Published in final edited form as:

J Transcult Nurs. 2018 July ; 29(4): 335–345. doi:10.1177/1043659617723073.

Outcomes of a Culturally Tailored Partially Randomized Patient Preference Controlled Trial to Increase Physical Activity Among Low-Income Immigrant Latinas

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Abstract

Introduction—Almost half (47.8%) of adult Latinas report they never engage in any leisure time physical activity (PA) which is an independent risk factor for the development of cardiovascular disease and other chronic illnesses. There is a pressing need to develop and test PA interventions among Latinas. Therefore, the purpose of this study was to evaluate the effects of a PA Intervention for Latinas, a culturally tailored, *promotora*-facilitated 12-week PA intervention. It was hypothesized that at the completion of the intervention, participants would have (a) higher daily PA levels; (b) improved aerobic fitness, muscle strength, and flexibility; and (c) lower body mass index and percentage of body fat.

Methodology—A partially randomized patient preference trial design with lag group was used to test the intervention. Participants ($N = 76$) attended twice weekly, low-impact aerobic/Latin dance PA classes taught by laywomen trained as *promotoras*.

Results—Significant improvements were measured in aerobic fitness, muscle strength and flexibility, and daily PA levels ($p < .001$). Sixty percent of the participants attended at least 60% of the PA sessions.

Discussion—Findings suggest laywomen trained as *promotoras* can successfully facilitate the delivery of an intervention to increase PA among immigrant Latinas.

Keywords

other methods/designs; participatory action research; migration; women's health; community health; physical activity

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

A growing body of knowledge suggests that a lack of physical activity (PA) is driving the current obesity pandemic (Katzmarzyk et al., 2015; Ladabaum, Mannalithara, Myer, & Singh, 2014). It is estimated that sedentary lifestyles are more than twice as deadly as obesity itself (Ekelund et al., 2014). These findings are particularly true for women. While the benefits of regular PA are well known, girls are more than twice as likely to be sedentary as boys (Centers for Disease Control and Prevention, 2008; Lenhart et al., 2014), and females of all races and ethnicities demonstrate greater declines in PA as compared with males, beginning in early adolescence and lasting throughout adulthood (Cairney, Veldhuizen, Kwan, Hay, & Faught, 2014; Dumith, Gigante, Domingues, & Kohl, 2011).

Sedentary lifestyles are more widespread among Hispanic women/Latinas as compared with other groups of women (Centers for Disease Control and Prevention, 2008; Roger et al., 2012; Slattery et al., 2008). Almost half (47.8%) of adult Latinas report they never engage in any leisure time PA, compared with just 29.2% of non-Latino White women (Pleis, Ward, & Lucas, 2010). Moreover, levels of PA among immigrant Latinas decrease dramatically following arrival in the United States (Goel, McCarthy, Phillips, & Wee, 2005; Lindsay, Sussner, Greaney, & Peterson, 2009).

Because decreased PA is an independent risk factor for the development of cardiovascular disease (Barengo et al., 2004; Williams, 2001) and other chronic illnesses (World Health Organization, 2011), there is a pressing need to develop and test PA interventions among Latinas. With few exceptions (Ickes & Sharma, 2012; Perez, Fleury, & Keller, 2010), there is a paucity of research examining the interplay of behavioral factors, cultural norms, and gender-based role beliefs that influence participation in PA. Therefore, the purpose of this study was to evaluate the effects of a physical activity intervention for Latinas (PAIL), a culturally tailored, *promotora*-facilitated 12-week PA intervention. It was hypothesized that at the completion of the intervention, participants would have (a) higher daily PA levels; (b) improved aerobic fitness, muscle strength, and flexibility; and (c) lower body mass index (BMI) and percentage of body fat (% BF).

Background

Physical Activity Among Hispanic Women

A variety of explanations have been put forth to explain these low levels of PA among Hispanic women. Low-income Latinas who work in highly physical jobs may find additional PA unappealing or unnecessary (Im et al., 2010). Many low-income minority women cite concerns about neighborhood safety as a compelling reason for lack of outdoor PA (Bennett et al., 2007; Roman, Knight, Chalfin, & Popkin, 2009). Negative cultural perceptions about PA among Latinas, including fear of harm to a women's reproductive health, have been noted as deterrents (D'Alonzo & Fischetti, 2008). Finally, Hispanic women are often socialized into placing family needs above their own, a mind-set associated with *marianismo* (Comas-Diaz, 1988; Englander, Yáñez, & Barney, 2012; Gil & Vasquez, 1996; Stevens, 1973), the female cultural counterpart to *machismo*. Immigrant Latinas with strong *marianismo* beliefs may view habitual PA as a selfish indulgence rather than a health promoting lifestyle behavior (D'Alonzo & Sharma, 2010). To be successful, PA interventions designed for Latinas should be culturally responsive and culturally tailored.

Culturally Tailored Interventions Using Promotoras

The immigration process often results in disrupted family and social networks, economic difficulties, and discrimination, all of which can inhibit the maintenance of a healthy lifestyle. Latino immigrants tend to make decisions about health promoting behaviors, including PA, that are consistent with their personal beliefs and the values of family members (Marquez et al., 2014). For this reason, new Latino immigrants may best learn about healthy behaviors from the experiences of older immigrants (Elder, Ayala, Parra-Medina, & Talavera, 2009).

Culturally tailored interventions have great promise for fostering behavior change, as they address human health behavior in the context of culture and social structure (Krumeich, Weijts, Reddy, & Meijer-Weitz, 2001). Cultural tailoring is defined as the process of conveying a health message in a manner, “which recognizes and reinforces a group’s cultural values, beliefs, and behaviours ...” (Resnicow, Braithwaite, & Glanz, 2002). In particular, trained community health workers/*promotoras de salud* are uniquely qualified to help immigrant Latinos adopt health promotion behaviors in a culturally appropriate manner. Although *promotoras* have been used to support health promotion efforts among Latinos for some time (WestRasmus, Pineda-Reyes, Tamez, & Westfall, 2012), only recently have *promotoras* been trained to facilitate and deliver a PA intervention. Studies by Brownstein et al. (2005); Cherrington et al. (2015); Keller et al. (2012); and Otiniano, Carroll-Scott, Toy, and Wallace (2012) provide preliminary support for the use of community health workers/*promotoras* as interventionists.

Theoretical Framework

The theoretical framework of PAIL intervention is based on Paulo Freire’s (1973) empowerment model, and is linked to the empirical findings from the Latina Interview Project (LIP; D’Alonzo, 2012), an ethnographic study of the attitudes, beliefs, preferences and social and culture-specific barriers to PA among low-income immigrant Latinas. The linkage of the two studies is depicted in Figure 1, in the form of a structured dialog model (Freire, 1973). Findings from the LIP study suggested that the interaction of *marianismo* beliefs, acculturation stress, loss of social support, and struggles with the individualism–collectivism dichotomy combine to adversely influence PA of immigrant women. Consistent with the concept of *marianismo*, the immigrant Latinas in this study prioritized their scarce discretionary time to meet the needs of their family. Such altruistic behavior also reflects the Latin American tendency toward collectivism, the desire to work together on group issues rather than individual pursuits.

With these findings in mind, the PA sessions in PAIL were designed to include culturally appropriate aerobic, muscle strengthening, and flexibility activities to elicit fitness improvements and to encourage more daily PA; specific examples of cultural tailoring are noted in the Method section. Each of the exercise sessions was followed by 10 minutes of cooldown with group discussion. The purpose of these *promotora*-led group discussions was to monitor progress, give feedback regarding goals, and problem-solve culturally appropriate ways for the women to achieve a balance between responsibilities toward others (*marianismo*) and self-care activities such as PA. Because Freirian methods seek to empower

individuals and communities to overcome feelings of powerlessness and assume control of their lives, this is a particularly appropriate framework for the study.

Method

This study is an example of Community-Based Participatory Research (CBPR; M. Minkler & Wallerstein, 2008) and was designed so that all participants could receive the intervention. The 12-week intervention was offered at two different times during the year, using a partially randomized patient preference trial (PRPPT) design (Ainsworth, Torgerson, & Kang 'Ombe, 2010; Swift & Callahan, 2009) with lag group. The PRPP choice-based experimental design is desirable when randomization is not suitable, such as when participants have a definite preference for a particular study group or are likely to drop out because of their group assignment. During the single enrollment period, participants were allowed to choose their group assignment, Group 1(G1) or the lag group/Group 2(G2). In G1, the 12-week intervention began immediately after the enrollment period and classes were held in the evening; in G2, the 12-week intervention began 16 weeks later and classes took place during the day. Nineteen women indicated a preference for G1, while 32 preferred G2 and 25 women expressed no preference. The "no preference" women were then randomly assigned to either G1 or G2, using a computer-generated list of random numbers. Not only does this ensure that all participants will receive the intervention, the lag groups design is cost effective, because participants serve as their own controls.

Setting and Sample

The study took place in an urban East Coast community, where approximately 52% of the city's 151,000 residents are Hispanic/Latino (U.S. Census Bureau, 2013); most are new immigrants who arrived since 2000. Indeed, 27% of the city's residents have median family incomes below \$25,000/year (U.S. Census Bureau, 2013) and reside in the census tracts where the study was conducted. Approval was obtained from the university's institutional review board. Spanish-speaking immigrant Latinas 18 to 55 years of age were invited to participate via face-to-face contacts with *promotoras* and bilingual flyers distributed at schools and Latino community events. A sample size of 80 women was calculated to achieve a final sample size of 68 (34 women/group), based on an expected attrition rate of 15% (Hertzog, 2008). This sample size was deemed adequate to investigate the feasibility and acceptability of the intervention, to detect methodological flaws, and to calculate effect sizes for consideration in planning a large-scale intervention, based on changes in levels of PA, aerobic fitness, muscle strength, flexibility, BMI, and % BF (Hertzog, 2008).

Following the consent process, participants underwent a screening history and preparticipation physical examination, following guidelines from the American College of Sports Medicine (ACSM; 2013). Exclusion criteria included regular participation in vigorous activity or competitive sport; musculoskeletal injury that impeded participation, acute or chronic illness (e.g., asthma) that would affect participation in PA and pregnancy. Women older than age 55 years were excluded, as they automatically met the criteria for "moderate risk," as defined by the ACSM risk-stratification categories (ACSM, 2013). To identify age-eligible women who might be at moderate or high risk for coronary artery

disease, a Spanish language version of PA Readiness Questionnaire (Canadian Society for Exercise Physiology, 2002) was read aloud to each potential participant. Women who identified one or more positive responses were advised to consult with a primary care provider for medical clearance before enrollment.

Intervention

In accordance with principles of CBPR, the format of the classes was culturally tailored according to data from the LIP Study (D'Alonzo, 2012). The classes consisted of a combination of low-impact aerobic exercise/Latin dance, with strength and flexibility activities to meet the current PA recommendations for adults (U.S. Department of Health and Human Services, 2008). Although recommendations suggest a minimum of 150 minutes of moderate intensity activity/week and muscle strengthening activities on 2 or more days/week (U.S. Department of Health and Human Services, 2008), data from LIP suggested that family responsibilities would make it difficult for most of the women to participate more than twice weekly. Hence, classes met two times per week at a neighborhood charter school. During the second 12-week session, classes were held at a local Latino community center. Participants were encouraged to participate in some type of moderate to vigorous PA on a third day each week. Babysitting was provided at both sites. The protocol for the PAIL PA classes is presented in Table 1.

One of the promotoras taught each of the classes in Spanish and met weekly with the principal investigator and Promotora Coordinator to review the routines, select culturally appropriate music, and monitor the intensity of the workouts. The goal was to have women engage in aerobic activity for 40 to 50 minutes at a time at either: (a) 60% to 80% of their age predicted maximum heart rate or (b) at a level of 14 to 16 on the Borg Relative Perceived Exertion scale (Borg, 1998). Promotoras taught the participants how to monitor their pulse during and after PA to ensure an aerobic effect. Music was selected at an appropriate tempo (beats per minute); the tempo was gradually increased weekly to keep participants' heart rates within the specified range. The 10-minute muscle strengthening and flexibility sessions used resistance bands and small hand weights; the intensity was gradually increased to increase the workload and stress on muscle fibers.

During each cooldown session, the *promotoras* led a brief discussion on one of a number of scripted topics. These scheduled topics changed weekly and emphasized problem-solving strategies to barriers to PA, including prioritization of family responsibilities, management of acculturation-related stressors, and finding sources of social support among other immigrant women.

Bimonthly incentives were provided to the women in the form of pedometers, fruit, water bottles, and a lottery (*Iotería*). Lottery prizes were donated by local community merchants and included sneakers, exercise clothing, and a Nintendo Wii. At the end of each 12-week session, the women hosted a closing party for their husbands and children, where they cooked healthy versions of traditional Latin American dishes, wore themed t-shirts, and practiced the dance routines they had learned in the classes.

Measures

To assess study outcomes, field measures of PA, anthropometry, and fitness were selected that were valid and reliable, inexpensive, required little equipment, and were feasible for mass testing (D'Alonzo, Aluf, Vincent, & Cooper, 2009; D'Alonzo, Vincent, & Marbach, 2006). Before testing, prescribed instructions were read aloud to each participant in Spanish. The quantitative outcomes of interest were PA level, BMI, % of BF, aerobic fitness, muscle strength, and flexibility. The measures and their original and current psychometric properties are summarized in Table 2. These variables were assessed at four time points during the study and were referred to as “Fit Checks”:

1. Week 0: Prior to the first 12-week session (G1, G2).
2. Week 12: Immediately following the first 12-week session (G1, G2).
3. Week 16: Prior to the second 12-week session (G2).
4. Week 28: Immediately following the second 12-week session (G2).

The additional preintervention measurements for G2 were used to improve the efficiency of statistical analyses conducted for the study. The Fit Check measurements were administered by *promotoras* who were not interventionists and were blinded to the participants' group assignment and previous assessment data.

Data Analysis

All statistical analyses were performed using the R Statistical Computing Environment (www.r-project.org). To handle missing data, an available-case and complete-case analysis were performed; differences between these analyses were negligible, and the results of the available-case analysis are reported here. A preliminary evaluation of assumptions of normality, homogeneity of variance, and sphericity was satisfactory for the fitness and anthropometric variables and no outliers were identified. However, deviations in values for skewness in the PA (PA-R) data were observed. To remedy this, a natural logarithmic transformation to PA-R scores was performed, after adding a constant of 1 to each PA-R score (Tabachnick & Fidell, 2013). This transformation resulted in a normal distribution.

Linear mixed models (LMM) with a subject-level random intercept (Diggle, Heagerty, Liang, & Zeger, 2013) were used to estimate the effect of the intervention on outcomes. The LMMs described here account for variability in outcomes between participants, while accurately estimating the intervention effect. Moreover, LMMs easily accommodate unbalanced study designs, which may be a significant obstacle for other statistical approaches, for example, analysis of variance. To identify a LMM that best fit the data for each outcome, three LMMs with subject-level random intercepts were considered; one “full model” and two “reduced models.” The full model included the following: (a) an intervention variable, (b) a group variable, and (c) a group-intervention interaction variable. In all three models, the effect of the intervention is expressed as the mean difference between postintervention and preintervention measurements. The full model accounts for the fact that the preintervention baseline measurements and intervention effects may be different for G1 and G2.

Preliminary data analyses indicated that there were no statistically significant differences in preintervention measurements between G1 and G2. Thus, two reduced models were considered. The first reduced model (RM1) included separate indicator variables for the intervention effects in G1 and G2. This model accounted for differences between the intervention effect for G1 and G2, which were observed in certain outcomes. The second reduced model (RM2) included only a single indicator variable for the intervention effect. This model assumes that the intervention effect was the same for G1 and G2. The reduced models discussed above have advantages over the full model in terms of both interpretation and parsimony.

Results

Participant Characteristics

A total of 81 women sought admission into the study. During screening, four women reported a medical condition that precluded participation, and one participant felt the classes would be too difficult for her. Thus, a total of 76 women ($n = 27$ in G1, $n = 49$ in G2) signed consent forms and enrolled in the study. Characteristics of the sample are described in Table 3. The majority of participants were from Mexico (76%), with smaller percentages from Guatemala (4%), Nicaragua (3%), Honduras (3%) and the Dominican Republic (3%), while an additional 11% were from other Latin American countries. Although 63% of the women did not respond to the question about family income, or answered “I don’t know,” participants were all considered to be low income based on their neighborhoods of residence. In accordance with CONSORT guidelines (Schulz, Altman, & Moher, 2010), enrollment, allocation, follow-up, and analysis data for all participants are summarized in the flow diagram in Figure 2.

Attendance records revealed that 60% of the participants attended 60% or greater of the PA sessions and attendance improved as the sessions progressed. The mean percentage of attendance in G1 was 39%; the most commonly reported reasons for poor attendance were husband’s/partner’s disapproval, and the participant’s need to work outside the home. After adding an additional intervention site, offering classes during the daytime and inviting some of the men to meet with the principal investigator in G1, attendance in G2 improved to a mean of 51%. Three women in G1 and nine women in G2 ($n = 12$, 16.8 % of the sample) ceased attending the classes because of pregnancy.

Fitness and Anthropometric Outcomes

Baseline anthropometric and fitness scores by group are reported in Table 4. The nontransformed mean preintervention PA score was 0.75 ($SD = \pm 0.50$) on a scale of 0 to 7, indicating most women engaged in very little PA. Mean BMI was 29.59 kg/m² ($SD = \pm 5.02$), indicating most of the women fell into the overweight category and nearing the cutoff BMI for obesity (30 kg/m²).

The full LMM (Model 1) was fit for each of the outcomes: PA, aerobic fitness, muscle strength, flexibility, BMI and % BF. As indicated in Table 5, t tests revealed no significant differences in baseline anthropometric and fitness statistics for G1 and G2 (p values ranged

from 0.45 to 0.60). In addition, there were no differences in the intervention effect for PA, flexibility, or BMI between G1 and G2 ($p > .18$). These results suggested that RM2 is most appropriate model for analysis of the PA, flexibility, and BMI outcomes. As seen in Table 6, there were statistically significant improvements in PA ($p = 10^{-10}$, 95% CI [0.21, 0.32]) and flexibility ($p < 10^{-10}$, 95% CI [2.95, 4.59]) in both groups. Conversely, results in Table 7 indicate the intervention led to higher improvements in muscle strength ($p < 10^{-10}$, CI [17.58, 23.16]) in G2 as compared with G1 ($p = .01$, CI [1.05, 8.94]) and greater improvements in aerobic fitness ($p < 10^{-10}$, CI [4.03, 7.11]) among participants in G1 as compared with G2 ($p = 10^{-10}$, CI [3.39, 4.81]). Thus, model RM1 is most appropriate for analysis of aerobic fitness, muscle strength and % BF data. Results for these analyses are reported in Table 7. Results for BMI and % BF were less conclusive (Tables 6 and 7); participants in both groups had a slight increase in mean BMI over the course of the intervention, and there were no significant decreases in the % BF in either G1 or G2.

Discussion

Participants who completed the intervention showed significant improvements in PA, aerobic fitness, muscle strength and flexibility, even as the classes met only twice weekly. These improvements are consistent with the results of the few other published *promotora*-led PA interventions (Ayala & San Diego Prevention Research Center, 2011; Keller & Cantue, 2008; Staten, Scheu, Bronson, Peña, & Elenes, 2005), which focused on walking as the mode of PA. Our study is unique, in that it resulted in increases in fitness using Latin dance, a popular and effective form of PA among Hispanic women (Jauregui-Ulloa, 2007); unfortunately, few studies have made use of this format in the past (Perez et al., 2010).

In this study, 60% of the participants attended 60% or greater of the PA sessions and attendance improved as the sessions progressed. While these rates may seem low, they are realistic, given that this was group of sedentary, low-income immigrant women, unaccustomed to participating in a research study. Data suggests minorities are less likely to be adherent to interventions for diet and exercise (Orzech, Vivian, Torres, Armin, & Shaw, 2013). Based on feedback from the participants, lack of adherence seemed to be related to schedule conflicts and competing family responsibilities, rather than issues of feasibility, acceptability, or fidelity. The integration of feedback from the spouses appeared to mollify some of their disapproval; future PA interventions should consider soliciting input from men or developing family-based interventions in which parents and children can participate together.

Intervention fidelity was well maintained throughout the study; comprehensive training of the *promotoras* was a likely factor. Cultural issues can play an unforeseen role in study outcomes and should be anticipated in future PA interventions. For example, the fear of appearing “too muscular” inhibited some of the participants in G1 and resulted in lower scores for muscle strength. Once the *promotoras* were aware of the participants’ concerns, they were better able to encourage the women and elicit more valid estimates of muscle strength in G2.

Unlike many PA interventions among minority groups (Conn, Phillips, Ruppar, & Chase, 2012), the PAIL intervention was culturally responsive and tailored to the needs of immigrant Latinas. In our study, the *Promotora* Coordinator was particularly adept at identifying cultural conflicts concerning issues such as *machismo* and *marianismo* and problem-solving ways to resolve them and improve attendance. Such attention to the individual needs of participants is consistent with the Latin American concepts of *personalismo* and *confianza*. *Personalismo* involves exhibiting warm, caring behaviors during interactions with others, and implies a respect for the person as an individual (Santiago-Rivera, Arredondo, & Gallardo-Cooper, 2002). *Confianza* is a unique mixture of reciprocal familiarity and trust (Zoucha & Broome, 2008) which is likewise characteristic of strong personal relationships. These behaviors are typically not part of recruitment and retention strategies in intervention studies in the United States, but should be considered when culturally tailoring health promotion interventions among immigrant Latinos.

Limitations

Although there are many advantages to the use of the PRPPT (Brewin & Bradley, 1989; Gemmell & Dunn, 2011; TenHave, Coyne, Salzer, & Katz, 2003), the PRPPT with a lag group also has limitations. In anticipation of the intervention, the G2 may alter their PA behaviors or responses, posing a threat to internal validity. In this study, the group differences in fitness and anthropometric outcomes did not appear to be related to anticipation. The discrepancies in muscle strength have previously been discussed. With regard to % BF, the estimated intervention effect for G1 indicated a small decrease in % BF (effect size 1.87; $p < 10^{-7}$), and essentially no change in G2 ($p = .69$). Since the measure of aerobic fitness was a nonexercise estimate of VO_{2max} , based in part on the % BF, there were also corresponding differences in aerobic fitness. Contrary to our hypothesis, there were no significant changes in BMI over the course of the intervention. While the participants increased their PA during the intervention, they may have also increased their caloric intake, a variable we did not assess. Weight gain is common among new immigrants, due at least in part to changes in dietary habits that accompany acculturation (Guendelman, Cheryan, & Monin, 2011) and obesity prevention among Latino immigrants has become a major public health concern (Tovar, Renzaho, Guerrero, Mena, & Ayala, 2014). This study specifically focused on increasing PA among immigrant Hispanic women; future interventions designed to decrease obesity among Latinas need to combine both PA and dietary management.

The only true dropouts after group assignment consisted of women who became pregnant during the study. Although an attrition rate of 16.8% due to pregnancy may seem high, Latin American immigrant women (particularly Mexican women) historically have higher total fertility rates than any other group in the United States (Pew Hispanic Center, 2011) and this study focused exclusively on Latinas of childbearing age. To minimize attrition, future interventions can make use of PRPPT and other pragmatic trial designs (Yoong et al., 2014) as an alternative to the randomized controlled trial; these approaches are consistent with principles of CBPR and are designed to test the effectiveness of an intervention in a real-life setting.

Study findings indicate that a *promotora*-facilitated PA intervention is feasible and acceptable, suggesting that as role models for health-promoting lifestyles, *promotoras* can influence Latinas to increase both habitual and incidental forms of PA. Overall, the study provides evidence that lay-women trained as *promotoras* can successfully deliver an intervention to increase PA among immigrant Latinas and become partners in community-level research.

Acknowledgments

Acknowledgements to Maria and Teresa Clarita Vivar, *Lazos America Unida*, for their valuable assistance and support in the study.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported in part by a Mentored Research Development Award (K01) from the National Institutes of Health (NIH)/National Institute of Nursing Research (NINR)-K01NR009381-01A2.

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Figure 1.
Freirian structured dialog model.
Adapted from Wallerstein and Sanchez-Merki (1994).

Figure 2.
Physical activity intervention for Latinas flow diagram.

Table 1

Exercise Protocol.

Intervention component	Time	Activity
Resting pulse check	30 seconds	Carotid pulse check
Warm up	5–10 minutes	Low-impact aerobic activity using large muscle groups to slowly increase heart rate
Aerobic activity	25–30 minutes	Low impact/Latin dance, increasing to 60% to 80% of age predicted maximum heart rate
Pulse check with relative perceived exertion (RPE) score	30 seconds	Carotid pulse check and estimation of RPE score
Strength training/flexibility	10 minutes	Exercise bands and floor exercises
Cooldown	5–10 minutes	Stretching exercises on floor, relaxation, and group discussion

Table 2

Summary of Study Measures.

Variable	Measures	Description	Properties	Comments
Physical activity	National Aeronautics and Space Administration-Johnson Space Center Physical Activity Rating (NASA-JSC PA-R) Scale (Ross & Jackson, 1990)	One item self-assessment of level of physical activity using a 7-point scale Responses range from "0" (<i>no physical activity</i>) to "7" (<i>run more than 10 miles per week</i>).	See Jackson et al. (1990) below. In the present study, the 2-week test-retest reliability was $r = .97$, $p = .000$. Convergent validity was established by a moderate correlation of the PAR with a measure of exercise self-efficacy ($r = .36$, $p = .03$)	A Spanish language version of the scale, developed by the principal investigator and previously piloted among the <i>promotoras</i> , was used in this study.
Aerobic fitness	Nonexercise estimate of VO_{2max} (Jackson et al., 1990)	Estimate based on age, percentage of body fat, gender, and a self-report of activity level using the NASA-JSC PA-R Scale.	In comparison with direct measurement of VO_{2max} , the authors report a validity coefficient of $r = .79$ and $SEE < 5.7$ ml/kg/min.	
Muscle strength	Robertson curlups (Hoeger & Hopkins, 1992).	Test measures the number of situps (abdominal curls) that the individual can perform in 1 minute, to assess abdominal muscle strength.	Test-retest reliability of the Robertson curlup in young adult women was reported by the authors at $r = .94$. In the present study, the 2-week test-retest reliability was $r = .96$, $p = .000$.	
Flexibility	Modified Sit-and-Reach test (S. Minkler & Patterson, 1994).	The test, which utilizes a commercially made Sit-and-Reach box, measures the flexibility of the hamstring muscles, paraspinals and calf muscles, and was used as a proxy measure of overall flexibility.	In two studies among adult females, test-retest reliability has been reported at $r = .89$ and $.99$. Internal consistency has been reported as alpha = $.94$.	
Percentage of body fat	Bioelectrical Impedance-Omron HBF-306 (Gibson, Heyward, & Mermier, 2000)	The Omron HBF-306 hand held model was used to measure arm to arm impedance. The equations programmed into the Omron unit were developed and cross-validated with a large multiethnic sample of women, aged 19 to 59 years.	In comparing the device with hydrostatic weighing (the Gold Standard) among adult women aged 18 to 55 years, the authors report concurrent validity of $r = .83$ and no significant differences in the percentage of body fat ($p < .05$) were noted between the two methods. A standard error of 2.8 kg in women between the two methods is considered acceptable.	
Body mass index	Body mass index	Calculated as follows: Weight in kilograms and height in meters ² . Height in centimeters and weight in kilograms were assessed on each participant without shoes, using the same scale at each time period.		

Table 3Characteristics of the Sample ($N = 76$).

Characteristic	<i>M</i>	<i>SD</i>
Age, years	29.80	7.92
Number of years living in the United States	10.36	6.78
Number of years of education	9.04	1.86

Table 4Baseline Anthropometric and Fitness Statistics for Groups 1 and 2 ($N = 76$).

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Physical activity (PA-R; log-transformed)					
Total	76	0.34	0.22		
Group 1	27	0.30	0.21	-.75	.45
Group 2	49	0.35	0.22		
Aerobic fitness ($\text{VO}_{2\text{max}}$, mg/kg/min)					
Total	69	25.84	5.50		
Group 1	24	24.93	5.41	-.85	.40
Group 2	45	26.10	5.55		
Muscle strength (Robertson curls, number of repetitions)					
Total	71	39.27	8.87		
Group 1	25	38.21	8.91	-.73	.46
Group 2	46	39.83	8.89		
Flexibility (Sit-and-Reach test, inches)					
Total	71	33.14	6.21		
Group 1	25	33.62	6.21	.45	.65
Group 2	46	32.92	6.26		
Body mass index (kg/m^2)					
Total	76	29.59	5.02		
Group 1	27	30.06	6.00	.55	.58
Group 2	49	29.33	4.46		
Body fat percentage					
Total	68	35.68	6.67		
Group 1	23	36.40	7.69	.63	.52
Group 2	45	35.32	6.15		

Note. PA-R = physical activity rating.

Table 5Baseline Anthropometric and Fitness Statistics for Groups 1 and 2 ($N = 76$).

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Physical activity (PA-R; log-transformed)					
Total	76	0.34	0.22		
Group 1	27	0.30	0.21	-.75	.45
Group 2	49	0.35	0.22		
Aerobic fitness ($\text{VO}_{2\text{max}}$, mg/kg/min)					
Total	69	25.84	5.50		
Group 1	24	24.93	5.41	-.85	.40
Group 2	45	26.10	5.55		
Muscle strength (Robertson curls, number of repetitions)					
Total	71	39.27	8.87		
Group 1	25	38.21	8.91	-.73	.46
Group 2	46	39.83	8.89		
Flexibility (Sit-and-Reach test, inches)					
Total	71	33.14	6.21		
Group 1	25	33.62	6.21	.45	.65
Group 2	46	32.92	6.26		
Body mass index (kg/m^2)					
Total	76	29.59	5.02		
Group 1	27	30.06	6.00	.55	.58
Group 2	49	29.33	4.46		
Body fat percentage					
Total	68	35.68	6.67		
Group 1	23	36.40	7.69	.63	.52
Group 2	45	35.32	6.15		

Note. PA-R = physical activity rating.

Table 6

Summary of Results for Linear Mixed Model (3); Estimated Intervention Effect Is the Same for Groups 1 and 2.

Outcome	<i>n</i>	Pretest, <i>M</i> (<i>SD</i>)	Posttest, <i>M</i> (<i>SD</i>)	Estimated size of intervention effect <i>d</i>	<i>SE</i>	<i>p</i>	95% CI
Physical activity (PA-R, log-transformed)	76	0.34 (0.22)	0.69 (0.46)	0.27	0.03	<10 ⁻¹⁰	[0.21, 0.32]
Flexibility (inches)	71	33.14 (6.21)	36.58 (5.98)	3.77	0.41	<10 ⁻¹⁰	[2.95, 4.59]
Body mass index (kg/m ²)	76	29.59 (5.02)	29.82 (4.22)	-0.87	0.11	<10 ⁻¹⁰	[-1.09, -0.64]

Note. *SE* = Standard error; CI = confidence interval; PA-R = physical activity rating.

Table 7

Summary of Results for Linear Mixed Model (2); Estimated Intervention Effect Differs for Groups 1 and 2 ($N = 76$).

Outcome	<i>n</i>	Group	Pretest, <i>M</i> (<i>SD</i>)	Posttest, <i>M</i> (<i>SD</i>)	Estimate effect size <i>d</i>	<i>SE</i>	<i>p</i>	95% CI
Aerobic fitness (mg/kg/min)	24	Group 1	24.93 (5.41)	30.18 (5.07)	5.57	0.78	<10 ⁻¹⁰	[4.03, 7.11]
	45	Group 2	26.10 (5.55)	30.56 (4.76)	4.10	0.36	<10 ⁻¹⁰	[3.39, 4.81]
Muscle strength (Robertson curls, No. of repetitions)	25	Group 1	38.21 (8.91)	42.25 (8.15)	5.00	1.98	.01	[1.05, 8.94]
	46	Group 2	39.83 (8.89)	62.52 (12.41)	20.37	1.40	<10 ⁻¹⁰	[17.58, 23.16]
Body fat percentage	23	Group 1	36.40 (7.69)	36.88 (6.43)	-1.87	0.32	<10 ⁻⁷	[-2.50, -1.24]
	46	Group 2	35.32 (6.15)	34.75 (4.70)	0.09	0.21	.69	[-0.34, 0.51]

Note. *SE* = Standard error; CI = confidence interval.