HHS Public Access

Author manuscript

J Phys Act Health. Author manuscript; available in PMC 2020 June 05.

Published in final edited form as:

J Phys Act Health. ; : 1–7. doi:10.1123/jpah.2017-0603.

Sumter County on the Move!: Evaluation of a Walking Group Intervention to Promote Physical Activity within Existing Social Networks

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Abstract

Background: Social network-driven approaches have promise for promoting physical activity in community settings. Yet, there have been few direct investigations of such interventions. This study tested the effectiveness of a social network driven, group-based walking intervention in a medically underserved community.

Methods: This study used a quasi-experimental pretest-posttest design with three measurement time points to examine the effectiveness of *Sumter County on the Move!* in communities in Sumter County, SC. A total of 293 individuals participated in 59 walking groups formed from existing social networks. Participants were 86% females, 67% Black and 31% white, with a mean age of 49.5 years. Measures included perceptions of the walking groups, psychosocial factors such as self-regulation, self-efficacy and social support, and both self-reported and objectively measured physical activity.

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Results: The intervention produced significant increases in goal-setting and social support for physical activity from multiple sources, and these intervention effects were sustained through the final measurement point six months after completion of the intervention. Nonetheless, few of the desired changes in physical activity were observed.

Conclusions: Our mixed results underscore the importance of future research to better understand the dose and duration of intervention implementation required to effect and sustain behavior change.

Keywords

health behavior; community-based research; intervention study; MVPA

INTRODUCTION

Recent evidence indicates that only one in five Americans is sufficiently active to meet recommendations for physical activity (PA)[1], and nearly one-third of Americans engages in no physical activity outside of their employment.[2] Insufficient PA has particularly negative consequences in disadvantaged communities, where residents experience disproportionate risk for chronic diseases[2–5], and greater barriers to sustaining PA[6]. Effective PA interventions tailored to the needs of such communities are needed[7,8].

Previous evidence points to the importance of social support (e.g., family, friend, church or neighborhood)[9–12] in walking inteventions. Members of social networks may help individuals overcome barriers to PA in their social environments and draw upon their existing social resources[13]. Researchers have begun to look beyond dyadic social relationships to group-based intervention approaches[14]; yet, most studies have grouped previously unacquainted individuals, rather than individuals who are already connected in existing social networks. This paper reports the results of a study of the effectiveness of a social network driven, group-based intervention to increase walking[15].

METHODS

This study used a quasi-experimental pretest-posttest design with three measurement time points to examine the effectiveness of the *Sumter County on the Move!* (SCOTM) walking intervention. The research protocol was approved by the University of South Carolina's Institutional Review Board and written informed consent was provided by all participants.

Setting

The research was conducted with underserved communities in Sumter County, South Carolina. Compared with state averages[16], Sumter County is comprised of a higher proportion of Black/African American residents (47.1% vs. 27.8%) and a higher proportion of residents living below the federal poverty level (23.2% vs. 18.0%).

Intervention

Sumter County On The Move!—(SCOTM!) is the result of integrating social cognitive[17] and social network[18] theories, empirical evidence and formative research to

develop a community-based program tailored to the social environments of target participants. Described in detail elsewhere[15], the intervention used strategies for mobilizing, supporting, and reinforcing existing social networks to increase walking. Program participants were guided in forming walking groups of 4–8 members from their existing social networks. Groups registered with the walking program and identified a leader to participate in leadership training workshops and/or serve as point of contact for distribution of information and materials. Groups were not required to walk together (although at least occasional group walks were encouraged), and group leaders were encouraged to provide support to their members for walking in general through methods including telephone contacts. Program components included the following:

Leadership Training for Group Leaders.—A Walk Leader Manual served as the basis for leadership training for group leaders. Topics included walking resources in the community, strategies for staying motivated and keeping team members motivated, tips for overcoming common barriers, and health and safety information. Consistent with the social cognitive theory[17], this training prepared group leaders to model desirable behaviors and draw attention to the outcomes participants could anticipate from engaging in PA. Since groups were formed from existing social networks and group leaders were identified by the groups themselves, the likelihood of members being able to identify with their group leaders was expected to be high.

Sessions for Success.—Brief (90–120 minutes in duration) informational and skill-building workshops covered a range of topics guided by elements of social cognitive theory. These included orientation for new group leaders as well as specific strategies such as planning for success, mobilizing friends and family for support, and tips for safe walking in hot weather. Attendance was strongly recommended for all group leaders, but they were open to all participants.

Informational Materials.—All participants received a Walk Member Handbook with community trail maps and other resources about issues of interest, such as nearby walking tracks and free indoor walking locations. Team leaders received the Walk Leader Manual and tips for facilitating group members' use of their Walk Member Handbook and other program materials. Electronic mail and social media such as *Facebook* and *Twitter* were used as communication vehicles to share information about upcoming Sessions for Success, community resources and events, and other information about walking. Consistent with social cognitive theory[20], these materials were intended to build participants' self-efficacy for exercise, provide self-regulatory skills, and guide participants in managing the environmental influences on their behaviors.

Follow-up Communication.—Staff contacted team leaders on a monthly basis throughout the 6-month program to answer any questions that arose with the coordination of the group and provide tips for overcoming any barriers encountered.

Recognition.—Staff worked with local community/neighborhood centers, work sites, social media and local print media to publicize and recognize the achievements of program participants. After six months of participation in the program, participants were honored as

"graduates" from the program. As enrollment in the program was ongoing, this element of the intervention served to provide another vehicle for making role models visible to newly enrolled program participants.

Participants

Individuals were recruited via word of mouth, local media, community flyers, electronic listservs and newsletters distributed by employers and community organizations, presentations to community groups, and direct mail. Prospective participants were eligible if they: (a) were18 years of age or older, (b) resided or employed in Sumter County, SC, and (c) had at least one other person in their group, preferably four or more. Additionally, we screened for contraindications for physical activity (adapted from the Physical Activity Readiness Questionnaire)[19] as well as use of insulin therapy and physical limitations that would prohibit intervention participation. Individuals taking medication for hypertension were not excluded, as long as their blood pressure was controlled. Our protocol minimized exclusions to make the program available to all who might benefit from walking and to avoid imposing any artificial restrictions on the social networks from which groups were formed.

Measures

Participants provided measurements at in-person sessions in centrally located space provided by a county agency. Baseline sessions were held from January 2012 to June 2013. Measurements were repeated at the end of the program (6 months) and six months after program completion (12 months). Participants reported their sociodemographic characteristics, health status, history of health conditions, physical limitations and whether they had need for any special equipment due to health problems. Objective physical measures by trained staff included waist circumference, height, weight and blood pressure[20]. Height and weight measurements were converted for calculation of body mass index (BMI)[21].

Group members rated their relationship with their walking group leader in terms of the nature of their relationship, proximity of residence, and frequency of contact.

Self-regulation was measured with the Exercise Goal-Setting Scale (10 items) and the Exercise Planning and Scheduling Scale (3 of original 10 items)[22]. Self-efficacy for overcoming common barriers to exercise was assessed with Marcus et al.'s 5-item scale[23]. The average across items was computed for each scale or subscale.

Social support for exercise from family and friends, and walking groups was assessed with Sallis and colleagues' scale[24]. One item, "Took over chores so I had more time to exercise," was added based on the relevance of this issue in our previous experiences with similar populations. The average of all items was computed for each subscale (participation and rewards) and source of support.

Self-reported physical activity over the past seven days was measured via the short form of the International Physical Activity Questionnaire (IPAQ-SF)[25–30]. Beginning immediately after the baseline measurement session, participants wore an ActiGraph accelerometer

(GT1M model, ActiGraph, LLC, Fort Walton Beach, FL) for seven consecutive days. To be included in analyses, participants had to wear the monitor for 10+ hours on a minimum of four days, including at least one Saturday[32]. Data from Sundays were not used due to low rates of protocol compliance. Counts/minute of ≥ 1952 were considered moderate- to vigorous-intensity physical activity, whereas counts/minute of ≤ 100 were considered sedentary behavior[34]. Consecutive strings of 60 minutes or more of 0 counts were considered to be non-wear time.

A program satisfaction survey was administered at the end of the intervention to provide both group leaders and group members with opportunities to provide feedback on intervention materials.

Statistical Analyses

All analyses were conducted with SAS version 9.3 (Cary, NC). For descriptive information at baseline, frequency distributions or means and standard deviations are presented. For analyses to assess change over time in physical activity behaviors and psychosocial variables, regression models tested whether there were differences in these variables (dependent variables) between the baseline and 6-month measurements, between 6-month and 12-month measurements, and across the entire follow-up period between baseline and the 12-month measurements. Models using accelerometer data controlled for wear time. SAS PROC MIXED was used to control for the potential clustering effect of walking group as well as race, age, gender, education, and the baseline factors associated with attrition (noted above). Analyses to make comparisons across time points were based on participants who had data at both time points.

RESULTS

Study Participants

Figure 1 displays the flow of participants through the phases of the study. Of the 401 individuals who initially expressed interest in the program, 74% (N=296) enrolled and provided baseline measurements. At the 6-month measurement, 65.5% of the baseline participants were measured. At the 12-month measurement, 57% of the baseline participants were measured. With respect to most sociodemographic and health characteristics, there were no differences between the baseline sample and those who completed follow-ups; however, those who missed the six-month measurement tended to be older, $X^2(1, N = 292)=4.74$, $p = 0.03$, have higher waist circumferences at baseline, $X^2(1, N = 292) = 4.49$, $p = 0.04$, and have higher BMI at baseline, $X^2(1, N = 292) = 3.92$, $p = 0.05$. Those with a history of high cholesterol were significantly more likely to be retained through at least the six-month measurement (74.5% vs. 62.3%), $X^2(1, N = 292) = 4.22$, $p = 0.04$. No additional factors were associated with retention through the 12-month measurement.

The majority of participants were women (86%), African American (67%) had some college education (33%) or had completed college or technical school (45%), and were employed (64%). Slightly more than half (52%) were married, and 39% reported having at least one

child. The relatively low participation among men mirrors previously documented challenges in recruiting men for preventive health programs[33].

The study participants' health histories reflected the moderate to high rates of chronic conditions expected in a medically underserved area with large proportions of Blacks/African Americans and families living below the poverty level. For example, 46% of participants had a history of hypertension, 32% had a history of high cholesterol, and 27% had a history of arthritis. Fully 71% of the sample had waist circumference measurements in the high risk range and 86% of the participants were overweight or obese. Approximately half of participants had blood pressure readings that would constitute prehypertension or high blood pressure.

Study participants formed a total of 59 walking groups, ranging in size from 2 to 10 members at baseline. Members' mean rating of the closeness of their relationship with their walking group leader was 2.30 ($SD = 0.46$) which represents a value between "somewhat close" and "very close." Eleven percent ($SD = 18.49$) of group members categorized their walking group leader as a casual acquaintance, 35% ($SD = 32.46$) categorized their walking group leader as a friend, 24% ($SD = 30.95$) categorized their group leader as a family member, and 30% ($SD = 36.25$) categorized their walking group leader as a co-worker. Only 23% ($SD = 31.09$) of members resided in the same neighborhood as their group leader. Most group members reported having contact with their group leader at least once a week.

Psychosocial Variables: Change Over Tiime

Table 1 presents the results of our analyses to assess change over time in the psychosocial variables that were direct intervention targets and hypothesized precursors to changes in PA behaviors. With respect to self-regulation, we observed an increase in goal-setting between baseline and the six-month measurement ($t(105) = 4.05$, $p = 0.00$), most of which was sustained through the 12-month measurement. Unfortunately, no increase was observed for planning. With respect to exercise self-efficacy, we observed a decrease between baseline and the six-month measurement ($t(105) = -2.72$, $p = 0.01$), most of which was sustained through the 12-month measurement.

Social support for PA was the area in which we found the most consistent pattern of change in the hypothesized direction. We found a relatively strong increase in ratings of support from the walking group, $t(105) = 5.59$, $p = 0.00$, much of which was sustained through the 12-month measurement, $t(105) = 3.78$, $p = 0.00$. The frequency with which walking group members or leaders participated in tangible supports for PA increased, $t(105) = 5.81$, $p = 0.00$), and much of that increase was sustained through the 12-month measurement, $t(105) = 3.95$, $p = 0.00$). There was no change in participants' perceptions of social support for PA from the walking group in the form of rewards for PA.

We observed an increase in ratings of support from family and friends at the six-month measurement, $t(105) = 3.18$, $p = 0.00$), much of which was sustained through the 12-month measurement, $t(105) = 2.17$, $p = 0.03$). The frequency with which friends and family participated in tangible supports for PA increased ($t(105) = 3.25$, $p = 0.00$), some of which was sustained through the 12-month measurement, $t(105) = 2.02$, $p = 0.05$). Nonetheless, as

with support from the walking group, there was no significant change in participants' perceptions of social support for PA from friends and family in the form of rewards for PA. The fact that we saw a smaller increase in social support from friends and family as compared with social support from walking groups may reflect some overlap in the targets for these measures, as many walking groups included friends and family members.

Physical Activity: Changes Over Time

Table 2 presents the results of our analyses to assess change over time in PA behaviors, adjusting for the clustering of participants within walking groups. We observed a decline in self-reported time spent sitting per day between the baseline and 6-month measurements, $t(105) = -2.28$, $p = 0.02$) that equates to an average of nearly 51 fewer minutes of sitting per day. Not only was the decline in this measure sustained through the 12-month measurement, but the trend continued, with an average of 76 fewer minutes of sitting reported as compared with the baseline measure. The decrease in self-reported sitting did not correspond to increased reports of walking. We did observe an increase in self-reported moderate PA at six-months, $t(105) = 2.23$, $p = 0.03$); nonetheless, this effect was not sustained through the 12-month measurement.

With respect to objectively measured PA behaviors, our results were mixed, and those changes that were statistically significant were contrary to our hypotheses. In contrast with the results based on self-reported measures of PA behaviors, we saw increases in sedentary activities, both in terms of minutes per day, $t(102) = 2.78$, $p = 0.01$ for the baseline to 12-month comparison) and in terms of the % of wear time spent in sedentary activities across the week, $t(102) = 2.46$, $p = 0.02$). These increases in objectively measured sedentary activities amount to approximately 21 minutes per day and 2% of wear time. We also observed a decrease in time spent in bouts of light physical activity, $t(102) = -2.28$, $p = 0.02$ for the baseline to 6-month comparison and $t(102) = -2.63$, $p = 0.01$ for the baseline to 12-month comparison. There were no changes in minutes of moderate- or vigorous-intensity PA; however, we did observe a small decrease in the number of days with bouts of 10 or more minutes of moderate- or vigorous-intensity PA, $t(102) = -1.96$, $p = 0.05$)

DISCUSSION

Overall, our intervention produced positive changes in some of the most direct and immediate intervention targets – namely, goal-setting and social support, particularly from the walking groups. Individuals' self-reports of physical activity behaviors reflected changes in the hypothesized direction for both sedentary behavior (i.e., sitting) and moderate-intensity physical activity. Unfortunately, increases in self-reported walking of approximately five minutes per day were not large enough to be statistically significant within our sample.

Estimates of time spent engaging in physical activity were higher for the self-reported measures than for accelerometer measures. We should note that the time frame of reference for the self-report measure was the 7-day period *prior to* the measurement visit, whereas the accelerometer was worn during the 7-day period *following* the measurement visit. We cannot rule out the possibility that differences between self-reported and directly observed

physical activity were attributable to intra-individual fluctuations in activity levels over time. Additionally, observed changes in self-reported PA may have been upwardly biased by participants' awareness of the effort involved in increasing PA; this awareness may be important for increasing PA.

Indeed, increases in goal-setting and social support with declining self-efficacy over the study period underscore the complexity of interrelationships between these psychosocial factors and behavior. Attempts to increase PA may have been accompanied by realizations of how difficult it can be to increase one's fitness level. Thus, confidence may decline before it increases. Future research should include more fine-grained consideration of these dynamics, in order to better contribute to questions regarding the appropriate duration of such interventions.

It is worthwhile to consider these results in light of those Centola[34,35] and Aral[36], both of whom found that the strength of social ties was associated with the spread of behaviors within networks and that ties to high status individuals had the greatest influences on behaviors among low status individuals. In the case of PA behaviors, the more an individual is concerned about whether they can successfully enact a decision to engage in more PA, the greater may be the influence of their social network, particularly network members who share certain relevant characteristics. What, then, would heighten such concerns and thereby heighten the relevance of the social network? An individual may feel pressure to succeed in order to lose weight and fear the health consequences of failure; others may have a low tolerance for the discomfort that goes practically hand in hand with efforts to improve one's fitness. Finally, some may have concerns about how features of the built environment will support or interfere with their efforts. Indeed, research on social factors, neighborhood walkability and physical activity behaviors, has identified interactions between social factors and neighborhood walkability as important to understanding behavior change.[37,38]

We cannot rule out the possibility that changes in self-reported physical activity were associated with social desirability bias. Nonetheless, if social desirability effects were responsible for the observed changes, one might have anticipated significant changes in self-reported walking, given that walking was the clear behavioral focus of our intervention. The fact that our results were mixed even for self-reported PA behaviors may underscore the importance of future research to better understand the dose and duration of intervention implementation required to effect and sustain behavior change. There is little previous empirical evidence related to social network-driven group interventions for PA; thus, our intervention should be viewed as a starting point for future refinement. To this end, the observed increases in self-regulation and social support for PA are promising and consistent with our hypothesis that walking groups formed from existing social networks would be an effective vehicle for delivering social support and influencing social cognitive factors necessary for changes in PA.

Even if social support and social cognitive factors are necessary to elicit changes in PA behaviors, they may not be sufficient to do so. Also, this study was limited to a single county and did not have a control group; thus, we were not able to examine the impact of variations

in community context and/or resources in as much detail as these issues warrant. Future studies should aim for variation on such factors when possible.

By carefully limiting our exclusion criteria, we were able to enroll a diverse sample with respect to health status, thereby maximizing the generalizability of our findings to populations that may have high rates of sedentary behaviors and very low rates of moderate or vigorous PA. Our efforts to make the program available to as many community members as possible helped to ensure that no artificial restrictions were imposed on the composition of the walking groups. This study provides evidence that community members can form walking groups from within their existing social networks and that even participants with histories of chronic health conditions can participate meaningfully.

Acknowledgements

We wish to thank the Sumter County On the Move! participants for taking part in the study. We thank the staff and students at the University of South Carolina and Sumter County Active Lifestyles for their time and hard work. We also thank Sumter County Recreation and Parks Department for their support and provision of facilities for the work to be carried out.

Funding Source

This work was supported by the Centers for Disease Control and Prevention's National Center for Chronic Disease Prevention and Health Promotion by Cooperative Agreement Number U48-DP-001936. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

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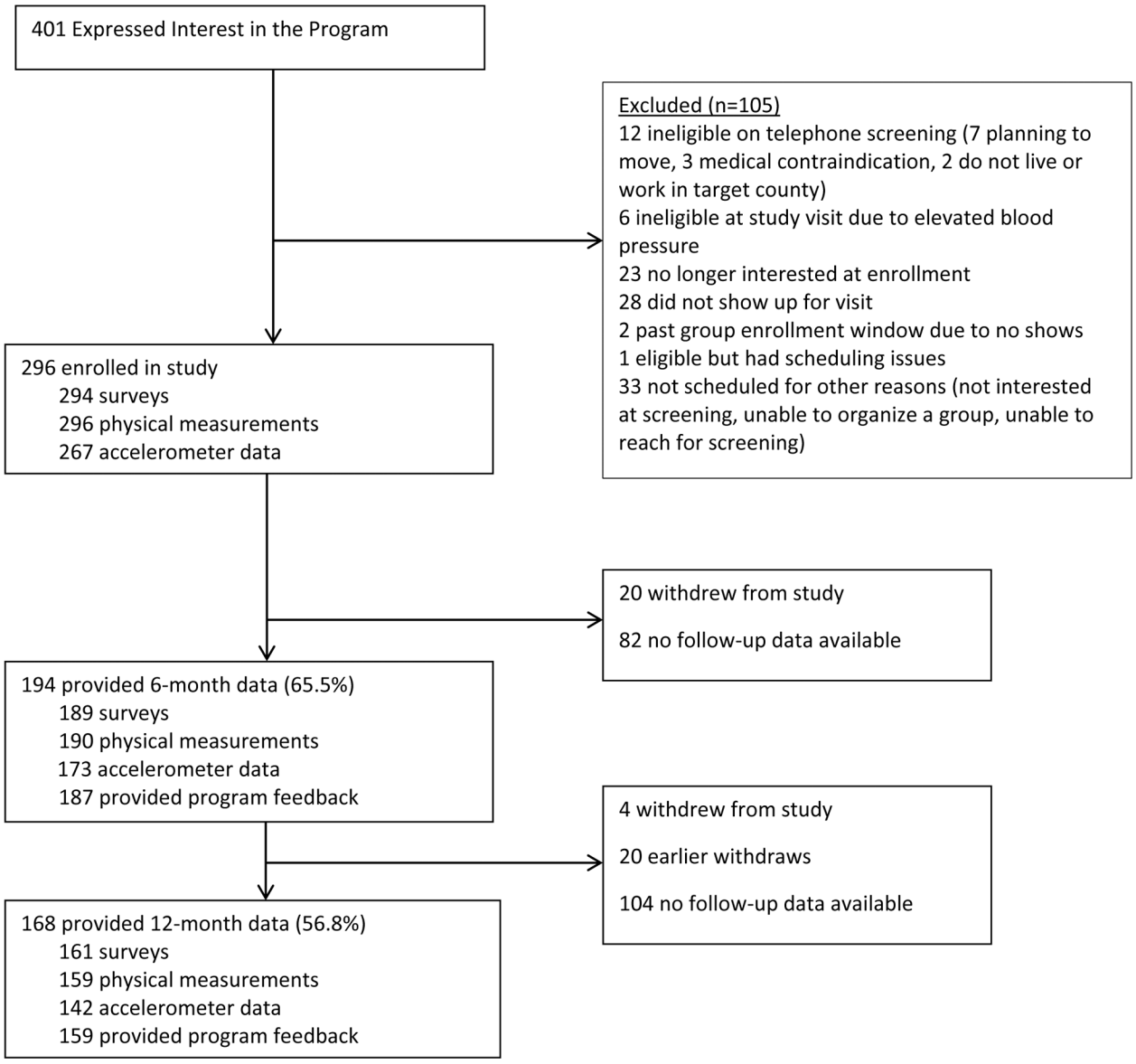

Figure 1.
Flow of Participants through Screening, Enrollment, and Follow-Up

Table 1.

Comparison of Baseline, 6-Month and 12-Month Means for Intervention Targets

Dependent Variables	Baseline Mean (SE) (N=293)	6-Month Mean (SE) (N=194)	12-Month Mean (SE) (N=168)	*t (P)* for difference (0–6 month)	*t (P)* for difference (0–12 month)	*t (P)* for difference (6–12 month)
Self-regulation						
Goals	2.52 (0.07)	2.79 (0.08)	2.79 (0.09)	**4.05 (0.00)**	**3.89 (0.00)**	0.07 (0.94)
Plans	3.37 (0.08)	3.45 (0.09)	3.43 (0.09)	0.99 (0.32)	0.76 (0.45)	−0.17 (0.87)
Exercise Self-Efficacy	4.19 (0.10)	3.93 (0.11)	3.92 (0.12)	**−2.72 (0.01)**	**−2.61 (0.01)**	−0.05 (0.96)
Social Support for PA – Walking Group						
Participation Subscale	1.93 (0.09)	2.52 (0.10)	2.35 (0.10)	**5.81 (0.00)**	**3.95 (0.00)**	−1.50 (0.14)
Rewards Subscale	3.68 (0.03)	3.66 (0.03)	3.66 (0.04)	−0.35 (0.72)	−0.50 (0.62)	−0.16 (0.88)
Total	2.25 (0.07)	2.67 (0.07)	2.55 (0.08)	**5.59 (0.00)**	**3.78 (0.00)**	−1.45 (0.15)
Social Support for PA – Friends and Family						
Participation Subscale	2.29 (0.06)	2.50 (0.07)	2.43 (0.07)	**3.25 (0.00)**	**2.02 (0.05)**	−1.00 (0.32)
Rewards Subscale	3.62 (0.03)	3.61 (0.03)	3.62 (0.04)	−0.30 (0.76)	−0.05 (0.96)	0.22 (0.83)
Total	2.50 (0.05)	2.66 (0.05)	2.62 (0.06)	**3.18 (0.00)**	**2.17 (0.03)**	−0.80 (0.43)
Social Support for PA – All	2.42 (0.05)	2.67 (0.05)	2.59 (0.06)	**4.98 (0.00)**	**3.32 (0.00)**	−1.33 (0.19)

Note: Means and p-values resulted from mixed regression models that adjusted for group clustering as well as race, age, gender, education, and baseline waist circumference, BMI and cholesterol history.

Boldface text indicates statistical significance ($p < .05$).

Table 2.

Comparison of Baseline, 6-Month and 12-Month Means for Physical Activity (PA) Behaviors

Dependent Variables	Baseline Mean (SE) (N=293)	6-Month Mean (SE) (N=194)	12-Month Mean (SE) (N=168)	*t (P)* for difference (0–6 month)	*t (P)* for difference (0–12 month)	*t (P)* for difference (6–12 month)
Self-Reported PA Behaviors						
Sitting, minutes/day	368.26 (16.61)	317.54 (19.51)	292.88 (20.83)	**−2.28 (0.02)**	**−3.22 (0.00)**	−0.98 (0.33)
Walking, minutes/day	41.63 (5.94)	47.41 (7.09)	44.60 (7.58)	0.71 (0.48)	0.35 (0.73)	−0.30 (0.76)
Moderate PA, minutes/day	21.91 (4.85)	34.99 (5.60)	30.88 (5.94)	**2.23 (0.03)**	1.45 (0.15)	−0.62 (0.54)
Vigorous PA, minutes/day	29.43 (4.41)	27.24 (5.18)	31.96 (5.52)	−0.39 (0.70)	0.42 (0.67)	0.73 (0.47)
Accelerometer-Measured PA Behaviors						
Time Spent in Sedentary Activities, minutes/day	527.30 (6.91)	542.84 (7.67)	548.26 (8.13)	**2.20 (0.03)**	**2.78 (0.01)**	0.69 (0.49)
Time Spent in Light PA, minutes/day	301.92 (6.57)	285.97 (7.30)	279.67 (7.76)	**−2.28 (0.02)**	**−2.99 (0.00)**	−0.81 (0.42)
Time Spent in MVPA, minutes/day	17.96 (1.33)	18.17 (1.47)	19.19 (1.56)	0.16 (0.87)	0.88 (0.38)	0.69 (0.49)
Time Spent in Sedentary Activities, % weekly	62.41 (0.81)	64.04 (0.90)	64.62 (0.96)	1.94 (0.06)	**2.46 (0.02)**	0.62 (0.54)
Time Spent in Light PA, % weekly	35.53 (0.78)	33.83 (0.87)	33.18 (0.92)	**−2.03 (0.05)**	**−2.63 (0.01)**	−0.70 (0.49)
Time Spent in MVPA, % weekly	2.06 (0.16)	2.15 (0.18)	2.25 (0.19)	0.58 (0.56)	1.12 (0.26)	0.55 (0.59)
# of days with MVPA	6.00 (0.14)	6.13 (0.16)	5.83 (0.18)	0.66 (0.51)	−0.80 (0.43)	−1.33 (0.19)
# of days with 10+ minutes bouts of MVPA	1.09 (0.11)	0.85 (0.13)	0.96 (0.14)	**−1.96 (0.05)**	−1.02 (0.31)	0.76 (0.45)

Note: Means and p-values resulted from mixed regression models that adjusted for group clustering as well as race, age, gender, education, and baseline waist circumference, BMI and cholesterol history.

Boldface text indicates statistical significance ($p < .05$).