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Do Sedentary Older Adults Benefit From Community-Based Exercise? Results From the Active Start Program

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Purpose: This study assessed the effectiveness of Active Start, a community-based behavior change and fitness program, designed to promote physical activity among sedentary community-dwelling older adults. ***Design and Methods:*** A quasi-experimental design was used. Data were analyzed using a within-group pretest–post-test design to calculate changes in the intervention group and changes in the waitlist comparison group. Further analyses were conducted after the comparison group completed the intervention. Paired *t* tests were employed to analyze unadjusted mean changes in physical performance measures from pretest to post-test. Repeated measures analysis of covariance (using SAS Proc Mixed) was then conducted to calculate the adjusted mean change for the intervention group. ***Results:*** Significant improvement was found on all performance measures (strength, flexibility, and balance) for the intervention group as a whole. Similar improvements were found among subgroups (Whites, African Americans, and Hispanics). No significant changes were found in the comparison group when they were in the control condition; however, they significantly improved on all measures after completing the intervention. ***Implications:*** This study suggests that a community-based physical activity program benefits sedentary, racially, and ethnically diverse older adults by coupling a behavioral change support group and fitness classes.

Key Words: Active Start, Older adults, Physical performance, Race–ethnicity

Regular physical activity is an important determinant of health and functioning for people of all ages (American College of Sports Medicine, 1998). Physical activity levels, however, are inversely associated with age, such that individuals aged 50 years and older are the most sedentary segment of the adult population (U.S. Department of Health and Human Services, 1996). About 28%–34% of adults aged 65–74 years and 35%–44% of adults aged 75 years or older are inactive, meaning that they engage in no leisure-time physical activity (Agency for Healthcare Research and Quality and the Centers for Disease Control, 2002). Moreover, the prevalence of physical inactivity varies by race and ethnicity, with Whites more likely to engage in leisure-time physical activity than African Americans and Hispanics (Center for Disease Control and Prevention, 2005).

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Various interventions designed to increase and enhance physical activity have been tested among predominately sedentary older adults. Individually adapted behavior change programs have been found to be effective and strongly recommended for increasing physical activity at the community level (Task force on Community Preventive Services, 2002). Most of the existing community-based physical activity interventions, however, have not been designed specifically to change the lifestyle or activity behavior of older adults (Conn, Minor, Burks, Rantz, & Pomeroy, 2003; King, Rejeski, & Buchner, 1998) and have not included a meaningful number of ethnic minorities (Glasgow, Lichtenstein, & Marcus, 2003; King et al.; Marcus et al., 2006). There is a need for continued research on the effectiveness of physical activity interventions that help people change their behavior and sustain their fitness efforts (Marcus et al., 2006). Information about physical activity among diverse subgroups is essential for health professionals to describe, target, and market physical activity programs (Prohaska et al., 2006).

Active Start was designed to change physical activity behavior among predominately sedentary and racially–ethnically diverse community-dwelling older adults. The purpose of the study was to assess the effectiveness of Active Start in improving physical performance among participants overall and by race–ethnicity.

Methods

Target Population

Active Start included community-dwelling older adults aged 50 years and older. The intervention targeted those who were sedentary or underactive, with physical activity levels less than the recommended moderate physical activity of at least 30 min per session on 5 or more days per week or vigorous physical activity of at least 20 min per session on 3 or more days per week (Nelson et al., 2007). Participants were recruited from community senior centers and senior housing facilities in the city of Los Angeles.

Design

A quasi-experimental design was used with an intervention group and a small waitlist comparison group. Participants were drawn from 11 senior centers. Because the program relied on voluntary participation and eight centers were ready and enthusiastic about beginning, random selection was not practical. Three centers who could postpone starting the program agreed to serve as the waitlist comparisons.

When the intervention group had completed the intervention, participants in the waitlist comparison group were invited to begin the intervention. The study, conducted from April 02, 2006, to September 29, 2008, was approved by the Institutional Review Board of the University of Southern California, and all study participants completed a written informed consent form. The City of Los Angeles Department of Aging, in partnership with OASIS, collaborated with the 11 local senior centers to conduct the intervention.

Recruitment Strategies

Active Start used a multifaceted approach to recruit participants. To improve the likelihood of recruiting success, the project coordinator identified potential participating sites by examining their demographics and unmet needs. The project coordinator then contacted directors of potential sites and scheduled presentations about the program fundamentals, benefits, and the necessary commitments of the directors and other staff.

Active Start also recruited peer lay leaders to motivate and train participants. Although a previous iteration of the Active Start program used paid professionally certified instructors, the lay leader approach was piloted and subsequently implemented in Active Start in response to consumer feedback that the fitness professionals did not understand and share their daily challenges. Lay leaders were selected based on their interests, ability to participate in the 2-day training session, commitment to complete the program, and potential to lead and motivate participants. Background in health or fitness was not required. Participating site directors and other staff helped identify potential peer lay leaders within the host agency's community. Strategies employed to recruit lay leaders included presentations, word of mouth, Internet postings, and print ads. Eight lay leaders were recruited, trained, and completed the 24-week intervention.

In addition to project presentations to recruit potential participants, flyers and brochures in English and Spanish were distributed at host sites, neighboring facilities where seniors congregate, health fairs, or other community events. The project

coordinator and other staff encouraged project participants to bring their friends or any interested potential participants to the project.

Theoretical Framework

Although physical activity is a complex behavior with multiple determinants and pathways to change (King, 2001; Sherwood et al., 2008), a common thread is that well-structured center-based programs using behavior change strategies, such as self-monitoring, goal setting, feedback, and self-evaluation, have been successful in increasing physical activity among community-dwelling older adults (Brawley, Rejeski, & King, 2003). Recognizing the importance of including a behavioral component, the Active Start program applied the Transtheoretical Stages of Change Model (Prochaska, Norcross, & DiClemente, 1994), a behavior change framework that helped motivate Active Start participants to overcome barriers to physical activity and maintain their behavior. This model suggests that, although sedentary older adults in the first or precontemplation stage have little interest in becoming physically active, they may be motivated to begin to recognize their need for activity. When this happens (in this case through early motivational sessions of Active Start), they move toward the contemplation and preparation stage of intending to take action and become active. Setting small and realistic goals, they enter the action stage, where they become fully engaged in physical exercise, building toward the maintenance stage where physical activity can be sustained indefinitely.

The Exercise Intervention

Active Start combined two 20-week evidence-based programs, Active Living Every Day (ALED) and ExerStart. As a result, Active Start was conducted for 24 weeks; the first 4 weeks were ALED only, followed by 16 weeks of the combined ALED and ExerStart programs; the last 4 weeks were ExerStart only. ALED, developed by the Cooper Institute, is a behavior change program that has been tested in randomized controlled trials (Dunn et al., 1999; Sevick et al., 2000). Participants meet 1 hr a week, in a group setting, to set goals, identify barriers, and establish social support systems (Dunn et al., 1999). Guided by the Transtheoretical Model described earlier, a number of behavior change strategies designed to change behavior in small steps were introduced in the first 4 weeks of the program. These included assessing motivation, identifying readiness, goal setting, education, starting with small goals, and identifying barriers. ExerStart began after 4 weeks of ALED to ensure that participants understood and embraced the lifestyle physical activity philosophy. After Week 4, when ExerStart was introduced, participants met three times a week, one 45-min session for ALED and two 45-min sessions for ExerStart.

ExerStart is a low-intensity program designed specifically for sedentary older adults. It comprised 43 exercises focusing on aerobic strength (e.g., standing squats), flexibility (e.g., point and flex ankles), and balance (e.g., around the clock weight shifts). Each class consists of a 5-min warm-up, 10-min aerobic stretch, 15-min strength, 5-min cooldown or balance, and a 10-min flexibility training. In the present study, all exercises were performed to culturally preferred music chosen by the group or the lay leader. Resistance bands were used for some of the exercises. To help reinforce class content, participants received a handout at the end of each class that included a safe exercise they could practice and complete at home. The Senior Fitness Test (SFT; Rikli & Jones, 1999) was used to measure the efficacy of the 20-week exercise curriculum. The SFT is a seven-item battery measuring lower body strength (chair stand), upper body strength (arm curl), aerobic endurance (6-min walk and 2-min step), lower body flexibility (chair sit-and-reach), upper body flexibility (back scratch), and balance (8-foot up-and-go). Due to limited space, the 6-min walk test was not included. The remaining six tests were measured before and after the ExerStart intervention. To ensure that lay leaders were able to complete the SFT for each participant, these items were broken up over three classes, with two SFT items administered in each of the first three classes of the intervention. Specifically, chair stand and back scratch were administered in the first class, arm curl and chair sit-and-reach in the second class, and 2-min step and 8-foot up-and-go in the third class. ExerStart introduced participants gradually to exercises with simpler exercises, and fewer repetitions of each exercise were recommended in the earlier stages of the program.

Training Procedure

Prior to implementation, all lay leaders attended a 2-day training covering Active Start's behavioral and exercise components. The first day focused on

the ALED program. Training was conducted by a master trainer certified through Human Kinetics. The scripted training exposed lay leaders to issues of group dynamics, facilitation, and dealing with difficult situations. All lay leaders had to successfully complete an exam to be certified by Human Kinetics. The second day focused on the ExerStart program. Lay leaders learned how to lead each exercise and how to conduct the SFT and practiced leading a mock exercise session.

Measures and Analysis

In both the intervention and the waitlist comparison group, data were analyzed using a within-group pretest–post-test design to calculate changes in the SFT. In the intervention group, change was examined by race–ethnicity as well.

Participation Rates.—The participation rate was computed as the total number of participants included in the pretest analysis divided by the number of participants who were screened as eligible to participate for the study. The dropout rate was computed as the number of participants who dropped out of the study by the post-test divided by the total number of participants in the pretest. Chi-square tests and *t* tests were used, as appropriate, to assess differences between participants who completed the program and those who did not.

Physical Performance.—Physical performance was measured at pretest (prior to beginning the exercise phase) and 20-week post-test (at completion of the formal program). Changes of physical performance from pretest to post-test were first measured using paired *t* tests to calculate the unadjusted mean change for the intervention group and the waitlist comparison group as well as across race–ethnicity in the intervention group. Repeated measures analysis of covariance (ANCOVA; using SAS Proc Mixed) was then used to calculate the adjusted mean change for the overall intervention group, controlling for physical activity level at baseline, age, gender, race–ethnicity, and self-reported health status.

Results

Sample Description

As shown in Figure 1, a total of 220 participants were screened into the study. Three participants who were too physically frail to do the exercises were excluded. Among those eligible (N = 217), 9 declined to participate and 208 (96%) were included in the pretest analysis.

Of the 208 participants who enrolled in the study, 151 were from the eight senior centers that chose to begin the intervention immediately and were therefore assigned to intervention status and 57 from the three senior centers who agreed to delay the intervention were assigned to the waitlist comparison group. Of the 151 participants in the intervention group, 140 (93%) completed the study. Of the 11 (7%) who did not, 7 identified health problems as the reason, 3 left the study without any reasons given, and 1 could not keep up with the exercise. Of the 57 participants in the waitlist comparison group, 16 (28%) remained in the study for the 24-week period and 41 withdrew. The primary reason for the high attrition in the waitlist comparison group was that two senior centers with a total of 31 waitlist control participants left the study because they could not recruit staff to oversee the program on-site. An additional 10 participants dropped out because they were no longer interested. Analyses were further conducted to compare characteristics between those who completed and those who dropped out in the waitlist comparison group (table not shown). Although no significant differences were found in age, gender, education, and self-rated health, a significant racial–ethnic difference was found ($p < .001$). The majority who left the study were Hispanics (46%); the majority who completed were Blacks (81%), reflecting the composition of the center that participated and the two that withdrew.

Baseline Characteristics

Table 1 shows participants' characteristics at pretest. The mean age was 73 years; 82% were female; more than half were Hispanics. About half had an education level below high school. More than 65% rated their health as good, very good, or excellent; only one third engaged in regular physical activity.

No significant differences were found between the intervention group and the waitlist comparison group in age, gender, education, and self-rated health. However, there was a significant racial–ethnic difference ($\chi^2 = 17.07$, $p < .001$). The majority in the intervention group were Hispanics (56%); in the waitlist comparison group, African Americans accounted for the largest percentage (39%) and Hispanics comprised 35%.

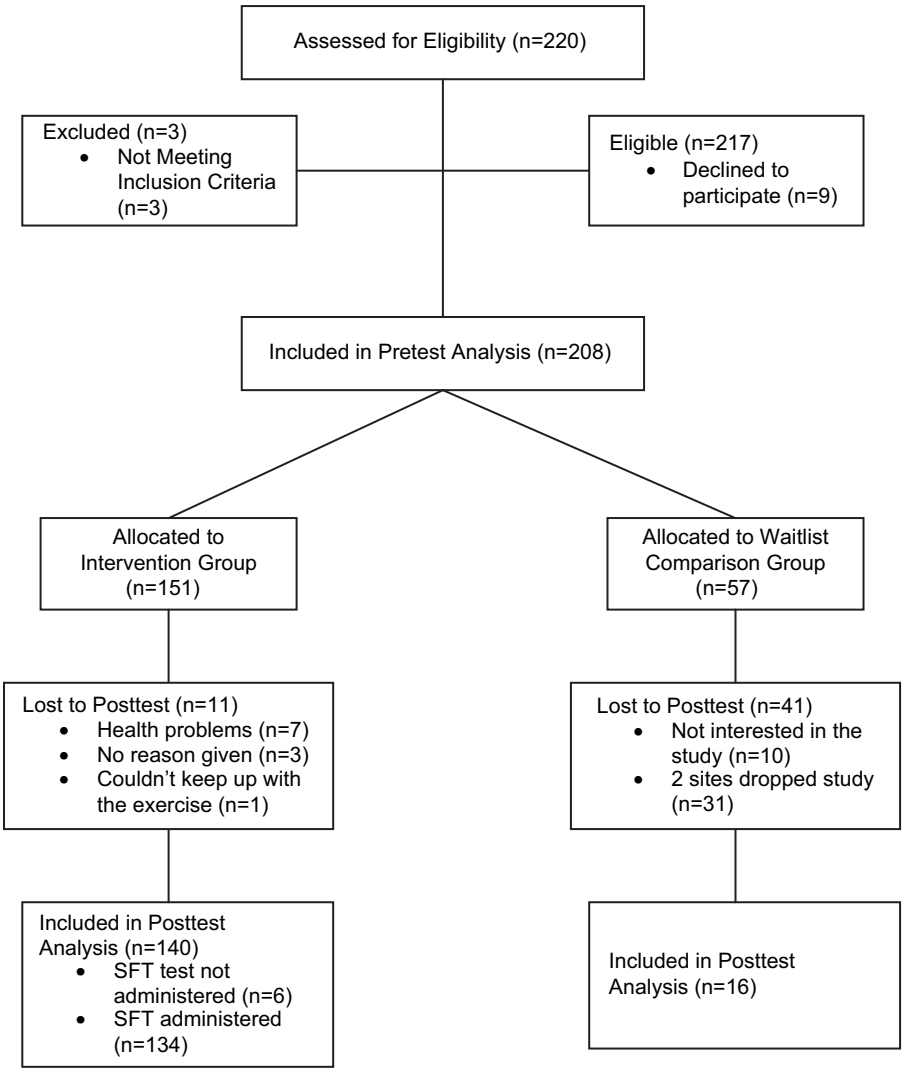

Figure 1. CONSORT diagram of Active Start.

Changes of Physical Performance

Table 2 presents unadjusted mean scores of the six SFT measures at pretest and post-test. Significant improvement on all SFT measures was found among the intervention group, whereas no significant changes were found in the waitlist comparison group. When analyzed separately by race–ethnicity for the intervention group, improved scores were found on all six SFT measures, although changes of chair sit-and-reach for Whites and Blacks and changes of back scratch for Whites were not statistically significant. The adjusted mean scores of the six measures for pretest and post-test were further calculated by the ANCOVA for the entire intervention group after controlling for pretest physical activity levels, age, gender, race–ethnicity, and self-reported health status (see Table 3). Similar trends were found; participants in the intervention group had significant improvements on all six SFT measures from pretest to posttest. For example, the number of chair stands in 30 s, on average, improved from 9.62 (SE = 0.31) to 12.84 (SE = 0.31, $p < .0001$).

Changes of SFT measures were analyzed for the waitlist comparison group after they completed the intervention (n = 12). Statistically significant improvements were found in all six SFT measures ($p < .05$, table not shown).

Discussion

The majority of empirically evaluated community-based programs have targeted endurance-oriented activities, such as brisk walking, general aerobic movement, or conditioning activities, either with or without additional strengthening

Table 1. Participant Characteristics at Pretest

	Total (N = 208)	Intervention group (n = 151)	Comparison group (n = 57)	p[a]
Age (M, SD)	72.88 (8.83)	73.52 (9.31)	71.23 (7.27)	.10
Gender, n (%)				
Female	171 (82.21)	127 (84.11)	44 (77.19)	.25
Male	37 (17.79)	24 (15.89)	13 (22.81)	
Race–ethnicity, n (%)				
White	47 (22.60)	38 (25.17)	9 (15.79)	.0007
Black	45 (21.63)	23 (15.23)	22 (38.60)	
Hispanic	105 (50.48)	85 (56.29)	20 (35.09)	
Other	4 (1.92)	2 (1.32)	2 (3.51)	
Missing race	7 (3.37)	3 (1.99)	4 (7.02)	
Education, n (%)				
Below high school	95 (45.67)	76 (50.33)	19 (33.33)	.15
High school and above	97 (46.63)	69 (45.70)	28 (48.12)	
Missing education	16 (7.69)	6 (3.97)	10 (17.54)	
Self-rated health, n (%)				
Poor or fair	60 (28.85)	43 (28.48)	17 (29.82)	.76
Not poor or fair	137 (65.87)	101 (66.89)	36 (63.16)	
Missing self-rated health	11 (5.29)	7 (4.64)	4 (7.02)	
Physical activity level, n (%)				
Sedentary	52 (25.00)	42 (27.81)	10 (17.54)	.20
Underactive	77 (37.02)	52 (34.44)	25 (43.86)	
Regularly physical active	69 (33.17)	53 (35.10)	16 (28.07)	
Missing physical activity level	10 (4.81)	4 (2.65)	6 (10.53)	

Note: [a]Differences between the intervention group and the comparison group: chi-square tests were used for categorical variables; t tests were used for continuous variables.

and flexibility activities (King, 2001; Van der Bij, Laurant, & Wensing, 2002; Wallace et al., 1998). Fewer studies have investigated the combination of strength, flexibility, and balance training among healthy sedentary older adults (Brawley et al., 2003). The current study was undertaken to determine if Active Start, a center-based group exercise program that used a combination of two evidence-based interventions, was effective in improving strength, flexibility, and balance in diverse community-dwelling older adults. Results suggest that participation in Active Start produced significant improvements in physical performance measuring strength, flexibility, and balance. Moreover, a remarkably high percentage (93%) of participants in the intervention group completed the 24-week study.

Previous studies have reported difficulties in completing the SFT items in routine class sessions (Belza et al., 2006). The present study successfully resolved this challenge by breaking up the six SFT items over three classes, with two SFT items administered in each of the first three classes of the intervention.

Many existing physical activity interventions have not been able to target or recruit a meaningful number of ethnic minorities, who may face such barriers to participation as inability to speak or read English, illiteracy in their native language, and a lack of interpreters or bilingual health care professionals (Brawley et al., 2003). Active Start successfully recruited and retained a large proportion of minority participants by providing culturally sensitive services, such as bilingual project coordinators and lay leaders, bilingual handouts, and culturally preferred music.

Some evidence-based interventions have been shown to be less effective or ineffective in ethnic minority or low-income populations (Yancey et al., 2004). In contrast, results from the present study showed that Hispanics significantly improved their physical performance on all the six SFT items in 20 weeks. Similar results were found for Whites and Blacks.

The effectiveness of the Active Start program also hinged on being able to keep people engaged in exercise as reflected in the high (93%) retention rate. To support maintenance of physically active lifestyles, it is essential that interventions are tailored to individuals' ideas and preferences and that a variety of options are available (Rejeski & Mihalko, 2001). Active Start met participant's

Table 2. Unadjusted Mean Pretest and Post-Test Scores With Standard Deviations

SFT	Intervention group				Comparison group
	Total	White	Black	Hispanic	
Chair stand, No. in 30 s					
n	125	25	18	81	16
Pretest, *M* (*SD*)	9.92 (3.51)	10.04 (3.06)	9.44 (4.74)	9.95 (3.36)	10.44 (2.90)
Post-test, *M* (*SD*)	13.19 (3.61)	12.24 (3.28)	13.00 (3.97)	13.49 (3.63)	10.31 (2.52)
t (*p* value)	15.42 (<.0001)	4.69 (<.0001)	6.54 (<.0001)	13.69 (<.0001)	−0.25 (.81)
Arm curl, No. in 30 s					
n	130	25	21	81	16
Pretest, *M* (*SD*)	11.47 (4.17)	13.32 (4.03)	12.24 (5.17)	10.79 (3.75)	10.81 (4.32)
Post-test, *M* (*SD*)	16.03 (4.57)	17.04 (4.80)	17.10 (5.13)	15.35 (4.21)	10.31 (0.70)
t (*p* value)	14.44 (<.0001)	3.89 (.001)	5.49 (<.0001)	14.08 (<.0001)	−0.44 (.66)
2-min step, No. in 2 min					
n	126	25	17	81	16
Pretest, *M* (*SD*)	68.50 (21.61)	72.36 (24.45)	61.71 (16.32)	68.89 (21.45)	60.06 (17.95)
Post-test, *M* (*SD*)	89.40 (22.24)	91.56 (24.11)	83.18 (20.55)	89.60 (22.23)	64.75 (20.04)
t (*p* value)	15.71 (<.0001)	5.58 (<.0001)	4.87 (.0002)	14.03 (<.0001)	2.08 (.06)
Chair sit-and-reach, inch from toe					
n	129	24	21	81	16
Pretest, *M* (*SD*)	−2.51 (3.88)	−1.50 (3.86)	−2.55 (3.34)	−2.83 (3.99)	−2.41 (2.85)
Post-test, *M* (*SD*)	−1.20 (3.50)	−0.33 (3.52)	−2.14 (3.73)	−1.20 (3.47)	−2.38 (3.24)
t (*p* value)	5.05 (<.0001)	1.18 (.25)	0.58 (.57)	7.37 (<.0001)	0.07 (.94)
Back scratch, inch from middle fingers					
n	133	27	21	83	16
Pretest, *M* (*SD*)	−6.09 (5.62)	−2.80 (5.36)	−6.81 (4.62)	−6.93 (5.65)	−7.88 (4.23)
Post-test, *M* (*SD*)	−4.81 (4.79)	−2.15 (4.68)	−5.62 (4.02)	−5.65 (4.68)	−8.81 (5.09)
t (*p* value)	4.10 (<.0001)	1.63 (.12)	2.53 (.02)	3.10 (.003)	−1.18 (.26)
8-foot up-and-go, s					
n	129	25	19	82	16
Pretest, *M* (*SD*)	8.87 (4.20)	6.86 (2.46)	11.35 (5.11)	8.96 (4.16)	7.53 (6.15)
Post-test, *M* (*SD*)	7.52 (3.37)	6.21 (1.66)	9.35 (5.05)	7.56 (3.15)	8.62 (2.67)
t (*p* value)	−9.66 (<.0001)	−2.85 (.001)	−6.20 (<.0001)	−7.54 (<.0001)	0.61 (.55)

Notes: For chair sit-and-reach test and back scratch test, the higher (positive) the score, the better the performance. Tests were given in the same order at post-test. Variation in the number of subjects in each of the six SFT measures is a result of missing pretest data. SFT = Senior Fitness Test.

needs by (a) using trained lay leaders who understood and shared the same daily challenges of the participants, (b) using behavior change principles in ALED, and (c) using specially designed evidence-based exercises.

Despite these impressive results, several limitations should be noted. First, the evaluation used a comparison group from three senior centers that had agreed to delay the intervention; it did not use random assignment. Second, difficulties were encountered in sustaining the waitlist comparison group when two sites left the program before the intervention phase because they could not recruit staff ($n = 31$), and 10 older adults in the third center

Table 3. Adjusted Mean Pretest and Post-Test Scores With Standard Errors for the Intervention Group

	Pretest, *M* (*SE*)	Post-test, *M* (*SE*)	*t* (*p* value)
Chair stand, No. in 30 s (*n* = 116)	9.62 (0.31)	12.84 (0.31)	15.13 (<.0001)
Arm curl, No. in 30 s (*n* = 120)	11.42 (0.35)	15.84 (0.36)	14.17 (<.0001)
2-min step, No. in 2 min (*n* = 115)	66.55 (1.90)	86.45 (1.89)	14.60 (<.0001)
Chair sit-and-reach, inch from toe (*n* = 118)	−2.05 (0.57)	−0.81 (0.57)	4.41 (<.0001)
Back scratch, inch from middle fingers (*n* = 123)	−5.53 (0.45)	−4.55 (0.46)	3.33 (.001)
8-foot up-and-go, s (*n* = 118)	8.75 (0.30)	7.49 (0.30)	−8.94 (<.0001)

Note: All means and standard errors were adjusted for physical activity levels, age, gender, race–ethnicity, and self-reported health status.

dropped out during the 24 weeks they were on the waitlist. Ory and colleagues (2006) suggested that the latter type of attrition occurs when participants do not realize immediate benefits. Third, attrition of those on the waitlist resulted in a small *number* in the comparison group, reducing statistical power to address differences in change scores between the comparison and the intervention groups. Because of the small number of participants in the comparison group, the analysis depended on comparing pretest–post-test differences within each group rather than measuring differences between the intervention and the comparison groups. Despite a small sample size in the comparison group, results suggest that the findings are valid, demonstrated by a lack of trends in pretest–post-test differences in all but one measure as well as the robust positive findings when the comparison group received the intervention. In addition, reflecting the difficulties inherent in community-based research, the high level of attrition among Hispanics from the comparison group is a limitation of this study that should be considered when interpreting the results. Finally, no data were collected regarding which participants followed the handout of safe exercises to complete at home. Therefore, the effects of home exercise versus the formal group exercises were unknown.

Despite these challenges, the evaluation indicates that a community-based physical activity program benefits sedentary, ethnically diverse older adults. Coupling a behavioral change support group and fitness classes results in significant improvements in all measures of physical performance. In addition to the curriculum and the use of lay leaders, Active Start was conducted using community agencies. The City of Los Angeles Department of Aging used its network of agencies to recruit lay leaders and participants and to bring the intervention to its local senior centers. Similarly, there is an extensive aging network in communities throughout the United States that could provide leadership to replicate the program.

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