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Lower life satisfaction, active coping and cardiovascular disease risk factors in older African Americans: outcomes of a longitudinal church-based intervention

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Abstract

This study examined lower life satisfaction, active coping and cardiovascular disease risk factors (diastolic and systolic blood pressure, body mass index, and circumferences) in older African Americans over the phases of an 18-month church-based intervention, using a quasi-experimental design. Participants (n = 89) were 45 years of age and older from six churches (three treatment, three comparison) in North Florida. Lower life satisfaction had a persistent unfavorable effect on weight variables. Active coping showed a direct beneficial effect on selected weight variables. However, active coping was adversely associated with blood pressure, and did not moderate the association between lower life satisfaction and cardiovascular risk factors. The intervention had a beneficial moderating influence on the association between lower life satisfaction and weight variables and on the association between active coping and these variables. Yet, this pattern did not hold for the association between active coping and blood pressure. The relationship of lower life satisfaction and selected cardiovascular risk factors and the positive effect of active coping were established, but findings regarding blood pressure suggest further study is needed.

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Compliance with ethical standards

Conflict of interest Yesenia P. Mendez, Penny A. Ralston, Kandauda (K. A. S.) Wickrama, Dayoung Bae, Iris Young-Clark, Jasminka Z. Ilich declare that they have no conflict of interest.

Human and animal rights and Informed consent All procedures performed in this study involving human participants were in accordance with the ethical standards of the Florida State University Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Keywords

Life satisfaction; Active coping; Cardiovascular disease risk; Church-based health promotion

Introduction

Cardiovascular disease (CVD) is the leading cause of death in the U.S and is a particular issue for Africans Americans where mortality rates are highest in comparison to other racial/ethnic groups. For example, both African American male (352.4 per 100,000) and female (241.3) mortality rates exceed those of their White counterparts (266.1 and 182.1, respectively) (Benjamin et al., 2017). Two key risk factors for the incidence of CVD in African Americans are hypertension and overweight/obesity (Benjamin et al., 2017). Of increasing interest is the link between these CVD risk factors and mental health in African Americans.

As a measure of mental health, life satisfaction is a construct related to the evaluation of one's cumulative life experiences at a particular point in time and provides a global assessment in relation to several life domains (Brief et al., 1993; Diener, 1984). For some older African Americans, lower life satisfaction may be evident due to the cumulative effects of social hardship including systematic and day-to-day discrimination (Boehm et al., 2015; Utsey et al., 2000). Life satisfaction reflects either "top down" or "bottom up" theories. While top down theories posit that people first compute a general life satisfaction judgment and then rely on this general feeling when judging specific domains, the bottom up theories suggest that life satisfaction is the sum of how one judges each domain. Thus, those who have lower levels of satisfaction may have experienced more life challenges over the life course than those who have had fewer challenges (Diener, 2009). These life challenges can have a cumulative negative effect on health (Boehm et al., 2015). This health influence may largely operate through psychological and behavioral mechanisms. For instance, previous research has documented the relationship between lower life satisfaction and unhealthy behaviors in African American population (Wickrama et al., 2012a, 2012b). Further, studies conducted with Caucasian and mixed-race populations have established a link between overweight/obesity (i.e., body mass index and waist/hip ratio) and mental health indicators including depression, anxiety, sleep disturbances and lower life satisfaction (Kuroki, 2016; Rosmond & Bjorntorp, 1998; Rosmond et al., 1996).

Another construct related to mental health is active coping. Consistent with the social cognitive theory (Bandura, 1989, 1998, 2001), active coping is a process by which people manage stress by taking active steps to try to remove or overcome the stressors in their lives or to modify the effects of stress (Carver et al., 1989). For African Americans, stress may include day-to-day and systemic racism and discrimination, and social and economic disadvantages (Jackson et al., 1996; Pascoe & Richman, 2009; Roberts et al., 2008). Previous research has documented that African Americans have been shown to employ active coping strategies (Ellison et al., 2008; Ellison & Taylor, 1996; Wittink et al., 2009) but to our knowledge no studies have examined active coping in church-based African American populations. And although active coping and blood pressure in African Americans

has been studied (Dressler et al., 1998; Subramanyam et al., 2013), less is known about the relationship between active coping and CVD risk factors related to overweight/obesity in this population.

The overall aim of this study was to examine the relationship of lower life satisfaction, active coping and CVD risk factors in mid-life and older African Americans over the phases of a church-based intervention (Fig. 1). A church-based intervention was investigated because churches are key organizations for African Americans due to history, culture and religious values. Further, church-based health interventions have resulted in positive physical health outcomes (Campbell et al., 2007; Crook et al., 2009; DeHaven et al., 2004; Yeary et al., 2012). However, few studies have examined mental health outcomes in church-based interventions (Campbell et al., 2007; DeHaven et al., 2004; Hankerson & Weissman, 2012) and to our knowledge no church-based intervention studies have investigated the relationship of lower life satisfaction, active coping and CVD risk factors as outcomes. Finally, the rigor of church-based studies has been limited due to lack of theoretical frameworks and longitudinal experimental designs, among other issues (Campbell et al., 2007; Crook et al., 2009).

Drawing from the “bottom up” life satisfaction theories and social cognitive theory, the present study specifically investigated the association between lower life satisfaction (LLS), active coping, and CVD risk factors related to hypertension (systolic and diastolic blood pressure [SBP, DBP]) and overweight/obesity (body mass index [BMI] and circumferences including waist, hip, abdomen, and waist/hip ratio) in mid-life and older African Americans. The specific objectives for the study included the examination of: (1) the influence of LLS on CVD risk factors, (2) the direct influence of active coping on CVD risk factors, (3) the moderating effect of active coping on the association between LLS and CVD risk factors, and (4) the treatment effect on the association between LLS and CVD risk factors and on the association of active coping and CVD risk factors. Confounding factors in the study included age, gender, marital status and educational level.

Lower life satisfaction and CVD risk factors

The literature suggests that there is a relationship between poor mental health measures and CVD risk factors. Rosmond and Bjorntorp (1998) found, in their study of 1464 Swedish women, that there was an association between psychiatric symptoms and obesity and abdominal distribution of body fat in women. Further, in a subsequent study of 1040 Swedish men, Rosmond et al. (1996) found linkages between waist/hip ratio and symptoms of depression, anxiety with associated sleep disturbances, as well as psychosomatic symptoms and dissatisfaction.

With regard to the relationship of LLS and CVD risk factors, studies using African American populations have shown a linkage between LLS and unhealthy behaviors such as poor diets, physical inactivity, and insufficient sleep (Wickrama et al., 2012a, 2012b) which are related to the incidence of hypertension and overweight/obesity (Benjamin et al., 2017).

However, few studies could be found that investigated the direct relationship between life satisfaction and CVD risk related to hypertension and obesity/overweight variables,

especially in African Americans. In one of the few studies identified, Kuroki (2016) examined the association between body weight and life satisfaction using data from the Behavioral Risk Factor Surveillance System (2005–2010) and found that adverse life satisfaction and obesity were significantly associated even when socioeconomic factors were controlled. Based on this literature, our first hypothesis is that there would be positive associations between LLS and selected CVD risk factors over the phases of the study, with higher LLS scores associated with higher CVD risk (see Fig. 1).

The direct effect of active coping on CVD risk factors

The direct contribution of coping resources to positive health outcomes has been documented in recent psychophysiological research (Matthews & Gallo, 2011; Taylor & Stanton, 2007; Tomaka et al., 1993; Wickrama et al., 2015). Yet for African Americans, active coping styles are complex. For example, John Henryism, historically identified with this population (Flaskerud, 2012; James, 1994), is based on the mythical Black folk hero John Henry, the steel-driver whose prowess was measured in a race against a steam-powered hammer where he was victorious but died of heart failure due to stress. The resulting hypothesis of the link between striving against life challenges and CVD risk was further supported by the case study of an illiterate sharecropper, John Henry Martin, who overcame great odds to own land in North Carolina but suffered from cardiovascular and other diseases in his early 60s and was forced to give up farming (James et al., 1983). Studies of African Americans examining the John Henry hypothesis have linked active coping to negative cardiovascular health outcomes (Dressler et al., 1998; Fernander et al., 2004; Subramanyam et al., 2013; Whitfield et al., 2010). In particular, systolic and diastolic blood pressure have been shown to be positively linked to active coping in African American men and those with lower socioeconomic status (Dressler et al., 1998; Merritt et al., 2004; Subramanyam et al., 2013).

Type of active coping may influence health outcomes. African Americans who regularly attend Christian churches may adopt more active coping styles that reflect their religious beliefs (Ellison et al., 2008; Ellison & Taylor, 1996; Wittink et al., 2009) but less is known about the association of non-religious active coping and CVD risk in church-based populations. Based upon the literature on active coping and African Americans our second hypothesis is that active coping will be negatively associated with CVD risk factors of blood pressure, BMI and circumferences (see Fig. 1), yet complexities such as John Henryism need to be considered especially in relation to blood pressure.

The moderating effect of active coping

As posited by social cognitive theory, individuals with a strong sense that they are able cope with life challenges are expected to be more active in avoiding harmful consequences of these challenges (Bandura, 1998). Similarly, Diener (1984) has suggested that perceived control is positively associated with life satisfaction, as the feeling of control over one’s life empowers people to deal effectively with life circumstances. Previous research has established a linkage between active coping and life satisfaction with those who are more proactive having higher life satisfaction (Dubey & Agarwal, 2007). As discussed above, the literature shows that African Americans use active coping strategies. Thus, our third

hypothesis is that active coping—in this instance non-religious active coping—will buffer the detrimental influence of LLS on CVD risk in African Americans (see Fig. 1).

Treatment effect on the associations between lower life satisfaction and CVD risk factors

Finally, we expect that the church-based intervention will moderate the associations between LLS and CVD risk factors and the association between active coping and CVD risk factors (Fig. 1). In general, few church-based health interventions have examined mental health as a component in improving physical health (DeHaven et al., 2004; Hankerson & Weissman, 2012). However, health interventions with active coping components in non-church community settings have been successful in reducing weight (Cox et al., 2012) and in improving mental health of African American women (Groh & Urbancic, 2015) especially if the interventions are culturally tailored. Based on these studies, our fourth hypothesis is that the intervention will have a moderating influence on the association between LLS, active coping and selected CVD risk factors.

Methods

Participants

Data for this paper were from a larger, quasi-experimental longitudinal study to determine the effectiveness of a church-based intervention to reduce CVD risk in mid-life and older African Americans. A detailed description of the methodology for the study is provided in Ralston et al. (2014), but in brief the data were collected from participants in six churches (three treatment, three comparison) in two North Florida counties. Size of church and community were used as criteria in the assignment of churches to treatment or comparison based on feedback from community advisors (Ralston et al., 2014). The sample (n = 89) included participants in the identified churches who attended church at least twice a month, who were randomly selected from church lists stratifying by age (45–64 years, 65 years and over) and gender, and who had completed all four phases of data collection (baseline, 6 months, 18 months and 24 months). The broader study was approved by the Florida State University Institutional Review Board. Per this approval, informed consent was obtained from all individual participants in the study.

Intervention

The Health for Hearts United (HHU) intervention was an 18-month program developed by the three treatment churches using community-based participatory research (CBPR) approaches (see Ralston et al., 2017 for a full description). The intervention was implemented in 6-month phases, framed around three conceptual components: awareness building (individual knowledge development), clinical learning (individual and small group educational sessions), and efficacy development (recognition and sustainability). Four types of programming were used throughout the intervention: (1) church-initiated (CVD awareness kick-off events implemented by the treatment churches), (2) joint programming (educational sessions planned jointly with health leaders and staff and held at the treatment churches), (3) standard programming (culturally tailored post cards and newsletters developed by staff with input from health leaders sent to the treatment participants) and (4) data collection health promotion (generic materials on reducing CVD risk during data

collection; counseling sessions with a Registered Dietitian based on clinical outcomes for both treatment and comparison participants). Specifically, CVD awareness kick-off events were implemented in phase I (awareness building), followed by joint programming in phase II (clinical learning) and phase III (efficacy development). Standard programming was implemented in all three phases (see Ralston et al., 2017). Key messages were identified for the intervention including eating better, moving around more, reducing stress (with attention to active coping strategies), and taking charge of your health.

Throughout the intervention, there were themes related to positive mental health. For example, the awareness building component focused on churches building capacity in promoting health themselves by using their own creative ideas to conceptualize and implement an event that would address CVD awareness (Campbell et al., 2007; Ralston et al., 2017). The clinical learning component, to promote in-depth learning from resource persons (Ralston et al., 2017), specifically included sessions held at the churches comprised of interactive speakers (psychologist, personal trainer) who addressed mental health awareness and active coping strategies. Physical activity was specifically included as an active coping strategy for mental health (Paluska & Schwenk, 2000). As a part of standard programming, culturally tailored post cards on reducing stress/active coping along with newsletters summarizing the content were mailed to each treatment group participant following the sessions to reinforce learning (Ralston et al., 2017). Finally, in the efficacy development component to promote confidence in maintaining health behavior changes (Campbell et al., 2007), sessions again were held at the churches with speakers focusing on the taking charge of your health message (increase knowledge, know your resources, and get empowered).

Comparison churches participated in health ministry development activities during the intervention and then received the intervention on a delayed basis (Ralston et al., 2014, 2017). Data were collected from participants in both the treatment and comparison churches prior to the initiation of the intervention (baseline), at 6 months (following phase I on awareness building), at 18 months (following phase II on clinical learning and phase III on efficacy development) and at 24 months (6 months following the intervention). Comparison church participants received the comparable intervention following 24 months, once all data had been collected.

Instruments and clinical measures

Instruments—The food habits and lifestyle questionnaire was administered to participants at sessions held at the churches. Trained staff provided assistance and conducted interviews when needed. The instrument included measures for life satisfaction, active coping, and background characteristics:

- LLS was measured using four reverse coded items of the Satisfaction with Life Scale (Diener et al., 1985) (i.e., “In most ways my life is close to ideal,” “The conditions of my life are excellent”, “So far I have gotten the important things I want in life”, and “I am satisfied with my life”) with 7-point-Likert-type responses (uncoded) ranging from 1 = strongly disagree to 7 = strongly agree

(internal consistency α = .86). Higher scores indicate lower life satisfaction (Wickrama et al., 2012a).

- Active coping was measured using a three-item scale created for the project. The scale, which reflected non-religious strategies that represent best practices in stress management emphasized in the Health for Hearts United intervention, included the following items: “When I feel stress, I: Do some type of physical activity,” “Do things for others” and “Do fun activities,” with responses ranging from “never (0)” to “very often (4).” Higher scores indicate engaging in active coping. The scale, which had an internal consistency of α = .735, was developed because other active coping measures were substantially longer (e.g., Carver’s Brief COPE measure is 28 items) and we were concerned about participant burden. Further, other active coping measures did not incorporate messages consistent with improving physical health through physical activity which was one of our key themes in the HHU intervention (Carver et al., 1989; Carver, 1997).
- Age was determined using 12 categories, ranging from “18–21” to “over 91” coded as 1–12 respectively. Categories were used to increase the response rate for this item, based on our prior experiences with the study population. Gender was coded as “female” (1) and “male” (2). Marital status was determined by the item “What is your marital status?” with responses of single (including separated, widowed, divorced) (coded as 0) and married (coded as 1). Respondents provided their education level using five categories ranging from “some high school” to “master’s degree or above” (coded 1–5 respectively).

Clinical measures—Clinical data were collected by trained staff at sessions held at the churches. After the participants rested for about 10 min, three blood pressure readings in the sitting position were taken using a digital device (A&D Medical, Miltitas, CA) on the non-dominant arm, with the average included in the analyses. Height was measured without shoes to the nearest 0.1 cm using a Charder stadiometer (Issaquah, WA). Weight was measured in indoor clothing to the nearest 0.1 kg using a Tanita digital scale (Arlington Heights, IL) and BMI (kg/m^2) was calculated. The circumferences (cm) were measured with a plastic, non-flexible, circumference measuring tape (Issaquah, WA) as the participant exhaled. The abdomen was measured at the top of the iliac crest, the hip at the largest circumference around the buttocks, and waist at the narrowest part of the torso.

Data analysis

Descriptive statistics were used to describe participants’ demographic characteristics, LLS, active coping, and CVD risk factors. Independent samples Chi square and t-tests assessed the treatment and comparison group differences across study variables. In addition, given the small sample size, path analysis incorporating multiple outcomes within the structural equation modeling (SEM) framework were performed to determine the proposed association between LLS, active coping, and the selected cardiovascular disease risk factors. In addition, multi-group comparison was performed to test the differences between the associations between LLS and CVD risk, and the associations between active coping and CVD risk

across treatment and comparison groups. All models were estimated using maximum likelihood estimation method with the Mplus software (version 7). Missing data were accounted for using Full Information Maximum Likelihood (FIML) procedures (Enders & Bandalos, 2001). We used the Comparative Fit Index (CFI > .95) and Root Mean Square Error of Approximation (RMSEA <.06) to evaluate model fit.

Results

The majority of participants were females (68.6%), in the age range of 50 to 63 (52.3%), married (51.7%) and with an education level of high school graduate or some college (23.9%, 31.0%, respectively) (Table 1). The comparison and treatment participants were similar except for marital status and work status with the treatment group having more married and retired participants than the comparison group. The treatment and comparison groups also were similar for LLS (M = 9.8, SD = 6.4; M = 10.8, SD 6.5, respectively), active coping (M = 6.1, SD = 2.9; M = 6.5, SD = 2.4, respectively), and CVD risk factors, except for diastolic blood pressure with the comparison group having higher levels (M = 77.5, SD = 12.9 mmHg; M = 83.1, SD = 9.8 mmHg, respectively; p < .05) (Table 2).

Lower life satisfaction

As shown in Tables 3 and 4, three incremental regression models were estimated for each of the CVD risk factors over phases of the treatment within the SEM framework. The results showed that, as expected, LLS (higher scores) was positively associated from baseline to 24 months with higher scores for abdomen circumference (.90 p <.01; 1.11 p <.001; .74, p < .05; 1.19, p < .001, respectively) (Table 3), waist (1.05, p < .001; .76, p <.01; .90 p <.01; .88, p < .001, respectively) (Table 3), hip (.85, p <.01; .77, p < .01; .90, p < .01, .88, p <.01, respectively) (Table 3), and with BMI (.36, p <.05, .44, p < .01; .39, p <.01, .38, p < .01, respectively) (Table 4). LLS (higher scores) also was associated with higher scores of diastolic blood pressure at 6 months only (.52, p < .01) (Table 4). In general, these results support the study hypothesis that LLS was positively associated with CVD risk in mid-life and older African Americans over the phases of a church-based longitudinal intervention.

However, no significant results were noted for LLS and waist/hip ratio (data not shown) or systolic blood pressure (Table 4). Also, no significant effects of being in the treatment group or interactions in terms of confounding factors (age, gender, marital status, and education) were found.

Active coping

Showing a direct beneficial health influence of coping resources, active coping was negatively associated with abdominal circumference at baseline through 18 months (− 1.79, p < .05; − 1.87, p < .05; − 1.58, p < .05, respectively) (Table 3), waist circumference at baseline only (− 1.72, p <.05) (Table 3), hip circumference at baseline and 18 months (− 1.88, p <.01; − 1.47, p < .05, respectively) (Table 3), and BMI at six and 18 months (−.74, p <.05; −.66, p < .05, respectively) (Table 4). Active coping was positively associated with systolic BP at 18 and 24 months (1.64, p <.05; 2.11, p < .01, respectively) and diastolic BP at 24 months (.93, p < .05) (Table 4). In general, these results support the study hypothesis

that active coping directly decreases the CVD disease risk (except for BP) in mid-life and older African Americans over the phases of a church-based longitudinal intervention.

However, no significant results were noted for active coping and waist/hip ratio (data not shown). Also, except for the treatment group at 24 months (6.13, $p < .05$), there were no significant treatment effects in the analysis and no confounding factor or significant LLS interactive effects (LLS × TRT) not shown by multiplicative terms.

Moderating and treatment effects

In addition to the testing of multiplicative interaction term (LLS × TRT) to examine the moderating effect of the treatment, the multi-group comparison in SEM framework was performed and the associations between LLS and CVD risk across treatment and comparison groups over the four phases of the study were compared (Table 5). These results show that most of the associations between LLS and CVD risk factors were not significant in the treatment group. However, most of the associations were significant in the comparison group suggesting greater vulnerability to LLS in this group. Most of Chi square for equality constraints suggest that these differences were statistically significant.

Similarly, the multi-group comparison in SEM framework was performed and the associations between active coping and CVD risk across treatment and comparison groups over phases of the study were compared (Table 6). These results show that most of the associations between active coping and the CVD risk factors were stronger and significant in the treatment group. Except for BP, these associations are beneficial. However, only the Chi squares involving the waist circumference measure were statistically significant.

Discussion

This study identified the associations among lower life satisfaction (LLS), active coping and selected CVD risk factors (diastolic and systolic blood pressure, BMI, and waist, abdomen, hip and waist/hip ratio circumferences) in mid-life and older African Americans over the phases of a longitudinal church-based intervention. The differences among the above variables in the treatment and comparison groups over the phases of the intervention were established as well. The results partially supported study hypotheses. With regard to the first hypothesis related to the association between LLC and CVD risk, the study showed observed significant relationships between LLS and waist, abdomen and hip circumferences and BMI over the course of the longitudinal study which is supported by previous studies (Kuroki, 2016; Rosmond & Bjorntorp, 1998; Rosmond et al., 1996). However, there were no significant relationships between LLS and waist/hip ratio and diastolic blood pressure. In general, the study findings suggest that there were persistent unfavorable effects of LLS on weight-related variables across the longitudinal study. The study also provided evidence that this effect was weaker in the treatment group. Thus, the emphasis on themes of positive mental health and well-being may have had some effect on the psychological outlook of participants.

Our second hypothesis related to the negative relationship between active coping and CVD risk factors was partially supported as well. Active coping was negatively related to waist,

abdomen and hip circumferences, yet the patterns only partially held across the longitudinal study. And this beneficial influence of active coping was stronger in the treatment group. These findings are consistent with the resource model perspective (Matthews & Gallo, 2011; Taylor & Stanton, 2007; Tomaka et al., 1993; Wickrama et al., 2015) which posits that coping resources have a direct positive influence on health (with or without moderating or buffering effect).

In contrast to our second hypothesis, active coping was positively associated with systolic and diastolic blood pressure at selected time points, although these findings were not as pervasive as the circumferences results. It could be that for these participants, active coping may have some elements of "John Henryism" where active coping has some effect on blood pressure levels (Fernander et al., 2004; Flaskerud, 2012; Hudson et al., 2015). Clearly, more research is needed to sort out these relationships. Finally, because there were no significant findings regarding active coping moderating the association between LLS and CVD risk factors, our third hypothesis was not supported.

With regard to support for our fourth hypothesis, the results regarding LLS, active coping and CVD risk factors comparing the treatment and comparison groups suggest a beneficial moderating influence of treatment on the associations between these factors. The treatment group showed a moderation of the effects of LLS and active coping on abdomen, waist, hip and BMI, with these effects intensified for the most part over the phases of the study.

Although there was a beneficial interacting or joint influence of active coping with the treatment group on weight related outcomes, this interaction effect was detrimental for the blood pressure outcomes. Further, with effects shown at baseline for some risk factors, it appears that other environmental or selection factors beyond the intervention itself may have played a role in the positive outcomes in the treatment group. These findings point out that additional exploration is needed to sort out other factors that could be contributing to these findings.

This study has implications for both theory and practice. In general, the findings are supportive of "bottom up" theories of life satisfaction in that LLS is associated in this study with weight-related variables including circumferences and BMI. Consistent with previous studies that linked LLS to increasing participation in unhealthy behaviors such as poor diets, physical inactivity, and insufficient sleep (Wickrama et al., 2012a, 2012b), this study suggests that the consequences of these behaviors also may be associated with LLS in this population. At the same time, active coping was negatively related to waist, abdomen and hip circumferences, demonstrating active coping is linked to positive health outcomes (Taylor & Stanton, 2007; Tomaka et al., 1993) and consistent with best practices related to positive mental health strategies (Bandura, 1998).

With regard to practice, it appears that the longitudinal church-based intervention developed for this study had an effect on the association between LLS in relation to certain CVD risk factors, particularly weight related factors. Yet this effect did not hold for blood pressure. We intentionally focused on non-religious coping strategies so religious strategies were not captured by our active coping construct. Because the participants in the study were active

church members, measures that included religious coping mechanisms such as prayer and meditation might have yielded different results. Another possible explanation was that having four sequential health messages may have been too many for participants to act on within the 18-month intervention. Frontloading mental health awareness might increase visibility and ensure that the topic does not get lost. It is clear that more effort is needed to develop effective church-based interventions to address the linkage between mental health and CVD risk factors in African Americans, especially considering the ongoing issues of obesity and hypertension in this population.

This study has both strengths and limitations. A major strength of this study is that it is one of the few that has focused on the relationship of LLS, active coping and CVD risk on a longitudinal basis in African Americans. In addition, it is one of the few studies that included a mental health component within a church-based intervention, especially one that tested outcomes longitudinally. There are, however, several limitations in this study: (1) Because the participants were mid-life and older African Americans who attended church, the results of this study cannot be generalized to broader African American populations. Further, the sample was small and based in a two-county area in North Florida which further limits generalization. (2) There were limitations with some of the instruments and clinical assessments. LLS and active coping were measured using brief, global scales because we were concerned with participant burden. There may be other, more valid measures that are also brief that could capture these constructs. Also, although all clinical measurements, including blood pressure, were conducted by trained personnel, a more accurate blood pressure estimates could have been obtained either by home or ambulatory measurements (Drawz et al., 2012). However, those measurements require more involvement on the part of participants and clinical staff, as well as having proper equipment in the home of each participant. (3) Finally, in this paper, we examined lower life satisfaction, active coping and CVD risk factors in relation to a complex, longitudinal intervention. In the current analysis, we did not examine the possible effect of the three components (awareness building, clinical learning and efficacy development) and four types of programs on the results of the study. Thus, a future research direction will be to disaggregate these intervention elements and determine the extent to which they may influence study outcomes.

Conclusions

The results of this study to determine the association between lower life satisfaction, active coping, and selected cardiovascular disease risk factors in African Americans participating in a longitudinal church-based intervention demonstrate that LLS had a persistent unfavorable effect on weight-related variables of waist, abdomen and hip circumferences and BMI across most phases of this longitudinal study. The results also suggest a beneficial moderating influence of treatment on the association between LLS and the weight-related risk factors and on the association between active coping and these risk factors. Although active coping did not moderate the association between LLS and the CVD risk variables, as expected, active coping showed a direct beneficial health effect on waist, abdomen and hip circumferences.

Of concern is the persistent adverse theme of blood pressure in the study. LLS (higher scores) was positively associated with diastolic blood pressure. Contrary to our expectation, active coping also was positively associated with blood pressure in most of intervention phases. Further, although the intervention intensified the beneficial influence of active coping on most of CVD risk factors, for blood pressure, this moderating effect was in the opposite direction. It seems that active coping may invoke adverse physiological responses involving the cardiovascular regulatory system. Thus, while this study highlights the positive effects of active coping and the intervention on weight-related variables in mid-life and older African Americans, it also raises a cautionary note about the limitations of these strategies in more directly influencing blood pressure in this population. Clearly more research is needed to understand mental health in relation to hypertension and more broadly the CVD health of African Americans.

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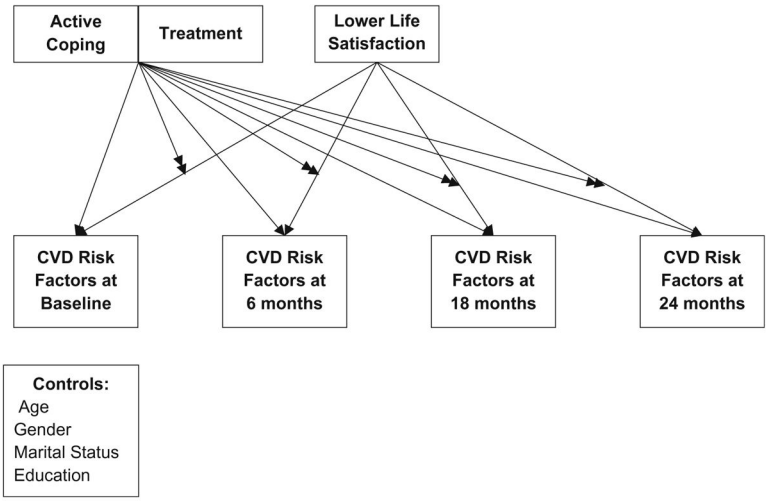

Fig. 1.
The theoretical model

J Behav Med. Author manuscript; available in PMC 2019 June 01.

Table 1

Descriptive statistics and Chi square analyses at baseline comparing treatment and comparison groups

	Treatment		Comparison		Total		χ^2	*p*
	n	%	n	%	n[a]	%		
Age								
43–49 years old	3	10.0	15	25.9	18	20.5	6.27	.51
50–56 years old	7	23.3	14	24.1	21	23.9		
57–63 years old	8	26.7	17	29.3	25	28.4		
64–70 years old	6	20.0	6	10.3	12	13.6		
71–77 years old	3	10.0	4	7.0	7	8.0		
78–84 years old	2	6.7	1	1.7	3	3.4		
85–91 years old	1	3.3	1	1.7	2	2.3		
Gender								
Female	18	62.1	41	71.9	59	68.6	1.38	.50
Male	11	37.9	16	28.1	27	31.4		
Marital status								
Married	20	66.7	26	44.1	46	51.7	4.07	.04*
Unmarried	10	33.3	33	55.9	43	48.3		
Education								
Some high school	2	8.0	5	10.9	7	9.9	3.22	.67
High school graduate	8	32.0	9	19.6	17	23.9		
Some college	8	32.0	14	30.4	22	31.0		
Bachelor's degree	3	12.0	10	21.7	13	18.3		
Master's degree or above	4	16.0	6	13.0	10	14.1		
Other[b]	0	0.0	2	4.4	2	2.8		
Employment status[c]								
Full-time	5	20.8	24	52.1	29	41.4	12.83	.02*
Part-time	0	0.0	1	2.1	1	1.4		
Unemployed	1	4.1	0	0.0	1	1.4		
Retired	18	75.0	17	37.0	35	50.0		

	Treatment		Comparison		Total		χ^2	*p*
	n	**%**	**n**	**%**	**n**[a]	**%**		
Other	0	0.0	4	8.7	4	5.7		

[*] $p < .05$

[a] n = 89; different samples sizes due to missing data

[b] Other category (two respondents) was treated as missing and managed by FIML procedure

[c] Employment status is at 18 months only

Table 2

Means (SD) and T-values for lower life satisfaction and CVD risk factors for treatment and comparison groups at baseline

	Treatment	Comparison	t	Total	Range
Lower life satisfaction	9.8 (6.4)	10.8 (6.5)	1.11	10.4 (6.8)	1.0–29.0
Active coping	6.1 (2.9)	6.5 (2.4)	1.09	6.1 (2.7)	0.0–12.0
Abdomen (cm)	110.6 (18.7)	110.4 (16.1)	−.06	110.9 (6.8)	64.8–172.7
Waist (cm)	104.2 (15.9)	105.9 (18.7)	.44	105.4 (17.7)	70.0–176.5
Hip (cm)	117.0 (14.9)	118.6 (16.1)	.48	118.2 (16.2)	89.3–174.0
Waist/hip ratio	0.8 (.1)	0.8 (.1)	.04	0.8 (.1)	0.5–1.1
Body mass index (kg/m^2)	35.8 (7.4)	33.4 (10.1)	.79	34.9 (9.2)	20.2–80.5
Systolic BP (mmHg)[a]	132.9 (21.0)	131.5 (15.9)	−.36	132.3 (17.8)	96.0–193.3
Diastolic BP (mmHg)	77.5 (12.9)	83.1 (9.8)	2.30*	81.4 (11.1)	58.3–113.3

[a] *BP* blood pressure

* $p < .05$

Table 3

Lower life satisfaction (LLS) and active coping (AC) as predictors of abdomen, waist and hip circumferences

Outcome variable	Abdomen circumference		Waist circumference		Hip circumference	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Baseline						
LLS	.90 (.29) **	.95 (.28) **	1.05 (.25) ***	1.01 (.26) ***	.85 (.26) **	.87 (.25) ***
Active Coping	− 1.79 (.75) *	−.46 (1.10)	− 1.72 (.70) *	− 1.24 (1.03)	− 1.88 (.65) **	− 1.18 (.97)
Treatment Group	2.17 (4.09)	2.82 (4.00)	−.72 (3.59)	−.90 (3.71)	.17 (3.59)	.44 (3.57)
LLS * AC	−.02 (.12)	–	−.15 (.10)	–	−.05 (.11)	–
TRT * AC	–	− 2.72 (1.66)	–	−.85 (1.50)	–	− 1.38 (1.47)
6 months						
LLS	1.11 (.30) ***	1.12 (.29) ***	.76 (.27) **	.82 (.27) **	.77 (.28) **	.85 (.27) **
Active Coping	− 1.87 (.77) *	−.79 (1.16)	−.81 (.74)	.23 (1.05)	− 1.13 (.71)	−.08 (1.05)
Treatment Group	3.36 (4.20)	3.59 (4.16)	1.87 (3.76)	2.31 (3.73)	− 1.19 (3.90)	−.47 (3.83)
LLS * AC	−.08 (.12)	–	−.03 (.10)	–	−.01 (.11)	–
TRT * AC	–	− 2.17 (1.70)	–	− 2.00 (1.49)	–	− 2.16 (1.56)
18 months						
LLS	.74 (.30) *	.79 (.29) **	.90 (.26) **	.83 (.28) **	.90 (.29) **	.99 (.28) ***
Active Coping	− 1.58 (.73) *	−.56 (1.05)	−.93 (.69)	−.22 (1.04)	− 1.47 (.73) *	.03 (1.05)
Treatment Group	.23 (3.96)	.60 (3.89)	.91 (3.77)	.79 (3.95)	.40 (4.03)	1.22 (3.92)
LLS * AC	−.04 (.12)	–	−.13 (.10)	–	−.04 (.12)	–
TRT * AC	–	− 2.05 (1.54)	–	− 1.34 (1.54)	–	− 2.99 (1.57)
24 months						
LLS	1.19 (.29) ***	1.24 (.28) ***	.88 (.24) ***	.90 (.25) ***	.88 (.28) **	1.01 (.27) ***
Active Coping	−.78 (.73)	.22 (1.05)	−.76 (.64)	−.11 (.93)	−.91 (.70)	.19 (1.02)
Treatment Group	3.56 (3.93)	4.01 (3.87)	4.21 (3.44)	4.61 (3.50)	2.87 (3.86)	3.80 (3.80)
LLS * AC	−.01 (.12)	–	−.04 (.09)	–	.07 (.11)	–
TRT * AC	–	− 2.05 (1.55)	–	− 1.25 (1.37)	–	− 2.24 (1.52)

Outcome variable	Abdomen circumference		Waist circumference		Hip circumference	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Model fit						
χ^2(DF)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
CFI / TLI	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00
RMSEA	.00	.00	.00	.00	.00	.00

Unstandardized coefficients are shown (standard errors in parentheses)

LLS lower life satisfaction, *AC* active coping, *TRT* treatment group

LLS*TRT was tested and not significant, the model not shown.

* $p < .05$;

** $p < .01$;

*** $p < .001$

J Behav Med. Author manuscript; available in PMC 2019 June 01.

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Table 4

Lower life satisfaction and active coping as predictors of BMI, systolic blood pressure, and diastolic blood pressure

Outcome variable	BMI		Systolic blood pressure		Diastolic blood pressure	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Baseline						
LLS	.36 (.15)*	.41 (.15)**	−.10 (.28)	−.20 (.27)	.20 (.18)	.19 (.18)
Active Coping	−.38 (.55)	.13 (.72)	−.77 (.73)	− 2.24 (1.02)*	−.35 (.51)	−.36 (.73)
Treatment Group	−.09 (2.08)	.24 (2.05)	1.63 (3.85)	.54 (3.75)	− 4.69 (2.41)	− 4.74 (2.41)
LLS *AC	.01 (.08)	–	−.08 (.11)	–	−.01 (.08)	–
TRT *AC	–	− 1.19 (1.18)	–	2.95 (1.47)*	–	−.01 (1.07)
6 months						
LLS	.44 (.14)**	.43 (.14)**	.18 (.31)	.10 (.30)	.52 (.18)**	.52 (.18)**
Active Coping	−.74 (.33)*	−.37 (.48)	.68 (.82)	−.50 (1.22)	.04 (.49)	−.02 (.76)
Treatment Group	1.52 (1.81)	1.53 (1.81)	− 2.70 (4.07)	− 3.62 (4.01)	− 3.38 (2.42)	− 3.24 (2.42)
LLS *AC	−.04 (.05)	–	−.06 (.12)	–	.05 (.07)	–
TRT *AC	–	−.71 (.72)	–	2.28 (1.63)	–	.15 (1.02)
18 months						
LLS	.39 (.13)**	.39 (.13)**	−.51 (.34)	−.60 (.33)	−.02 (.19)	−.08 (.18)
Active Coping	−.66 (.30)*	−.33 (.45)	1.64 (.80)*	.31 (1.12)	.71 (.46)	.06 (.64)
Treatment Group	2.50 (1.69)	2.52 (1.69)	.66 (4.54)	−.33 (4.44)	− 1.21 (2.54)	− 1.83 (2.50)
LLS *AC	−.04 (.05)	–	−.06 (.12)	–	−.03 (.07)	–
TRT *AC	–	−.65 (.67)	–	2.67 (1.60)	–	1.29 (.90)
24 months						
LLS	.38 (.13)**	.39 (.13)**	−.05 (.31)	−.14 (.30)	.44 (.20)*	.36 (.20)
Active Coping	−.55 (.30)	−.28 (.44)	2.11 (.70)**	1.42 (.97)	.93 (.46)*	.71 (.67)
Treatment Group	1.97 (1.68)	2.06 (1.67)	6.21 (3.95)	5.31 (3.95)	6.13 (2.60)*	5.64 (2.64)
LLS *AC	−.02 (.05)	–	−.10 (.10)	–	−.10 (.07)	–
TRT *AC	–	−.54 (.66)	–	1.40 (1.37)		.55 (.92)

Outcome variable	BMI		Systolic blood pressure		Diastolic blood pressure	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Model fit						
χ^2 (DF)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
CFI / TLI	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00
RMSEA	.00	.00	.00	.00	.00	.00

Unstandardized coefficients are shown (standard errors in parentheses)

LLS lower life satisfaction, *AC* active coping, *TRT* treatment group

LLS*TRT was tested and not significant, the model not shown.

* $p < .05$;

** $p < .01$;

*** $p < .001$

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Table 5

Associations between lower life satisfaction and CVD risk factors for treatment and comparison groups at baseline, 6, 18, and 24 months

	Treatment group				Comparison group				$\Delta\chi^2$ (df)
	Baseline	**6 months**	**18 months**	**24 months**	**Baseline**	**6 months**	**18 months**	**24 months**	
Abdomen (cm)	.22	.36	−.08	.16	.70*	.79*	.80*	1.12***	**39.7 (24)**
Waist (cm)	.28	.29	.32	.40	1.06**	.75*	.72*	.83**	**42.9 (24)**
Hip (cm)	.40	.61	.59	.64	.65*	.48	.71*	.73*	**33.8 (24)**
WHR	.00	−.001	−.002	−.001	.003	.001	.000	.001	4.1 (24)
BMI (kg/m^2)	.20	.25	.24	.22	.31	.38*	.31*	.31*	29.0 (24)
SBP (mmHg)	.43	−.13	−.31	−.47	−.37	.55	−.64	−.13	**39.3 (24)**
DBP (mmHg)	.40	.34	.21	.24	.08	.59*	−.22	.44*	**40.7 (24)**

Unstandardized coefficients are shown. A significant reduction in Chi square between the unconstrained and constrained (at an alpha level of .10) is indicated in bold

Significant $\Delta\chi^2$ (df) suggest associations are different across treatment and comparison groups

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 6

Associations between active coping and CVD risk factors for treatment and comparison groups at baseline, 6, 18, and 24 months

	Treatment group				Comparison group				$\Delta\chi^2$ (df)
	Baseline	**6 months**	**18 months**	**24 months**	**Baseline**	**6 months**	**18 months**	**24 months**	
Abdomen (cm)	− 2.34*	− 2.15**	− 2.14**	− 1.18	− 1.46	− 1.79	− 1.31	−.80	28.7 (24)
Waist (cm)	− 2.24**	− 2.09**	− 1.51	− 1.69*	− 1.83	−.52	−.70	−.54	**45.9 (24)**
Hip (cm)	− 2.49***	− 2.09*	− 2.25*	− 2.25**	− 1.78	−.79	−.61	−.40	29.9 (24)
WHR	.001	.000	.004	.00	−.002	.003	−.002	−.003	11.81 (24)
BMI (kg/m^2)	− 1.07**	− 1.10*	− 1.01*	−.91*	−.10	−.69	−.63	−.55	29.9 (24)
SBP (mmHg)	.71	2.68*	3.22**	2.97*	− 1.97*	−.06	.69	1.45	26.7 (24)
DBP (mmHg)	−.01	.61	1.39**	1.49*	−.06	−.18	−.01	.69	25.7 (24)

Unstandardized coefficients are shown. A significant reduction in Chi square between the unconstrained and constrained models (at an alpha level of .10) is indicated in bold.

* $p < .05$;

** $p < .01$;

*** $p < .001$