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The Effects of Pilates vs. Zumba Dancing on Functional Performance, Mood and Health-Related Quality of Life in Postmenopausal Women

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Abstract: This study aimed to compare the effects of Zumba and Pilates training on functional performance, mood, and health-related quality of life in postmenopausal women. Fifty-four postmenopausal women, aged 55–65, were randomly allocated to a control group (CG), a Pilates group (PG), or a Zumba group (ZG). Functional performance factors, in terms of walking speed, lower body muscle strength, dynamic balance, and functional mobility, as well as mood and health-related quality of life (HRQoL), were assessed before and after the intervention period. As results, both training modalities significantly improved the walking speed (PG ($p < 0.001$)/ZG ($p < 0.001$)), strength (PG ($p < 0.001$)/ZG ($p < 0.05$)), dynamic balance (PG ($p < 0.001$)/ZG ($p < 0.001$)), and functional mobility (PG ($p < 0.001$)/ZG ($p < 0.001$)), as well as mood (PG ($p < 0.01$)/ZG ($p < 0.001$)). Additionally, both intervention programs significantly improved their HRQol [physical function (PG ($p < 0.001$)/ZG ($p < 0.001$)) domain and SF36 total scores (PG ($p < 0.01$)/ZG ($p < 0.001$))] with better performance following Zumba training. However, the domains of social function ($p < 0.001$), mental health ($p < 0.001$), and role limitation due to emotional problems ($p < 0.05$) significantly enhanced only for the ZG. In conclusion, Pilates or Zumba training appears to be an ideal exercise for promoting functional performance, mood, and HRQoL in postmenopausal women. However, Zumba training seems to be more effective, resulting in optimal scores.

Keywords: quality of life; women; Zumba training; Pilates exercise; mood

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1. Introduction

Menopause is the time of life when a woman has experienced one year of amenorrhea due to the loss of ovarian follicular activity. The menopause transition is linked to altered health functioning and overall quality of life (QoL) [1–3]. It is characterized by a decrease in endogenous hormones (i.e., estrogen), inducing a range of menopausal symptoms, notably hot flushes, night sweats, balance disorders, loss of strength, muscle and joint pain, mood swings, anxiety, depression, memory loss, fatigue, and sleep disturbances [1–3]. As a consequence, these alterations in physical and mental health negatively affect QoL, which in turn can lead to serious health problems in these women [4]. For this reason, menopause is currently considered a significant public health concern linked to poorer health-related quality of life (HRQoL) [5–7]. Among the many effects of menopause on postmenopausal women's health, functional decline, and mood have gained attention because they significantly impair their HRQoL and compound the medical burden for the aging female population [8].

Furthermore, an altered functional performance due to aging, including declines in walking speed, balance, muscular strength, flexibility, agility, and cardiorespiratory fitness, has been well established in the scientific literature on functional performance [9,10]. These performance declines were suggested to be a normal consequence of aging. Nevertheless, previous studies revealed that functional performance declines are more related to lifelong physical activity levels rather than aging. In fact, previous research indicated that physically active individuals, particularly women, exhibit flexibility, balance, and agility patterns that are more akin to younger individuals rather than to their inactive peers of the same age group [11].

Given that a decrease in functional performance was found to be a major cause of limited mobility and activity mainly for women [12], they were strongly recommended to exercise regularly in order to maintain and recover their functional capacities.

Importantly, several studies included in a systematic review confirmed the beneficial effects of physical activity on the prevention of many chronic diseases and physical and mental health in postmenopausal women [13]. Indeed, physical activity has been evidenced to reduce menopausal symptoms; improve several functional, mood, and cognitive capacities; and promote the HRQoL of aging women [14]. Yet, despite the well-documented benefits of exercise, aging women remain sedentary, and interventions designed to help women in their 50s and 60s maintain that exercise programs may prove particularly valuable [15]. It has been proposed that measures should focus on boosting women's confidence to overcome barriers to exercise [15]. A better understanding of the benefits associated with exercise could lead to more effective public health interventions designed to increase exercise in this population. In addition, enjoyment is an important factor in physical activity participation and maintenance [16].

Interestingly, popular physical activities such as Zumba and Pilates are commonly preferred by women worldwide, as they represent enjoyable and effective exercise options [17,18]. One of these emerging activities is Zumba fitness, a high-impact cardio-dance program that has gained popularity in fitness programs. Zumba fitness has been proven to boost the motivation for being physically active and is beneficial for enhanced postural balance and aerobic capacity, muscle strength development, and reduced depression and anxiety [19–22], as well as for the promotion of Qol in different female populations [21,23]. While numerous studies have highlighted the beneficial effects of Zumba across various populations, it is important to note that the existing literature on its impact specifically in healthy postmenopausal women remains notably sparse, thus warranting further investigation into this demographic. A recent study examined the effect of a 12-week Zumba dance program, at a rate of three sessions/week in the evening, on static postural balance, muscle strength, mood, and quality of life among 53 postmenopausal women over 50 years old. The findings of this study indicate that Zumba dancing yields positive effects on the parameters investigated, indicating its potential as an effective strategy [21]. Further exploration into the implications of these findings is warranted to better understand the broader impact and applicability of Zumba in similar contexts.

Exercise intensity is an important determinant of physiological responses (cardiorespiratory, musculoskeletal, and neuromotor fitness) when programming physical training interventions [24]. In this context, previous studies have revealed that training activities of moderate-to-high intensity improve functional and psychological performance in postmenopausal women [25,26]. On the other hand, other studies have noted that low-intensity training activities also improve these performances [27,28]. Low-intensity training has many advantages, particularly for sedentary people, as it is easier, safer, and less likely to cause ligament damage [29]. In addition, low-intensity exercise has been shown to provide a suitable training stimulus for older women who have been sedentary and may be at higher risk of cardiac injury or musculoskeletal damage, particularly at the start of a training program. For this reason, targeting inactive women, particularly middle-aged women, with low-impact exercises would be interesting. One of the most interesting options is Pilates, a new type of low-impact resistance training program.

Pilates has stood out for its benefits and adhesion [30]. Its positive effects have been established in improving strength [31], balance, functional autonomy [32], and psychological well-being [33,34]. Pilates is relatively safer than other exercises due to the fact that there is no physical contact, which decreases the risk of injury to the musculoskeletal system [35]. Consequently, Pilates has been widely recommended as an effective method for improving physiological, functional, and psychological function [36]. Indeed, Pilates has been shown to improve several physical abilities such as postural control [37], proprioception, body coordination [38], and muscular strength [39], as well as psychological state, sleep quality, and HRQoL [40], of postmenopausal women by reducing their menopausal symptoms [34,40].

Given that effective intervention programs are needed to face the physical and psychological impairments observed in postmenopausal women, it is crucial to compare various intervention programs in order to determine the optimal intensity and performance outcomes. Moreover, choosing an exercise mode that is comfortable and familiar will lead to postmenopausal women's increased perception of success and better adherence to an exercise routine [41]. Postmenopausal women were strongly recommended to choose physical activities that they perceived themselves as being successful while at the same time meeting the recommended physical activity guidelines for health benefits [42].

Based on the above, the aim of the current study was to compare different popular training intensities (Zumba training as moderate-to-high-intensity aerobic training versus Pilates as "low-intensity" resistance training) and study how these different types of physical activity affect functional performance, mood, and health-related quality of life (HRQoL) in postmenopausal women. This comparative analysis aims to provide valuable insights into the efficacy of different exercise modalities for addressing the specific needs of this population. We hypothesized that both training modalities would have beneficial effects on these parameters with better results following Zumba training.

2. Materials and Methods

2.1. Participants

Healthy women aged between 55 and 60 were selected through community-wide direct advertising, family/friends, and billboards. Each woman was subsequently contacted by telephone to confirm her participation.

The inclusion criteria were as follows: healthy; with no history of cardiovascular, metabolic, renal, hepatic, or musculoskeletal complaints; no severe orthopedic, neurological, or respiratory disorders; no visual and/or vestibular alterations; no joint problems or no mental illness; maximum of 5 years after menopause onset; have not practiced any structured physical activity in the prior 6 months; and no previous experience of Zumba or Pilates training.

Participants completed the following questionnaires to ensure they met the inclusion criteria: Medical History (MHQ), International Physical Activity Level (IPAQ), Menopause Index (BKMI), and Mini-Mental Questionnaire (MMSE).

In order to ensure sample homogeneity, participants were selected based on their menopausal degree and physical activity level. All women had a low level of physical activity (IPAQ) and a mild degree of menopause, according to Kupperman's Menopause Index [43].

Fifty-four eligible women (age: 57 $\pm$ 2 years; height: 158 $\pm$ 0.05 cm; weight: 74 $\pm$ 3.1 kg, IPAQ: 452.5 $\pm$ 20.8 MET) who meet the inclusion criteria were randomized by an independent well-experienced investigator, who had undergone comprehensive training and had extensive experience in conducting randomization procedures, into three groups (Table 1). Each group of 18 participants was designated as the Zumba group (ZG), the Pilates group

(PG), or the control group (CG) (Figure 1). Of those, six women dropped out during the intervention program and were excluded from the study. Finally, only the data of 16 participants per group, who completed the intervention program, were considered (Figure 1).

Table 1. Means ± SD of the participants' characteristics.

	Pilates Group	Zumba Group	Control Group	*p*
Age (years)	57.1 ± 1.4	57.4 ± 0.6	58.06 ± 0.94	0.29
Height (m)	1.58 ± 0.04	1.59 ± 0.03	1.57 ± 0.02	0.41
Weight (kg)	72.40 ± 3.28	74.08 ± 2.18	73.20 ± 3.13	0.73
IPAQ (Mets/week)	473.52 ± 25.5	453.25 ± 21.5	466.21 ± 15.16	0.22

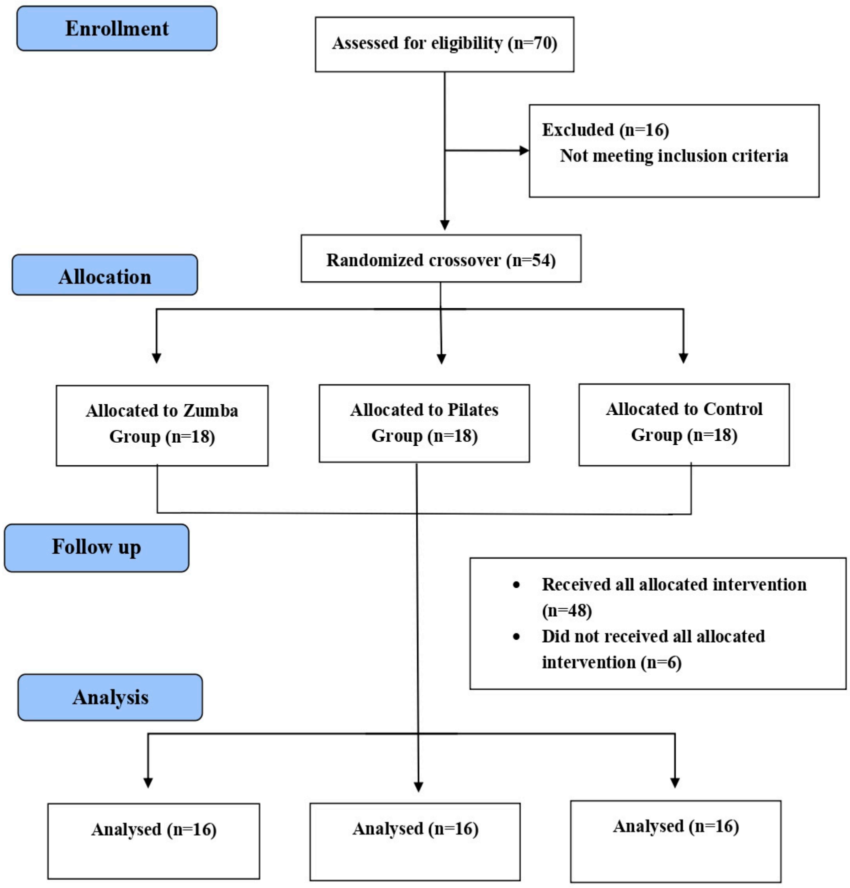

Figure 1. The flowchart of participant enrollment.

2.2. Study Design

This study was conducted on the basis of the latest Helsinki Declaration and was approved by the local Ethics Committee of the Vasile Alecsandri University of Bacău (NR: 169/2/16.01.2024). Prior to the start of the study, all participants signed a written informed consent form once they had been carefully briefed on all experimental procedures and the possible harms and benefits of the program.

Before the beginning of the intervention period, the participants were familiarized with the experimental equipment and protocol in order to ensure good quality results and reduce the effects related to task performance technique. They were also informed of their right to withdraw from the study at any stage without any consequence. To evaluate the effects of both intervention programs on functional performance (dynamic balance, functional mobility, walking speed, and upper body strength), mood, and HRQoL, all participants attended the laboratory for two test sessions, a preintervention session and a postintervention one, 2 days before and after the intervention period. Both test sessions (preintervention and postintervention) were delivered in the same place and under the same conditions.

For both training programs (Zumba fitness and Pilates exercises), the training protocol consisted of three sessions per week for 12 weeks, in the evening at 18:00 h. All the training sessions were held in a fitness center under the supervision of certified professional trainers. Both training exercises were performed at progressive levels of difficulty in order to minimize the fall risk. If participants were absent in over 10% of the total training sessions, they were systematically excluded from this study. However, participants in the CG were not assigned to any exercise program during the same 12-week period and were encouraged to maintain their usual daily activities.

2.2.1. Zumba Training Programs

Zumba training involved ongoing dance movements (forward, sideways, and backward steps, and spinal rotations, coupled with direction changes) accompanied by music (Latin, merengue, samba, salsa, oriental dance, cha cha, tango, etc.) at varying intensity levels during the sessions. In fact, each workout began with a 5 min warm-up, featuring easy Zumba elements and dynamic stretching with fast music to increase the heart rate to 50–60% of HRmax). Then, the session continued with a 50 min main Zumba section, in which the intensity was set between 60% and 75% of HRmax, followed by a 5 min cool-down period, including walking and recovery with relaxation delivered at approximately 40% of HRmax.

The combination and difficulty of the exercises were progressively increased over the intervention. Moreover, song velocity (beats/minute) during the main session was raised every two weeks.

2.2.2. Pilates Training Programs

The Pilates exercise program included a 5 min warm-up, a 50 min main program, and a 5 min cool-down. The warm-up consisted of kinetic movements and gentle traction of various joints. The main exercises contained 3 parts. The first week's session mainly involved introducing participants to the Pilates method and its principles, proper movement execution, and breathing. The second part was based on floor exercises for four weeks (week 2 to week 5). During the third part (week 6 to week 12), resistance exercises were performed using a series of instruments such as elastic bands and Swiss balls. All exercises were performed according to Pilates principles: centering, focus, control, precision, flow, and breathing [35,44].

Each session was performed with 10 to 15 exercises, 2 to 4 sets of each exercise with 8 to 12 repetitions per set, 15 to 20 s, and a 30 s recovery between exercises. Exercise intensity was between 40% and 55% of HRmax. Training intensity was increased by changing the type of exercises and the number of repetitions and sets.

2.3. Exercise Intensity

Exercise intensity for the Zumba and Pilates training programs was controlled by the percentage of HRmax within the group setting and involved a combination of individual monitoring and group management techniques. The HR was collected throughout each training session, including pre-exercise, warm-up, main exercise segments, and cool-down periods, for both the ZG and PG.

Before the start of the intervention, in the preintervention session, we calculated participants' HRmax using the formula established by Tanaka et al. [45]. Participants were educated on the concept of exercising within target HR zones based on their fitness objectives. Additionally, verbal guidance was provided to instruct participants on how to monitor their HR during exercise sessions. Participants were advised to periodically check their HR to ensure they maintained an appropriate intensity level. The relative exercise intensity during each exercise section was calculated by dividing the HRmax value by the HR measured during exercise, and this calculated number was then multiplied by 100 [24].

2.4. Measurements

2.4.1. Functional Performance Assessment

Functional performance was evaluated through the assessment of dynamic balance, functional mobility, walking speed, and lower body muscle strength, which were measured with the standard valid and reliable tests for women aged over 50 years old, such as the Functional Reach Test (FRT) [46], Timed Up and Go (TUG) test [47], 10-Meter Walk Test (10MWT) [48] and the 30S Chair Stand Test [49], respectively. These selected tests are relevant and appropriate for our target population, recognizing that older adults may have unique functional needs and limitations. Moreover, we chose tests that required minimal space and equipment and could be implemented in multiple field settings such as a general practitioner's office.

To evaluate the lower body muscle strength, the 30S Chair Stand Test was performed [50]. During this test, participants were instructed to rise to a full stand from a seated position for 30 s, maintaining a straight back and feet flat on the floor, without using their arms for support (Figure 2). The number of repetitions during the 30 s timeframe was recorded as the final score.

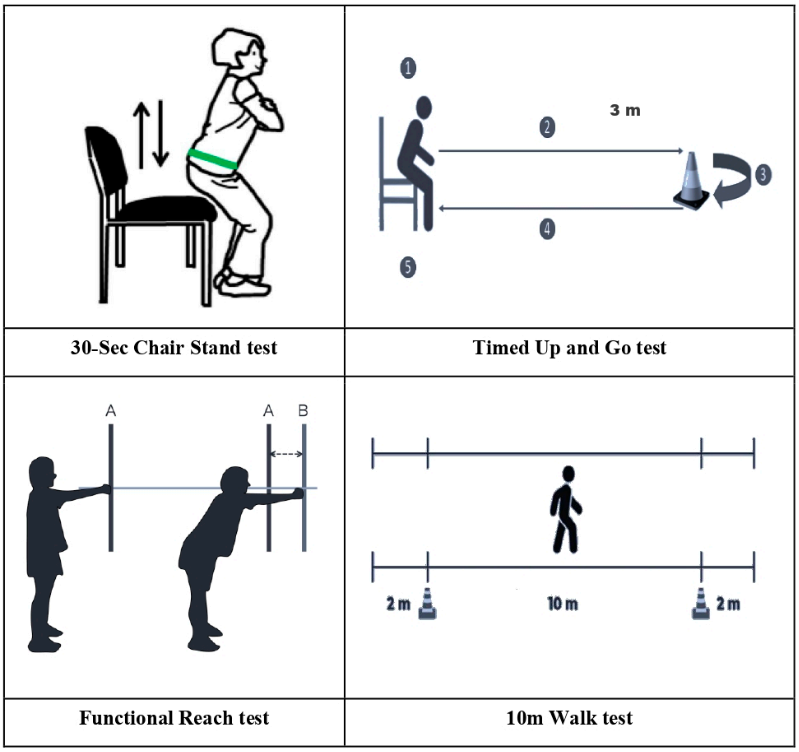

Figure 2. Functional performance assessments.

Functional mobility was evaluated using the TUG test [51]. During this test, participants were asked to stand up from a chair, walk a distance of 3 m, turn around, and return to a seated position as quickly as possible. The duration taken to complete the test was recorded as the score (Figure 2).

Dynamic balance was assessed using the FRT. Functional reach is the maximum forward-reaching distance (cm) that individuals can reach in the forward direction from a comfortable standing posture while fixing their base of support on the floor, without balance loss [52]. The distance between the starting position of their third metacarpal bone and the maximal reach position was measured (Figure 2).

Walking speed performance was measured using the 10MWT [53]. During this test, participants were instructed to walk at their usual pace for a distance of 10 m. Timing commenced when they started walking, and the time taken to complete the walk was recorded using a digital stopwatch (Figure 2). No verbal encouragement was provided during the test.

2.4.2. Mood Assessment

Mood level was assessed using the Brief Mood Introspection Scale (BMIS). It has been shown to have high reliability and validity [54] in healthy subjects aged over 50 years. The BMIS is a valid mood test that evaluates the intensity of 16 mood adjectives: lively, happy, sad, tired, caring, content, gloomy, nervous, sleepy, grumpy, buoyant, nervous, calm, loving, fed up, and active [55]. The participant chooses one of four ratings that best reflect their current mood (1: I feel absolutely nothing/2: I feel nothing/3: I feel a little/4: I feel very much), for each adjective. The possible scores for this scale range from −4 (extremely calm) to 64 (extremely aroused). The range of the response rating scale = [(the maximum response value for an item − the minimum response value for an item)/the overall number of items on a scale] + 1 (e.g., 4 on the 4-point scale) [56]. Higher scores indicate a greater positive mood.

2.4.3. HRQoL Assessment

The SF-36 Health Survey is a valid questionnaire comprising 36 items designed to assess various aspects of perceived health status [57]. It encompasses eight domains, including physical functioning, social functioning, role limitations due to physical problems, pain, role limitations due to emotional problems, mental health, vitality, and general health perception. Each item is scored and transformed to a scale ranging from 0 to 100, where a higher score indicates better health status.

2.5. Statistical Analysis

The G*power software (version 3.1.9.4; Kiel University, Kiel, Germany) [58] was used to calculate the required sample size. We set the significance level (α) at 0.05 and aimed for a statistical power of 0.80, in line with conventional standards. Based on a previous study by Norouzi et al. (2020), which reported a Cohen's effect size of 0.54 for similar outcomes [20], we estimated the effect size for our study. This effect size was deemed appropriate given the nature of our study objectives and the anticipated outcomes. With these parameters, the calculated sample size required was 10 participants per group.

All data were processed and analyzed using STATISTICA 12 software (StatSoft, France), and data are expressed as means ± SD.

Shapiro–Wilk W and Mauchly tests were performed to confirm the normality and sphericity of the data distribution, respectively. Once normality and sphericity had been confirmed, parametric tests were performed.

A two-way repeated-measure analysis of variance (ANOVA) [3 groups × 2 sessions] was used to determine the effects of the group (GC/GZ/GP) and session (pre-/postintervention) factors on functional performance (TUG, 30S Chair Stand Test, 10MWT, and FRT), mood (BMIS) and HRQoL (SF23). When significant differences were observed, a post hoc analysis was then performed using the Bonferroni significant difference test (McHugh, 2011). The alpha level of statistical significance was set as $p < 0.05$.

To calculate the effect size, the partial eta-squared $\eta 2p$ formula was performed (small effect: $0.01 < \eta 2p < 0.06$; medium effect: $0.06 < \eta 2p < 0.14$; and large effect: $\eta 2p > 0.14$).

3. Results

3.1. Lower Body Strength

The two-way repeated-measure ANOVA revealed a significant main effect of the session ($F(1,15) = 33.08$, $p < 0.001$, $\eta 2p = 0.68$) factor and a significant group × session interaction ($F(2,30) = 9.98$, $p < 0.001$, $\eta 2p = 0.39$) on the lower body strength scores. However, no significant effect of the group factor was found. Concerning the session effect, the post hoc analysis showed that the CS-30 test scores increased significantly during the postintervention session in comparison to preintervention for both the PG (p = 0.0001) and ZG (p = 0.022) but not for the CG (Table 2 and Figure 3).

Table 2. Mean ± SD of the mean scores of the functional performance tests [functional mobility (Timed Up and Go (TUG) test), lower body strength (30S Chair Stand Test), walking speed (the 10-Meter Walk Test (10MWT)), and dynamic balance (Functional Reach Test (FRT))] and mood (BMIS) during the preintervention session compared to the postintervention session for the Zumba group (ZG), Pilates group (PG), and control group (CG).

	PG		ZG		CG	
	Preintervention	**Postintervention**	**Preintervention**	**Postintervention**	**Preintervention**	**Postintervention**
Functional performance tests						
TUG (s)	8.99 ± 1.03	7.55 ± 0.83 **	8.97 ± 1.33	7.66 ± 1.06 **	7.82 ± 0.93	7.93 ± 0.89 £
30S Chair Stand Test (reps)	17.31 ± 3.74	22.25 ± 4.21 **	18.37 ± 4.54	21.18 ± 4.54 *	18.50 ± 4.57	18.37 ± 4.45 £
FRT (cm)	29.93 ± 4.78	37.12 ± 2.91 *	31.62 ± 4.12	37.12 ± 4.20 **	31.37 ± 3.64	31.50 ± 3.40 £
10MWT (s)	8.93 ± 0.49	7.53 ± 0.46 **	8.85 ± 0.78	7.18 ± 0.52 **	8.89 ± 0.60	8.88 ± 0.83 £
Mood						
BMIS (score)	48.00 ± 3.44	51.62 ± 4.09 *	48.62 ± 4.88	55.00 ± 3.70 **#	48.87 ± 4.47	50.06 ± 5.10 £

* Significant difference between pre- and postintervention sessions at $p < 0.05$, ** at $p < 0.001$. # Significant difference between ZG and PG at $p < 0.05$. £ Significant difference in the postintervention session between the CG and the two groups, ZG and PG, at $p < 0.01$.

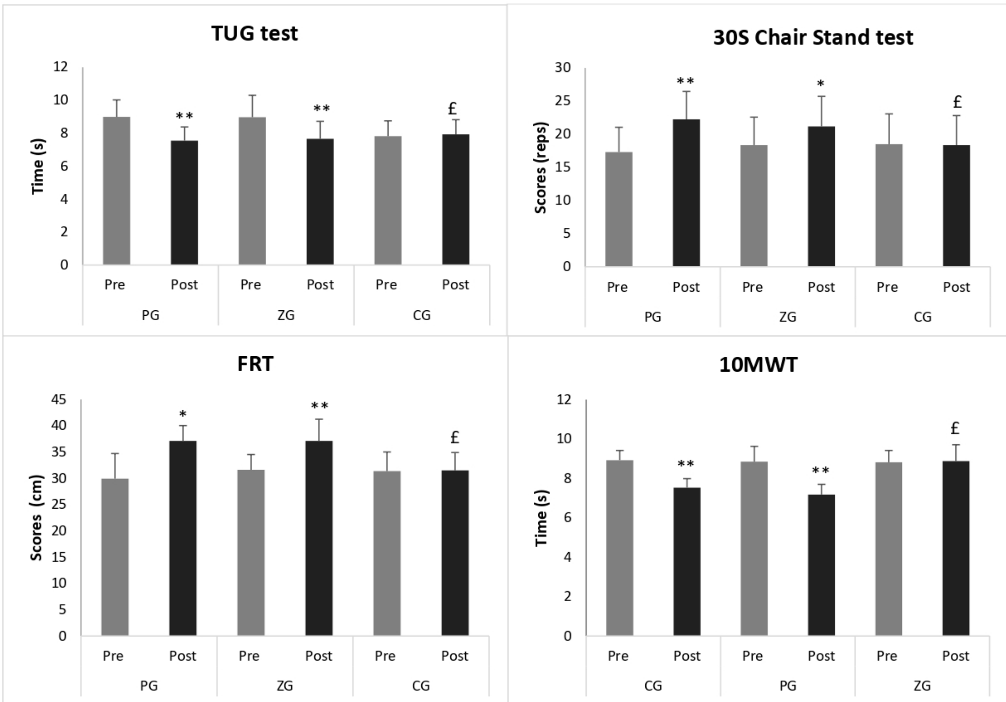

Figure 3. Mean ± SD of the mean scores of the functional performance tests [functional mobility (Timed Up and Go (TUG) test), lower body strength (30S Chair Stand Test), walking speed (the 10-Meter Walk Test (10MWT)) and dynamic balance (Functional Reach Test (FRT))] during the preintervention session compared to the postintervention session for the Zumba group (ZG), Pilates group (PG), and control group (CG). * Significant difference between pre- and postintervention sessions at $p < 0.05$, ** at $p < 0.001$; £ Significant difference in the postintervention session between the CG and the two groups, ZG and PG, at $p < 0.01$.

3.2. Functional Mobility

The two-way repeated-measure ANOVA revealed significant main effects of the session ($F(1,15) = 41.31$, $p < 0.001$, $\eta 2p = 0.73$) factors and a significant group × session interaction ($F(2,30) = 11.96$, $p < 0.001$, $\eta 2p = 0.44$) on the functional mobility scores. The post hoc analysis showed that the TUG scores significantly decreased ($p < 0.001$) during the postintervention session in comparison to preintervention for both the PG ($p = 0.00004$) and ZG ($p = 0.00001$) but not for the CG (Table 2 and Figure 3).

3.3. Walking Speed

The two-way repeated-measure ANOVA revealed significant main effects of the group ($F(2,30) = 4$, $p < 0.01$, $\eta 2p = 0.39$) and session ($F(1,15) = 160.87$, $p < 0.001$, $\eta 2p = 0.91$) factors and a significant group × session interaction ($F(2,30) = 6.36$, $p < 0.001$, $\eta 2p = 0.72$) on the 10MWT scores. The post hoc analysis showed that these scores significantly increased ($p < 0.001$) during the postintervention session in comparison to preintervention for both the PG ($p = 0.0000$) and ZG ($p = 0.0000$) but not for the CG (Table 2 and Figure 3).

3.4. Dynamic Balance

The two-way repeated-measure ANOVA revealed a significant main effect of the session factor ($F(1,15) = 54.68$, $p < 0.001$, $\eta 2p = 0.78$) and a significant group × session interaction ($F(2,30) = 13.37$, $p < 0.001$, $\eta 2p = 0.47$) on the FRT scores. The post hoc analysis showed that the reached distance significantly increased ($p < 0.001$) during the postintervention session in comparison to preintervention for both the PG ($p = 0.00001$) and ZG ($p = 0.00009$) but not for the CG (Table 2 and Figure 3).

3.5. Mood

The two-way repeated-measure ANOVA revealed a significant main effect of the session factor ($F(1,15) = 42.47$, $p < 0.001$, $\eta 2p = 0.73$) and a significant group × session interaction ($F(2,30) = 6.08$, $p < 0.01$, $\eta 2p = 0.28$) on the BMIS scores. The post hoc analysis showed that the BMIS scores were significantly higher during the postintervention session in comparison to preintervention for both the PG ($p = 0.0024$) and ZG ($p = 0.00002$) but not for the CG (Table 1). These BMIS scores were significantly ($p = 0.04$) higher in the postintervention session for the ZG compared to the PG (Table 2 and Figure 4).

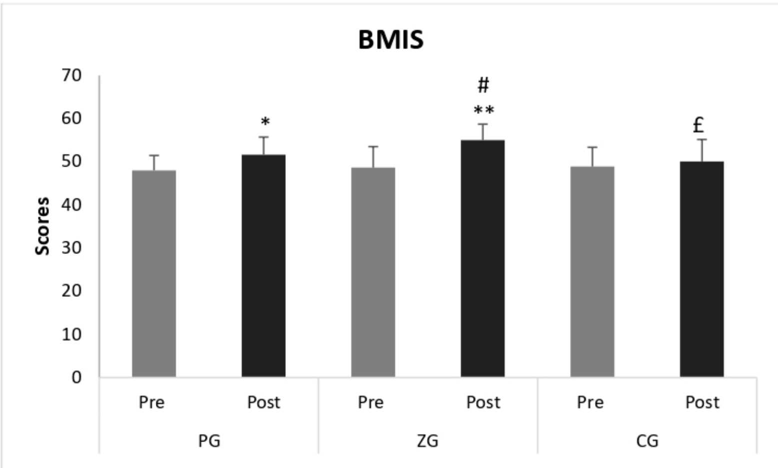

Figure 4. Mean ± SD of the mean scores of the mood level (BMIS) during the preintervention session compared to the postintervention session for the Zumba group (ZG), Pilates group (PG), and control group (CG). * Significant difference between pre- and postintervention sessions at $p < 0.05$, ** at $p < 0.001$; # Significant difference between ZG and PG at $p < 0.01$; £ Significant difference in the postintervention session between the CG and the two groups, ZG and PG, at $p < 0.01$.

3.6. HRQoL

Two-way ANOVA showed a significant effect of the session factor on the SF-36 total scores ($F(1,15) = 112.52$, $p < 0.001$, $\eta 2p = 0.88$), physical functioning ($F(1,15) = 192.11$, $p < 0.001$, $\eta 2p = 0.92$), social functioning ($F(1,15) = 30.29$, $p < 0.001$, $\eta 2p = 0.66$), mental health (F(1,15) = 26.17, $p < 0.001$, η2*p* = 0.63), and role limitations due to emotional problems (F(1,15) = 8.60, $p < 0.05$, η2*p* = 0.36). In addition, a significant group × session interaction on the SF-36 total scores (F(2,30) = 33.46, $p < 0.001$, η2*p* = 0.69), physical functioning (F(2,30) = 192.11, $p < 0.001$, η2*p* = 0.53), social functioning (F(2,30) = 12.29, $p < 0.001$, η2*p* = 0.45), mental health (F(2,30) = 6.69, $p < 0.01$, η2*p* = 0.30), and role limitations due to emotional problems (F(2,30) = 4.04, $p < 0.05$, η2*p* = 0.21) was observed.

The Bonferroni test results showed that the SF-36 scores were significantly better in the post-test session than in the pretest session in terms of the SF-36 total score (ZG: $p = 0.0000$; PG: $p = 0.0000$) and the physical functioning (ZG: $p = 0.0000$; PG: $p = 0.00001$) domain ($p < 0.001$ for both the ZG and PG) (Table 2), with significant better total scores ($p = 0.0014$) found for the ZG compared to the PG. Nonetheless, the Bonferroni test results showed that the scores on social functioning ($p = 0.00007$), mental health ($p = 0.0004$), and role limitations due to emotional problems ($p = 0.041$) were significantly higher in the post-test session than in the pretest session only for the ZG (Table 3).

Table 3. Mean ± SD of the mean scores of the HRQoL (the total score of SF36 and the eight domains (physical function, social function, mental health, pain, health perception, vitality, role limitations due to physical problems, and role limitations due to emotional problems) during the preintervention session compared to postintervention session for the Zumba group (ZG), Pilates group (PG), and control group (CG).

	ZG		PG		CG	
	Preintervention	**Postintervention**	**Preintervention**	**Postintervention**	**Preintervention**	**Postintervention**
SF36 (scores)						
Total score (38.50–94.75)	62.75 ± 10.56	85.69 ± 6.92 **	61.56 ± 10.91	76.21 ± 12.00 **,#	67.02 ± 9.66	66.00 ± 8.21 £
Physical function (49–95)	61.81 ± 14.60	88.43 ± 3.96 **	62.12 ± 13.15	83.75 ± 12.17 **	60.25 ± 13.45	59.37 ± 11.38 £
Social function (22–100)	64.43 ± 19.96	89.68 ± 14.74 **	64.62 ± 21.84	74.75 ± 19.41	64.25 ± 11.69	64.43 ± 12.57 £
Mental health (20–100)	62.25 ± 16.84	86.93 ± 7.54 **	62.43 ± 19.51	76.25 ± 18.71	62.93 ± 11.77	61.62 ± 11.36 £
Pain (22–80)	74.43 ± 18.50	85.43 ± 11.26	70.56 ± 23.01	78.93 ± 22.70	67.68 ± 17.68	67.93 ± 17.44
Health perception (25–95)	42.18 ± 15.05	79.68 ± 31.90	42.18 ± 17.60	55.93 ± 26.40	70.42 ± 13.29	70.62 ± 14.81
Vitality (35–90)	62.81 ± 21.44	72.81 ± 12.64	63.12 ± 21.82	74.37 ± 15.04	64.25 ± 17.80	61.31 ± 15.28
Role limitations due to physical problems (25–100)	62.5 ± 35.35	90.62 ± 12.50	60.62 ± 26.00	84.68 ± 17.17	71.18 ± 13.99	70.93 ± 12.64
Role limitations due to emotional problems (25–100)	71.56 ± 32.65	91.93 ± 14.43 *	66.81 ± 25.31	81.06 ± 25.31	75.62 ± 15.37	71.81 ± 16.09 £

* Significant difference between pre- and postintervention sessions at $p < 0.05$, ** at $p < 0.001$. # Significant difference between ZG and PG at $p < 0.01$. £ Significant difference in the postintervention session between the CG and the two groups, ZG and PG, at $p < 0.01$.

Concerning the rest of the SF36 domains, no significant effects of the session or group factors and no interaction were found regarding health perception, vitality, role limitations due to physical problems, and pain.

4. Discussion

This study compared the 12-week effects of two exercise programs of different intensities [Zumba training (moderate-to-high-intensity physical activity) vs. Pilates training (low-intensity physical activity)] on functional performance, mood, and HRQoL in postmenopausal women. The main findings showed that both exercise programs had a positive impact on these parameters, with greater improvements in mood and HRQoL following Zumba training. Indeed, both Zumba fitness (moderate-to-high-intensity physical activity) and Pilates training (low-intensity physical activity) significantly improved functional performance, including lower body muscle strength, mobility, dynamic balance, and walking speed, as well as mood, in postmenopausal women, with better scores following Zumba fitness. Moreover, both intervention programs improved HRQoL in terms of the total SF36 scores and the physical functioning domain. However, only moderate-to-high-intensity training, i.e., "Zumba fitness", was effective in enhancing HRQoL in terms of social functioning, mental health, and emotional limitations in postmenopausal women.

To the best of our knowledge, Zumba fitness and Pilates training have not been compared in terms of their effects on these parameters in postmenopausal women. However, a similar comparison among women across a large age range [19–62 years] was performed. In particular, this previous study investigated the effect of 12 weeks of Pilates, Step, and Zumba exercises, at a rate of three sessions/week, on muscle and fat weight in arms, legs, the core abdominal area, and the total body in 60 women aged 19 to 62 years [59]. These authors reported similar significant effects of both Pilates and Zumba and recommended them for women who want to lose weight by reducing fat on their arms, legs, and the core abdominal area, as well as their total body fat. In contrast with our findings, among hockey players, the Pilates group was found to be better than the Zumba group in developing agility, strength, and resting heart rate [60]. The conflicting outcomes observed could be attributed to variations in both the study populations (young hockey players versus postmenopausal women) and the experimental protocols employed (agility and resting heart rate versus functional performance).

4.1. Functional Performance

Our study showed that both Zumba fitness (moderate-to-high-intensity physical activity) and Pilates training (low-intensity physical activity) significantly improve lower body muscle strength, mobility, dynamic balance, and walking speed in postmenopausal women. As previously mentioned, Zumba fitness benefits on functional performance have been demonstrated in different populations [21,23,61]. A possible explanation for this beneficial effect is the beneficial influence of dance practice on neuroplasticity (the capacity of neural networks to adapt to environmental or intrinsic changes) at the structural level, notably in areas involved in motor, cognitive, and somatosensory functions [62]. In agreement with our results, 12 weeks of Zumba were effective in improving postural balance and strength performance in postmenopausal women [21]. One possible explanation is that Zumba exercises involve jumping, spinning, and fast movements [63], which induces neuromuscular adaptations [23]. Such neuromuscular adaptations lead to improved functional performance such as flexibility, muscle power, endurance, and strength performance, resulting in improved postural performance [64,65].

Similarly, 12-week Pilates training (low-intensity physical activity) was also sufficient to enhance these functional performance parameters. In accordance, it has been revealed that Pilates was effective in increasing upper and lower body and abdominal muscle strength among postmenopausal women [37]. Indeed, during the Pilates training program, the participants were engaged in a combination of muscle strengthening (isometric, eccentric, and concentric muscle contractions), stretching, and breathing exercises [66], which was assumed to improve the proprioceptive sensitivity and regulation of the muscle actions involved in multiple functions such as muscle strength, mobility, postural balance, and walking performance.

4.2. Mood

Our findings indicated that, regardless of the intensity or type of training program, 12 weeks of physical training (Zumba training [moderate-to-high-intensity physical activity] and Pilates training [low-intensity physical activity]) improved mood in postmenopausal women. A recent meta-analysis confirms that exercise leads to a complementary and necessary lifestyle change and thus improves overall health, including the reduction in depressive symptoms in middle-aged and elderly women [67]. Several studies have shown the importance of Pilates exercises in postmenopausal women insofar as they improve their psychological performance by reducing depressive symptoms (anxiety and depression) [40,68]. This improvement has been attributed to the increased secretion of endorphins and serotonin, which enable mood modulation [69].

Nevertheless, a more pronounced improvement in mood was recorded in the ZG than in the PG. This difference in results between the two types of training could be due to the fact that participation in a moderate-to-high-intensity activity such as "Zumba" significantly increases feelings of happiness and joy [70]. Moreover, Zumba training is fun and involves emotions and social interactions [71] under the effect of the rhythms of motivating universal music [72].

4.3. HRQoL

Our study showed significant effects of moderate-to-high-intensity training, i.e., "Zumba fitness" as well as low-intensity training "Pilates" in the total SF36 scores and the physical functioning domain. It has been evidenced that physical activity, in general, improves both biological and psychological functions [73] and is considered a basic principle of most health promotion programs. It has been shown that physically active people, regardless of age, generally tend to be healthier than sedentary people. However, only moderate-to-high-intensity training, i.e., "Zumba fitness", was sufficient to promote social functioning, mental health, and emotional limitations in postmenopausal women. These HRQoL improvements could be related to the intensity (moderate-to-high intensity) as well as the nature of the Zumba training program [23]. Being a high-intensity activity, Zumba training promotes greater improvement in chronic well-being than lower-intensity exercise [74]. A further possible explanation is that such improvements in terms of social functioning, mental health, and emotional limitations may be explained by the pleasant emotions induced thanks to the variety of Latin dance choreographies and dynamic music in Zumba exercises creating a fun atmosphere [72]. Furthermore, mood status is a predictor of a person's HRQoL and well-being [75]. Thus, the improved mood following Zumba training may also be explained by the optimal HRQoL scores found in the ZG compared to the PG [76].

4.4. Limitations

This study has certain limitations that should be taken into consideration in future studies. First, it would be interesting to evaluate the endorphin dose to support our hypothesis of the contribution of the emotional level to the improvement in balance found in the SF-36 questionnaire. Second, it would be more relevant to evaluate the evolution of all postmenopausal women every 2 weeks to individualize the program's progression. While functional improvements may indicate positive changes in specific functional abilities, they do not necessarily reflect comprehensive changes in the overall physical fitness or health. Therefore, it would be interesting to evaluate the effect of both intervention programs on physical performance. Moreover, in future studies, it would also be important to measure other functional performance parameters like upper limb strength, flexibility, and muscle endurance, in order to have a more detailed and objective explanation of our results. Ultimately, it is crucial to assess the protective effect of exercise in the months following an intervention, as the potential for detraining effects may emerge during this period (3 to 6 months postintervention).

4.5. Practical Implications

Our findings are likely to have important practical implications. In fact, both Zumba fitness and Pilates training, among the most popular training programs, especially for women, are well established in terms of published evidence on their positive effects on women. It is interesting to note that the high level of participant adherence in our intervention illustrates the importance of these training modalities to attract, motivate, and retain participation among postmenopausal women. The promising results of the current study, in relation to the effects of these programs on the functional performance, mood, and HRQoL of postmenopausal women, should prompt further investigation of the effects of these training modalities on other parameters related to health promotion. Furthermore, due to the optimal gains found thanks to Zumba fitness, it can also be recommended for these women as an effective modality to reduce functional limitations and health risks related to menopause.

5. Conclusions

Our findings showed stronger adaptations in favor of Zumba fitness in terms of functional performance parameters, mood, and HRQoL. Both types of training modalities (Zumba fitness and Pilates) improved mood in postmenopausal women, with better performance following Zumba training. In contrast, only Zumba training improved their HRQoL. Therefore, to promote functional performance, including walking speed, lower body muscle strength, dynamic balance, and functional mobility, in daily living activities, as well as mood and HRQoL in postmenopausal women, it would be interesting to include a program that involves practicing Zumba fitness for three sessions (50 min) per week, in the evening, for 12 weeks. This could be a valuable addition for public health practitioners concerned with the rehabilitation and HRQoL of postmenopausal women.

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