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Multiple Behavior Change among Church Members Taking Part in the Faith, Activity, and Nutrition Program

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Abstract

Objective—To examine the extent to which participants in a combined physical activity (PA) and dietary intervention achieved changes in multiple health behaviors.

Design—Group randomized trial; includes participants assigned to the intervention group only.

Setting—36 churches in South Carolina.

Participants—360 African American church members.

Intervention—15-month PA and dietary intervention, guided by the structural ecological model, targeting environmental (i.e. social, cultural, physical) and organizational (i.e. policies, practices) changes within the church.

Main Outcome Measures—Self-reported PA, fruit and vegetable consumption, fat-, and fiber-related behaviors.

Analysis—Change in each behavior was defined as unadjusted pretest-posttest improvement 0.20 of the baseline standard deviation. The total number and each combination of behaviors changed were calculated.

Results—19.2% changed no health behaviors as defined above, 31.4% changed one health behavior, 30.8% changed two health behaviors, 13.3% changed three health behaviors, and 5.3% changed all four of the targeted health behaviors. Combinations of multiple behavior change included PA and dietary behaviors, suggesting both behaviors can be changed simultaneously.

Conclusions and Implications—Nearly half of participants changed at least two health behaviors. Faith-based interventions targeting environmental and organizational change can successfully change multiple behaviors, potentially leading to greater improvements in public health.

Keywords

physical activity; diet; multiple behavior change; African Americans; faith-based

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INTRODUCTION

Consuming a healthy diet and engaging in regular physical activity (PA) reduce the risk of premature mortality¹. A recent study showed that globally, physical inactivity causes 6–10% of the major non-communicable diseases, and causes 9% of premature mortality (5.3 million deaths), a number similar to the deaths caused by smoking and obesity². PA and diet have been recognized globally as public health priorities for both adults and children³. Government programs, including the First Lady's Let's Move! initiative⁴, have recognized the consequences of a lifestyle of poor diet and inadequate PA, and have created programs to improve these health behaviors.

Modifiable risk behaviors (i.e. lack of PA, poor nutrition, tobacco use, excessive alcohol consumption) are responsible for a majority of chronic diseases⁵, and often times, risk behaviors cluster^{6,7}. Bambs and colleagues⁸ found that only 1.4% of African Americans in their sample met the American Heart Association Ideal Health Behavior Index, defined as being a non-smoker, having a body mass index (BMI) <25 kg/m², being very physically active, and consuming 3 fruits and vegetables per day. PA and diet are considered major components of a healthy lifestyle and both are important for disease prevention^{9,10}, premature mortality¹, and reaching and maintaining a healthy weight¹¹. Often times, individuals engaging in one behavior (i.e. PA) are more likely to engage in the other (i.e. favorable dietary behaviors)^{7,12–15}. Because these behaviors are often related, it seems reasonable to believe that individuals changing one behavior may also try to change the other. Therefore, interventions have targeted and attempted to change dietary and PA behaviors simultaneously^{16–18}. A recent review found that interventions aiming to simultaneously improve dietary and PA behaviors have yielded inconsistent and somewhat disappointing results thus far¹⁹; however, these types of interventions remain understudied¹⁹.

Churches are a promising setting for delivering health behavior change programs, particularly in underserved populations. Faith-based studies have shown promise for increasing PA and improving dietary behaviors (e.g. fruit and vegetable [FV] consumption) among African Americans²⁰. A number of large-scale faith-based studies targeting African Americans have focused on changing a single health behavior (i.e. diet^{21–23} or PA²⁴), whereas others have focused on both behaviors simultaneously^{16,25,26}. However, among the studies targeting both diet and PA, only one study¹⁶ has reported the extent to which participants made changes in both behaviors (i.e. diet and PA). A closer examination of the patterns of change in interventions that target multiple behaviors can provide insight into whether participants making changes in one behavior are more likely to make changes in another behavior(s), or if they are only successful in changing a single behavior. Such findings have important implications for intervention development and implementation.

The Faith, Activity, and Nutrition (FAN) program was a PA and dietary intervention delivered in churches in South Carolina. The results of FAN have been previously published and showed significant group differences at post, favoring the intervention group, in leisure time PA and FV consumption, but no differences in blood pressure, and fat- or fiber-related behaviors²⁷. Although differences in outcomes according to group assignment have been previously reported²⁷, the extent to which individuals in the intervention group changed multiple targeted behaviors was not examined. In this secondary analysis of FAN, we examined the percentage of participants who were able to successfully increase PA, FV consumption, and fiber-related behaviors, and decrease fat-related behaviors (all behavioral targets of the intervention), and the percentage of participants who improved multiple health behaviors.

METHODS

The methods of FAN are described in detail elsewhere^{27,28}. FAN was a 15-month PA and dietary intervention delivered in 74 African Methodist Episcopal (AME) churches in South Carolina. Churches were randomized to receive the intervention immediately (intervention group) or at 15-months (delayed group). FAN used a group randomized design and included three waves of implementation. Churches were randomized to receive the intervention immediately following baseline assessments (i.e. intervention group) or at the end of the 15-month intervention period, following post measurements (i.e. control group). Because this study aimed to examine the extent of multiple behavior change among those receiving the intervention, analyses were limited to participants in the intervention group. The primary goals of FAN were to increase moderate to vigorous intensity PA and FV consumption, and to improve blood pressure; secondary aims were to decrease fat-related behaviors and increase fiber-related behaviors²⁸.

Procedures

As reported in more detail elsewhere^{27,28}, presiding elders from 4 geographically-defined AME districts in South Carolina sent pastors a letter introducing the FAN program and inviting participation. Program staff made follow-up telephone calls to pastors to provide more details about the FAN program and to answer questions. Pastors from interested churches were encouraged to appoint a liaison, usually the health director, to assist program staff in scheduling and coordinating a measurement session to take place at their church. Measurement sessions typically took place on Saturdays, following church services, or during/after Bible study.

Liaisons from interested churches recruited members of their congregation to take part in a measurement session at baseline (pre intervention), with recruitment goals a function of church size (13 small church, 32 medium, 63 large). At each session, participants completed an informed consent form approved by the Institutional Review Board at the university and by the FAN planning committee. To be eligible, participants had to be at least 18 years of age, free of serious medical conditions or disabilities that would make changes in PA or diet difficult, and attend church at least once a month. Upon providing consent, trained staff took physical assessments and participants completed a comprehensive survey. The same measures were repeated 15 months later (post-program).

Intervention

The intervention, developed using a community-based participatory research approach, targeted environmental (i.e., social, cultural, physical) and organizational (i.e., policies, practices) change within the church. Guided by the structural ecologic model²⁹, churches were asked to implement intervention activities, focusing on PA and healthy eating, that targeted each of the four structural factors thought to influence behavior: provide opportunities for PA and healthy eating, make opportunities for PA and healthy eating appropriate and fun, set organizational guidelines and provide support for PA and healthy eating, and get the message out about PA and healthy eating. Examples of activities churches could implement include offering opportunities for PA before, during, or after church services, setting guidelines regarding food choices and PA at church events, forming walking groups, planting a garden, or providing healthy eating/cooking educational classes.

Although churches had a great deal of flexibility in what intervention activities they implemented (based on the needs and wants of the congregation), they were asked to implement some core activities, focusing on PA and healthy eating, that were consistent across churches: distribute bulletin inserts (provided by study staff), share messages from

the pulpit (e.g. church announcements, sermons), pass out educational materials (e.g. brochures, handouts provided by study staff), create a FAN bulletin board, and suggest policies and practices the pastor could set (e.g. incorporate PA breaks into church meetings). So although the FAN intervention did not necessarily look the same across all churches, there were some consistent activities implemented by all.

Each church formed a committee and attended a full-day training. The purpose of the committee training was to provide an overview of the FAN program and its goals, to engage the pastor in supporting FAN, and to brainstorm activities the church could do to promote PA and healthy eating. Each FAN committee developed a formal intervention plan (that included the activities described above) that was in line with the overall FAN objectives. Upon submission, churches received a stipend to assist with FAN-related activities.

Each church also sent two individuals to a one-day cooks training that focused on the Dietary Approaches to Stop Hypertension (DASH) diet plan. The goals of the training were to provide a participatory training workshop to: improve healthy meals and snacks within the church food program, enlist cooks in hands-on cooking with chef training, take part in menu planning activities, and demonstrate the development of flavor in foods through healthy ingredients. The training was expected to provide church cooks with the knowledge and skills necessary to prepare healthy and flavorful foods that nourish and satisfy their congregations as well as themselves³⁰.

In addition to the trainings, committees, cooks, and pastors received monthly mailings over the intervention period. Each mailing focused on either PA or healthy eating, a health condition related to poor activity or dietary habits, and highlighted a health behavior change strategy consistent with the social cognitive theory (e.g. social support, self-monitoring)³¹. The FAN committee was instructed to share the monthly mailing materials, which would assist church members in meeting FAN goals, with its congregants. Finally, FAN intervention staff made follow-up technical assistance calls to pastors, FAN coordinators, and cooks. The purpose of the calls was to learn what types of activities were being implemented, and to help problem-solve any challenges they were facing. More details of the committee training, cooks training, monthly mailings, and technical assistant calls can be found elsewhere²⁸.

Measures

All measures were completed at baseline (pre) and at 15 months (post).

Sociodemographic and health variables—Participants self-reported their age, gender, race, marital status, and education. BMI (kg/m²) was calculated with measured height and weight.

Fruit and vegetable intake—The National Cancer Institute (NCI) Fruit and Vegetable all-day screener measured FV consumption (cups/day) in the past month³². Nine of the original ten items were used (French fry consumption was excluded)^{33,25}. This instrument has shown acceptable psychometric properties^{21,34,16}.

Physical activity—A 36-item modified version of The Community Health Activities Model Program for Seniors (CHAMPS) questionnaire³⁵ assessed the frequency and duration of leisure-time moderate to vigorous PA “in a typical week during the past 4 weeks.” This measure has been shown to have strong psychometric properties^{35,36}. Hours per week of leisure-time moderate to vigorous PA (≥ 3.0 METs, household and related activities removed) was calculated.

Fat and fiber intake—The Fat and Fiber-Related Behavior Questionnaire ³⁷ assessed fat- (27 items) and fiber-related (14 items) dietary behaviors over the past three months. These summary scores have shown strong psychometric properties ^{37,38}.

Statistical Analyses

A square root transformation corrected skewness in both baseline and post-program PA and FV consumption scores. Basic descriptive statistics included frequencies and means of key survey variables for the total sample and across the number of health behavior changes (i.e. participants with 0, 1, 2, 3 behavior changes). Differences in demographic, health-related, and other key variables across behavior change groups were examined with ² or ANOVAs. Unadjusted change in each behavior was calculated by subtracting the baseline score from the post-test score (post-pre). Using effect sizes from the primary outcomes paper as a guide ²⁷, a change in each outcome was defined as an unadjusted pretest-posttest improvement ≥ 0.20 of the baseline standard deviation. The percentage of participants successfully changing each individual behavior was calculated first. Then, the total number of behaviors changed, and each combination of behaviors changed was calculated.

Repeated measures ANOVA using PROC MIXED to control for church clustering examined baseline to posttest change in each outcome. ANCOVA models using PROC GLIMMIX to control for church clustering examined whether changes in one outcome (yes) were associated with changes in another outcome (yes). Odds ratios and the associated 95% confidence intervals are presented. All models controlled for age, gender, education, church wave, and church size.

RESULTS

Of the 749 participants from 38 churches randomized to the intervention group at baseline, 360 participants from 36 churches had complete pre and post study data and were included in this study. Participants included in this study were older and engaged in less leisure PA at baseline compared to those not included ($p < 0.05$). Demographic and health-related characteristics of the total sample and for participants in each category of number of behaviors changed are shown in Table 1. The mean age of the entire sample was 56.6 ± 12.0 years and the mean BMI was 32.6 ± 7.3 kg/m². A majority of participants were female (76%), married (54%), had at least some college education (57%), and overweight or obese according to their BMI (88%). In general, participants who changed more behaviors had a higher BMI, were less likely to be in the 'normal' weight category, and had lower PA, lower FV consumption, higher fat-related behaviors, and lower fiber-related behaviors at baseline.

The most common behavior change was decreasing fat-related behaviors (43%), followed by improving fiber-related behaviors (42%), increasing PA (36%), and increasing FV consumption (33%). PA increased by a mean of 0.42 ± 5.2 hours/week (adjusted $p = 0.10$), FV consumption increased by 0.02 ± 4.1 cups/day (adjusted $p = 0.84$), fat behaviors decreased by 0.05 ± 0.3 points (adjusted $p = 0.02$), and fiber behaviors improved by 0.02 ± 0.4 points (adjusted $p = 0.18$).

Of the 360 participants, 69 (19%) changed no behaviors, 113 (31%) changed one behavior, 111 (31%) changed two behaviors, 48 (13%) changed three behaviors, and 19 (5%) changed all four behaviors. The most common combination was changing no behaviors (19%) followed by decreasing fat behaviors and improving fiber behaviors (13%), increasing PA (9%), increasing FV consumption (8%), decreasing fat behaviors (8%), improving fiber behaviors (6%), increasing PA and FV consumption (6%), increasing FV consumption, improving fiber behaviors, and decreasing fat behaviors (5%), increasing PA, improving

fiber behaviors, and decreasing fat behaviors (5%), and changing all four behaviors (5%). The prevalence of all other combinations of behavior change was <5%.

The relationship between changes in each of the four health behaviors (odds ratios, 95% confidence intervals, and p-values) is shown in Table 2. Participants who increased PA were 1.76 times more likely to increase FV consumption (OR=1.76, p=0.02) and participants who decreased fat-related behaviors were 5.93 times more likely to improve fiber-related behaviors (OR=5.93, p=<0.0001). There were no other significant relationships between changes in any other health behaviors.

DISCUSSION

Health behaviors (positive or negative) often cluster ^{6,8}, and as a result, a growing number of interventions have targeted multiple behaviors simultaneously ¹⁹. Because physical inactivity and poor diet are associated with disease and premature mortality ³⁹, successfully changing both behaviors simultaneously may have a greater public health impact than changing each behavior individually. Although a handful of large-scale faith-based interventions with African American populations have targeted multiple behaviors ^{16,25,26}, only one has examined patterns of simultaneous change ¹⁶. This study examined the extent to which participants taking part in a combined PA and dietary intervention achieved changes in four health behaviors. Nearly half (49%) of participants made changes in at least two health behaviors, providing support that faith-based interventions targeting environmental and organizational change can successfully change multiple health behaviors.

Participants were more likely to change multiple behaviors compared to a single behavior when examining the total number of behaviors changed (i.e. 0–4). Nearly half (49%) of participants in this study made changes in at least two behaviors, and 19% changed 3+ behaviors. Among those with multiple behavior changes, the most common combination was decreasing fat behaviors and improving fiber behaviors, followed by increasing PA and FV consumption, increasing FV consumption, improving fiber behaviors, and decreasing fat behaviors, increasing PA, improving fiber behaviors, and decreasing fat behaviors, and changing all four behaviors. The combinations of multiple behavior changes included both PA and dietary behaviors; participants did not focus exclusively on changing dietary behaviors and neglect PA, suggesting that PA and dietary behaviors can simultaneously change.

Often times, individuals attempting to make changes in dietary habits also report attempting to make changes in their PA habits ⁴⁰. It has been suggested that successfully changing one health behavior may increase one's confidence in improving other behaviors ¹⁹. We found some evidence of that in this study; an increase in PA was associated with an increase in FV consumption, whereas a decrease in fat-related behaviors was associated with an improvement in fiber-related behaviors.

FAN was unique in that it focused on structural change (e.g. the church environment, policy) for multiple health behaviors. Unlike other faith-based studies ^{22,23,25,26}, the intervention did not include individualized intervention activities such as workbooks, videos, one-on-one counseling sessions delivered via telephone or face-to-face, or group-based sessions focusing on healthy eating and PA. Instead, FAN focused on changing church policies and the church environment so that it was supportive of PA and healthy eating. Simultaneous changes in dietary and physical activity behaviors resulted from intervention activities such as providing information about PA and healthy eating, the pastor preaching about PA and healthy eating from the pulpit, and establishing guidelines and practices for PA and healthy eating. The findings from this study suggest that it is feasible to change multiple behaviors

in structural interventions such as FAN that target environmental and organizational change, and results should be interpreted within a public health context. Changes in multiple behaviors, even if small in magnitude, across an entire population such as AME church members in South Carolina (estimated at 275,000 members) can have a significant and meaningful impact on public health.

A study by Resnicow and colleagues ¹⁶ is the only faith-based intervention targeting African Americans that has examined the extent to which participants made simultaneous changes in PA and FV consumption. Among those in the intervention groups, 40% (self-help group) and 49% (self help + motivational interviewing) made changes in one behavior, and 18% and 22% made changes in both behaviors ¹⁶. It is difficult to make direct comparisons with our study, as we examined change in four (compared to two) behaviors, the definitions of 'change' were different, and the Healthy Body Healthy Spirit Trial ¹⁶ focused on the individual through a number self-help materials and telephone counseling, whereas FAN focused on the environment, not on individual church members. Nonetheless, results from these two studies suggest that faith-based interventions may be effective in changing multiple health behaviors simultaneously in African American church members. In addition to reporting the overall effects of an intervention, future studies targeting multiple health behaviors (i.e. faith-based) should examine and report the extent to which individuals achieve changes in the targeted behaviors. Additional studies examining the number of behaviors that can be successfully changed are also warranted.

Nearly one in five participants (19%) in the intervention group made no changes in any of the targeted behaviors, suggesting that additional work remains in how to effectively change PA and dietary behaviors through churches. Interestingly, mean baseline values among individuals who did not change a particular health behavior were more favorable, leaving less room for change. From a public health perspective, these findings are encouraging, as positive changes among those who are in most need of change (e.g. those with lower PA or FV consumption at baseline) have the most impact on population levels of health ⁴¹.

The findings from this study should be interpreted with some limitations in mind. This study relied on self-report measures to assess change in all behavioral outcomes. Although validated measures were used, all are subject to biases. Further, fat- and fiber- behaviors were assessed, not actual consumption. Finally, the attrition rate was also higher than anticipated, although similar to what has been previously reported in studies with African Americans ⁴².

Implications for Research and Practice

Although a handful of faith-based interventions have targeted multiple behaviors, only one study has examined the extent to which participants change multiple targeted behaviors. Nearly half of participants taking part in the FAN intervention changed more than one behavior, and nearly one in five changed three or four of the targeted behaviors. These findings point to the feasibility of faith-based interventions targeting organizational and environmental change in changing multiple health behaviors in African Americans. Interventions targeting and changing multiple behaviors simultaneously have the potential to be efficient and cost effective ¹⁸¹¹, and to produce meaningful changes in population levels of health.

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Table 1
Baseline Characteristics of Participants taking part in the FAN Intervention according to Number of Behaviors Changed

	Total Sample (n=360)		0 Behaviors (n=69)		1 Behavior (n=113)		2 Behaviors (n=111)		3 Behaviors (n=48)		4 Behaviors (n=19)	
	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)
Age, years	360	56.6 (12.0)	69	55.2 (14.1)	113	58.2 (12.0)	111	55.6 (11.3)	48	55.9 (11.0)	19	60.3 (9.8)
BMI, kg/m ² *	356	32.6 (7.3)	69	30.6 (6.3)	112	32.7 (7.7)	110	32.0 (7.1)	46	36.2 (8.0)	19	33.6 (5.6)
Gender												
Male	87	24	17	25	31	27	26	23	7	15	6	32
Female	273	76	52	75	82	73	85	77	41	85	13	68
Education												
< HS grad	34	9	6	9	13	12	8	7	6	13	1	5
HS grad or GED	121	34	27	39	39	35	38	34	13	27	4	21
Some college	97	27	14	20	26	23	32	29	18	38	7	37
College grad	108	30	22	32	35	31	33	30	11	23	7	37
Marital status												
Married	194	54	33	49	63	56	60	55	28	58	10	53
Not married	163	46	34	51	50	44	50	45	20	42	9	47
Weight category *												
Normal	41	12	11	16	16	14	12	11	0	0	2	11
Overweight	107	30	25	36	32	29	38	35	9	20	3	16
Obese	208	58	33	48	64	57	60	55	37	80	14	74
Physical Activity, hours/week *	360	3.2 (4.8)	69	3.9 (4.9)	113	3.5 (5.8)	111	3.3 (4.4)	48	2.0 (2.7)	19	1.4 (2.7)
Fruit and Vegetables, cups/day *	360	3.9 (4.0)	69	4.6 (4.7)	113	4.3 (4.2)	111	3.7 (4.0)	48	3.0 (2.4)	19	2.6 (1.9)
Fat Behaviors ^a *	360	2.6 (0.4)	69	2.6 (0.4)	113	2.6 (0.5)	111	2.7 (0.4)	48	2.8 (0.4)	19	2.7 (0.5)

	Total Sample (n=360)		0 Behaviors (n=69)		1 Behavior (n=113)		2 Behaviors (n=111)		3 Behaviors (n=48)		4 Behaviors (n=19)	
	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)	n	% or Mean (SD)
Fiber Behaviors ^a *	360	2.8 (0.5)	69	2.8 (0.5)	113	2.8 (0.6)	111	2.8 (0.5)	48	3.0 (0.5)	19	2.9 (0.5)

^aRange 1–4, lower more favorable fat- and/or fiber-related behaviors

* Significant difference across risk factor groups (p<0.05)

Table 2

Relationship between Changes^a in one Health Behavior with Changes in another Health Behavior among Participants taking part in the FAN Intervention (n=360)

	Physical Activity	Fruit and Vegetable Consumption	Fat Behaviors	Fiber Behaviors
	Odds Ratio ^b (95% Confidence Interval) p-value	Odds Ratio ^b (95% Confidence Interval) p-value	Odds Ratio ^b (95% Confidence Interval) p-value	Odds Ratio ^b (95% Confidence Interval) p-value
Fruit and Vegetable Consumption	1.76 (1.10, 2.81) p=0.02			
Fat Behaviors	0.89 (0.56, 1.41) p=0.61	0.90 (0.57, 1.43) p=0.67		
Fiber Behaviors	1.2 (0.76, 1.91) p=0.44	1.24 (0.78, 1.97) p=0.36	5.93 (3.61, 9.72) p<0.0001	

^aDefined as at least a .20 standard deviation improvement from pretest to posttest.

^bModeling the odds that change in one behavior is associated with change in the other behavior; model adjusts for age, gender, education, church wave, and church size