CHANGES IN PHYSICAL ACTIVITY BARRIERS AMONG AMERICAN INDIAN ELDERS: A PILOT STUDY

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Abstract: The objective of the present study was to assess whether self-reported physical activity barriers could be reduced among American Indian elders who participated in a 6-week randomized physical activity trial that compared the use of a pedometer only to that of pedometers with step-count goal setting. Elders (N = 32) were compared on the Barriers to Being Physically Active Quiz after participating in a pilot physical activity trial. Elders were classified into high- and low-barrier groups at baseline and compared on self-reported physical activity, health-related quality of life, pedometer step counts, and 6-minute walk performance. At the conclusion of the 6-week trial, only the lack of willpower subscale significantly decreased. The low-barrier group reported significantly higher physical activity engagement and improved mental health quality of life than the high-barrier group. The groups did not differ on daily step counts or 6-minute walk performance. Additional research is needed with a larger sample to understand relevant activity barriers in this population and assess whether they can be modified through participation in structured physical activity and exercise programs.

INTRODUCTION

Barriers to physical activity and exercise may partially account for escalating rates of physical inactivity in the general U.S. population (Centers for Disease Control and Prevention [CDC], 2000; Martin, Morrow, Jackson, & Dunn, 2000; Owen, Humpel, Leslie, Bauman, & Sallis, 2004). Relative to other ethnic groups, American Indians (AIs) report the lowest levels of leisure-time physical activity (Coble & Rhodes, 2006; Duncan, Goldberg, Buchwald, Wen, & Henderson, 2009), and they express a variety of personal, social, and environmental barriers to exercise (Belza et al., 2004; Eyler, Brownson, Donatelle, & King, 1999; Henderson & Ainsworth, 2003; Jahns, McDonald, Wadsworth, Morin, & Liu, 2014; King et al., 2000;

Sawchuk, Russo, Bogart, et al., 2011; Thompson, Wolfe, Wilson, Pardilla, & Perez, 2003; Wilcox, Castro, King, Housemann, & Brownson, 2000). A recent review of physical activity levels among AI adults found that approximately 27% met recommended physical activity requirements when assessed by self-report, yet when assessed using more objective measures of physical activity, only 9% met recommended levels (Foulds, Warburton, & Bredin, 2013). Challenges in reaching minimal recommended levels of physical activity may be better understood in the context of identifying relevant barriers to being more physically active. For example, in a sample of Lakota women, the most frequent barriers to physical activity included lack of childcare, limited time, and concerns about the safety of walking areas (Harnack, Story, & Rock, 1999). A small qualitative study of AI adults residing in the Northern Plains identified jobs, lack of time, and limited access to exercise facilities as the most frequent barriers to physical activity (Jahns et al., 2014). Lack of willpower is also a commonly reported barrier to physical activity among AI adults (Harnack et al., 1999; Jahns et al., 2014). Barriers are often multimodal in nature and may vary considerably as a function of age, gender, tribal culture, and neighborhood features that either promote or inhibit physical activity levels.

Older AIs may be at particular risk for adverse health outcomes associated with physical inactivity (Duncan et al., 2009; Galloway, 2005; Sawchuk, Russo, Bogart, et al., 2011) and may face unique challenges to establishing and maintaining healthy activity levels (Coble & Rhodes, 2006). However, very little research has been conducted with AI elders, and better understanding these barriers may prove useful in promoting more durable engagement in physical activity programs.

We conducted a pilot study to assess changes in self-reported barriers to physical activity, especially walking, among AI elders who participated in a randomized physical activity pilot trial (Sawchuk, Russo, Charles, et al., 2011). The purposes of this study were 1) to compare pre- to post-changes on self-reported barriers to physical activity among participants who only monitored step counts to those who monitored step counts plus had step-count goal setting; 2) to determine if all participants would report pre- to post-reductions in self-reported barriers to physical activity across the 6-week trial; and, 3) compare those reporting high to low levels of physical activity barriers at baseline to pre- to post-changes in self-reported and performance-based outcomes of physical activity. We classified participants into high- and low-barrier groups based on their baseline scores on the Barriers to Being Physically Active Quiz. We hypothesized

that all elders would report a significant decrease in Barriers Quiz scores across our 6-week trial. We also predicted that, relative to the high-barrier group, the low-barrier group at baseline would report greater caloric expenditure and engagement in physical activity, as assessed by the Community Healthy Activities Model Program for Seniors Questionnaire, and higher physical and mental health quality of life scores, as assessed by the Short Form 36 of the Medical Outcomes Survey. Further, we hypothesized that the low-barrier group at baseline would have greater total daily pedometer step counts and enhanced performance on the 6-minute walk test of fitness in comparison to the high-barrier group.

METHODS

Subjects

Thirty-six AI elders participated in a 6-week randomized pilot study that compared physical activity monitoring with a pedometer only ($N = 19$) to physical activity monitoring with a pedometer plus additional instruction in setting weekly step-count goals ($N = 17$; Sawchuk, Russo, Charles, et al., 2011). Due to limitations in funding for the pilot study, a maximum of 36 participants were recruited. A total of four female elders did not complete the 6-week post-assessment, reducing the final sample size to 17 in the pedometer only group and 15 in the pedometer goal-setting group. All study recruitment efforts and procedures were conducted between May and December 2007 at the Seattle Indian Health Board (SIHB), a primary care medical facility serving the healthcare needs of AIs and Alaska Natives in Seattle, Washington. Advertisements for the study occurred at the SIHB, local-area Native health fairs, and by word of mouth. Interested participants were contacted by study staff by phone to determine eligibility. Inclusion criteria were: between 50 and 85 years of age; sedentary lifestyle (responding "no" to the question, "Have you been physically active for the past 6 months?"); ability to walk without assistance; lack of medical contraindications to walking; and living within a 2-hour driving radius of the SIHB. Approval for this study was obtained from the Institutional Review Board at the University of Washington and from the SIHB Privacy Board.

Measures

Demographics

Demographic information included age, sex, marital status, education level, body mass index, and current smoking status.

Physical activity barriers

The Barriers to Being Physically Active Quiz (U.S. Department of Health and Human Services, 1999) is a 21-item measure assessing activity barriers across seven domains: 1) lack of time, 2) social influence, 3) lack of energy, 4) lack of willpower, 5) fear of injury, 6) lack of skill, and 7) lack of resources (e.g., recreational facilities, exercise equipment). Each domain contains three items that are rated on the degree to which they interfere with physical activity on a four-point scale ranging from 0 (*Very unlikely*) to 3 (*Very likely*). In this sample, the total score on the Barriers Quiz had an internal consistency reliability of 0.89.

Self-reported physical activity and health

The Community Healthy Activities Model Program for Seniors (CHAMPS) Questionnaire is a 41-item measure assessing a range of light, moderate, and vigorous physical activities in leisure, work, exercise, and chore-related domains (Stewart et al., 1997). Respondents report their weekly frequency and duration of participation in activities over the previous 4 weeks. In the present study, we assessed total weekly caloric expenditure for all exercise activities and total weekly frequency of all exercise-related activities. The CHAMPS has established psychometric characteristics with older populations (Harada, Chiu, King, & Stewart, 2001).

The Short Form 36 (SF-36) is a 36-item measure of health-related quality of life (Ware & Sherbourne, 1992). In the present study, we used the Physical (PCS) and Mental Health Component (MCS) summary scores. The SF-36 has been used previously with AI samples (Beals et al., 2006; Sawchuk, et al., 2008).

Objective measures of physical activity and fitness

All participants used a pedometer and recorded their total daily step counts in a journal over the course of the 6-week trial. The 6-minute walk test was used as our primary behavioral outcome of fitness. Following a standardized protocol (ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories, 2002), a research assistant instructed participants to walk around two traffic cones on opposite ends of a 40-foot corridor, unassisted,

covering as much distance as possible within the 6-minute time frame. At the end of 6 minutes, a marker was placed on the ground next to the participant, and total distance was calculated in feet with a rolling tape measure.

Procedures

This pilot study was conducted between May and November of 2007. Participants completed two face-to-face visits with the research assistant at the SIHB, spaced 6 weeks apart. Each clinic visit lasted 60 to 90 minutes. Participants also received weekly 5- to 10-minute telephone calls from the research assistant to bolster continued participation in the study, address any study-related concerns, and encourage engagement with physical activity.

During the first clinic visit, the research assistant orally described the study's purpose and procedures, and obtained written informed consent from each participant. A structured interview was conducted to collect additional demographic and medical information; the participant then completed the Barriers Quiz, CHAMPS, and SF-36. The research assistant measured the participant's height and weight, and then randomly assigned the participant to one of two groups: a group that monitored step counts only, and a group that monitored step counts and also set a weekly step-count goal. Each participant was then trained in the use of a pedometer and shown how to read the step counter and how to record their total daily step count on activity-monitoring forms.

During their weekly telephone conversations, elders in the step-count plus goal-setting group were given additional instructions to set a new weekly goal of increasing their counts by 5% above the previous week's average. All participants in both groups were compensated with a $40 grocery gift card after the first clinic visit, and all were mailed another $40 grocery gift card after completing the fourth weekly phone call.

At the second clinic visit, the research assistant reviewed the daily activity-monitoring forms and re-administered the Barriers Quiz, CHAMPS, and SF-36. The research assistant also measured changes in health status and ambulatory functioning since starting the study, as well as resting oxygen saturation, heart rate, blood pressure, and the Borg-Dyspnea scale. Elders then completed the 6-minute walk test. Afterward, they were debriefed and compensated with a $60 grocery gift card.

Statistical Analyses

Descriptive statistics were generated for the full sample. The two step-count groups were initially compared on the Barriers Quiz and its subscales, using between-group t-tests. We then defined two groups based on a median split of the total Barriers Quiz score at baseline, with one group reporting higher barriers and the other reporting lower barriers to physical activity. *T*-tests were used to determine whether the two barrier groups differed on demographics, self-reported physical activity, health-related quality of life, total step counts, and performance on the 6-minute walk test.

RESULTS

Participant Characteristics

The average age of the elders was 61 years (SD = 8.9), with the majority being female (66%), college-educated (55%), and not currently employed (86%). The average BMI was 30.8 (SD = 6.5), and 40% were current smokers.

Changes in Barriers to Physical Activity

We found no statistically significant differences on Barriers Quiz scores or demographic characteristics between the step-count only group and the step-count plus goal-setting group, either at baseline or at the 6-week assessment. Therefore, the data were collapsed into a single sample for within-subjects analyses. Table 1 presents change scores on the Barriers Quiz between baseline and 6-week assessment for the entire sample. Higher scores on the full scales and subscales indicate more self-reported barriers to physical activity. Subscale mean scores on the Barriers Quiz decreased from baseline to 6 weeks, although only the lack of willpower subscale showed a statistically significant change over time (p < .05).

Table 1
Change scores across the 6-week trial on the Barriers to Being Physically Active Quiz for the entire sample (*N* = 32)

Barriers Quiz	Total Sample (*N* = 32)		Test Statistic *t*
	Baseline	6 Weeks	df(30)
Total score	18.9 (11.8)	16.3 (8.8)	1.42
Lack of time	2.0 (2.1)	2.2 (2.0)	-0.42
Social influence	2.9 (1.8)	2.2 (1.5)	1.78
Lack of energy	2.7 (2.6)	2.2 (2.2)	1.11
Lack of willpower	4.7 (2.8)	3.4 (2.2)	2.43*
Fear of injury	2.0 (2.3)	1.8 (1.8)	0.39
Lack of skill	1.8 (2.2)	1.6 (2.0)	0.92
Lack of resources	2.8 (2.2)	2.8 (2.2)	0.08

Note: *$p < .05$

Comparison of High- versus Low-barrier Groups

We used the median of 17 on the total baseline Barriers Quiz score to define two groups on the basis of higher or lower barriers to physical activity. Table 2 compares the barrier groups in terms of demographics, CHAMPS, SF-36 PCS, SF-36 MCS, average daily step counts, and performance on the 6-minute walk test. The high- and low-barrier groups did not differ on any demographic or health-related variables. The low-barrier group reported significantly higher frequency of all exercise activities on the CHAMPS questionnaire relative to the high-barrier group ($p < .05$), although total caloric expenditure did not differ significantly between groups. The low-barrier group reported significantly better scores on the SF-36 MCS relative to the high-barrier group ($p < .01$), although no between-group differences were found on the SF-36 PCS. The barrier groups did not differ on either total average daily step counts or performance on the 6-minute walk test.

Table 2
Comparison of high- and low-barrier groups on demographics, CHAMPS, SF-36, average daily step counts, and 6-minute walk performance

Measure	High-barrier Group (N = 15)	Low-barrier Group (N = 17)	t (34) (p) or chi-square (1)
Age, mean (SD)	60.4 (10.3)	61.8 (7.8)	0.49
Female, %	60.0% (9)	70.6% (12)	0.05
BMI, mean (SD)	32.5 (6.7)	29.2 (6.1)	1.56
CHAMPS total caloric expenditure for all activities, mean (SD)	5779.1 (8084.7)	9496.5 (9217.6)	1.28
CHAMPS total frequency of all activities, mean (SD)	12.6 (10.7)	20.6 (10.9)	2.23*
SF-36 PCS, mean (SD)	41.2 (5.8)	40.3 (8.5)	-0.38
SF-36 MCS, mean (SD)	42.0 (9.1)	50.6 (7.8)	3.04**
Average number of daily steps, mean (SD)	5359.0 (2955.5)	5335.8 (4435.7)	-0.02
6-minute walk distance in feet, mean (SD)	1236.5 (314.0)	1222.9 (282.0)	-0.12

Notes: *$p < .05$, **$p < .01$. SD = standard deviation; BMI = body mass index; CHAMPS = Community Healthy Activities Model Program for Seniors; SF-36 PCS = Short Form 36 Physical Component Summary; SF-36 MCS = Short Form 36 Mental Health Component Summary.

DISCUSSION

Several studies have identified a wide variety of personal, social, and environmental factors that are associated with lower rates of physical activity (Duncan et al., 2005; Humpel, Owen, & Leslie, 2002; McCormack et al., 2004; Owen et al., 2004). A better understanding of these factors would have direct implications for efforts to promote physical activity at both individual and community levels. Contrary to our hypothesis, elders did not report a significant reduction on their total Barriers Quiz score during the 6-week trial. The only Barriers Quiz subscale that showed a significant reduction was lack of willpower, a commonly endorsed reason for physical inactivity among AIs (Belza et al., 2004; Harnack et al., 1999; Jahns et al., 2014) as well as older White populations (Rye, Rye, Tessaro, & Coffindaffer, 2009). We created two groups using baseline scores on the Barriers to Being Physically Active Quiz. Only the

CHAMPS score for frequency of engagement in all exercise activities and the SF-36 MCS score significantly improved in the low-barrier group compared to the high-barrier group. Our objective measures of physical activity did not differentiate the groups, because pedometer step counts and performance on the 6-minute walk test were similar across both groups. However, including objective indicators of physical activity remains an important outcome measure in this area of investigation, especially given the discrepancy between self-reported and objective measures of physical activity (Foulds et al., 2013). Although we did not find any differences between elders who only monitored pedometer step counts with those who were given instructions in step-count goal setting (Sawchuk et al., 2011), other studies have reported enhanced step-count performance among those who are given prescriptive step-count goals (Hultquist, Albright, & Thompson, 2005). Future research using a larger sample may provide a more fair assessment of the relative value of pedometer goal setting as a means of engaging AI adults in promoting increased physical activity.

As observed in other samples of AI adults (Harnack et al., 1999; Jahns et al., 2014) lack of willpower was the highest-rated barrier by elders in our sample. Even though the lack of willpower subscale decreased significantly over the course of the 6-week trial, it still remained the highest reported barrier. Enhancing self-efficacy and confidence in one's ability to become more physically active is an important element of sustainable physical activity programs. Principles of motivational enhancement, for example, may be particularly important to incorporate into such programs in order to bolster confidence to stay engaged in healthier physical activity routines (Martins & McNeil, 2009; Merom et al., 2009). Additional research has also shown that individuals who report higher levels of self-efficacy also report significantly fewer personal, social, and environmental barriers to physical activity than those who report low self-efficacy (Pan et al., 2009). Future research should determine whether motivational enhancement interventions can improve willpower in AIs, and, in turn, whether improved willpower can also lead to improved performance on objective measures of physical activity and fitness. Furthermore, screening for relevant barriers on the front end of exercise interventions may allow for more tailored problem solving in an effort to reach desired changes in physical activity engagement (Sawchuk, Russo, Bogart, et al., 2011).

Our pilot study has several limitations. First, the nature of the pilot investigation, including limited funding for recruitment efforts, resulted in a small sample size, hence

weakening statistical power. The small sample size likely negatively impacted the ability to detect more meaningful changes from baseline to post-assessment on the Barriers Quiz. Although we found that the low-barrier group reported a greater overall level of engagement in physical activity and improved mental health quality of life than did the high-barrier group, this distinction appeared only in the self-reported measure. No between-group differences were found on more objective outcomes of physical activity and fitness. Larger sample sizes may allow for a more robust between-group comparison on these subjective and objective outcome measures. Second, we did not collect neighborhood data that were thorough enough to provide an objective index of built environment features that either promote or inhibit physical activity. Third, our study assessed older, urban-dwelling AIs, so our findings may not generalize as well to other AI cohorts. Finally, we used pedometers as a means of enhancing engagement with physical activity. Future research may determine whether structured activity programs and exercise prescriptions that meet nationally recommended benchmarks for weekly exercise (Duncan et al., 2005) can lead to reductions in self-reported barriers.

CONCLUSIONS

The present study contributes to the scant literature on barriers to physical activity in an understudied population. Additional research with a larger sample is warranted to better understand personal, social, and environmental barriers to physical activity, and to assess whether these barriers can be reduced through time-limited and cost-effective physical activity interventions. Studying a broader sample of AIs may also provide insight into whether specific barriers are more relevant to some age cohorts than to others. Promoting improved physical activity through exercise prescription and problem-solving relevant barriers among this at-risk population may help reduce health disparities in AI elders.

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