



HHS Public Access

Author manuscript

J Behav Med. Author manuscript; available in PMC 2018 December 01.

Published in final edited form as:

J Behav Med. 2017 December ; 40(6): 902–912. doi:10.1007/s10865-017-9858-7.

Spiritual Well-being, Religious Activity, and the Metabolic Syndrome: Results from the Hispanic Community Health Study/ Study of Latinos Sociocultural Ancillary Study

Carrie E. Brintz, PhD¹, Orit Birnbaum-Weitzman, PhD², Maria M. Llabre, PhD², Sheila F. Castañeda, PhD³, Martha L. Daviglus, MD, PhD⁴, Linda C. Gallo, PhD⁵, Aida L. Giachello, PhD⁶, Ryung S. Kim, PhD, MDiv⁷, Lenny Lopez, MD, MPH, MDiv⁸, Yanping Teng, MD, MSPH, PhD⁹, and Frank J. Penedo, PhD¹⁰

¹Department of Physical Medicine and Rehabilitation, University of North Carolina at Chapel Hill

²Department of Psychology, University of Miami

³Institute for Behavior and Community Health, Graduate School of Public Health, San Diego State University

⁴Department of Medicine, University of Illinois at Chicago

⁵Department of Psychology, San Diego State University

⁶Institute for Health Research and Policy, University of Illinois at Chicago

⁷Department of Epidemiology and Population Health, Albert Einstein College of Medicine

⁸School of Medicine, University of California, San Francisco

⁹Gilling School of Public Health, University of North Carolina at Chapel Hill

¹⁰Department of Medical Social Sciences, Northwestern University

Abstract

The Hispanic Community Health Study/Study of Latinos was carried out as a collaborative study supported by contracts from the National Heart, Lung, and Blood Institute (NHLBI) to the University of North Carolina (N01-HC65233), University of Miami (N01-HC65234), Albert Einstein College of Medicine (N01-HC65235), Northwestern University (N01-HC65236), and San Diego State University (N01-HC65237). The following institutes, centers, or offices contribute to the HCHS/SOL through a transfer of funds to the NHLBI: National Center on Minority Health and Health Disparities, the National Institute on Deafness and Other Communications Disorders, the National Institute of Dental and Craniofacial Research, the National Institute of Diabetes and Digestive and Kidney Diseases, the National Institute of Neurological Disorders and Stroke, and the Office of Dietary Supplements. The authors thank the staff and participants of HCHS/SOL for their important contributions. A complete list of staff and investigators is available on the study website, <http://www.csc.unc.edu/hchs/>. The HCHS/SOL Sociocultural Ancillary Study was supported by grant 1 RC2 HL101649 from the NIH/NHLBI (Gallo/Penedo MPIS). The authors

thank the staff and participants of HCHS/SOL and the HCHS/SOL Sociocultural Ancillary Study for their important contributions. Preparation for this manuscript was supported by NIH Ruth L. Kirschstein Institutional National Research Service Awards T32HL007426 and T32AT003378.

Religiosity and spirituality are integral aspects of Hispanic/Latino culture that play important roles in relationships, health, and well-being (Campesino & Schwartz, 2006). Although a large percentage of the U.S. population as a whole is fairly religious (believes in God, attends religious services, and prays; Pew Research Center, 2015), Hispanics/Latinos appear to be different in how they practice religion and in the intensity of certain beliefs. For example, population-based surveys indicate that Hispanics/Latinos are more likely than non-Hispanics to say that religion is very important in their lives (Pew Hispanic Center, 2007). For the majority of Hispanics/Latinos, God is an active force in daily life, and most Hispanics/Latinos pray every day, attend religious services at least once per month, and attend Hispanic/Latino-oriented churches (Pew Hispanic Center, 2007). Cultural influences such as collectivistic and family-oriented values also impact spirituality for many Hispanics/Latinos (Campesino & Schwartz, 2006; Gallo et al., 2009). Yet, there are limited studies of religiosity and/or spirituality (R/S) as they relate to physical health in Hispanics/Latinos, and the existing studies focus primarily on Mexican Americans to the exclusion of other Hispanic/Latino backgrounds (Campesino & Schwartz, 2006; Hill et al., 2008).

Hispanics/Latinos also encounter culturally-specific stressors that may impact health and well-being and contribute to ethnic disparities in health. For example, they experience greater socioeconomic adversity, particularly compared with non-Hispanic Whites in the U.S. (Pew Hispanic Center, 2011). In addition, many experience immigration-related and acculturative stressors, such as a loss of social networks and status within their communities, family and intergenerational conflict, ethnic discrimination, and stress regarding legal status, to name a few (Caplan, 2007). Research indicates that for Hispanics/Latinos, religiosity and spirituality may serve as important factors when coping with many of life's adversities (Campesino & Schwartz, 2006). Given the importance of R/S for Hispanic/Latino culture, more research in this population is warranted to understand how R/S is associated with health and risk factors for disease.

To our knowledge, no study has examined the association between R/S and the metabolic syndrome (MetS). The MetS is characterized by the presence of co-occurring cardiometabolic risk factors including abdominal obesity, hypertension, raised triglycerides, reduced high-density lipoprotein cholesterol (HDL-C), and elevated glucose levels. It is associated with increased risk for CVD, type 2 diabetes, and premature all-cause mortality (Gami et al., 2007; Haffner, 2006). Approximately one-fifth to one-third of the adult U.S. population meet criteria for MetS (Ervin, 2009; Beltrán-Sanchez et al., 2013), with more than 50% of adults age 60 and over meeting criteria for MetS (Mozumdar & Liguori, 2011). According to the American Heart Association, the presence of MetS is an important call to healthcare providers and patients to intervene to address multiple underlying risk factors related to lifestyle that could lead to the development or progression of conditions such as CVD and type 2 diabetes (Go et al., 2014).

Hispanics/Latinos vary from other ethnic groups in prevalence rates of conditions of metabolic origin. The prevalence of MetS is higher in Mexican Americans, particularly women, than in non-Hispanic White and Black Americans (Mozumdar & Liguori, 2011). The MetS was present in 36% of women and 34% of men who participated in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), which included over 16,000 Hispanic/Latino adults in the U.S. (Heiss et al., 2014). U.S. Hispanics/Latinos also have higher rates of obesity and diabetes than non-Hispanic White Americans (Okosun et al., 2001; Myers & Rodriguez, 2003; National Center for Health Statistics, 2016).

Prospective studies have shown that higher levels of (R/S) are protective against premature all-cause mortality, cardiovascular disease (CVD) incidence, and/or CVD-related mortality across ethnic groups (Chida et al., 2009; Li et al., 2016; McCullough et al., 2000; Powell et al., 2003) and specifically in older Mexican Americans (Hill et al., 2008) and in Black women (VanderWeele et al., 2017). While a limited number of those studies measured multidimensional aspects of R/S, including non-organizational religious activity (e.g. prayer), intrinsic religiosity, and religious/spiritual coping, the majority of studies examined only religious service attendance in relation to mortality or disease incidence (Chida et al., 2009). Multidimensional aspects of R/S, such as religious well-being, existential well-being, composite spiritual well-being, and forgiveness, in addition to frequency of prayer and service attendance have been associated with more favorable levels of cardiovascular and cardiometabolic risk factors. These include lower physiological reactivity in response to stress (Edmondson et al., 2005; Tartaro et al., 2005), lower ambulatory blood pressure, and lower levels of inflammatory markers, fasting glucose, cholesterol, and triglycerides (Doster et al., 2002; Holt-Lundstad et al., 2011).

A growing number of individuals who identify as spiritual do not necessarily identify with any religious belief, doctrine, or denomination (Campesino & Schwartz, 2006), leading researchers to distinguish spirituality and religiosity as overlapping, yet distinct multidimensional constructs (Zinnbauer et al., 1999). Moreover, different facets of R/S have related differentially to mental and physical health outcomes. For example, in a sample of cancer survivors, having higher scores on a spiritual well-being subscale measuring one's sense of purpose and peacefulness in life (i.e. Meaning/Peace) was associated with less depressive symptoms, whereas the subscale measuring one's sense of comfort and strength in their faith and spiritual belief's (i.e. Faith) was not associated with depressive symptoms (Gonzalez, et al., 2014). In a study of young adult women, measures of Religious Well-being and Existential Well-being differentially related to heart-rate and blood pressure reactivity in response to acute stress (Edmondson et al., 2005).

R/S has been hypothesized to promote health through varying mechanisms such as positive health behaviors, increased social support, improved access to resources, adaptive coping methods, and better mental health (George et al., 2002; Powell et al., 2003; Seybold & Hill, 2001). While previous research has supported the hypothesized relationship between organized religious activity (e.g. church attendance) and many of these potential mechanisms, the role of other aspects of R/S has been given less attention.

The current study explored the cross-sectional associations between several dimensions of religious activity and spiritual well-being and prevalent MetS, as well as its five individual components, in a population-based sample of Hispanics/Latinos from four major metropolitan communities in the U.S. (Bronx, NY; Chicago, IL; Miami, FL; and San Diego, CA). It was hypothesized that higher scores on R/S variables would be associated with lower prevalence of the MetS and more favorable outcomes on individual MetS components. There were no a priori hypotheses as to how dimensions of religiosity and spiritual well-being might differentially relate to these risk factors. Previous research has suggested that religious involvement may be a protective factor for all-cause mortality in women only (McCullough et al., 2000), whereas another study has shown that religiosity/spirituality was associated with greater cardiovascular stress reactivity in women than in men (Tartaro et al., 2005). Thus, sex was also explored as a potential moderator variable in this study.

Method

Participants and Procedures

HCHS/SOL is a prospective, epidemiological cohort study of the prevalence of multiple chronic health diseases and their risk factors. Exclusion criteria included the following: 1) being on active military service, 2) planning to move from the area in the next six months, 3) inability to complete the study in English or Spanish, or 4) physically unable to attend the clinic examination. The Sociocultural Ancillary Study (Gallo et al., 2014) examined additional socioeconomic, sociocultural, and psychological correlates of health in the same cohort of Hispanics/Latinos. Participants in the HCHS/SOL and Sociocultural Ancillary Study were aged 18–74 years, self-identified as Hispanic or Latino, and included individuals of Cuban, Central American, Dominican, Mexican, Puerto Rican, South American, and other Hispanic/Latino background living in four defined communities in the Bronx, NY; Chicago, IL; Miami, FL; and San Diego, CA.

Recruitment for HCHS/SOL was implemented through a two-stage area household probability design, with over-sampling of the 45–74 year age group at each stage. Participants attended a baseline examination consisting of a fasting blood draw, 2-hour oral glucose tolerance test (OGTT), anthropometric examination, and interviewer-administered questionnaires in English or Spanish at the preference of the participant. All questionnaires were previously translated into Spanish through a standard process, or newly translated into Spanish, certified by an independent translator, and tested by focus groups. Further details concerning the sampling design, recruitment (LaVange et al., 2010) and HCHS/SOL study procedures (Sorlie et al., 2010) are described elsewhere.

Participants in the Sociocultural Ancillary Study were a sub-sample of the HCHS/SOL cohort who consented to be contacted for ancillary studies. Those who were able and willing to attend a separate visit within 9 months of their baseline exam were eligible. Assessments consisted of interviewer-administered questionnaires in English or Spanish. Questionnaire translation procedures were consistent with the HCHS/SOL parent study. Participants received \$60 for their time and effort, as well as reimbursement for travel expenses as appropriate. Of the 16,415 HCHS/SOL baseline participants, recruiters attempted to reach 7,321 individuals, and 5,313 (N=72.6%) participated in the Sociocultural Ancillary Study.

Participants less than 45 years of age ($n=2,035$) were excluded from the current analyses because younger adults are significantly less likely to have developed MetS (Grundy, 2011). With this exclusion, the final sample size for the present study was 3,278.

Measures

Religious Activity—Religious activity was measured at the Sociocultural Ancillary Study interview with the Duke University Religion Index (DUREL; Koenig et al., 1997). Two distinct religious behaviors were assessed using two items from the DUREL. Organizational religious activity (Organizational) consisted of one item assessing frequency of religious service/meeting attendance (six response options ranging from “never” to “more than once per week”). Non-organizational religious activity (Non-organizational) consisted of one item assessing frequency of private religious activities such as prayer, meditation, or bible study (six response options ranging from “rarely or never” to “more than once a day”). Higher scores on each item correspond to greater frequency of the religious behavior. The DUREL has demonstrated high test-retest reliability (intra-class correlation = 0.91) and high convergent validity with other measures of religiosity (r 's = 0.71–0.86; Koenig & Bussing, 2010).

Spiritual Well-being (SWB)—SWB was measured at the Sociocultural Ancillary Study interview with a non-illness version of the Functional Assessment in Chronic Illness Therapy – Spiritual Well-Being Scale, Expanded (FACIT-Sp-Ex; Peterman, et al., 2002). The scale was originally developed for chronic illness populations, but has since been adapted for non-illness populations by re-wording two items from the original scale that refer to illness to refer instead to “difficult times” (available at FACIT.org). The scale consists of 23 items rated on a 5-point Likert scale from 0 = “not at all” to 4 = “very much.” The FACIT-Sp-Ex was administered in either English or Spanish in the current study. Items 1–12 were available in Spanish (see FACIT.org) and therefore did not require translation. Items 13–23 were translated using forward and backward standard translation procedures (Bonomi et al., 1996) and then underwent pilot testing at the HCHS/SOL San Diego site. Prior to conducting the present analyses, HCHS/SOL investigators examined the factor structure of the FACIT-Sp-Ex within the HCHS/SOL Sociocultural cohort ($N=5,278$) using confirmatory factor analysis (CFA), and found that a four-factor model with factors representing Meaning (e.g. “I feel a sense of purpose in my life”), Peace (e.g. “I feel a sense of harmony within myself”), Faith (e.g. “I find comfort in my faith or spiritual beliefs”) and Relational aspects of SWB (e.g. “I feel connected to other people”) best fit the data. The four-factor model excluded one problematic item from the Faith factor (“even during difficult times, things will be ok”), and one item was moved from the Relational factor to the Faith factor to improve model fit (“I feel connected to a higher power, e.g., God;” Brintz et al., 2016). The FACIT-Sp-Ex items demonstrated adequate internal consistency in the HCHS/SOL sociocultural sample (Cronbach's α for the total scale and each subscale ranging from .67-.90), as well as strong measurement invariance (i.e., the same factor structure, factor loadings, and item intercepts) across English and Spanish language administration of the measure. The measure was scored by summing the items in each subscale to yield four subscale scores, and then by summing the subscales to yield the total score, which included 22 of the 23 original items. Higher scores indicate higher levels of

each subscale and of total SWB. Participants with missing data for one or more items (N = 115) were not included in the total score or in the subscale score/s for which they had a missing item/s.

The Metabolic Syndrome (MetS)—Presence of the MetS was defined based on guidelines of the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III (Grundy et al., 2004), with changes to include self-reported anti-hypertensive and anti-diabetic medication use. It required the presence of 3 or more of the following risk factors: waist circumference > 102 cm (men) and > 88 cm (women); blood pressure $\geq 130 / 85$ mm Hg, or self-reported use of anti-hypertension medications; triglycerides ≥ 150 mg/dL; high-density lipoprotein cholesterol (HDL-c) < 40 mg/dL (men) and < 50 mg/dL (women); fasting plasma glucose (FPG) ≥ 100 mg/dL, or self-reported use of anti-diabetic medication. This information was collected by laboratory examination and by participant self-report of medications at the baseline HCHS/SOL examination.

Covariates—Variables collected during the HCHS/SOL baseline examination and included as covariates in analyses were age (in years), sex, Hispanic/Latino background group, field site, acculturation (Short Acculturation Scale for Hispanics [SASH] Language & Ethnic Social Relations Subscales; Marin et al., 1987), education level (<high school [HS] diploma/general education degree [GED], HS diploma/GED only, > HS diploma/GED), yearly household income level (five categories ranging from <\$10,000 to >\$75,000), prescription of anti-diabetic and/or anti-hypertensive medications, alcohol consumption (no current use or any current use), cigarette use (never, former, current), dietary quality ascertained from 24-hour dietary recall (Alternative Healthy Eating Index; Chiuve et al., 2012), and current self-reported daily minutes of physical activity, converted into metabolic minutes (combines moderate and vigorous physical activity and biking and walking for transportation).

Statistical Analyses

Preliminary analyses were performed in SPSS Version 22.0. Variables were evaluated for missing data, outliers and univariate normality. 299 participants were missing values on at least one religiosity, spirituality, or control variable. 20 participants were missing values on at least one outcome variable (i.e., MetS prevalence or a MetS component). Distributions were considered non-normal if the absolute value of the skew index was greater than 3.0 and the kurtosis index was greater than 10.0 (Kline, 2011). Triglycerides and glucose were log transformed to approximate normality in the initial analyses; however, results prior to log transformation are presented for ease of interpretation. Weighted means and standard errors for continuous variables and weighted percentages for categorical variables were evaluated for all variables in order to characterize the sample.

All remaining analyses were performed in Mplus Version 7.0 (Muthen & Muthen). All R/S variables were standardized within each analysis, while outcome variables were not standardized, so that regression estimates would be interpreted as the unit change in the outcome per 1 standard deviation change in the R/S variable. Logistic regression analyses were performed in which prevalent MetS was entered as a dichotomous outcome (0 = did not meet criteria; 1 = met criteria). All R/S subscale scores (Organizational, Non-

organizational, Meaning, Peace, Faith, Relational SWB) were entered simultaneously as continuous indicators with initial adjustment for sociodemographic covariates and subsequent adjustment for both sociodemographic and lifestyle covariates, and examined in relation to MetS prevalence. Odds ratios (OR) were estimated describing the change in odds of having the MetS per standard unit increase on religious activity and spiritual well-being variables. An OR of less than 1 signifies a decrease in odds and an OR of greater than 1 signifies an increase in odds, with increasing scores on R/S variables.

Similarly, multiple linear regression analyses were performed in which each of the individual MetS components were entered simultaneously as continuous outcomes. Unstandardized coefficients (B) were estimated describing the unit change in the MetS component per one standard deviation increase in the religious activity and spiritual well-being variables (R/S variables were standardized to ease interpretation). Analyses in which fasting plasma glucose or diastolic/systolic blood pressure were outcomes also adjusted for anti-diabetic or anti-hypertensive medication use, respectively. All analyses were repeated, including the FACIT-Sp-Ex total score (Total SWB) in place of the subscale scores. Post-hoc analyses were conducted in order to examine if sex moderated any of the associations by including interaction terms of each R/S variable with sex. Additionally, the original analyses were repeated while excluding participants with diagnosed coronary heart disease (CHD; excluded N = 305) to examine whether results were altered, as it is possible that individuals' levels of religiosity or spirituality may change after a life-changing diagnosis such as CHD, and the aim was to examine R/S associations with risk factors for CHD.

Maximum likelihood estimation with robust standard errors (MLR) was used to estimate parameters. MLR is a full information maximum likelihood approach, which provides an unbiased estimate of parameters by treating the missing data as random variables to be removed from the likelihood fit function as if they were never sampled, rather than deleting cases or imputing missing observations. This approach is usually more accurate than other approaches for handling missing data (Schafer & Graham, 2002) when data are missing at random. All analyses took into account the weights, clustering, and stratification of the sampling design. Statistical significance was defined at $p .05$.

Results

Sub-Population Description

Weighted descriptives indicated that the mean age of the sub-population (N = 3,278) ranging in age from 45 to 74 years was 57 years (SE = 0.24), and that 56% of participants were female. Participants were of diverse Hispanic/Latino background (29% Mexican, 28% Cuban, 19% Puerto Rican, 12% Central/South American, 10% Dominican, and 1% more than one/other background). Interviews were conducted primarily in Spanish (85%). More than half of participants (57%) reported a yearly household income less than \$20,000, with 41% not completing a high school education. Ten percent of participants were born in the U.S. Most participants identified as Roman Catholic (61%), with approximately 8% not identifying with any religion. Almost half (46%) of participants reported attending religious services once per week or more than once per week, and more than half (55%) reported engaging in non-organizational religious activity such as prayer, meditation, or bible study

daily or more than once daily. Around half (49%) of all participants aged 45–75 years (46% of males; 52% of females) met criteria for the MetS, with prevalence varying by Hispanic background (ranging from 45–54%). Weighted demographic characteristics are presented in Table 1, and descriptives for all R/S indicators, lifestyle covariates, and the metabolic syndrome and its components are presented in Table 2.

Correlations between Religious Activity and Spiritual Well-being variables

All R/S variables were significantly, positively correlated with each other (Pearson $r_s = .15 - .67$; $p_s < 0.001$). The Meaning, Peace, Faith, and Relational subscales of the FACIT-Sp-Ex were most strongly correlated with each other ($r_s = .40 - .67$). The Faith subscale was also moderately correlated with Organizational and Non-organizational religious activity ($r_s = .38$ and $.44$), whereas Meaning, Peace and Faith had low correlations with religious activity ($r_s = .15 - .28$). Correlation coefficients are reported in Table 3.

Primary Analyses

Religious Activity/Spiritual Well-being associations with prevalent metabolic syndrome—No R/S variable (Organizational, Non-organizational, Meaning, Peace, Faith, Relational) was significantly associated with presence of the MetS in logistic regressions including all R/S variables simultaneously, with initial adjustment for sociodemographic variables and subsequent adjustment for both sociodemographic and lifestyle variables. Total SWB was also not associated with presence of the MetS in similar analyses replacing the four SWB subscales with Total SWB. Results of analyses adjusting for both sociodemographic and lifestyle covariates are summarized in Table 4 as ORs (reference group = did not meet criteria for MetS). Post-hoc analyses indicated that sex did not significantly moderate any associations, and that excluding participants with diagnosed CHD did not alter the results (data not shown).

Religious Activity/Spirituality Well-being associations with individual components of the metabolic syndrome—Several R/S variables were significantly associated with MetS components in linear regression analyses that simultaneously included the religious activity subscales (Organizational and Non-organizational) and the four individual SWB subscales (Meaning, Peace, Faith, Relational), with adjustment for sociodemographic covariates and medication use where appropriate. Similar analyses were conducted replacing the four SWB subscales with Total SWB. Both Meaning ($B = -1.38$, $p = .010$, 95% CI $[-2.44, -.32]$) and Total SWB ($B = -.72$, $p = .042$, 95% CI $[-1.41, -.02]$) were significantly, inversely associated with waist circumference, with higher scores on Meaning and Total SWB related to lower waist circumference. In addition, Faith was significantly, inversely associated with diastolic blood pressure ($B = -.98$, $p = .002$, 95% CI $[-1.59, -.36]$), with higher scores on Faith related to lower diastolic blood pressure. Both Non-organizational ($B = .65$, $p = .034$, 95% CI $[.05, 1.25]$) and Peace ($B = .71$, $p = .026$, 95% CI $[.08, 1.33]$) were significantly, positively associated with diastolic blood pressure, with higher scores on Non-organizational and Peace related to higher diastolic blood pressure. Peace was also positively associated with systolic blood pressure ($B = 1.51$, $p = .013$, 95% CI $[.32, 2.70]$). R/S variables were not significantly associated with log-transformed fasting plasma glucose, log-transformed triglycerides, or HDL cholesterol.

When analyses were repeated with adjustment for lifestyle variables in addition to sociodemographic variables, the results appeared to be substantively comparable (although statistical difference tests were not conducted). However, when correcting p -values to account for multiple testing using the Bonferroni correction procedure, the only result that remained significant at $\alpha = .05$ was the inverse association between Faith and diastolic blood pressure. Because of the exploratory nature of the analyses, results of analyses *prior to* correcting for multiple testing are summarized in Table 4.

Post-hoc analyses indicated that sex did not significantly moderate any associations (data not shown). When the original analyses were repeated while excluding participants with diagnosed CHD, the results appeared to be comparable (data not shown), with the exception that a significant, inverse association between Faith and systolic blood pressure emerged ($B = -1.19, p = 0.036, 95\% \text{ CI } [-2.30, -.08]$), with higher scores on Faith related to lower systolic blood pressure.

Discussion

Previous research has found that dimensions of religiosity and spirituality (R/S) are associated with better health outcomes, including lower all-cause mortality, CVD incidence, and CVD-related mortality. R/S is an integral part of Hispanic/Latino culture, but research on R/S and health in Hispanics/Latinos is limited. Furthermore, many studies focus on religious service attendance to the exclusion of other aspects of R/S. The present study examined the associations between multiple dimensions of R/S and the MetS and its components in U.S. Hispanics/Latinos of diverse background, aged 45–74. Results showed that dimensions of religious activity (frequency of organizational religious service attendance, frequency of non-organizational religious activity) and of spiritual well-being as measured by the FACIT-Sp-Ex (Meaning, Peace, Faith, Relational, Total SWB) were not significantly associated with the presence of the MetS, a clustering of factors that pose a significant risk for diseases such as CVD and type 2 DM. Furthermore, the associations between R/S variables and individual components of the MetS were largely non-significant, and those that were had small effect sizes. Sex did not moderate the association with MetS or any of the individual MetS components. While previous studies have found associations between R/S variables and several individual components of the MetS, there are no previously published studies examining how R/S associates with presence of the MetS.

Although the effects were small, this study found several significant associations between R/S variables and blood pressure. Higher levels of Faith were associated with lower resting diastolic blood pressure. Possible mechanisms include increased use of adaptive coping and ability to manage stressful life events, although this was not tested in the current study. Of note is that the Faith subscale of the FACIT-Sp-Ex is the only subscale that directly mentions spirituality.

A population-based study of adults from the Chicago Community Adult Health Study examined the cross-sectional relationships between multiple dimensions of R/S, blood pressure and hypertension (Buck et al., 2009). Approximately 25% of the participants were Hispanic, with the largest group being non-Hispanic White followed by Non-Hispanic

Black. They found that higher self-reported spirituality was associated with higher diastolic blood pressure, and greater frequency of prayer was associated with greater odds of having hypertension (Buck et al., 2009). These findings are interesting, considering that the present study found positive associations between frequency of prayer (i.e. Non-organizational), Peace, and blood pressure. There is some research to suggest that harmful forms of religious coping are associated with worse health (Seybold & Hill, 2001). However, results from cross-sectional studies such as the present study must be interpreted cautiously, as individuals with worse health may turn to religious and/or spiritual practices more than healthy individuals as a form of coping with illness, possibly explaining the positive relationships between aspects of R/S and higher blood pressure (Gall et al. 2005).

Previous literature has found a link between greater frequency of religious service attendance and lower blood pressure, with most studies including primarily non-Hispanic/Latino samples in the U.S (see review by Seeman et al., 2003; Gillum & Ingram, 2006). Furthermore, previous literature suggests that the link between religious attendance and blood pressure is stronger for diastolic than for systolic blood pressure (see Koenig et al., 2001). However, consistent with the present study, results from the Chicago Community Adult Health Study mentioned above did not support the relationship between religious service attendance and blood pressure in Hispanics/Latinos (Buck et al., 2009).

There is a smaller existing body of literature than that on blood pressure examining the association between R/S and other individual components of the MetS or related outcomes. Inconsistent with the present study, a study of 100 married, primarily non-Hispanic White adults, found that higher levels of Spiritual Well-being (i.e. total scores on the FACIT-Sp-Ex) were significantly associated with lower fasting glucose and marginally lower triglycerides (Holt-Lunstad et al., 2011). However, that study also found non-significant associations between Spiritual Well-being, HDL and LDL cholesterol, consistent with the present study's null findings regarding HDL cholesterol. A separate study of Black women with diagnosed type 2 DM found that scores on measures of Religious Well-being and Existential Well-being were positively and inversely associated with hemoglobin A1C, respectively (Newlin et al., 2008). The present study did not support the association between R/S variables and glucose, although it included a different population and used different measures of R/S and glucose control.

The significant associations in the present study were not attenuated when additionally controlling for lifestyle variables. Higher scores on both Total Spiritual Well-being and the Meaning subscale were associated with lower waist circumference; yet, covariates including cigarette use, alcohol consumption, self-reported metabolic minutes of physical activity, and dietary behavior do not appear to explain the associations. It is possible that aspects of R/S are associated with lifestyle variables not included in the analyses, such as specific dietary profiles or other facets of physical activity behavior such as light intensity activity and sedentary behavior. Although some prior studies have found correlations between R/S and dietary and other health behaviors, existing research has focused primarily on African American populations (Reeves et al., 2012; Underwood & Powell, 2006). Additionally, psychosocial variables such as depression, coping, and social support have been associated both with R/S (Gonzalez et al., 2014; Westgate, 1996; Powel et al., 2003) and with

cardiometabolic health (Blaine, 2008; Goldbacher & Matthews, 2007; Bosworth et al., 2003; Kinder et al., 2004; Vogelzangs et al., 2007), and could be the focus of future studies.

Results of the present study also suggest that separating the FACIT-Sp-Ex into its four subscales (Meaning, Peace, Faith, Relational) demonstrated utility over using the total score, and that there appear to be meaningful distinctions between the FACIT-Sp-Ex subscales and the religious activity variables, as seen by the correlations amongst the subscales and religious activity items. The differential, although weak, associations of several of these variables with individual MetS components also demonstrated their distinctions as separate constructs.

Limitations and Future Directions

The present study has several limitations. First, the data are cross-sectional. Results must be interpreted with caution regarding directionality as well as causality, which cannot be inferred within the present study. Although the study included a diverse population of Hispanics/Latinos, participants were recruited from major metropolitan areas, so the results of this study may not be generalizable to Hispanics/Latinos in suburban and rural areas of the U.S. It should also be noted that although the FACIT-Sp-Ex was developed as a measure of what many commonly consider representative of dimensions of spiritual well-being, it is possible that individuals who score high on the measure do not consider themselves to be spiritual individuals. With the exception of the items included within the Faith subscale, the items in the FACIT-Sp-Ex do not directly refer to spirituality. Furthermore, although some R/S measures, including the FACIT-Sp-Ex have been validated in Hispanic/Latino populations, many were initially developed and validated using primarily non-Hispanic white samples (Campestrino & Schwartz, 2006; Bredle et al., 2011). Future studies can address some of these limitations by examining the longitudinal relationships between multidimensional aspects of R/S and health risk factors in Hispanics/Latinos. Additionally, studies should include Hispanics/Latinos living in more rural geographic locations, as these populations may encounter unique stressors that impact health outcomes, or have varying experiences with religiosity and spirituality.

The present study has a number of strengths. To our knowledge, this is the first study to examine R/S in relation to the MetS. It also included objective measures of risk for CVD and type 2 DM in a large, well-powered sample of Hispanic/Latino adults middle aged and older, who have been understudied with regards to R/S and health outcomes. This study included well-validated measures of religious involvement and spiritual well-being. It also examined multiple dimensions of R/S, including separate subscales of spiritual well-being in addition to the single-item measures of religious behavior that have predominantly been examined in previous studies of religiosity and health.

Conclusion

This study found largely non-significant and several significant, but weak associations between multiple dimensions of religious activity and spiritual well-being and individual components of the metabolic syndrome. This study was exploratory, and thus, can serve as a guide for future studies aiming to examine the role of R/S in health outcomes in Hispanic/

Latino populations. Prospective, longitudinal research is needed to clarify the complex role of religiosity and spirituality in Hispanic/Latino health. However, this study does not support a link between several dimensions of R/S and presence of the metabolic syndrome in middle-aged and older Hispanics/Latinos in the U.S.

References

- Beltrán-Sánchez H, Harhay MO, Harhay MM, McElligott S. Prevalence and trends of metabolic syndrome in the adult US population, 1999–2010. *Journal of the American College of Cardiology*. 2013; 62(8):697–703. [PubMed: 23810877]
- Blaine B. Does depression cause obesity? A meta-analysis of longitudinal studies of depression and weight control. *Journal of Health Psychology*. 2008; 13(8):1190–1197. [PubMed: 18987092]
- Bonomi AE, Cella DF, Hahn EA, Bjordal K, Sperner-Unterweger B, Gangeri L, ... Zittoun R. Multilingual translation of the Functional Assessment of Cancer Therapy (FACT) quality of life measurement system. *Quality of Life Research*. 1996; 5(3):309–320. [PubMed: 8763799]
- Bosworth HB, Bartash RM, Olsen MK, Steffens DC. The association of psychosocial factors and depression with hypertension among older adults. *International Journal of Geriatric Psychiatry*. 2003; 18:1142–1148. [PubMed: 14677147]
- Bredle JM, Salsman JM, Debb SM, Arnold BJ, Cella D. Spiritual Well-Being as a Component of Health-Related Quality of Life: The Functional Assessment of Chronic Illness Therapy Spiritual Well-Being Scale (FACIT-Sp). *Religions*. 2011; 2:77–94.
- Brintz, CE., Birnbaum-Weitzman, OB., Merz, EL., Penedo, FJ., Daviglius, ML., Fortmann, AL., ... Llabre, MM. Validation of the Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing, Expanded (FACIT-Sp-Ex) across English and Spanish-speaking Hispanics/Latinos: Results from the Hispanic/Community Health Study/Study of Latinos Sociocultural Ancillary Study. *Psychology of Religion and Spirituality*. 2016. [org/10.1037/rel0000071](https://doi.org/10.1037/rel0000071)
- Buck AC, Williams DR, Musick MA, Sternthal MJ. An examination of the relationship between multiple dimensions of religiosity, blood pressure, and hypertension. 2009
- Camposino M, Schwartz GE. Spirituality among Latinas/os: Implications of culture in conceptualization and measurement. *Advances in Nursing Science*. 2006; 29:69–81. [PubMed: 16495689]
- Chida Y, Steptoe A, Powell LH. Religiosity/spirituality and mortality. *Psychotherapy and Psychosomatics*. 2009; 78:81–90. [PubMed: 19142047]
- Chiuve SE, et al. Alternative Dietary Indices Both Strongly Predict Risk of Chronic Disease. *J Nutr*. 2012; 142:1009–1018. [PubMed: 22513989]
- Doster JA, Harvey MB, Riley CA, Goven AJ, Moorefield R. Spirituality and cardiovascular risk. *Journal of Religion and Health*. 2002; 41(1):69–79.
- Edmondson KA, Lawler KA, Jobe RL, Younger JW, Piferi RL, Jones WH. Spirituality predicts health and cardiovascular responses to stress in young adult women. *Journal of Religion and Health*. 2005; 44:161–171.
- Ervin RB. Prevalence of metabolic syndrome among adults 20 years of age and over, by gender, age, race and ethnicity, and body mass index: United States, 2003–2006. *Natl Health Stat Report*. 2009; (13):1–7.
- Gall TL, Charbonneau C, Clarke NH, Grant K, et al. Understanding the nature and role of spirituality in relation to coping and health. *Canadian Psychology*. 2005; 46:88–104.
- Gallo LC, Penedo FJ, Carnethon M, Isasi C, Sotres-Alvarez D, Malcarne VL, ... Talavera GP. The Hispanic community health study/study of Latinos sociocultural ancillary study: Sample, design, and procedures. *Ethnicity & disease*. 2014; 24(1):77–83. [PubMed: 24620452]
- Gallo LC, Penedo FJ, Espinosa de los Monteros K, Arguelles W. Resiliency in the face of disadvantage: Do Hispanic cultural characteristics protect health outcomes? *Journal of Personality*. 2009; 77:1707–1746. [PubMed: 19796063]

- Gami AS, Witt BJ, Howard DE, Erwin PJ, Gami LA, Somers VK, et al. Metabolic syndrome and risk of incident cardiovascular events and death: a systematic review and meta-analysis of longitudinal studies. *Journal of the American College of Cardiology*. 2007; 49:403–414. [PubMed: 17258085]
- George LK, Ellison CG, Larson DB. Explaining the relationships between religious involvement and health. *Psychological inquiry*. 2002; 13(3):190–200.
- Gillum RF, Ingram DD. Frequency of attendance at religious services, hypertension, and blood pressure: the third national health and nutrition examination survey. *Psychosomatic Medicine*. 2006; 68(3):382–385. [PubMed: 16738068]
- Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, ... Stroke SS. Heart disease and stroke statistics--2014 update: a report from the American Heart Association. *Circulation*. 2014; 129(3):e28. [PubMed: 24352519]
- Goldbacher EM, Matthews KA. Are psychological characteristics related to risk of the metabolic syndrome? A review of the literature. *Annals of Behavioral Medicine*. 2007; 34:240–252. [PubMed: 18020934]
- Gonzalez P, Castaneda SF, Dale J, Medeiros EA, Buelna C, Nunez A, ... Talavera GA. Spiritual well-being and depressive symptoms among cancer survivors. *Support Care Cancer*. 2014
- Grundy, SM., editor. *Atlas of atherosclerosis and the metabolic syndrome*. 5. New York, NY: Spring Science and Business Media; 2011.
- Grundy SM, Brewer HB, Cleeman JI, Smith SC, Lenfant C. Definition of Metabolic Syndrome: Report of the National Health, Lung, and Blood Institute/American Heart Association conference on scientific issues related to definition. *Circulation*. 2004; 109:433–438. [PubMed: 14744958]
- Haffner SM. Relationship of metabolic risk factors and development of cardiovascular disease and diabetes. *Obesity*. 2006; 14:121S–127S. [PubMed: 16931493]
- Heiss G, Snyder ML, Teng Y, Schneiderman N, Llabre MM, Cowie C, ... Avilés-Santa L. Prevalence of metabolic syndrome among Hispanics/Latinos of diverse background: the Hispanic Community Health Study/Study of Latinos. *Diabetes care*. 2014; 37(8):2391–2399. [PubMed: 25061141]
- Hill TD, Angel JL, Ellison CG, Angel RJ. Religious attendance and mortality: An 8-year follow-up of older Mexican Americans. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2005; 60(2):S102–S109.
- Holt-Lunstad J, Steffen PR, Sandberg J, Jenson B. Understanding the connection between spiritual well-being and physical health: an examination of ambulatory blood pressure, inflammation, blood lipids and fasting glucose. *Journal of Behavioral Medicine*. 2011 online only.
- Kinder LS, Carnethon MR, Palaniappan LP, King AC, Fortmann SP. Depression and the metabolic syndrome in young adults: Findings from the third National Health and Nutrition Examination Survey. *Psychosomatic Medicine*. 2004; 66:316–322. [PubMed: 15184689]
- Kline, RB. *Principles and practice of structural equation modeling*. 3. New York, NY: The Guilford Press; 2011.
- Koenig HG, Büssing A. The duke university religion index (DUREL): A five-item measure for use in epidemiological studies. *Religions*. 2010; 1(1):78–85.
- Koenig, HG., McCullough, ME., Larson, DB. *Handbook of Religion and Health*. New York: Oxford University Press; 2001.
- Koenig HG, Meador K, Parkerson G. Religion Index for psychiatric research. *American Journal of Psychiatry*. 1997; 154:885–886.
- LaVange LM, Kalsbeek WD, Sorlie PD, et al. Sample Design and Cohort Selection in the Hispanic Community Health Study/Study of Latinos. *Ann Epidemiol*. 2010; 20(8):642–649. [PubMed: 20609344]
- Li S, Stampfer MJ, Williams DR, VanderWeele TJ. Association of religious service attendance with mortality among women. *JAMA Internal Medicine*. 2016; 176:777–785. [PubMed: 27183175]
- Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences*. 1987; 9:183–205.
- McCullough ME, William H, Larson DB, Koenig HG, Thoreson C. Religious involvement and mortality: A meta-analytic review. *Health Psychology*. 2000; 19:211–222. [PubMed: 10868765]
- Mozumdar A, Liguori G. Persistent increase of prevalence of metabolic syndrome among U.S. adults: NHANES III to NHANES 1999–2006. *Diabetes Care*. 2011; 34:216–219. [PubMed: 20889854]

- Muthén, LK., Muthén, BO. Mplus User's Guide. 7. Los Angeles, CA: Muthén & Muthén; 1998–2012.
- Myers, HF., Rodriguez, N. Acculturation and physical health in racial and ethnic minorities. In: Chun, KM, Organista, PB., Gerardo, M., editors. *Acculturation: Advances in theory, measurement, and applied research*. Washington, DC: American Psychological Association; 2003. p. 163-185.
- National Center for Health Statistics. *Health, United States, 2015: With special feature on racial and ethnic health disparities*. Hyattsville, MD: Centers for Disease Control; 2016. Report No. 76–641496
- Newlin K, Melkus GD, Tappen R, Chyun D, Koenig HG. Relationships of religion and spirituality to glycemic control in Black women with type 2 diabetes. *Nursing research*. 2008; 57(5):331–339. [PubMed: 18794717]
- Okosun IS, Chandra KM, Choi S, Christman J, Dever GE, Prewitt TE. Hypertension and type 2 diabetes comorbidity in adults in the United States: risk of overall and regional adiposity. *Obesity research*. 2001; 9(1):1–9. [PubMed: 11346661]
- Park CL. Religiousness/spirituality and health: A meaning systems perspective. *Journal of Behavioral Medicine*. 2007; 30:319–328. [PubMed: 17522971]
- Peterman AH, Fitchett G, Brady MJ, Hernandez L, Cella D. Measuring spiritual well-being in people with cancer: the functional assessment of chronic illness therapy--Spiritual Well-being Scale (FACIT-Sp). *Annals of Behavioral Medicine*. 2002; 24(1):49–58. [PubMed: 12008794]
- Pew Hispanic Center. *Changing faiths: Latinos and the transformation of American religion*. Washington, DC: 2007.
- Pew Hispanic Center. *Statistical Portrait of Hispanics in the United States, 2009*. Washington, DC: 2011.
- Pew Research Center. *US Public Becoming Less Religious*. Washington, DC: 2015.
- Powell LH, Shahabi L, Thoreson CE. Religion and spirituality. *American Psychologist*. 2003; 58:36–52. [PubMed: 12674817]
- Reeves RR, Adams CE, Dubbert PM, Hickson DA, Wyatt SB. Are religiosity and spirituality associated with obesity among African Americans in the Southeastern United States (the Jackson Heart Study)? *Journal of Religious Health*. 2012; 51:32–48.
- Salkind, NJ., editor. *Encyclopedia of research design*. Vol. 1. Sage; 2010.
- Schafer JL, Graham JW. Missing data: our view of the state of the art. *Psychological Methods*. 2002; 7:147–77. [PubMed: 12090408]
- Seeman, Teresa E., Dubin, Linda Fagan, Seeman, Melvin. Religiosity/spirituality and health: A critical review of the evidence for biological pathways. *American Psychologist*. 2003; 58(1):53. [PubMed: 12674818]
- Seybold KS, Hill PC. The role of religion and spirituality in mental and physical health. *Current Directions in Psychological Science*. 2001; 10(1):21–24.
- Sorlie PD, Avilès-Santa LM, Wassertheil-Smoller S, et al. Design and Implementation of the Hispanic Community Health Study/Study of Latinos. *Ann Epidemiol*. 2010; 20(8):629–641. [PubMed: 20609343]
- Tartaro J, Luecken LJ, Gunn HE. Exploring heart and soul: Effects of religiosity/spirituality on gender on blood pressure and cortisol stress responses. *Journal of Health Psychology*. 2005; 10:753–766. [PubMed: 16176954]
- Tull ES, Doswell WM, Cort MA. Spirituality moderates the relationship of psychosocial stress to metabolic risk factors among Afro-Caribbean immigrants in the US Virgin Islands. *Journal of racial and ethnic health disparities*. 2015; 2(1):132–138. [PubMed: 25745593]
- Underwood SM, Powell RL. Religion and spirituality: Influence on health/risk behavior and cancer screening behavior of African Americans. *The ABNF Journal*. 2006; 17:20–31. [PubMed: 16596897]
- VanderWeele TJ, Yu J, Cozier YC, Wise L, Argentieri MA, Rosenberg L, ... Shields AE. Attendance at Religious Services, Prayer, Religious Coping, and Religious/Spiritual Identity as Predictors of All-Cause Mortality in the Black Women's Health Study. *American journal of epidemiology*. 2017; 185:515–522. [PubMed: 28338863]

- Vogelzangs N, Beekman ATF, Kritchevsky SB, Newman AB, Pahor M, Yaffe K, et al. Psychosocial risk factors and the Metabolic Syndrome in elderly persons: Findings from the Health, Aging and Body Composition Study. *Journal of Gerontology*. 2007; 62A:563–569.
- Zinnbauer BJ, Pargament KI, Scott AB. The emerging meanings of religiousness and spirituality: Problems and prospects. *Journal of Personality*. 1999; 67:889–919.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Weighted HCHS/SOL Sociocultural Ancillary Study (SCAS) Sample Demographic Characteristics in Participants Aged 45 and Older (Total N=3,278).

Variable	Mean (SE) or Percentage (%)
Age (years)	56.84 (.24)
Female Sex	56.4%
Spanish Language Interview	84.7%
High school equivalent or beyond	59.4%
Born in the U.S.	9.8%
SASH Language (range 1–5)	1.75 (.04)
SASH Ethnic Relations (range 1–5)	2.15 (.02)
<i>Yearly family income</i>	
\$20,000	56.6%
\$20,001–\$40,000	28.3%
>\$40,000	15.1%
<i>Hispanic Background</i>	
Mexican	28.7%
Cuban	28.3%
Puerto Rican	19.0%
Central/South American	12.3%
Dominican	10.4%
More than one/other	1.3%
<i>Religious Identification</i>	
Roman Catholic	61.4%
Christian (nonspecified)	14.5%
None	7.6%
Pentecostal	6.0%
Jehovah's Witness	3.4%
All others (< 2.0% in each group)	7.1%

Note. All descriptives take into account participant sampling weights

Table 2

Weighted Descriptive Statistics for R/S Indicators, Lifestyle Covariates, and the Metabolic Syndrome for Participants Aged 45 and Older (Total N = 3,278)

Variable	M (SE) or Percentage (%)
Waist circumference (cm)	100.00 (.32)
HDL-cholesterol (mg/dL)	49.60 (.37)
Fasting glucose (mg/dL)	107.55 (.89)
Triglycerides (mg/dL)	152.12 (4.17)
Systolic BP (mmHg)	129.27 (.47)
Diastolic BP (mmHg)	75.50 (.31)
Metabolic Syndrome	49.1%
Anti-hypertensive meds	28.5%
Anti-diabetic meds	18.3%
Physical Activity (METS/day)	451.78 (20.27)
Alternative Healthy Eating Index (range 28–77)	50.08 (.26)
Current alcohol consumption (vs. none)	42.8%
<i>Cigarette Use</i>	
Never	54.2%
Former	25.7%
Current	20.1%
<i>Organizational Religious Activity (range 1–6)</i>	
Never	18.4%
Once a year or less	8.0%
A few times a year	13.9%
A few times a month	13.7%
Once a week	26.7%
More than once per week	19.3%
<i>Non-Organizational Religious Activity (range 1–6)</i>	
Rarely or never	18.5%
A few times a month	8.0%
Once a week	8.2%
Two or more times/week	10.0%
Daily	41.8%
More than once/day	13.6%
<i>Facit-Sp-Ex Total Score (range 9–88)</i>	69.27 (.32)
Meaning (range 0–16)	13.19 (.07)
Peace (range 0–16)	11.83 (.09)
Faith (range 0–16)	12.55 (.09)
Relational (range 0–40)	31.67 (.17)

Note. R/S = Religiosity/Spirituality. M = mean. SE = standard error. BP = blood pressure. METS = metabolic minutes.

Table 3

Intercorrelations between Religious Activity/Spiritual Well-being Scales

Scale	ORA	NORA	Meaning	Peace	Faith	Relational	Overall SWB
ORA	—						
NORA	.43	—					
Meaning	.15	.19	—				
Peace	.16	.21	.67	—			
Faith	.38	.44	.40	.44	—		
Relational	.23	.28	.61	.60	.60	—	
Total SWB	.29	.35	.77	.79	.75	.92	—

Note. All correlations significant at $p < .001$. ORA = organizational religious activity (i.e., frequency of religious service attendance). NORA = non-organizational religious activity (i.e., frequency of prayer, meditation or bible study). SWB = spiritual well-being.

Table 4
 Regression Estimates for Religiosity/Spirituality Variables and Metabolic Syndrome Components

	Diastolic BP (mmHg)		Systolic BP (mmHg)		Waist Circumf. (cm)		Fasting Glucose (mg/dL)		Triglycerides (mg/dL)		HDL-cholesterol (mg/dL)		Metabolic Syndrome	
	B	[95% CI]	B	[95% CI]	B	[95% CI]	B	[95% CI]	B	[95% CI]	B	[95% CI]	B	[95% CI] ^a
ORA	-.16	[-.78, .46]	-.46	[-1.41, .50]	.03	[-.61, .68]	.18	[-1.41, 1.77]	-.94	[-5.57, 3.68]	-.07	[-.76, .62]	.97	[.86, 1.06]
NORA	.70	[1.10, 1.30]*	.59	[-.34, 1.52]	-.10	[-.79, .58]	-.86	[-2.45, .74]	-2.20	[-7.66, 3.27]	.55	[-.24, 1.35]	.95	[.17, .06]
Meaning	-.61	[-1.28, .07]	-.51	[-1.68, .65]	-1.29	[-2.30, -.27]*	-.23	[-1.84, 1.37]	-1.41	[-6.55, 3.73]	.38	[-.37, 1.13]	.88	[.75, 1.02]
Peace	.75	[1.12, 1.38]*	1.54	[3.35, 2.73]**	.05	[-.93, 1.04]	1.96	[-.08, 4.00]	-5.91	[-20.63, 8.81]	-.12	[-1.12, .87]	1.13	[.97, 1.31]
Faith	-.95	[-1.55, -.34]**	-.82	[-1.86, .21]	-.02	[-.82, .77]	-1.21	[-3.83, .79]	2.06	[-6.54, 10.65]	-.24	[-1.17, .68]	1.06	[.87, 1.23]
Relational	.31	[-.41, 1.04]	-.72	[-1.98, .55]	.29	[-.60, 1.17]	.004	[-2.06, 2.07]	6.62	[-7.62, 20.85]	.01	[-1.17, 1.21]	.93	[.79, 1.08]
Total SWB	-.28	[-.89, .32]	-.45	[-1.51, .60]	-.71	[-1.41, -.02]*	-1.45	[-3.34, .44]	1.33	[-5.05, 7.70]	.07	[-.32, .57]	.96	[.87, 1.06]

Note. ORA = organizational religious activity, NORA = non-organizational religious activity, SWB = spiritual well-being, HDL = high density lipoprotein, BP = blood pressure. Only Religiosity/Spirituality variables were standardized, so that B can be interpreted as the unit change in the metabolic outcome for every standard unit increase in the religiosity/spirituality variable. The odds ratio (OR) can be interpreted as the relative change in odds of having the metabolic syndrome per standard unit increase on religiosity/spirituality variables. All religiosity/spirituality variables were entered in one model simultaneously, except for Total SWB, which was entered in a separate model simultaneously with ORA and NORA. All models adjusted for sociodemographic and lifestyle covariates. Fasting glucose and blood pressure models also adjusted for anti-diabetic or anti-hypertensive medication use, respectively.

^aReference group = metabolic syndrome not present

* $p < .05$,

** $p < .01$, prior to applying correction for multiple testing