
Changes in social support over time in a faith-based physical activity intervention

Chandra R. Story^{1*}, Douglas Knutson², Jameisha B. Brown³, Erica Spears-Laniox³, Idethia Shevon Harvey³, Ziya Gizlice⁴ and Melicia C. Whitt-Glover⁵

¹Department of Health and Human Performance, Middle Tennessee State University, Murfreesboro, TN, USA, ²Department of Psychology, Southern Illinois University at Carbondale, Carbondale, IL, USA, ³Department of Health and Kinesiology, Transdisciplinary Center for Health Equity Research, Texas A & M University, College Station, TX, USA, ⁴Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA and

⁵Gramercy Research Group, Winston-Salem, NC, USA

*Correspondence to: C. Story. E-mail: chandra.story@mtsu.edu

Received on August 12, 2016; accepted on August 17, 2017

Abstract

African-American women report higher levels of chronic conditions and church attendance relative to the overall US population. Therefore, efforts have increased over the past decade to design church-based health promotion programs. The present study compared changes in religiosity, religious social support and general social support across time within a church-based physical activity study. In a clustered randomized controlled trial, 31 churches and ~15 African-American women per church were recruited to participate. Churches were randomized to one of three 10-month programs to promote physical activity: faith-integrated (FI), non-faith integrated (NFI) or self-guided control program (C). Comparisons were made between baseline and 10-month time points to assess differences over time. A significant reduction in general social support was observed across all groups. Private religious practices and religious emotional support received increases in C and FI, respectively. Prior research findings and the current study highlight difficulty in demonstrating strong, unilateral changes in religiosity, social support and health. Additional research is needed to identify more accurate measures of these concepts. Findings from the current study have implications for the role of social support in future church-based health promotion studies.

Introduction

African-American women exhibit particularly high rates of chronic disease (e.g. obesity, heart disease and some cancers) that can be exacerbated by infrequent physical activity [1–3]. For example, rates of obesity and excessive body weight are highest among African-American women (at nearly 80%), compared with other racial and ethnic populations [4]. As chronic diseases are associated with low levels of physical activity, they can be addressed and/or prevented by the application of physical activity interventions. Regular physical activity plays a critical role in chronic disease prevention and is consistently associated with lower risk of cardiovascular disease, stroke, metabolic syndrome, type 2 diabetes and certain cancers [5].

Religiosity and health

Despite low levels of participation in physical activity and high rates of chronic disease, African-American women maintain higher rates of church attendance than the general US population [6, 7]. Higher levels of religiosity are of interest to researchers and practitioners. Religiosity is defined as religious involvement in private and organizational religious practices [8]. Examples of private practices are personal prayer and bible reading, while organizational practices include church attendance. High prevalence rates of chronic disease among African-American women seem

counterintuitive, since several studies have verified the positive relationship between religiosity and enhanced health [9–11, 3]. The fact that high rates of church attendance is not accompanied by low rates of chronic illnesses among African-American women is perplexing. Due to the paradox, researchers have investigated patterns in religiosity and social support within church-based physical activity interventions [12–14].

Investigating changes in religious involvement and well-being over a period of time may yield important findings for health promotion among African-American women [15, 16]. In order to explore the connection between health and religious involvement, researchers have designed faith-integrated (FI) health programs incorporating religious tenets with health psychoeducation and participation in healthy behaviors [15]. Results from a systematic review of African-American faith-based interventions [17] indicated that FI health programs focusing on social support were more successful than non-faith integrated (NFI) programs. FI health programs incorporated tenets of private spiritual practices in a group setting. However, many of the aforementioned studies are limited by their cross-sectional, non-experimental design [6, 18]. Furthermore, substantial differences might exist between FI and church-based health programs [19]. It remains unclear whether these programs led to increases in religiosity and social support over time or as conduits for increased health-related behaviors.

General social support

Moving beyond original efforts to isolate the relationship between religiosity and health, more complex studies with larger sample sizes have evaluated factors (i.e. general and/or religious social support) potentially underlying the positive association between religiosity and health [6, 20]. Broadly, general social support is defined as sustenance transmitted interpersonally through relationships, and can involve the exchange of both emotional and concrete aid [21, 20]. To date, results are mixed as studies addressing the role of general and/or religious social support have produced positive, negative and null outcomes

[22, 16, 23]. Scarapicchia *et al.* [24] found that the strength and direction of the relationship between general social support and physical activity were unsettled. The majority of the studies utilized social support measures specific to physical activity. Results demonstrated that negative social support might be associated more with physical activity than positive social support. Researchers felt that the inconclusiveness of the relationship could be due to the hesitancy of researchers to publish studies with decreased levels of social support. Still, a relationship between general social support and health has been established in the literature making it theoretically plausible that social support is involved in the maintenance and/or changes in religiosity and health across time [25, 26]. The present study utilized social support measures non-specific to physical activity.

Religious social support

The definition and measurement of religious support, as a construct that is distinct from general social support, have been debated in recent years [27, 6]. Researchers have suggested that religiosity involves a unique and distinct form of social support [6]. Such a viewpoint seems to be supported in theoretical manuscripts and interdisciplinary discussions examining the communally shared values and apparent belief-based cohesion shared by church attendees [20, 28]. To our knowledge, a comparison of changes in religiosity and types of social support over a period of time is limited within the literature. Thus, we included measures of both general social support [overall questions assessing tangible and intangible emotional aid in the context of the Learning and Developing Individual Exercise Skills (L.A.D.I.E.S.) physical activity program] and religious social support (emotional aid transmitted and received in religious settings and/or within the context of a religious interpersonal dynamic).

Measurement difficulties

Some of the difficulty that has arisen while trying to track changes in religiosity and social support within a health intervention is possibly due to the complexity and multi-factorial nature of the constructs

involved [6, 18]. Measures of religiosity assess participants' self-reported levels of involvement in both communal (e.g. church attendance) and private (e.g. personal prayers and bible readings) religious practices [8, 18]. Likewise, measures of social support are dependent on perceived, self-reported provision and receipt of many forms of assistance (e.g. emotional, informational and/or instrumental support) in a variety of contexts (e.g. at school, home, church and work) [29, 20]. Since researchers are interested in the unique ways that religiosity relates to health promotion, examining general social support and religious social support as separate constructs is justified.

Present study

In the present study, we sought to examine potential changes in religiosity, religious social support and general social support in the context of an experimental church-based health promotion intervention. Our analyses were conducted on data collected at two time points, utilizing separate measures assessing religiosity, general social support and religious social support. The purpose of the present study is to evaluate the effect of FI, NFI and self-guided control health interventions on religious social support, general social support and religiosity, according to L.A.D.I.E.S. participants. We hoped to answer the following research questions: Does total religious social support, general social support and measures of religiosity change in a church-based physical activity intervention program over a period of time within and between groups (i.e. FI, NFI and control)? Do positive changes occur in religious social support, general social support and religiosity over a period of time within and between groups?

Methods

Study design

Data for this study were derived from the L.A.D.I.E.S. study [13]. The L.A.D.I.E.S. study was developed to assess physical activity among low-active African-American women. A total of 31 churches were recruited for the clustered, randomized study. Churches were randomized into one of

three clusters: an FI group; a traditional NFI group and a self-study group (control). The FI and NFI participants received 25 group-based sessions, each lasting approximately 2 hours, during which intervention curricula were administered. The FI health program incorporated biblical scriptures, while the NFI health program incorporated general readings to illustrate concepts related to increasing physical activity. Both programs integrated key concepts from the Social-Ecological Model [30] and Social Cognitive Theory [31]. Programs included leverage points for influencing adult behaviors, such as social environment, self-efficacy, incentives, values placed on external health reinforcements and social support for health-related behaviors. For example, a social support session for the FI group focused on biblical passages associated with receiving help from others [13]. The NFI social support session opened with a secular quote and examination of a secular song pertaining to social support [13]. Control group self-study material [32] was provided at the end of the baseline data collection visit. Participants were encouraged to follow the guide and instructions for increasing physical activity on their own.

Community health workers, who were African-American women and familiar with faith-based settings and group facilitation, received approximately 60 hours of training and a scripted guide for leading each session. The group facilitator trainings included a 2 hour session with a trained behavioral psychologist on general group facilitation, with group facilitation modeled by the study investigators (~24 hours). Trainings also consisted of practice sessions with facilitators engaging study team members as participants (~20 hours, including time for each facilitator to prepare sessions), and ~20 hours of session delivery to a pilot group of participants. Facilitators received feedback and corrective action throughout the training to ensure session delivery was consistent across group leaders and consistent with the scripted guide that was provided to each group leader. Facilitators and study investigators met after each session for a debriefing and to review the next session to be delivered.

Low-active African-American women (those who reported achieving equal or less than 150 min/week of moderate-to-vigorous physical activity) at least 18 years old were recruited to participate within each church. Approximately 15 African-American women per church were recruited to participate in the study. Data were collected at baseline ($n = 417$) and 10 months (immediately post-intervention) ($n = 333$). Sample sizes for the FI and NFI programs were 151 and 140, respectively. One hundred and twenty-six female parishioners participated in the control group. Participants were observed for an additional year to assess program sustainability, and final data were collected at 22 months. The Copernicus Group Independent Review Board approved the study, which included documentation of informed consent.

Theoretical framework

The L.A.D.I.E.S. study is based on both the Social - Ecological model and Social Cognitive Theory [13, 33, 34, 35]. Ecological-based interventions center on interactions between the environment (physical and social) and the individual [35]. The potential for church-based programs to influence the social environment is particularly salient for religious communities in which the unique setting has the potential to influence individuals' cognitions and behaviors. Specifically, physical activity interventions using the ecological model tend to focus on social relationships [36–38]. The church is a social center in African-American communities, and is an ideal place to examine social support and health behaviors. Therefore, the current study included a general social support measure of both intangible (e.g. emotional) and tangible (e.g. food, gifts) support given and received during the L.A.D.I.E.S. study. To assess the impact of the religious environment more directly, a religious social support measure was utilized to measure intangible and tangible social support within the religious setting.

Social Cognitive Theory posits that cognitions are affected by the social environment, and are believed to impact behavior patterns [33, 39, 40]. Social support is among the social environmental mechanisms

that potentially contributes to positive behavior change, and ultimately, self-efficacy [39]. The L.A.D.I.E.S. study was designed to increase self-efficacy for physical activity by increasing social support. Strategies for increasing social support and self-efficacy included guided physical activity, regular meetings and group devotionals. Social support strategies differed according to group (FI, NFI and Control). We hypothesized that religiosity would change in the FI group, compared with the NFI and control groups, and that social support would increase in the FI and NFI groups compared to the control group. In other words, the L.A.D.I.E.S. study hypothesized that participants would internalize religious principles, social support and exercise information in a way that would support physical activity self efficacy beyond the conclusion of the intervention.

Measures

We used three separate measures to assess general social support [41], religious social support [42, 43] and religiosity [44] at two (baseline and 10 months) time points for each of the three groups. Results from the 22-month assessment were very similar to 10 months, and were not reported in this study.

General social support

The Social Provision Scale (SPS) was designed to measure assistance-related dimensions and non-assistance-related dimensions of interpersonal relationships [41]. Likert-type scales recorded responses ranging from 1 = 'not at all' to 4 = 'always'. The measure has six subscale scores ranging from 6 to 24, and the summary score ranged from 24 to 96. Higher scores were indicative of stronger social relationships. Factor analysis confirmed a six-factor structure corresponding to the six social provisions, supported by findings from Cutrona and Russell [41]. Cutrona and Russell [41] reported a Cronbach's alpha of 0.92 across a variety of populations (i.e. college students, adults and older adults). An abbreviated version of the SPS was validated among African-American samples, and the

SPS highly correlated with other measures of relationship quality and stability [45].

Religious social support

The religious social support measure was designed to assess the strength of relationships shared between individuals in religious communities [42, 43]. The measure assesses four subscales on social relationships and religious beliefs (e.g. emotional support received, emotional support provided, anticipated support and negative interaction) [46–49]. Items are rated in a 4-point Likert scale from ‘never’ to ‘very often’ for emotional support and negative interaction. Items are rated in a 4-point Likert scale from ‘none’ to ‘a great deal’ for anticipated support. Higher scores indicated higher levels of support. The Cronbach’s alpha for this measure is 0.63.

Religiosity

Questions assessing religiosity were ascertained from several measures [8, 18, 44]. The items included measures from private religious practices and organizational religiousness. Private religious practices measured religious behaviors (e.g. ‘Within your religious or spiritual tradition, how often do you meditate?’). This sub-scale is composed of five items with a 5-point response format, ranging from 1 (‘more than once a day’) to 5 (‘never’). The internal consistency reliability was 0.81. Organizational religiousness measured the frequency of involvement in formal public religious institutions (e.g. ‘How often do you go to religious service?’). This subscale consists of two items with a 6-point response format, ranging from 1 (‘never’) to 6 (several times a week). The internal consistency reliability was 0.68. Higher scores on the measures indicated higher levels of religiosity.

Data analysis

Data analysis utilized summary and subscale scores on the three measures (religiosity, religious support and general social support) at the two time points. Demographic characteristics, such as age, body mass index (BMI) and level of education were

Table I. *Baseline demographics*

Variables	<i>n</i> = 417
Age, <i>M</i> (CI)	51.4 (49.2–53.6)
BMI, <i>M</i> (CI)	35.8 (34.8–36.8)
Education	
Less than high school	44.1%
Greater than high school	55.9%
Marital status	
Married	45.9%
Not married	54.1%
Income	
<15K	14.6%
15–35K	24.2%
>35K	46.0%
Not reported	15.1%
Self-reported health status (excellent to good)	80.4%

assessed at baseline for the entire sample, and were summarized using descriptive statistics (e.g. means, percentages, standard deviations and 95% confidence intervals) per intervention arm (Table I). Mean values for each group were assessed at baseline and 10 months (Table II). At each time point, pre–post mean changes within each study group and differences in mean changes across them were estimated and tested using generalized linear mixed models (GLMM) that included churches as the random intercept. These comparisons were repeated using two sets of GLMMs: (i) the baseline value of the outcome measure as a fixed covariate and (ii) marital status, income, age and BMI as fixed covariates due to associations of these covariates with dropping out of the study (Table III). Because this study was a clustered, randomized trial, all analyses conducted took into account the study design and correlated data due to clustering of participants with churches.

Results

Descriptive statistics

The sample for the current study was restricted to participants who had complete data at two time points: baseline (*n* = 417) and 10 months (*n* = 333). Participants’ mean age was 51.4. Most

Table II. Mean values for religiosity, religious support and social support at times 1 and 2

Variables	FI			NFI			Control		
	Baseline	Follow-up	n	Baseline	Follow-up	n	Baseline	Follow-up	n
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)	
Organizational religiosity	13.95 (1.97)	14.30 (1.90)	115	14.16 (1.47)	14.22 (2.63)	92	14.29 (2.76)	14.28 (2.64)	92
Private religious practices	12.81 (6.48)	12.29 (5.79)	113	11.95 (3.21)	12.15 (4.15)	91	11.80 (8.00)	12.50 (8.70)	92
Overall self ranking	3.28 (0.82)	3.34 (0.76)	116	3.22 (0.85)	3.31 (0.81)	90	3.22 (0.95)	3.17 (1.59)	93
Total religious support	22.63 (2.86)	22.76 (3.13)	115	22.68 (3.64)	22.84 (2.60)	90	22.97 (4.38)	23.08 (4.44)	92
Emotional support received	5.89 (1.47)	6.10 (1.42)	116	6.01 (1.20)	6.12 (1.13)	92	5.97 (1.84)	6.00 (1.48)	93
Emotional support provided	6.48 (0.80)	6.52 (1.19)	116	6.33 (1.36)	6.42 (0.82)	92	6.47 (1.84)	6.48 (1.90)	93
Negative interaction	3.24 (0.88)	3.16 (0.89)	116	3.26 (1.60)	3.21 (0.93)	91	3.24 (1.15)	3.30 (1.17)	92
Anticipated support	6.99 (1.94)	6.97 (1.62)	115	7.07 (1.53)	6.99 (1.24)	93	7.23 (0.91)	7.25 (1.53)	93
Total social support	75.54 (9.01)	58.68 (2.53)	105	74.49 (8.91)	59.94 (2.90)	84	76.74 (10.51)	58.26 (4.46)	74
Reassurance of worth	12.39 (1.70)	9.78 (1.02)	110	12.46 (1.28)	9.75 (1.73)	87	12.96 (1.20)	9.41 (0.56)	80
Social integration	12.76 (2.09)	9.72 (0.81)	112	12.54 (1.80)	9.93 (0.56)	89	13.01 (1.07)	9.49 (0.89)	81
Attachment	12.47 (1.81)	10.07 (0.84)	110	12.66 (1.96)	10.41 (1.06)	87	12.80 (2.61)	10.28 (1.47)	79
Nurturance	10.71 (1.65)	9.75 (1.67)	110	10.27 (2.85)	9.98 (1.01)	89	10.51 (1.73)	9.79 (1.29)	80
Reliable alliance	13.79 (2.08)	9.76 (0.71)	112	13.35 (1.89)	9.92 (1.11)	89	13.82 (2.14)	9.62 (0.61)	79

participants were obese (BMI > 30 kg/m²; 72.7%) or overweight (BMI 25.0 to <30.0 kg/m²; 18.9%). No significant differences were apparent in age, BMI, education, marital status, income or perceived health status between the three randomized clusters of participants. Additional demographic information is provided in Table I.

Table II provides baseline and 10-month follow-up measurements from time 1 to time 2 for religiosity, religious social support and general social support scales, as well as subscales for each. Results were organized by randomization arm. Table III provides the mean change from time 1 to time 2 for religiosity, religious social support and general support scales, along with subscales for each. Table III results were organized by randomization arm. Control group participants experienced a significant increase in ‘private religious practices’ ($M = 0.70$, $P < 0.05$) (Table III) from baseline to post-intervention. We observed no other changes in total religiosity or related subscales in any other subgroups. The FI participants reported an increase in ‘emotional support received’, a subscale of total religious support between baseline and immediately post-intervention ($M = 0.22$, $P < 0.01$) (Table III). Again, we observed no other changes for total religious social support or any other subscales for any other intervention subgroups. With regard to general social support, all groups reported statistically significant decreases for total social support, as well as for each of the social support subscales (Table III).

Discussion

The purpose of the current study was to explore differences in religiosity, religious support and social support at baseline and 10 months among participants enrolled in the L.A.D.I.E.S. study. Findings from the current study were in the opposite direction of what was expected: (i) no change in total religiosity for the FI group; (ii) only a small change in total religious emotional support immediately post-intervention for the FI group; (iii) an increase in private religious practices in the control group participants and (iv) significant decreases in total social

Table III. Mean changes across time for religiosity, religious support and social support

Variables	FI		^a Adjusted ^b Adjusted		NFI		^a Adjusted ^b Adjusted		Control	
	n	ΔM (SD)	ΔM	ΔM	n	ΔM (SD)	ΔM	ΔM	n	ΔM (SD)
Organizational religiousness	115	0.35 (2.83)	0.149	0.070	91	0.05 (1.70)	-0.012	-0.064	92	-0.01 (2.19)
Private religious practices	113	-0.52 (3.30)	-0.871	-0.694	91	0.21 (3.41)	-0.386	-0.235	92	0.70 (3.27)*
Overall self ranking	116	0.06 (0.75)	0.128	0.153	90	0.09 (0.87)	0.133	0.184	93	-0.04 (1.26)
Total religious support	115	0.12 (2.63)	-0.126	-0.043	90	0.17 (2.99)	-0.062	-0.125	92	0.11 (2.85)
Emotional support received	116	0.22 (0.75)**	0.144	0.164	92	0.11 (0.85)	0.098	0.059	93	0.03 (1.29)
Emotional support provided	116	0.03 (1.62)	0.010	0.015	92	0.10 (1.29)	0.006	-0.041	93	0.01 (1.38)
Negative interaction	116	-0.09 (0.70)	-0.151	-0.171	91	-0.05 (1.43)	-0.110	-0.145	92	0.07 (0.93)
Anticipated support	115	-0.03 (1.53)	-0.141	-0.079	91	-0.08 (1.79)	-0.191	-0.192	93	0.02 (1.24)
Total social support	105	-16.9 (9.88)***	0.346	0.216	84	-14.5 (9.01)***	1.546	1.414	74	-18.5 (13.39)***
Reassurance of worth	110	-2.61 (1.83)***	0.346	0.395	87	-2.71 (2.01)***	0.284	0.297	80	-3.55 (1.35)***
Social integration	112	-3.04 (2.40)**	0.204	0.189	89	-2.61 (2.06)***	0.008**	0.386	81	-3.52 (1.81)***
Attachment	110	-2.40 (1.51)***	0.219	-0.219	87	-2.24 (2.16)***	0.129	0.110	79	-2.52 (3.36)***
Nurturance	110	-0.95 (2.78)***	-0.007	-0.051	89	-0.29 (3.06)***	0.178	0.159	80	-0.73 (2.49)***
Reliable alliance	112	-4.04 (1.92)***	0.137	0.079	89	-3.43 (2.06)***	0.278	0.260	79	-4.20 (2.37)***

^aAdjusted for baseline.^bAdjusted for baseline and covariates.* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.

support among all groups over a 10-month period. These findings are remarkable when considered with findings from the original study. Within the original L.A.D.I.E.S. study, the FI group experienced a significant increase in physical activity and maintained moderate levels of physical activity post-intervention [50]. In contrast, the NFI group did not demonstrate an increase in physical activity post-intervention. In addition, the control group did not show an increase in physical activity. Present study findings challenge presumptions about concurrent positive or negative changes in social support and health-related behaviors.

Although we did not report 22-month assessments for the current study, we noted that the retention rate for the 22-month program was impressive ($n = 305$). Findings should be viewed in light of the fact that participants demonstrated commitment to the study and their engagement strengthens results pertaining to social connections. The low rate of attrition may be a particular strength of this study. While it is impossible to know from the study itself, it is possible that lack of attrition is a function of

high rates of religious commitment and connectedness to church involvement among participants.

General social support

Experiential and statistical factors explain the decline in general social support for the two group-based intervention arms (FI and NFI). By design, L.A.D.I.E.S. meetings decreased from weekly to monthly during the study. Participants met weekly for 17 sessions, bi-weekly for four sessions and monthly for four sessions to ease the transition from regular group meetings as the intervention period was ending [13]. According to church leaders, some participants were disappointed with the change in meeting frequency [51]. Less frequent meetings could have reduced opportunities for health-oriented conversations and encouragement, which are a commonly reported means of social support among parishioners [25].

It is also possible that participants overestimated levels of social support at baseline. Participation in group activities likely increased an awareness of the need for social support that was not simultaneously

addressed by the program. Anecdotally, participants at most churches indicated that they rarely engaged in non-church related conversations with other women in the group, although they had been church members for years. This is interesting considering Kumanyika *et al.*'s finding [26] that preexisting relationships do not impact perceptions of social support upon entry into and/or during a health promotion program. Building on these findings, we would encourage researchers to consider opportunities for creating longer term, self-sustaining relationships during programs in order to buffer against the abrupt end of interventions leaving participants feeling less supported. A longer term approach has the added benefit of providing group members longer exposure to their peers, which is a mechanism for increasing social support [26].

Meanwhile, completion of the survey and group activities may have increased awareness of social support in a way that led to more accurate reporting over a 10-month period. In future studies, researchers can develop a brief psycho-education session to participants about social support and religiosity. Information would provide participants with context leading to more accurate assessments of social support and/or religiosity. Furthermore, we posit that education would encourage standardized knowledge that can aid in buffering against maturation and threats to validity that occur when a participant's knowledge increases over time [52].

Another potential reason for the decline in self-reported social support could have been positive program outcomes. It is possible that successful participants accessed support from individuals outside the research group (e.g. family, friends, co-workers), instead of developing friendships with group members as expected [53, 54]. While participants were expected to build relationships within their group, they may have become less connected to their group members as they turned to outside sources for models and positive feedback. Consequently, lower reports of general social support would be due to the fact that questionnaires focused on support received from study group members only. When selecting measures for future studies, we suggest that researchers utilize questionnaires including

social support received from family and friends in addition to study participants. Information would contribute to a different model for faith-based programs that includes family and non-congregation friends.

Religiosity and religious social support

As individuals who were already engaged in religious practices, participants reported high levels of religiosity at baseline. High levels of religiosity might not have changed significantly throughout the course of the intervention, due to the possibility that participants perceived themselves to be committed people of faith. So far, researchers have yet to demonstrate whether rates of religiosity remain consistent or alter significantly during the lifetimes of African-American women. Therefore, it is difficult to compare the findings of this study regarding the apparent stability in religiosity to findings elsewhere.

Changes in religiosity (private religious practices) among members of the control group were difficult to interpret since control group activities were self-guided and did not necessarily take place at churches. Incidentally, control group participants were somewhat disappointed that they did not have a group meeting to attend. As a result, some control group churches began holding regular, non-physical activity-focused meetings with these participants. Meetings potentially led to discussions about faith and health and to increases in private religious practices.

Related literature indicates the existence of a positive association between religiosity and emotional support [55]. Individuals who maintain higher levels of church attendance and have high levels of religiosity generally report higher levels of emotional religious support [56]. Interestingly, baseline findings from the L.A.D.I.E.S. intervention indicated a negative correlation between religiosity and religious social support, which now appear to hold over a period of time [57]. The Black church is a historic place of religious support [28], and it is feasible that emotional social support would increase over time in the context of a faith-based

intervention. For the FI group, the L.A.D.I.E.S. intervention was probably perceived as a religious activity or practice due to the inclusion of scripture and prayer. Perception of program activities would possibly facilitate an increase in perceived religious emotional support received from fellow participants and site captains. One of the perceived outcomes of the L.A.D.I.E.S. intervention was described as ‘fellowship’, or gathering around a common goal [51]. Fellowship within the FI group likely encouraged participants who were already involved in church but were emotionally isolated. Findings are significant as anticipated religious support is associated with vigorous levels of physical activity and other positive health behaviors [27].

Limitations

Similar statistical outcomes across groups were probably more a function of the broader experiences of congregations who worship at historically black churches than of the impact of the intervention. Furthermore, the use of self-report measures to assess social support within a health-promotion program may have led to skewed results due to response bias. Perceptions of the constructs being measured could have affected responses as participants were exposed to program content. Also, the frequency of measurement may have caused survey fatigue. Lastly, results for the guidance subscale were not assessed. While omission of these results represents a limitation for the study, the summary score and subscales present a solid indication that social support decreased across subscales for all participants.

One of the greatest strengths of the L.A.D.I.E.S. intervention was the experimental design over a period of time. The design allows researchers to explore potential facilitators and barriers to social support based on the context of the intervention. Current study findings represent a significant contribution to the literature as general social support results countered some of the literature. The population assessed is also a strength, considering that African-American women have higher levels of religious involvement compared with the general

population, accompanied by assumptions of higher social support levels.

Conclusions

Findings from the current study have implications for measurement and health-promotion program design. We suggest that researchers who wish to evaluate social connectedness in religious institutions use measures assessing both the religious and general dimensions of social support provided and received among participants. Addressing both dimensions will allow researchers to highlight differences between shared social experiences among community members and social phenomena at the local church level. In terms of measures, religiosity should be less sensitive to religious involvement, as measured by hours spent involved in church activities or attendance frequency. Since church attendance (i.e. organizational religiousness) is not likely to change during participation in FI interventions, this may not be an adequate measure of changes in religiosity. Future studies should include assessment measures incorporating additional dimensions of social support (both general and religious) over a period of time. For example, social support, as indicated by connections with both family members and friends, can support program success.

Current study findings also have implications for health-promotion program design in that consistent meetings are needed to increase perceived levels of social support in physical activity interventions. It is possible that increased dosage could translate into increased social support through collective self-efficacy. In addition, faith-based programs should consider inclusion of family members and friends as a mechanism for increasing social support and self-efficacy.

Because a strong case has been made for changes in social support across time, our findings present puzzling issues that call for additional investigation. Findings represent a significant contribution to the field since assessments of different social support constructs across time are minimal within the literature. Current study findings demonstrate a need to

further define and explore social support with FI contexts. Given the documented effects of religiosity and social support on health, more studies on longitudinal interventions are warranted.

Funding

The project described is supported by Award Number R01HL094580 from the National Heart, Lung, and Blood Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Health.

Conflict of interest statement

None declared.

References

1. Flegal KM, Carroll MD, Kit BK, *et al.* Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999 - 2010. *J Am Med Assoc* 2012; **307**: 491–7.
2. Pekmezi D, Marcus B, Meneses K *et al.* Developing an intervention to address physical activity barriers for African-American women in the deep south (USA). *Women's Health* 2013; **9**: 301–12.
3. Whitt-Glover MC, Taylor WC, Heath GW *et al.* Self-reported physical activity among blacks: Estimates from national surveys. *Am J Prev Med* 2007; **33**: 412–7.
4. Durant NH, Joseph RP, Cherrington A *et al.* Recommendations for a culturally relevant Internet-based tool to promote physical activity among overweight young African American women, Alabama, 2010–2011. *Prev Chronic Disease* 2014; **11**: 130169.
5. Clark LT, El-Atat F. Metabolic syndrome in African Americans: implications for preventing coronary heart disease. *Clin Card* 2007; **30**: 161–4.
6. Holt CL, Wang MQ, Clark EM *et al.* Religious involvement and physical and emotional functioning among African Americans: the mediating role of religious support. *Psyc Health* 2013; **28**: 267–83.
7. Sahgal N, Smith G. *A Religious Portrait of African Americans*. Washington, DC: Pew Research Center, 2009.
8. Hill PC, Pargament KI. Advances in the conceptualization and measurement of religion and spirituality: implications for physical and mental health research. *Am Psyc* 2003; **58**: 64–74.
9. Centers for Disease Control and Prevention. *National diabetes statistics report: Estimates of diabetes and its burden in the United States, 2014*. Atlanta, GA: U.S. Department of Health and Human Services. Available at <https://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>. Accessed August 1, 2016.
10. Koenig HG, King DE, Carson VB. *Handbook of Religion and Health* (2nd ed.). New York, NY: Oxford University Press, 2012.
11. Krause N, Shaw B, Liang J. Social relationships in religious institutions and healthy lifestyles. *Health Educ Behav* 2011; **38**: 25–38.
12. Sessoms L, Payne PW. “Sisters in motion Memphis:” A based-integrated community effort to lose weight and improve the health of African American women. *J Health Care Poor Underserved* 2013; **24**: 1599–603.
13. Whitt-Glover MC, Goldmon M, Karanja N, *et al.* Learning and Developing Individual Exercise Skills (L.A.D.I.E.S.) for a better life: a physical activity intervention for black women. *Contemp Clin Trials* 2012; **33**: 1159–71.
14. Yearly KH, Cornell E, Prewitt E *et al.* The WORD (wholeness, oneness, righteousness, deliverance): Design of a randomized controlled trial testing the effectiveness of an evidence-based weight loss and maintenance intervention translated for a faith-based, rural, African American population using a community-based participatory approach. *Contemp Clin Trials* 2015; **40**: 63–73.
15. Bopp M, Peterson J, Webb B. A comprehensive review of faith-based physical activity interventions. *Am J Lifestyle Med* 2012; **6**: 460–78.
16. DeHaven MJ, Hunter IB, Wilder L *et al.* Health programs in faith-based organizations: Are they effective? *Am J Public Health* 2004; **94**: 1030–6.
17. Lancaster KJ, Carter-Edwards L, Grilo S *et al.* Obesity interventions in African American faith-based organizations: a systematic review. *Obes Rev* 2014; **15**: 159–76.
18. Oman D, Thoresen CE. ‘Does religion cause health?: Differing interpretations and diverse meanings. *J Health Psyc* 2002; **77**: 365–80.
19. Bielefeld W, Cleveland WS. Defining faith-based organizations and understanding them through research. *Nonprofit Voluntary Sector Quart* 2013; **42**: 442–67.
20. Kanu M, Baker E, Brownson RC. Exploring associations between church-based social support and physical activity. *J Phys Act Health* 2008; **55**: 504–15.
21. Israel BA. Social networks and health status: Linking theory, research, and practice. *Patient Couns Health Educ* 1982; **4**: 504–15.
22. Campbell MK, Hudson MA, Resnicow K *et al.* Church-based health promotion interventions: Evidence and lessons learned. *Ann Rev Public Health* 2007; **28**: 213–34.
23. Fitzgibbon ML, Stolley MR, Ganschow P *et al.* Results of a faith-based weight loss intervention for Black women. *J Natl Med Assoc* 2005; **97**: 1393–402.
24. Scarapicchia TMF, Amireault S, Faulkner G, *et al.* Social support and physical activity participation among healthy adults: a systematic review of prospective studies. *Int Rev Sport Exerc Psyc* 2017; **10**: 50–83.
25. Kegler M, Escoffery C, Alcantara I *et al.* Perceptions of social and environmental support for healthy eating and physical activity in rural southern churches. *J Relig Health* 2012; **51**: 799–811.

-
26. Kumanyika SK, Wadden TA, Shults J *et al.* Trial of family and friend support for weight loss in African American adults. *Arch Int Med* 2009; **169**: 1795–804.
 27. Debnam K, Holt CL, Clark EM *et al.* Relationship between religious social support and general social support with health behaviors in a national sample of African Americans. *J Behav Med* 2012; **35**: 179–89.
 28. Lincoln CE, Mamiya LH. *The Black Church in the African American Experience*. Durham, NC: Duke University Press, 1990.
 29. Fischer J, Corcoran K. *Measures for Clinical Practice: A Sourcebook Volume 2 Adults* (4th ed.). New York, NY: Oxford University Press, 2007.
 30. Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot* 1996; **10**: 282–98.
 31. Bandura A. *Social cognitive theory: an agentic perspective*. *Annu Rev Psychol* 2001; **52**: 1–26.
 32. National Institute on Aging, National Institutes of Health, and U.S. Department of Health and Human Services. *Exercise & Physical Activity: Your Everyday Guide from the National Institute on Aging*, 2010.
 33. Bandura A. Health promotion by social cognitive means. *Health Educ Behav* 2004; **31**: 143–64.
 34. Fleury J, Lee SM. The social ecological model and physical activity in African American women. *Am J Comm Psychol* 2006; **37**: 129.
 35. Bronfenbrenner U. Ecological models of human development. In Brookfield S. (Ed.), *International Encyclopedia of Education* (2nd ed.). Oxford, England: Elsevier, 1994.
 36. Bopp M, Lattimore D, Wilcox S *et al.* Understanding physical activity participation in members of an African American church: a qualitative study. *Health Educ Res* 2006; **22**: 815–26.
 37. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: A Meta-analytic review. *PLoS Med* 2010; **7**: e1000316.
 38. Peterson JA, Cheng AL. Heart and soul physical activity program for African American women. *West J Nurs Res* 2011; **33**: 652–70.
 39. Bandura A. *Self-efficacy: The Exercise of Control*. New York, NY: W. H. Freeman, 1997.
 40. Baranowski T, Lin LS, Wetter DW *et al.* Theory as mediating variables: Why aren't community interventions working as desired? *Ann Epidemiol* 1997; **7**: 89–95.
 41. Cutrona CE, Russell DW. The provisions of social relationships and adaptation to stress. *Adv Pers Relations* 1987; **1**: 37–67.
 42. Fetzer Institute Publication. *Multidimensional Measurement of Religiousness/Spirituality for Use in Health Research*. Kalamazoo, MI: Fetzer Institute Publication, 1999.
 43. Krause NM. Assessing change in social support during late life. *Res Aging* 1999; **21**: 539.
 44. Levin JS. How religion influences morbidity and health: Reflections on natural history, salutogenesis and host resistance. *Soc Sci Med* 1996; **43**: 849–64.
 45. Gottlieb BH, Bergen AE. Social support concepts and measures. *J Psychoso Res* 2010; **69**: 511–20.
 46. Krause N, Markides K. Measuring social support among older adults. *Int J Aging Hum Dev* 1990; **30**: 37–53.
 47. Krause NM. Negative interaction and satisfaction with social support among older adults. *J Geront Ser B: Psych Sci Soc Sci* 1995; **50B**: 59–73.
 48. Krause NM. Anticipated support, received support, and economic stress among older adults. *J Geront Ser B: Psych Sci Soc Sci* 1997; **52B**: 284–93.
 49. Liang J. *The National Survey of Japanese Elderly*. Ann Arbor, MI: Institute of Gerontology, 1990.
 50. Whitt-Glover MC, Gizlice Z, Heil DP *et al.* Increasing physical activity in Black Women: results from a randomized trial testing a faith-integrated program. *Med Sci Sports Exerc* 2012; **48**: 663.
 51. Story CR, Gross TT, Harvey IS *et al.* Pastoral perceptions of a faith based physical activity program: A Qualitative Study. *Health Educ Res* 2017; **32**: 81–95.
 52. Christ TJ. Experimental control and threats to internal validity of concurrent and nonconcurrent multiple baseline designs. *Psychol Schools* 2007; **44**: 451–9.
 53. Johnson ER, Carson TL, Affuso O *et al.* Relationship between social support and body mass index among overweight and obese African American women in the rural deep south, 2011–2013. *Prev Chronic Disease* 2014; **11**: E224.
 54. Peterson JA. Evaluation of the heart and soul physical activity program by African American women. *ABNF J* 2011; **22**: 64–72.
 55. Le D, Holt CL, Hosack DP *et al.* Religious participation is associated with increases in religious social support in a national longitudinal study of African Americans. *J Relig Health* 2016; **55**: 1449–60.
 56. Hayward RD, Krause N. Changes in church-based social support relationships during older adulthood. *J Geront Ser B: Psych Sci Soc Sci* 2013; **68**: 85–96.
 57. Harvey IS, Story CR, Knutson D *et al.* Exploring the relationship of religiosity, religious support, and social support among African American women in a physical activity intervention program. *J Relig Health* 2016; **55**: 495–509.
-