determine the effects of spirituality on adherence or weight loss. From the results of this study, it is predicted that older women will rely more on spirituality to adopt healthier lifestyles than younger women. Additional studies including men or focusing on family groups are also needed if there is hope to decrease the rising tide of obesity in the United States.

Future studies could benefit from including locus of control as a covariate. Internal and external locus of control may provide important information in how a person approaches weight loss. A person with a high internal locus of control would approach weight loss as something they had control over whereas someone with a high external locus of control may attribute weight loss from forces outside of themselves. “e.g., God is the only person who could help me lose weight it must be God’s will”. Another person who is high in external locus of control may give up trying to lose weight because it must be God’s will. Additional studies could determine if locus of control moderates the relationship of spirituality and treatment outcomes in weight loss.

Summary

In summary, this nation is dealing with an epidemic of obesity. Many people struggle with their weight every day. In fighting obesity, it is important to get beyond the health risks and prevalence rates presented in this paper and reported in the media. To effectively fight obesity one must understand how obesity affects people in their everyday lives and specific cultures. This study was based on evaluating whether spirituality predicted weight loss in African American women in two treatment settings, church vs. university. The study was designed to examine spirituality beyond a one-item measure nested within a larger study and to explore different aspects of spirituality as it

relates to behavioral weight loss program outcomes in overweight African American women. Intrinsic and extrinsic spirituality were significantly associated with weight gain at post treatment. As women scored higher on spirituality measures they lost less weight and in some cases gained weight. Surprisingly, adherence was not significantly associated with post treatment weight loss and did not mediate the relationship between spirituality and weight gain. The relation between spirituality and weight loss was moderated by age. Older women who scored higher on intrinsic spirituality lost less weight than older women with lower scores of intrinsic spirituality or younger women regardless of intrinsic spirituality levels. This study also compared spirituality scores of participants in either church or university settings. Neither the treatment site nor the age of participant contributed to significant differences in weight loss. However, there were significant weight loss differences between women who scored higher on intrinsic spirituality based on their age and treatment location. The older participants were less likely to lose weight at the university setting compared to the younger participants while the younger participants were less likely to lose weight at the church setting. This could be due to older women being more comfortable in church settings with their peers and younger women doing better in the university where younger women would be more likely to be around their peers.

This study does not support the body of literature identifying spirituality is a distinct social determinant of health and well-being. Future studies are needed to examine why spirituality had a negative effect on weight loss and also to examine the different aspects of spirituality and how they interact with age, sex, and obesity. Developing effective culturally based weight loss programs is critical in reducing health disparities in

the prevalence of obesity in African Americans. Given both the importance of spirituality in the African American community and the evidence supporting a health-spirituality link, such work should be pursued.

Tables & Figures

Table 1

Means, Standard Deviations for Demographic Variables and Spirituality by Race and Treatment Site (N = 105).

	Overall		African American		Caucasian		Church		University	
Measure	M	SD	M	SD	M	SD	M	SD	M	SD
Age (yrs)	42.06	9.41	41.75	8.39	48.59	6.10	42.94	9.59	43.62	7.816
Initial BMI (kg/m^2)	36.08	6.24	36.33	5.65	36.39	6.59	34.16	4.80	37.72	7.23
Weight Loss (lb)	5.97	5.86	4.94	5.64	10.55	5.07	3.80	5.39	7.67	5.94
Extrinsic Spirituality	51.38	9.19	52.88	7.96	45.63	11.19	53.49	6.94	49.79	10.29
Intrinsic Spirituality	43.46	5.44	44.30	5.10	41.63	6.09	44.06	5.10	43.34	5.52

Note. BMI= Body Mass Index (kg/m^2).

Table 2

Demographic Distribution of Race, Marital Status, Income, and Education Level by Race and Treatment Location (N = 105).

Measure	Overall	African American	Caucasian	Church	University
Race (% AA)	74.5	100	0	91.4	66.1
Married (%)	41.4	44.4	42.3	57.1	42.9
Income (%)					
< $20K	2.0	1.5	3.8	3.0	1.5
$20-30K	8.0	10.3	3.8	9.1	7.5
$30-40K	25.0	26.5	15.4	27.3	23.9
$40-50K	22.0	23.5	19.2	18.2	23.9
$50-60K	10.0	7.4	15.4	6.1	11.9
$60-70K	11.0	10.3	15.4	12.1	10.4
> $70K	21.0	20.6	23.1	24.2	19.4
Education (%)					
Some high school	1.0	0	3.8	0	1.5
Completed high school	8.9	11.6	3.8	6.1	10.3
Some college	27.7	30.4	19.2	33.3	25.0
Completed college	23.8	24.6	19.2	30.3	20.6
Partial grad school	7.9	5.8	11.5	6.1	8.8
Completed grad school	29.7	27.5	38.5	24.2	32.4

Note. AA = African American.

Table 3

Inter-correlations for Age, Initial BMI, Weight Loss, and Spirituality (N = 105).

Measure	1	2	3	4	5
1. Age	--	-.15	.15	.01	.05
2. Initial BMI		--	-.22*	-.11	-.05
3. Weight Loss			--	-.39**	-.27**
4. Extrinsic SP				--	.81**
5. Intrinsic SP					--

Note. BMI = Body Mass Index (kg/m^2), SP = Spirituality.

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

Table 4

Results of the Hierarchical Multiple Regression Analysis of Extrinsic Spirituality and Post-treatment Weight Loss, Controlling for Initial BMI, and Race (N = 105)

Step	Variable	R^2	R^2 Change	Beta	*p*
1	Constant	.12	.12		*ns*
	Initial BMI			.24	.012
	Race			.27	.007
2	Constant	.21	.09		*ns*
	Initial BMI			.20	.028
	Race			.20	.031
	Extrinsic SP			-.31	.001

Note. BMI = Body Mass Index (kg/m^2), SP = Spirituality.

Table 5

Results of the Hierarchical Multiple Regression Analysis of Intrinsic Spirituality on Post-treatment Weight Loss, Controlling for Initial BMI, and Ethnicity (N = 105)

Step	Variable	R^2	R^2 Change	Beta	*p*
1	Constant	.12	.12		*ns*
	Initial BMI			.24	.012
	Race			.27	.007
2	Constant	.17	.05		*ns*
	Initial BMI			.23	.015
	Race			.24	.018
	Intrinsic SP			-.23	.017

Note. BMI = Body Mass Index (kg/m^2), SP = Spirituality.

Table 6

Results of the Hierarchical Multiple Regression Analysis of Extrinsic Spirituality, Age, and Treatment Location on Post-treatment Weight Loss, Controlling for Initial BMI, and Ethnicity (N = 105)

Step	Variable	R^2	R^2 Change	Beta	*p*
1	Constant	.12	.12		*ns*
	Initial BMI			.24	.01
	Race			.27	.01
2	Constant	.26	.14		*ns*
	Initial BMI			.18	.05
	Race			.12	*ns*
	Extrinsic SP			-.30	.001
	Age			.16	.08*
	Location			-.16	*ns*
3	Constant	.28	.02		*ns*
	Initial BMI			.19	.04
	Race			.13	*ns*
	Extrinsic SP			-.08	*ns*
	Age			.10	*ns*
	Location			-.15	*ns*
	ESP x Age			-.26	*ns*
	ESP x Location			-.24	*ns*
	Age x Location			.04	*ns*
	ESP x Age x Location			.34	*ns*

Note. BMI = Body Mass Index (kg/m^2), SP = Spirituality, ESP = Extrinsic Spirituality.

Table 7

Results of the Hierarchical Multiple Regression Analysis of Intrinsic Spirituality, Age, and Treatment Location on Post-treatment Weight Loss, Controlling for Initial BMI, and Ethnicity (N = 105)

Step	Variable	R^2	R^2 Change	Beta	*p*
1	Constant	.12	.12		*ns*
	Initial BMI			.24	.01
	Race			.27	.01
2	Constant	.23	.11		*ns*
	Initial BMI			.20	.04
	Race			.14	*ns*
	Intrinsic SP			-.24	.01
	Age			.16	.09*
	Location			-.19	.05
3	Constant	.28	.05		*ns*
	Initial BMI			.20	.04
	Race			.16	*ns*
	Intrinsic SP			-.34	*ns*
	Age			.21	*ns*
	Location			-.18	.07*
	ISP x Age			-.55	.05
	ISP x Location			.11	*ns*
	Age x Location			-.05	*ns*
	ISP x Age x Location			.63	.03

Note. BMI = Body Mass Index (kg/m^2), SP = Spirituality, ISP = Intrinsic Spirituality.

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