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Effectiveness of a flamenco and sevillanas program to enhance mobility, balance, physical activity, blood pressure, body mass, and quality of life in postmenopausal women living in the community in Spain: a randomized clinical trial

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Abstract

Objective: This study aimed to test the effectiveness of a dance therapy program in improving mobility, balance, physical activity, blood pressure (BP), body mass, and quality of life in postmenopausal women in Spain.

Methods: Fifty-two sedentary postmenopausal women (mean age 69.27 ± 3.85 y) were randomly assigned to receive either dance therapy ($n = 27$) or self-care treatment advice ($n = 25$). The intervention group participated in 2 months of dance therapy, three sessions weekly, based on Spanish folk dance (flamenco and sevillanas). The control group was provided a booklet containing physical activity recommendations. Mobility, balance, physical activity, BP, body mass, and quality of life were assessed at baseline and posttreatment in both groups. Statistical analysis was performed using a 2×2 analysis of variance (ANOVA).

Results: Women in the intervention group showed significant improvements in mobility and balance (timed up-and-go test [$P = 0.022$], cognitive timed up-and-go [$P = 0.029$], and one-leg stance test results [$P = 0.001$]), physical activity (total time index [$P = 0.045$], energy expenditure [$P = 0.007$], vigorous physical activity [$P = 0.001$], leisure activity [$P = 0.001$], moving [$P < 0.001$], and activity dimension summary [$P = 0.001$]), and fitness (overall fitness [$P = 0.039$], cardiorespiratory fitness [$P < 0.001$], speed-agility [$P = 0.001$], and flexibility [$P = 0.007$]) compared with those in the control group. No differences were observed in BP, body mass, or quality of life.

Conclusions: Spanish dance therapy may be effective to improve mobility, balance, and levels of physical activity and fitness in sedentary postmenopausal women.

Key Words: Dance therapy – Exercise – Postmenopause – Sedentary lifestyle.

Worldwide, sedentary lifestyles are responsible for over 2 million deaths each year. In women, together with changes that take place during and after menopause, such lifestyles have been associated with high rates of mortality due to cardiovascular disease. According to a 2008 statistical report on cardiovascular disease in Europe, 42% of all deaths in women under 75 years of age are the result of heart disease, which is influenced by physical inactivity and weight gain, among other factors.[1] Furthermore, the prevalence of hypertension, musculoskeletal disease, obesity, and impaired balance increases with age and menopause. As a consequence, postmenopausal women are at increased risk of cardiovascular disease and are more susceptible to falls.[2,3]

Good balance requires integration of sensory information regarding body position and the proper generation of motor responses to maintain postural stability. Balance disorders are increasingly becoming a public health problem because of their association with falls, which may mark the beginning of a decline in function and independence, and are the leading cause of injury-related hospitalization among older adults.[4] One in three persons over 65 years of age living in the community experiences at least one fall per year, and 10% to 15% of these falls are associated with serious injuries and long periods of physical inactivity.[4]

Studies have shown that regular physical exercise by postmenopausal women improves the functional, physiological, and behavioral components of physical fitness These

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components include arterial hypertension, cardiorespiratory function, body composition, quality of life, and balance.[5] In a recent study of induced menopause in rat models, Quinteiro et al[6] concluded that aerobic exercise training was the most effective remedy for blood pressure (BP) disorders. Nordic walking has also been found to improve balance and decrease the risk of falls in older people.[7]

Although the benefits of physical activity for perimenopausal and postmenopausal women are well known, adherence to recommended patterns of physical activity remains low among this population. Reasons for poor response to exercise-oriented treatment programs for women with obesity include embarrassment, fear of ridicule or criticism, the existence of family obligations, a lack of inclination, insufficient time, and poor self-efficacy related to exercise.[8] Motivation to exercise can also be reduced by concerns about the absence of social interaction during physical training or the reduced enjoyment of leisure activities.[9]

A variety of physical activity programs have been proposed for older adults living in the community. These approaches in these programs vary considerably,[10] and as of yet, there is no consensus on the amount, quality, or intensity of exercise needed to enhance health and functionality within this population.[11] In this context, dance-based aerobics is a form of physical activity that improves balance, locomotion, and agility by including music as a recreational factor (ie, music stimulates enjoyment through the interaction with dance partners and increases positive expectations toward the exercise).[12] When used as therapy, dance provides innovative, creative, and useful ways to help women rehabilitate through a comprehensive focus on the mind and body and integrating both cognitive and social aspects. The American Dance Therapy Association defines dance therapy as ''the psychotherapeutic use of movement to further the emotional, cognitive, physical, and social integration of the individual.''[13] Like that of other creative therapies, its purpose is to offer an alternative instrument to enhance the sensorimotor components and the cognitive,[14] emotional, and psychosocial skills of the person,[15] at a low financial cost. Dance therapy seems to increase motivation and adherence to therapy, and can provide a real alternative to conventional exercise.[16] In Spain, few studies, however, have reported on the effectiveness of dance therapy in improving balance and levels of physical activity among especially inactive populations, such as older postmenopausal women, who have led a sedentary lifestyle throughout adulthood.

In view of this background, the aim of the present study was to analyze the effectiveness of a Spanish dance therapy program based on flamenco and sevillanas in improving mobility, balance, physical activity, BP, body mass, and quality of life in sedentary postmenopausal women. We hypothesized that the use of the body's postural control alongside the stimuli of the cardiovascular system induced by dance therapy would have positive effects on balance, physical activity, BP, body mass, and quality of life in this population.

METHODS

Study design and participants

In this single-blinded randomized clinical trial, participants included white postmenopausal women with at least 12 months of amenorrhea and prehypertension or hypertension (according to the criteria of the 2008 American Heart Association scientific statement). Women attended a primary care clinic in Cordoba (southern Spain) and were referred to the clinical laboratory of the Physiotherapy Department at the University of Granada between March 2012 and January 2014. All women were diagnosed by a specialist as having spontaneous menopause, in accordance with hospital protocol, which included the determination of hormone levels. None of the women was receiving hormone therapy. Inclusion criteria were as follows: age 65 to 75 years and a history of little physical activity (less than the hour of daily walking recommended in the guidelines for cardiovascular risk prevention) during the last 40 years before inclusion in the study. The following exclusion criteria were applied: an injury precluding questionnaire completion or hampering evaluation, regular engagement in physical exercise training during the 4 weeks before inclusion in the study, symptomatic peripheral arterial occlusive disease, aortic insufficiency or stenosis above stage I, hypertrophic obstructive cardiomyopathy, congestive heart failure (exceeding New York Heart Association II), uncontrolled cardiac arrhythmia with hemodynamic relevance, systolic office BP at least 180 mm Hg, signs of acute ischemia in exercise electrocardiography, and a change of antihypertensive medication during the 4 weeks before inclusion in the study or during the follow-up period.

To minimize noncompliance bias, all of the women in the exercise group were consistently reminded of the importance of their uninterrupted participation. An adherence rate of 100% was obtained. Written informed consent was obtained from all participants before inclusion in the study. The study was approved by the local ethics committee at the Faculty of Health Sciences of Granada University.

Procedures and interventions

During the screening process, an experienced physician conducted an exploratory clinical examination to identify participants with prehypertension (systolic BP of 130 mm Hg and a diastolic BP of 85 mm Hg) and hypertension[17,18] (systolic BP of $\geq$140 mm Hg and diastolic BP of $\geq$90 mm Hg), in accordance with the American Heart Association guidelines, and to apply the stipulated criteria for inclusion and exclusion. After being interviewed to obtain data on age, body mass index (BMI), smoking habits, and alcohol consumption, the women were randomly assigned to either the experimental group (dance therapy, $n = 27$) or the control group (self-care advice, $n = 25$). Women were assigned to a treatment group based on block randomization after prestratification according to age (<65 or $\geq$65 y). Randomized, permuted blocks of six participants were generated for each stratum using a computer-generated random-sequence table. A researcher who was not involved in the project prepared

TABLE 1. *Dance therapy program and components*

Structure of the session	Activities	Activity components	Repetition of activity	Session duration, min
Warm up	Mobility exercises and low-intensity aerobics	Sensorial, neuromuscular, motor, and cognitive	2-4 times	10
Dance therapy	Dance-based therapy Basic dance moves *Sevillanas* Flamenco	Laterality, spatial orientation, attention, adaptation to the rhythm, coordination, balance	4-8 times	15-30
Choreographed	Low-impact aerobics	Memory, coordination, rhythm-timing	Depending on participant fatigue	5-30
Cooldown	Stretching-relaxing	Breathing, bodily awareness	Depending on participant fatigue	5-30

opaque, sequentially numbered sealed envelopes each containing a folded card indicating one of the two interventions. Three therapists, who were blinded to group allocation, collected all outcome measures at baseline and posttreatment.

The treatment group received 24 dance sessions, three times per week, for 2 months (a total of 8 wk). Each session lasted 50 minutes. Sessions were composed of the following activities: 10 minutes of mobility and low-intensity aerobic exercise, 20 minutes of more active movement (dance therapy), 10 minutes of choreography, and 10 minutes of cooldown. Each session allowed a maximum of 10 participants and the therapist closely monitored those with balance impairments. Dance therapy included low-impact aerobics and stretching mixed with dance movements. The dance movements were based on simple flamenco dance steps (forward, backward, transversal, and rotational), sevillanas, and ballet steps. They were choreographed specifically for older adults, and involved shifting the body weight, stretching the arms in every direction, lifting the legs, and flexing the feet. The dance steps were designed to improve balance by shifting the body weight and relocating the center of gravity and were performed after flamenco music. The protocol for this program was based on published practice recommendations, in accordance with American College of Sports Medicine guidelines.[19] Table 1 shows the sequence followed and the repetitions performed in the complete dance therapy program.

The women in the control group were instructed to follow the physical activity recommendations outlined in the protocols for the reduction of cardiovascular risk. During the initial examination, each woman was given a booklet stressing the importance of exercise, highlighting the risk posed by a sedentary lifestyle for postmenopausal women, and the need for aerobic exercise, such as swimming or walking for 40 to 60 minutes per day (at least 3 d/wk).

Measurements

Data were collected on mobility and balance, physical activity, BP, body composition, and quality of life at two time points: baseline (before the treatment) and immediately after the end of the treatment program. The primary outcome measure for this analysis was the change between groups at week 8 for the timed up-and-go (TUG) test. The other tests analyzed at secondary outcome were the one-leg stance (OLS), Yale Physical Activity Survey (YPAS), International Fitness Scale (IFIS), systolic and diastolic BPs, BMI, and 12-item Short Form Health Survey (SF-12) quality of life questionnaire.

Mobility, dual-tasking, and balance

The TUG, dual-tasking, and OLS tests were used for evaluating mobility, activities of daily living performance, and balance.

TUG is a simple test that assesses mobility and involves dynamic balance and agility. The observer times how long (in seconds) is needed for the woman to stand up from a chair, walk 3 m, turn around, return to the chair, and sit down. The exercise is scored according to four levels: less than 10 seconds (independent mobility), at most 20 seconds (largely independent mobility), 21 to 29 seconds (variable mobility), and at least 30 seconds (dependent mobility). The TUG test as an interexaminer reliability of 0.86 and internal consistency of 0.85.[20,21]

In addition, dual-tasking[22] with TUG was performed. Postural stability during activities of daily livings usually takes place, while a minimum of one other task is being performed concurrently. Therefore, this test allows for evaluation of postural control and motor function during similar daily life situations. For the manual TUG test, the participant was asked to complete the TUG while carrying a glass of water in one hand. For the cognitive TUG test, the participant had to perform the TUG while counting backward in threes from a random start point. Women who had a dual-task performance time that exceeded that of the single-task performance time by 4.5 seconds or more were identified as being more frail and at a greater risk of suffering from a fall.[23] Each test was repeated three times, and the average was calculated for subsequent data analysis.

The OLS is described as a test of quantifying static balance ability. It was performed as follows: the participant was required to stand unassisted for as long as possible on one leg with the eyes open and arms on the hips. The observer recorded the time (in seconds) that elapsed beginning when one foot was flexed off the floor and ending at the time it touched the ground or the standing leg, or when an arm was separated from the hip. Women were given the opportunity to practice as many times as they desired, to ensure they understood how to perform the test. Beforehand, the woman stood in a relaxed position on both legs, while the observer explained and demonstrated the test. It has been reported that the reliability of the OLS test for an older population is 0.89 and 0.86 with the eyes open and closed, respectively.[24] Participants who were unable to maintain the OLS for at least 5 seconds were considered to have an increased risk of suffering from a fall.[25]

Physical activity and fitness

The YPAS was used to quantify changes in the level of physical activity during the study period. Part I of the YPAS obtains information about the length of time participants spend on specific activities in various domains (housework, gardening, care taking, exercise, and recreation). These responses are aggregated to the duration (in min) for each activity and then multiplied by a weight (developed by the YPAS designers) to yield total estimated energy expenditure. Part II obtains information about vigorous activities, leisure activities/walking, standing, moving about on one's feet, sitting, and stair climbing. This part of the survey is used to derive a total score (the Activity Dimensions Summary Index) and the number of minutes of vigorous activity and walking.[26]

Overall, physical fitness and its components were assessed according to the IFIS. The IFIS is composed of five Likert-scale questions (1 = very poor to 5 = very good), which obtains information about the women's perception of their overall fitness, cardiorespiratory fitness, muscular fitness, speed-agility, and flexibility.[27]

BP

BP was measured on the right arm on three occasions. The woman was seated and a minimum of 5 minutes elapsed between measurements. A standard mercury sphygmomanometer was used. Korotkoff phase I and phase V sounds were recorded for systolic BP and diastolic BP, respectively.

BMI

BMI was calculated by dividing body weight (in kilogram) by height (in meter) squared.

Quality of life

The SF-12[28] is a shortened form of the SF-36 Survey, which was designed for use in the general population as a multifactorial measurement of health-related quality of life. SF-12 assesses general health, functional limitations, and symptoms of mood and anxiety experienced over the past 4 weeks. It provides a total score and two summary scores assessing physical function and mental well-being. The Physical Component Summary and the Mental Component Summary scores are generated through a standardized scoring algorithm and, in our study, were based on weights derived from Spanish population patterns, with higher scores indicating better function.

Statistical analyses

Before commencing the study, the sample size was calculated. On the basis of published findings,[29] the primary outcome measure was the change in the TUG test. A change of 1.2 seconds in this test was considered the minimum clinically significant difference between groups. NCSS-PASS software was used to calculate the sample size required to detect this increase in the TUG test for the experimental versus control groups. Thus, a sample size of 29 participants per arm was needed to detect a minimal clinically significant difference (1.2 s) with 80% power at the two-sided 0.05 significance level, assuming an SD of 1.6. The sample was increased to a total of 70 in an effort to allow for losses through follow-up of up to 16% throughout the entire study (because women were evaluated for eligibility criteria).

SPSS for Windows version 20.0 (SPSS Inc, Chicago, IL) was used for the statistical analyses. Key baseline demographic variables and self-report measures were compared between groups using independent *t* tests for continuous data and χ^2 tests for categorical data. A separate 2×2 mixed model analysis of variance (ANOVA) was conducted to test the effect of the treatment on balance, with TUG as the primary outcome measure. Secondary outcomes were physical activity, BP, body mass, and quality of life with time (baseline and at 2-mo posttreatment) as the within-subject variable, and group (experimental or control) as the between-subjects variable. Post hoc analyses of significant group × time interaction effects were carried out using the Tukey multiple comparison procedure. All analyses followed the intention-to-treat principle, and the groups were analyzed as randomized. Changes in the scores for the variables within and between groups were measured by the mean values (95% CI) of the *t* tests for paired or independent samples as appropriate. The effect size was calculated according to Cohen's *d* statistic. An effect size of less than 0.2 was considered to reflect a negligible difference, at least 0.2 to at most 0.5 a small difference, at least 0.5 to at most 0.8 a moderate difference, and at least 0.8 a large difference. $P < 0.05$ was considered significant in all tests.

RESULTS

Baseline characteristics

Of the 70 persons recruited for the study, 52 (mean age 69.27 ± 3.85 y) met the inclusion criteria and were randomly assigned to either the self-care advice group (n = 25) or the dance therapy group (n = 27). Figure 1 shows the procedure applied for recruitment and follow-up, and lists the exclusion criteria. Baseline demographic characteristics ($P > 0.421$) were similar in both groups for all variables (Table 2). A high percentage (42%) of the women had impaired balance control and 38% were at risk of injurious falls. Of the total participants included in the study, two participants in the dance therapy group and one participant in the control group received discontinued treatment (did not attended all treatment sessions). Adherence to the program was 100%.

Balance

The group × time interaction for the 2×2 mixed ANOVA revealed significantly better scores for the experimental group

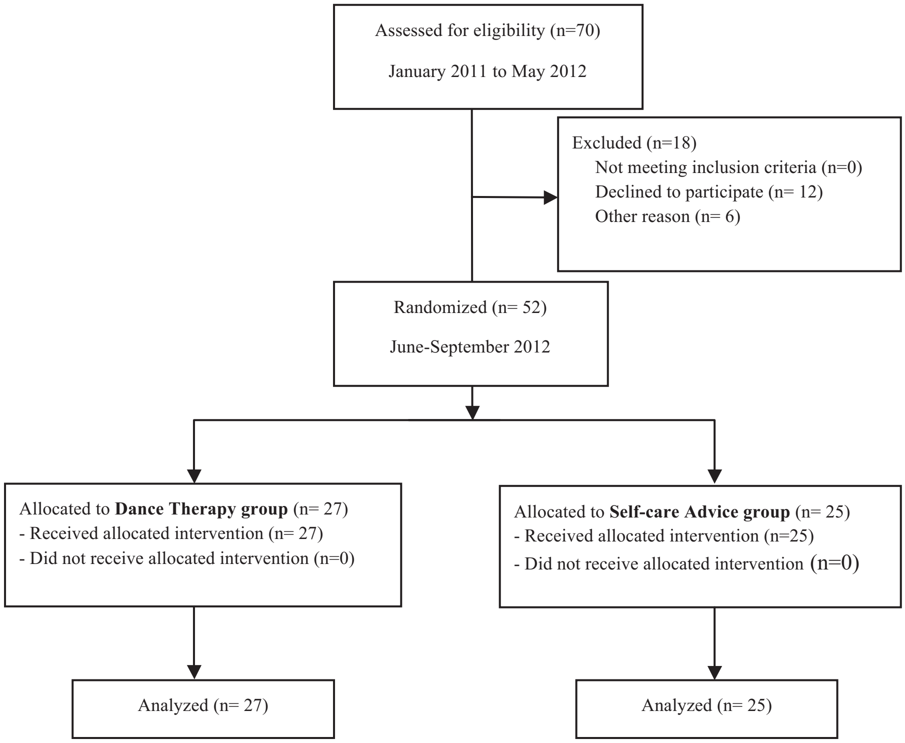

FIG. 1. Flow diagram of participants in the study.

in the TUG test ($F = 5.37$; $P = 0.022$), the cognitive TUG test ($F = 4.88$; $P = 0.029$), and the OLS test ($F = 20.76$; $P = 0.001$). There were no differences between the groups for the manual TUG test ($F = 1.75$; $P = 0.189$). A large effect size was observed in the TUG and OLS tests. Table 3 shows the baseline and postintervention values for balance, including the effect size and within- and between-group differences with the associated 95% CI.

The within-group comparisons revealed significant differences from baseline values for the TUG test ($P = 0.003$) and the dual-tasking variables (manual TUG, $P = 0.003$; cognitive TUG, $P = 0.010$) at 2 months posttreatment in the experimental group, but only in the cognitive TUG ($P = 0.02$) in the control group. Similar results were obtained for the OLS test, in which a significant improvement was obtained only by the experimental group ($P = 0.001$).

Physical activity and fitness

At the end of the 2-month treatment period, the group × time interaction for the 2 × 2 mixed ANOVA showed that the experimental group presented significantly higher values for total time index ($F = 4.14$, $P = 0.045$), energy expenditure ($F = 7.603$, $P = 0.007$), vigorous physical activity ($F = 13.42$, $P = 0.001$), leisure activity/walking ($F = 39.15$, $P = 0.001$), moving ($F = 32.52$, $P < 0.001$), Activity Dimensions Summary Index ($F = 39.15$, $P < 0.001$), overall fitness ($F = 4.36$,

TABLE 2. *Characteristics of participants at baseline*

	Dance therapy group, N = 27	Self-care advice group, N = 25	*P*
Mean age	69.07 ± 4.41	69.48 ± 3.22	0.71
Age range	60-78	65-75	
Body mass index, kg/m^2	28.64 ± 3.69	29.31 ± 3.69	0.51
Smokers (%)	5 (18.5)	6 (24.0)	0.42
Daily alcohol user (%)	2 (7.4)	3 (12.0)	0.67
Depression (%)	1 (3.7)	2 (8.0)	0.74
Timed up-and-go			0.80
Normal value (≤10 s)	15 (55.5)	13 (52.0)	
Altered (>10 s)	12 (44.4)	12 (48.0)	
One leg stance			0.46
Risk of injurious falls (≤5 s)	12 (44.4)	8 (32.0)	
Ability impairment (≤10 s)	9 (33.3)	13 (52.0)	
Altered value (<16.7 s)	5 (18.5)	4 (16.0)	
Normal value (≥16.7 × ≤30 s)	1 (3.7)	0	

Values are expressed as absolute and relative frequencies (N = 52) for categorical variables and as means ± SD for continuous variables. No differences between groups ($P > 0.421$).

TABLE 3. *Baseline, posttreatment, pre/posttreatment differences, and change in scores in each group (95% CI) for balance*

Outcome/group	Baseline	2-mo posttreatment	Between-group Cohen's *d*	Within-group score change	Between-group score change
TUG, s					
Experimental	10.08 ± 2.41	8.29 ± 1.39	1.21	1.79 (0.96, 2.72)	−2.14 (−3.13, −1.16)[a]
Control	10.36 ± 2.20	10.44 ± 2.09		−0.08 (−0.20, 0.04)	
TUG manual, s					
Experimental	11.32 ± 6.89	9.73 ± 2.19	0.70	1.58 (0.59, 2.57)	−1.98 (−3.44, −0.51)
Control	11.71 ± 3.16	11.60 ± 3.02		0.01 (−0.15, 0.18)	
TUG cognitive, s					
Experimental	11.32 ± 3.57	9.89 ± 2.29	0.66	1.42 (−2.48, −0.48)	−0.39 (−2.28, 1.49)[a]
Control	13.00 ± 8.93	11.71 ± 3.16		1.29 (0.50, 2.07)	
One-leg stance, s					
Experimental	7.14 ± 3.80	14.70 ± 5.95	1.56	−7.55 (−9.19, −5.91)	7.46 (4.76, 10.15)[a]
Control	7.20 ± 3.02	7.24 ± 3.20		−0.04 (−0.36, 0.28)	

Values are expressed as means ± SD for baseline and 1 month posttreatment and as mean (95% CI) for within- and between-group change in scores.
ANOVA, analysis of variance; TUG, timed up-and-go.
[a]Significant group × time interaction (ANOVA, $P < 0.05$).

$P = 0.039$), cardiorespiratory fitness ($F = 16.92$, $P < 0.001$), speed-agility ($F = 12.25$, $P = 0.001$), and flexibility ($F = 7.56$, $P = 0.007$) than the control group. Pair-wise comparisons with baseline values revealed significant differences in all variables for physical activity and fitness level ($P \leq 0.05$) with the exception of sitting, standing, and muscular fitness in the dance therapy group. The control group demonstrated no changes in these outcomes.

In general, the dance therapy produced a moderate-large effect on the physical activity score and fitness, presenting the highest effect on vigorous physical activity, leisurely walking, cardiorespiratory fitness, and speed-agility. Tables 4 and 5 show the baseline and postintervention levels, the effect size, and the changes in within- and between-group scores (95% CI) for all dimensions of physical activity and fitness.

BP, body mass, and quality of life

The group × time interaction for the 2 × 2 mixed ANOVA revealed no differences between the control and intervention

TABLE 4. *Baseline, posttreatment, pre/posttreatment differences, and change in scores in each group (95% CI) for physical activity level*

Outcome/group	Baseline	2-mo posttreatment	Between-group Cohen's *d*	Within-group score change	Between-group score change
Total time index, hours activity/wk					
Experimental	25.87 ± 6.08	30.75 ± 5.92	0.84	−4.88 (−5.42, −4.34)	5.17 (1.78, 8.56)[a]
Control Short Form Health Survey (SF-36)	25.50 ± 6.23	25.61 ± 6.18		−0.03 (−0.18, 0.12)	
Energy expenditure index, kcal/wk					
Experimental	5,497.19 ± 1,546	7,389.35 ± 2,150	0.83	−1,817 (−2,965, −789)	1,556 (493, 2,619)[a]
Control	5,828.88 ± 1,602	5,817.90 ± 1,594		10.85 (−7.63, 29.53)	
Activity dimension indexes[b]					
Vigorous physical activity, units/mo					
Experimental	2.96 ± 5.92	10.55 ± 1.60	4.21	−7.59 (−10.1, −5.11)	7.79 (5.36, 10.22)[a]
Control	2.80 ± 6.13	2.76 ± 2.07		0.04 (−0.14, 0.22)	
Leisurely walking, units/mo					
Experimental	9.48 ± 6.39	21.44 ± 4.13	2.32	−11.96 (−14.4, −9.47)	12.24 (9.30, 15.18)[a]
Control	9.28 ± 6.38	9.20 ± 6.21		0.08 (−0.27, 0.43)	
Moving, h/d					
Experimental	9.48 ± 3.08	12.00 ± 1.66	1.06	−2.5 (−3.82, −1.21)	2.4 (−11.2, 3.70)[a]
Control	9.28 ± 3.11	9.56 ± 2.77		−0.28 (−0.61, 0.46)	
Standing, h/d					
Experimental	7.25 ± 1.67	8.29 ± 1.20	0.58	−1.04 (−1.63, −0.44)	0.77 (0.04, 1.51)
Control	7.20 ± 1.73	7.52 ± 1.44		−0.32 (−0.77, 0.14)	
Sitting, h/d					
Experimental	3.44 ± 0.50	3.18 ± 0.55	0.40	0.25 (0.02, 0.49)	−0.25 (−0.60, 0.09)
Control	3.48 ± 0.51	3.44 ± 0.71		0.04 (−0.26, 0.34)	
Activity Dimensions Summary Index (total units)[c]					
Experimental	32.62 ± 10.22	55.48 ± 5.60	2.94	−22.85 (−26.93, −18.76)	22.84 (18.55, 27.12)[a]
Control	32.04 ± 10.26	32.64 ± 9.44		−0.60 (−1.35, 0.15)	

Values are expressed as means ± SD for baseline and 1 month posttreatment and as mean (95% CI) for within- and between-group change in scores.
ANOVA, analysis of variance.
[a]Significant group × time interaction (ANOVA, $P < 0.05$).
[b]Activity dimension indexes were derived from the following multiplication: a frequency score × duration score for each of the five categories × a weighting factor (vigorous = 5; leisurely = 4; moving = 3; standing = 2; sitting = 1).
[c]The Activity Dimensions Summary Index is calculated by summing the five individual activity dimension indexes (vigorous, leisurely, moving, standing, and sitting).

TABLE 5. *Baseline, posttreatment, pre/posttreatment differences, and change in scores in each group (95% CI) for fitness level*

Outcome/group	Baseline	2-mo posttreatment	Between-group Cohen's *d*	Within-group score change	Between-group score change
Overall fitness (1-5 points)					
Experimental	2.40 ± 0.57	2.66 ± 0.48	1.71	−0.26 (−0.49, −0.02)	0.78 (0.52, 1.04)[a]
Control Short Form Health Survey-36 (SF-36)	2.04 ± 0.53	1.88 ± 0.43		0.16 (−0.03, 0.35)	
Cardiorespiratory fitness (1-5 points)					
Experimental	1.40 ± 0.50	2.14 ± 0.45	1.95	−0.74 (−0.92, −0.56)	0.98 (0.70, 1.26)[a]
Control	1.24 ± 0.43	1.16 ± 0.55		0.08 (−0.03, 0.19)	
Muscular fitness (1-5 points)					
Experimental	2.44 ± 0.50	2.66 ± 0.48	0.93	−0.22 (−0.38, −0.05)	0.46 (0.21, 0.71)
Control	2.40 ± 0.49	2.20 ± 0.50		0.20 (0.03, 0.36)	
Speed-agility (1-5 points)					
Experimental	2.59 ± 0.63	3.14 ± 0.45	1.91	−0.55 (−0.75, −0.35)	0.86 (0.61, 1.12)[a]
Control	2.44 ± 0.50	2.28 ± 0.45		0.16 (0.01, 0.31)	
Flexibility (1-5 points)					
Experimental	2.59 ± 0.57	3.18 ± 0.62	1.38	−0.59 (−0.84, −0.34)	0.82 (0.49, 1.15)[a]
Control	2.40 ± 0.57	2.36 ± 0.56		0.04 (−0.04, 0.12)	

Values are expressed as means ± SD for baseline and 1 month posttreatment and as mean (95% CI) for within- and between-group change in scores. For all dimensions higher scores represent better performance. ANOVA, analysis of variance.
[a]Significant group × time interaction (ANOVA, $P < 0.05$).

groups for systolic and diastolic BPs ($F = 1.01$; $P = 0.372$ and $F = 2.68$; $P = 0.104$, respectively), body mass ($F = 0.017$; $p = 0.897$), or the physical and mental components ($F = 3.50$; $p = 0.064$ and $F = 3.50$; $p = 0.064$, respectively) of quality of life. Within-group comparisons with baseline values showed no significant changes over time in both groups for these outcomes. Table 6 shows the baseline and postintervention levels, the effect size and the changes in within-group and between-group scores (95% CI) for BP, body mass, and quality of life.

DISCUSSION

A randomized controlled trial was conducted to determine outcomes of a 2-month dance therapy program to improve balance in a sample population of postmenopausal women living in the community in Spain. The dance therapy intervention significantly improved balance, level of physical activity, and subjective fitness, compared with the women in the control group. There were, however, no significant improvements in BP, body mass, or quality of life in either group.

In this study, dance therapy was found to have positive effects on balance. This finding is in agreement with previous studies on older adults, using particular dance forms such as those associated with Turkish traditional music,[9] tango,[30] jazz,[31] or Scottish traditional music.[32] In all these studies, the authors conclude that the focused adaptation of folk dances for inclusion in exercise programs for older adults may be useful for improving balance, physical performance, and quality of life, which are the main pillars of independent life. In humans, balance control is based on the multisensory integration of the visual, vestibular, and somatosensory systems, which all deteriorate with age. The dance therapy program is designed to specifically address these systems

TABLE 6. *Baseline, posttreatment, pre/posttreatment differences, and change in scores in each group (95% CI) for blood pressure, body mass, and quality of life*

Outcome/group	Baseline	2-mo posttreatment	Between-group Cohen's *d*	Within-group score change	Between-group score change
Systolic blood pressure, mm Hg					
Experimental	119.4 ± 13.18	117.2 ± 10.94	0.76	2.96 (0.55, 5.37)	−7.5 (−13.2, 1.92)
Control SF-36	123.2 ± 11.44	125.0 ± 9.32		−2.00 (−4.91, 0.91)	
Diastolic blood pressure, mm Hg					
Experimental	68.33 ± 8.32	67.59 ± 7.64	0.87	0.74 (−0.31, 1.79)	−7.20 (−11.3, −3.07)
Control	70.40 ± 8.77	74.08 ± 7.14		−4.4 (−6.87, −1.92)	
Body mass index, kg/m^2					
Experimental	28.63 ± 3.69	28.27 ± 3.46	0.13	0.36 (0.08, 0.64)	−0.48 (−2.5, 1.5)
Control	29.31 ± 3.69	28.76 ± 3.80		0.55 (−010, 1.20)	
SF-12/PCS (0-100 points)					
Experimental	36.46 ± 6.98	39.63 ± 6.34	0.18	−3.14 (−6.07, −0.20)	1.24 (−2.5, 5.01)
Control	40.27 ± 6.83	38.39 ± 7.19		1.88 (−0.08, 3.85)	
SF-12/MCS (0-100 points)					
Experimental	43.54 ± 9.76	45.61 ± 9.32	0.54	−2.07 (−4.47, 0.32)	4.87 (−0.12, 9.87)
Control	43.83 ± 9.90	40.74 ± 8.56		3.09 (0.60, 5.47)	

Values are expressed as means ± SD for baseline and 1 month posttreatment and as mean (95% CI) for within- and between-group change in scores. ANOVA, analysis of variance; MCS, mental component summary score; PCS, physical component summary score; SF, Short Form Health Survey.

by means of auditory and visual stimuli, and therefore offers proprioceptive afferents for the various systems involved in maintaining postural stability.[9,30-32] Results for dynamic stability were especially positive when double cognitive tasks were assessed. Studies have shown that the repetition of movements and the memorizing of choreographed steps in dance therapy place specific demands on both short- and long-term memory and can improve cognitive function.[33] This finding could have important implications for the prevention of falls in the postmenopausal population because the activities of daily life frequently call for the joint performance of physical and cognitive tasks. In contrast to these results, Alpert et al[31] reported significant improvements in spatial and temporal organization and balance after the implementation of a 9-week jazz dance program, but observed no improvement in cognitive function. These differences may be due to the assessment tools used, the periodicity of the sessions, or the type of dance performed. Furthermore, the latter study population presented severe cognitive impairment (dementia), which would produce greater difficulty in achieving therapeutic improvement in this respect. Our own treatment program provided constant cognitive stimulation by including the representation of mental images of movement, tactile stimuli in the interaction with dance partners, and the reinforcement of positive thoughts, thus complying with the recommendations made in previous studies that physical activity should include attention to cognitive strategies to achieve not only a physical benefit, but also a psychological one.[34,35]

Significant improvements were obtained in levels of physical activity and fitness after the completion of the dance program, especially with regard to cardiorespiratory fitness and speed-agility. This may be related to the dance therapy protocol, which involves progressive aerobic exercise, which in turn can influence agility by enhancing balance. Agility has been defined as the ability to maintain and control the correct position of the body while changing direction quickly through a series of movements.[36] Among the factors that can contribute to improving agility are exercises focusing on explosive force, speed, and balance.[35] Although it is not known which of these factors exerts greatest influence, Miller et al[37] established that improving balance and the control of body positions during complex movements can result in improved agility. Maintaining balance during changes of direction would be a key factor in this process because the different parts of the body tend to maintain the direction of their movement. The ability to maintain good balance ensures the stability of the body position, thus enabling a subsequent change of direction.[35] Cruz-Ferreira et al[38] in their study of older women, who took part in a program of creative dance therapy, showed that this type of dance not only improved fitness (including aerobic endurance and speed-agility) after 24 weeks of treatment, but also ameliorated the women's life satisfaction after the first 3 months, thus encouraging the participants' adherence to the program and contributing to general well-being and self-perceived health. This outcome may be related to the ''fun'' aspect of dance therapy programs, which enhances social relationships through a situation of friendship and collaboration.[9,30,31,32,38]

In our study, no significant improvements were found in BP, BMI, or quality of life. This may be due to the short implementation time of the dance program and/or its application in isolation because the production of changes in body composition and BP often requires the implementation of multidisciplinary programs involving not only physical exercise, but also changes in lifestyle, nutrition, and occasionally the application of cognitive-behavioral therapy with a pharmacologic approach.[39] Wu et al[40] also applied a single-aspect program, but focused on modifying lifestyles by information and individual interviews. In their study, no improvements were, however, achieved in diastolic BP or body composition, although there was an overall decrease in weight, BMI, and systolic BP. The differences in BP may be because our study population was composed of hypertensive or prehypertensive women, whereas those in the Wu et al study were a priori healthy. In view of these considerations, future research should consider a multidisciplinary approach that addresses all these aspects.

To the best of our knowledge, this is the first study to contribute scientific evidence on the application of a dance therapy program to a population of sedentary postmenopausal women in Spain. Its main limitation is the short period of application of the program, as previous studies have attested to the value of multiple applications over a longer period. Furthermore, the results of this study cannot be extrapolated to male populations due to the exclusive use of a female group. In addition, the use of clinical measurements or simple static balance tests may not be sensitive enough to detect changes in the balance control system and postural adaptations to exercise. Therefore, future research should include the use of more specific tools for assessing balance as a force platform. Otherwise, the sample size was small due to difficulties in the recruitment, affecting the power of the statistical analyses for the primary outcome measure. The present study did not consider biochemical parameters, and therefore we were unable to establish the impact of the program on levels of triglycerides, total cholesterol, high-density lipoprotein, and glucose. It also needed to take into account that no corroboration of the adherence of the women in the control group to the physical activity recommendations could occur because there was a lack of control of this variable from the staff. Finally, more wide-ranging studies are needed on the utilization of this dance therapy program in combination with hydrotherapy and other conventional physical therapy programs.

CONCLUSIONS

This study shows that a Spanish dance therapy program may be an effective means of improving mobility and balance (especially in cognitive dual-tasking), levels of physical activity, and fitness in postmenopausal women.

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