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Original Article

Barrier Removal in Increasing Physical Activity Levels in Obese African American Women with Disabilities

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Abstract

Background: This pilot study examined the effectiveness of a telephone-based intervention to increase physical activity in obese African American women with mobility disabilities by targeting the removal of barriers to participation.
Methods: Severely obese (mean body mass index [BMI] = 49.1 kg.m^2) African American women ($n = 33$) with mobility disabilities completed a 6-month telephone-based physical activity coaching intervention.
Results: The major environmental/facility barriers at preintervention were *cost of the program* (66.7%), *lack of transportation* (48.5%), *not aware of fitness center in the area* (45.5%), and *lack of accessible facilities* (45.5%). The major personal barriers were *pain* (63.6%), *don't know how to exercise* (45.5%), *health concerns* (39.4%), *don't know where to exercise* (39.4%), and *lack of energy* (36.4%). Despite only two personal barriers being significantly lower at posttest (*don't know where to exercise* and *don't know how to exercise*) ($p < 0.01$), total exercise time increased from <6 minutes/day to 27 minutes/day at posttest ($p < 0.001$), and total physical activity time (structured exercise, leisure, indoor and outdoor household activity) increased from 26 minutes/day to 89 minutes/day at posttest ($p < 0.001$).
Conclusions: Interventions aimed at increasing physical activity participation among obese African American women with mobility disabilities should start with increasing their awareness/knowledge on where and how to exercise. Other reported barriers (e.g., cost, transportation, finding an accessible facility, health concerns, pain) may not be as critical to alter/remove as identifying where participants can exercise (i.e., home, outdoors, gym) and providing them with a variety of routines that can be performed safely in their desired setting.

Introduction

The proportion of women with physical disabilities is increasing, and African American women between 45 and 64 years of age, in particular, have a higher rate of physical disability compared with other ethnic groups.[1] The health status of African American women with disabilities is a significant issue.[2,3] African American women with physical disabilities have higher rates of obesity, depression, osteoporosis, diabetes, and hypertension than women without disabilities[2,4,5] and other ethnic groups of women with disabilities.[3]

Two studies have reported that physical inactivity among African American women with physical disabilities is higher than in the general population and among other ethnic groups of women with disabilities.[3,6] Patterns of low physical activity among African American women with disabilities raise serious concerns about their health and well-being, particularly as they enter their later years, when the effects of the natural aging process are compounded by years of sedentary living and severe deconditioning.[7,8] Reducing health disparities among African American women with disabilities continues to be an unattended, yet critically important, public health issue.[9]

Increasing participation in physical activity among people with disabilities is a major challenge for healthcare professionals.[10–16] Starting a new health behavior, such as physical activity, is often impacted by the perceived (i.e., exercise will make my condition worse) or actual (i.e., no transportation to

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get to an exercise facility) barriers expressed by individuals attempting to participate in the targeted behavior.[17,18] Rimmer et al.[19] found that the major barriers to physical activity reported in a group of predominantly African American women with mobility disabilities were lack of transportation, cost of the program, not knowing where to exercise, and not knowing how to exercise. These barriers were also reported in another study examining barriers to physical activity in a group of African American stroke survivors.[20] The five most common barriers were cost of the program (61%), lack of awareness of fitness center in the area (57%), no means of transportation to get to an exercise facility (57%), did not know how to exercise (46%), and did not know where to exercise (44%). Another study reported that health status may influence a person's ability to participate in physical activity because certain impairments associated with the disability (e.g., paralysis or loss of vision) may limit or restrict the person's ability to perform various types of physical activity, such as walking or playing a recreational sport.[21]

Several theories associated with behavior change (i.e., social cognitive theory, theory of planned behavior) recommend addressing barriers as an important prerequisite for altering a targeted behavior.[22,23] Cardinal et al.[24] examined the physical activity behavior in 332 adults with physical disabilities and noted that barriers had a significant influence on physical activity participation among people with physical disabilities and that addressing them may be a necessary step toward increasing their physical activity participation. Health promotion interventions are needed that systematically address barriers to initiating physical activity among people with disabilities.[25,26] Most of the research on barriers to physical activity in disabled[13,20,27,28] and other populations[26,29,30] is descriptive in nature, and there are no prospective studies on African American women with disabilities that target the removal of barriers to physical activity. Given the high rate of physical inactivity and obesity among African American women with disabilities,[3,31] there is an urgent need to better understand what barriers need to be removed in order to obtain increases in physical activity. Therefore, the purpose of this pilot study was to develop a telephone-based coaching intervention that targeted the removal of barriers to physical activity participation in an obese African-American group of women with mobility disabilities.

Materials and Methods

Sample

Fifty-three African American women were referred for enrollment into the study by their primary care physician from the general internal medicine clinic of a large Midwestern university medical center. They were assigned to a phone-based physical activity coaching intervention that involved a weekly telephone consultation with a health professional on how to plan and maintain a physical activity program. The inclusion criteria included (1) age $\geq$18, (2) mobility limitation, defined as having difficulty walking one block or using an assistive device, including a cane, walker, crutches, or wheelchair, (3) body mass index (BMI, weight[kg]/height^2[m]) $\geq$25 kg/m^2, (4) receiving primary medical care at the medical center, (5) being sedentary (no participation in regular physical activity over the past 6 months), and (6) having the ability to communicate in English. Exclusion criteria included any woman who was not approved by her physician to participate in the study because of a limiting medical condition. The study was approved by the IRB at the university-based medical center where the study was conducted.

Procedure

Participants received telephone-based counseling on initiating and sustaining increased physical activity. Each participant received weekly scheduled telephone calls from a project staff member to develop a personalized physical activity program. The staff member was a qualified fitness professional with a master's degree in exercise physiology and trained in motivational interviewing techniques by an expert consultant. The training consisted of two all-day workshops followed by ongoing consultation and review of phone coaching sessions to ensure fidelity of the intervention.

Intervention

Participants received weekly calls for a period of 6 months. Calls varied in length from 15 to 30 minutes and included a discussion of current health issues and new or persistent barriers to physical activity participation. Each week's phone session was used to assist the participant in identifying the barriers to physical activity that she experienced, problem solving and setting goals around those barriers, and monitoring the status of current and emerging barriers (e.g., being unable to access a fitness center because of stairs once the barrier of transportation to the center was removed). In situations where participants did not respond to calls, multiple attempts were made weekly and documented in their case record.

Motivational interviewing (MI) techniques were used to assist participants in removing barriers to physical activity/exercise participation.[32] This process involved building a relationship with the participant; identifying important ways to increase physical activity in the home, outdoors, and indoor facilities (e.g., activities around the home, senior exercise program, fitness facility) through an ongoing dialogue between the instructor and the participant until a solution was identified; and helping participants work through some of the barriers they reported as limiting their ability to engage in physical activity or exercise. For example, if a participant reported that pain was a major barrier to participating in physical activity or structured exercise, a discussion of what type of pain they were experiencing (e.g., dull vs. sharp pain) and in what location(s) of the body (e.g., knee pain when standing or walking for long periods) was used to make recommendations that avoided a certain body part or movement. The participant would be instructed to perform a weightbearing exercise routine for shorter lengths of time (i.e., 5 or 10 minutes), and encouraged to do more seated types of exercise that did not cause pain in the lower extremities (e.g., chair exercise video). Resources from the National Center on Physical Activity (www.ncpad.org) were used for ideas/suggestions on eliminating key barriers to physical activity or exercise participation. Community resources (e.g., fitness facilities within close proximity to the participant's home) and information on how to perform various types of physical activity/exercise were also available on this website and were used for making recommendations to participants

who identified one or both of the following barriers: Don't know where to exercise or Don't know how to exercise.

Measures

Physical Activity and Disability Survey (PADS). The PADS[33] was developed and designed as a semistructured interview for adults with mobility disabilities. Respondents are asked about their exercise/physical activity behavior in the following domains: (1) structured exercise (exercising at a specific time of day on a regular basis with an emphasis on improving fitness), (2) leisure time physical activity (unstructured physical activity performed on an infrequent basis, such as bowling, going for an occasional walk/roll, and not focused on fitness), (3) indoor and outdoor household activity (indoor activities, such as dusting, mopping floor, doing laundry), and (4) outdoor household activity (grocery shopping, gardening). The PADS has been shown to correlate significantly with peak oxygen uptake ($p < 0.01$) and is sensitive to pre-post changes in physical activity levels after specific exercise interventions. Cronbach's alpha coefficients ranged from 0.67 (exercise) to 0.77 (household activity and time spent indoors). Test-retest reliability (1-week interval) ranged from 0.78 (time indoors) to 0.95 (leisure time physical activity). Interrater reliability ranged from 0.92 (household activities) to 0.99 (exercise, leisure time physical activity, total activity). We calculated average time/day that each participant spent in each category of physical activity by asking them to state the number of days/week and number of minutes/day they spent performing each activity. The total minutes/week was then divided by 7 to obtain the average number of minutes/day spent in each activity area.

Barriers to Physical Activity and Disability Survey (B-PADS). The B-PADS[34] was used to collect data on environmental/facility barriers (e.g., cost of program, lack of transportation, not aware of fitness center in the area, inaccessible facilities) and personal barriers (e.g., pain, health concerns, lack of energy, don't know where or how to exercise) that the participants experienced related to physical activity participation. The B-PADS consists of 5 environmental and 18 personal barriers and was developed specifically for people with mobility disabilities. A total score was established by summing the total number of environmental/facility and personal barriers, with a range from 0 to 23 barriers. Test-retest reliability and interrater reliability for two independent raters on the B-PADS resulted in a Cohen's k of 0.76 and 0.86, respectively.[20]

Data analysis

All data were analyzed using SPSS version 16 (SPSS Inc., Chicago, IL). For the sample descriptive statistics, means and standard deviations (SD) were computed for the continuous variables and count and frequency for the categorical variables. Reported barriers were ranked using the percentage of participants endorsing the barrier as a yes. To determine if levels of physical activity were increased while barriers were reduced at postintervention, paired t tests were employed to examine pre-post differences on physical activity and total barriers (total score on environmental/facility barriers and personal barriers). McNemar tests with binominal distribution were conducted to examine changes in each individual barrier from preintervention to postintervention.

Results

Of the 53 participants who enrolled into the study, 33 completed the intervention. Twenty participants dropped out during the first 3 months of the study for the following reasons: health problems (2), the phone was disconnected or the phone number was changed (4), not available to answer the phone or return messages (9), and unknown reasons (5). At pretest, there were no differences between those who completed the intervention and the dropouts in age, education, employment status, number of barriers, and levels of exercise, leisure, indoor, and outdoor activities.

Demographics

Participant demographics are presented in Table 1. The mean age of the participants was 60.1 years, with a range from 25 to 79 years. The highest reported disability category was arthritis ($n = 22$), followed by multiple sclerosis ($n = 2$), stroke ($n = 2$), and back problems ($n = 2$). Nearly half of the participants (49%) used a cane, 24% used both a walker and a cane, 6% used a wheelchair and either a walker or a cane, and 12% did not use any assistive device. Almost one third of the participants did not complete high school (30%), 30% had a high school education, and 30% completed some college. More than half of the participants were retired, 42% were not

Table 1. Baseline Demographics ($N = 33$)

Demographic	n *(%) or mean ± SD*
Type of primary disability	
Arthritis	22 (67)
Multiple sclerosis	2 (6)
Stroke	2 (6)
Back problem	2 (6)
Other	5 (15)
Assistive device use	
Cane only	16 (49)
Cane and walker	8 (24)
Cane and wheelchair	2 (6)
Walker and wheelchair	2 (6)
Cane, walker, and wheelchair	1 (3)
None	4 (12)
Education	
8th grade	10 (30)
High school graduate	10 (30)
Some college	10 (30)
College graduate	2 (6)
Completed postgraduate school	1 (3)
Employment status	
Employed	2 (6)
Unemployed	14 (42)
Retired	17 (52)
Body weight status	
Overweight (BMI 25–29.9)	3 (9)
Obesity (BMI ≥ 30)	4 (12)
Extreme obesity (BMI ≥ 40)	26 (79)
BMI (range 27.8–79.5)	49.1 ± 12.4
Age (range 25–79 years)	60.1 ± 10.1

BMI, body mass index.

employed, and only 6% were employed. Most of the participants were severely obese (79%, BMI ≥ 40)

Barriers to physical activity

Table 2 presents the barriers endorsed by participants at baseline (i.e., preintervention), divided into environment/facility barriers and personal barriers. With respect to environment/facility barriers, cost of the program was the highest reported barrier (67%), followed by lack of transportation (49%), not aware of fitness center in the area (46%), and lack of accessible facilities (46%). Nearly one third (30%) of participants reported feeling uncomfortable exercising in a fitness center. For personal barriers, the most highly endorsed barriers were pain (64%), don't know how to exercise (46%), health concerns prevent me from exercising (39%), don't know where to exercise (39%), and lack of energy (36%).

Pre-post changes in physical activity

Table 3 shows the pre-post changes in physical activity (i.e., minutes of structured exercise and unstructured physical activity) by category (exercise, leisure, indoor, and outdoor physical activity). There was a significant increase in total minutes per day of structured exercise ($t[32] = 4.05$, $p = 0.00$), general indoor household physical activity (t [32] $= 2.06$, $p = 0.048$), and total physical activity ($t[32] = 3.94$, $p = 0.00$). There were no significant changes in leisure physical activity ($p = 0.07$) or outdoor household activity ($p = 0.41$).

Pre-post changes in barriers to physical activity

Pre-post changes in physical activity barriers are also shown in Table 3. There were no significant changes in environmental/facility barriers ($p = 0.90$) and the total number of reported barriers (personal + environmental barriers) ($p = 0.07$). However, there was a significant decrease in the total number of personal barriers reported by participants (t [32] $= -2.25$, $p = 0.03$). *Post hoc* analysis using McNemar tests indicated a significant decrease in two personal barriers from preintervention to postintervention: don't know how to exercise ($p = 0.001$) and don't know where to exercise ($p = 0.007$). Almost half of the participants (45.5%) reported don't know how to exercise as a barrier at preintervention, whereas only 4 participants (12%) reported it as a barrier at postintervention. Approximately 40% of participants reported don't know where to exercise as a barrier at preintervention, and none of the participants reported it as a barrier at postintervention. Two participants who did not report don't know where to exercise as a barrier at preintervention reported it as a barrier at postintervention.

Point biserial correlations were examined between the physical activity variables and the two major barriers (don't know where to exercise, don't know how to exercise). We excluded the leisure activity variable because of the small number of participants who performed leisure activity. Results showed small, nonsignificant ($p > 0.05$) correlations ranging from -0.01 to -0.20 between don't know how to exercise and all physical activity variables. Positive correlations were noted between don't know where to exercise and indoor household activity ($r_{pb} = 0.35$, $p < 0.05$) and total physical activity ($r_{pb} = 0.51$, $p < 0.01$). Participants who reported that they did not know where to exercise were likely to increase their physical activity by increasing their indoor household activity, which led to higher values for total physical activity. Correlation coefficients between don't know where to exercise and exercise and outdoor household activity were -0.19 ($p > 0.05$) and -0.06 ($p > 0.05$), respectively.

Figure 1 highlights the pre-post changes in barriers. There were small, nonsignificant reductions in the number of participants who reported the following barriers at posttest: lack of accessible facilities (12.2%), lack of transportation (9.1%), health concerns prevent me from exercising (6.1%), and pain (6.0%).

Table 2. Self-Reported Barriers to Physical Activity at Baseline ($N = 33$)

Barrier	*n* (%)
Environment/facility	
Cost of program	22 (67)
Lack of transportation	16 (49)
Not aware of fitness center in the area	15 (46)
Lack of accessible facilities	15 (46)
Feel uncomfortable exercising in a fitness center	10 (30)
Personal	
Pain prevents me from exercising	21 (64)
Don't know how to exercise	15 (46)
Health concerns prevent me from exercising	13 (39)
Don't know where to exercise	13 (39)
Lack of energy	12 (36)
Lack of motivation	10 (30)
Lack of personal care attendant	10 (30)
Physical activity is boring or monotonous	8 (24)
Family responsibilities prevent me from exercising	7 (21)
Exercise is too difficult	6 (18)
Lack of time	5 (15)
Satisfied with physical appearance	4 (12)
Lack of interest	3 (9)
Exercise will not improve my condition	3 (9)
Lack of friends/family support	2 (6)
Exercise will make my condition worse	2 (6)
Too old to exercise	2 (6)
Job responsibilities prevent me from exercising	1 (3)

Discussion

The telephone-based coaching intervention caused a significant increase in physical activity (structured exercise, indoor physical activity, and total physical activity) in a predominantly severely obese African American group of women with mobility disabilities. Interestingly, most of the barriers reported by participants at baseline were still present at the end of the intervention, including cost of the program, pain, lack of transportation to get to a facility, not aware of fitness center in the area, health concerns, and lack of energy. The two key barriers that were significantly lowered were don't know how to exercise and don't know where to exercise. The first barrier (don't know how to exercise) may have related to the women's perception that they were unable to exercise because of their mobility (e.g., difficulty with ambulation) and health limitations (e.g., severe obesity, joint pain, fatigue). However, after being reassured by the telephone coach that they could exercise safely and being provided with individually tailored suggestions on how and where to

Table 3. Preintervention to Postintervention Changes in Physical Activity and Barriers to Physical Activity ($N = 33$)

Outcome variable	*Preintervention Mean (SD)*	*Postintervention Mean (SD)*	t *value*	p *value*
Physical activity (min/day)				
Exercise	5.81 (13.71)	27.47 (27.01)	4.05	0.00*
Leisure	0	10.11 (31.30)	1.86	0.07
Indoor household	19.23 (48.90)	47.65 (56.20)	2.06	0.048*
Outdoor household	1.49 (5.63)	3.83 (16.02)	0.84	0.41
Total physical activity	26.52 (50.47)	89.06 (69.23)	3.94	0.00*
Barriers to physical activity (*n*)				
Environmental/facility	2.36 (1.39)	2.33 (1.24)	−0.12	0.90
Personal	4.15 (2.53)	3.21 (2.41)	−2.25	0.03*
Total barriers	6.52 (3.30)	5.55 (2.76)	−1.89	0.07

*Significant at 0.05 level.

exercise, many participants demonstrated substantial increases in exercise and physical activity participation.

A large component of the telephone-based coaching calls was to educate participants about ways they could increase their physical activity and exercise in various settings. The individualized coaching calls focused on getting each participant to understand how to exercise safely within her home, outside, or in a community-based exercise facility and providing her with several options for performing exercise routines that minimized pain or fatigue. Several suggestions to reduce or manage pain or fatigue included exercising for short intervals during the day (e.g., walking around the house for 5 minutes at a time), taking exercise breaks during TV commercials, following videos/TV programs that involved seated exercise instruction, walking short distances outdoors during safe times of the day, and using affordable city-sponsored exercise facilities (e.g., a senior-based exercise center with low to no cost membership) that offered a greater variety of exercise equipment, including stationary cycles that reduced pain on the lower extremities.

Participants were also encouraged to increase their physical activity by doing more indoor household activities for shorter intervals (e.g., cooking, cleaning, dusting, mopping, sweeping, and vacuuming). This proved effective for increasing their daily household activity. Interestingly, although posttest scores on pain and fatigue did not significantly decrease, suggestions for performing activities that minimized pain and fatigue seemed to be helpful in allowing individuals to increase their total daily physical activity. Part of this may have been associated with increasing participants' knowledge of how and where to exercise or engage in physical activity, as well as educating participants that accumulating physical activity across the day by engaging in more indoor household activity was an effective way to become more physically active and could likely achieve benefits equal to one daily bout of exercise. Our participants had limited knowledge about

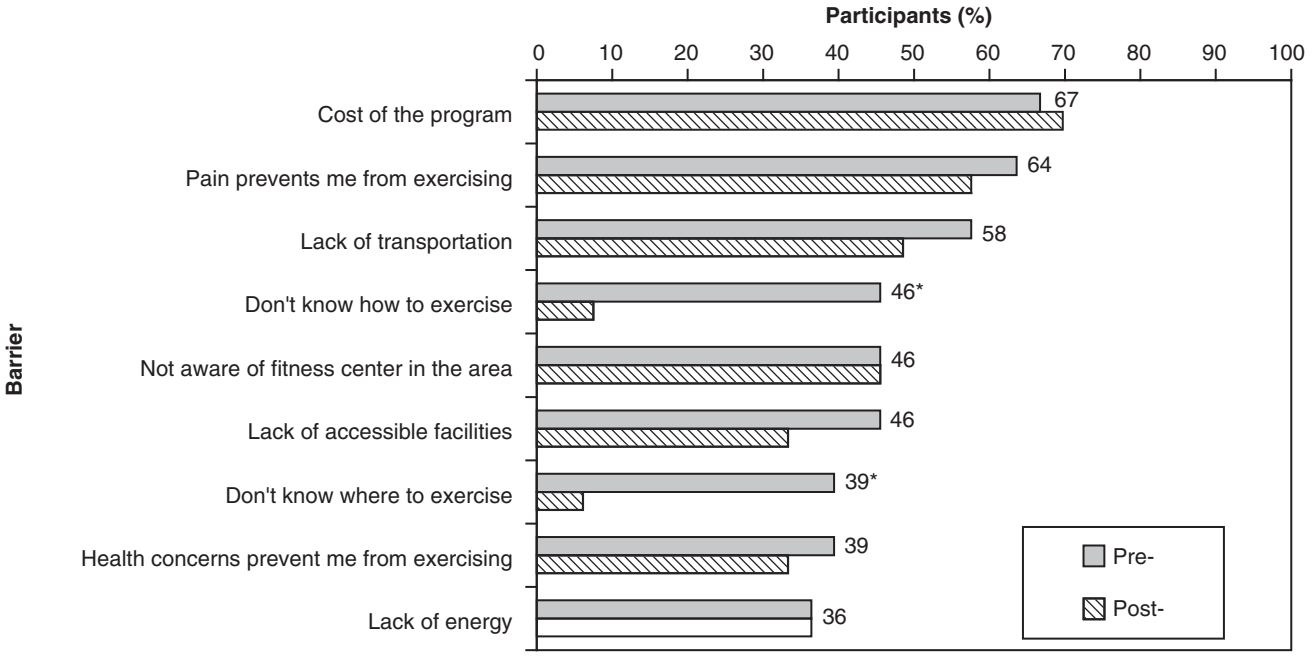

FIG. 1. Top six barriers to physical activity reported by participants who completed the intervention ($n = 33$). *Significant decrease from preintervention to postintervention, $p < 0.01$.

the benefits of cumulative physical activity, and the coaching framework provided a strong focus on teaching participants the value of cumulative physical activity performed throughout the day.

The telephone coach and each participant set individual physical activity goals in an interactive and cooperative manner during the first 2 weeks of the intervention to ensure that the goals were realistic for each participant and were based on reported barriers and contextual factors associated with their environment. Participants were encouraged to begin with small increments in physical activity and structured exercise, with the intended goal of 30 minutes/day by the end of the study. At pretest, only 12% of the participants engaged in walking; 15% performed aerobics, such as aerobic chair exercises; and 27% performed strength and flexibility exercises. At posttest, 64% of participants reported walking as their primary mode of aerobic exercise; 30% performed chair aerobics or used a treadmill or recumbent stationary bike at a local exercise facility; and 36% engaged in combined strength and flexibility activities (e.g., knee bends, elastic bands, milk containers filled with water). Many participants performed these exercise routines in their home, including walking through various rooms in the house during TV commercials or performing simple strength/flexibility routines at various times of the day for short periods (i.e., < 5 minutes). The emphasis on increasing physical activity/exercise was to perform the activities in short increments throughout the day. This seemed to have been a successful approach for increasing the participants' indoor physical activity.

Although time is often considered one of the most common barriers to physical activity participation among people without disabilities,[35–37] our participants did not report this as a major barrier. Only 15% of the participants responded that time was a major barrier to physical activity. This is likely associated with the low number of participants who were working (6%). The majority of participants (94%) were either not employed or retired. Other items that were less frequently endorsed included lack of interest, exercise is too difficult, exercise won't improve my condition, too old to exercise, and job responsibilities prevent me from exercising.

As we expected, there was an inverse trend between the number of barriers to physical activity and the amount of time spent in exercise. Something we did not expect, however, was a positive relationship between the number of barriers to physical activity and the amount of time spent in indoor household activities. Participants who experienced more barriers to participating in outdoor activities or using an exercise facility because of health limitations, safety of their neighborhood, or unavailable facilities in close proximity to their home may have elected to do more indoor household activities to achieve their targeted physical activity goals.

At baseline, participants did not report any leisure activities (Do you currently participate in any sports, recreational, or leisure activities?). Participants may have interpreted this question as participating in recreational sports, such as bowling, golf, or boating, activities that usually require financial resources and the physical ability to perform them. At posttest, only a few participants reported participating in bowling. Possible explanations for the low level of leisure activity include participants not having the financial resources to purchase recreational equipment (e.g., tennis racket, golf clubs), join a facility (e.g., tennis club, golf course), or pay for usage (bowling alley); lacking access (i.e., no transportation to get to facility, no facility in neighborhood, or too far from home); lacking interest; or feeling that they do not have enough mobility, stamina, or balance to perform various types of leisure/recreational activities. Additionally, many leisure activities require participation with other individuals and a greater time commitment and organizational structure compared with participating in exercise or physical activity that can be done individually, in the home, with less skill or balance (e.g., seated), and at more frequent (shorter) intervals during the day.

There are several limitations to this study. First, the barriers instrument we used (B-PADS) may not have captured all barriers that could have affected physical activity participation in our cohort. In the future, it would be helpful to expand the categories of barriers to include both personal and ecological factors associated with intrapersonal, interpersonal, community, organizational, and policy barriers, which could offer greater specificity for tailoring physical activity interventions. Second, participants were volunteers, making them a highly selected, motivated group. A number of participants did not complete the study, which limits our findings to this more select group. Future interventions should include motivational/adherence strategies to keep participants in the study. Third, although barriers may have a strong association with physical activity patterns, other factors, such as self-efficacy, sociocultural beliefs, and demographic influences, may also have had an effect on their physical activity behavior.[24,38,39] Measuring these factors in future intervention studies would provide a better overall composite of factors associated with exercise/physical activity patterns in our cohort. Fourth, the intervention program was not based on a specific motivational theory (e.g., Theory of Planned Behavior, Stages of Change) that would have more precisely classified participants by their interest/motivational level to alter their physical activity behaviors. Fifth, there was no control group to which to compare participants in terms of changes in physical activity and barriers to physical activity. It is plausible that other external factors could have affected our findings. Future research should randomize subjects to control and experimental groups to reduce potential threats to internal validity.

Conclusions

There is a strong need to identify the personal, environmental, and social contextual factors that influence physical activity participation in African American women with mobility disabilities. This population has one of the highest rates of physical inactivity compared to the general population and may be at risk for further physical decline and exacerbation of chronic health conditions, given their high rate of sedentary behavior. We were able to increase physical activity levels in this cohort (both exercise and indoor household physical activity) by reducing two primary barriers, not knowing how to exercise and not knowing where to exercise. Future research should continue to explore the relationship between removal of certain barriers to physical activity participation and changes in physical activity behavior in this population.

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Disclosure Statement

The authors have no conflicts of interest to report. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs on the U.S. Government.

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