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Influence of multicomponent exercise program or self-selected physical activity on physical, mental, and biochemical health indicators of older women

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Abstract

The aim of this study was to compare physical, mental, and biochemical health indicators of 48 older women (67 ± 1 year) who practiced multicomponent exercise program (ME, n = 25) and self-selected physical activity (PA, n = 23) for 6 months. It was an observational study, which aimed to relate a prospective intervention. Displacement speed, lower limb (LL) power, functional capacity, body composition, biochemical profile, physical activity levels (PAL), sedentary behavior (SB), quality of life (QoL), and mental illness risk (MIR) were evaluated. ME presented better values compared to the PA in the gait speed (p = 0.001, large ES), aerobic capacity (p = 0.0001, large ES), agility/dynamic balance (p = 0.0001, large ES), LL flexibility (p = 0.0003, large ES), UL flexibility (p = 0.04, large ES), upper limb (UL) strength (p = 0.07, moderate ES), Total cholesterol (p = 0.009, large ES), triglycerides (p = 0.003, large ES), creatinine (p = 0.007, large ES), glycated hemoglobin (p= 0.007, large ES), and lower mean glucose value (p = 0.008, large ES). ME was more efficient than PA to improve indicators of gait speed, and functional capacity, regulate glycated hemoglobin, blood glucose, and serum creatinine. Thys study also brings practical applications for coaches, which could adapt and use creativity to develop different types of systematized ME, aiming to enhance positive adaptations in the older people at multilevel outcomes.

Keywords: *Physical exercise, Psychophysiological factors, Aging, Quality of Life*

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Introduction

From the sixth decade of life onwards, organic functions begin to decline sharply, causing a reduction in the functional independence and quality of life of older people. Reductions in bone mass, strength, and muscle mass are evident during old age, and contribute to the evolution of sarcopenia, frailty, and disability, and in more advanced cases can lead to early mortality (Cruz-Jentoft et al., 2019). During aging, body fat content increases, leading to a higher incidence of obesity (Bosello & Vanzo, 2021). In turn, excess body fat worsens the QoL of older people, because it reduces mobility and increases joint discomfort and pain. In addition to functional deterioration, obesity contributes to the advancement of dyslipidemia, hypertension, diabetes, and various types of cancer (Ling & Rönn, 2019). Beyond the physical/physiological decline, aging is also associated with the worsening of cognitive function, then, being a stronger factor to increasethe rates of mental illness (García-Goñi et al., 2021). The emergence and aggravation of mental illnesses weaken older people, impairing their interpersonal relationships and thus worsening their autonomy, independence, and QoL. Furthermore, it is known that women have a greater degree of mental suffering during old age (Kiely et al., 2019).

Strong evidence supports that physical inactivity is one of the main risk factors for the aggravation and progression of diseases both in the physical and cognitive spheres of older people (Bueno-Antequera & Munguía-Izquierdo, 2020). Physical exercise is a systematic subcategory of physical activity that produces physiological stimuli in all systems of the body through the organized increase of the variables of the training program (e.g., volume, intensity, frequency, thus providing stimuli for the improvement of capacities, strength, cardiorespiratory endurance, flexibility, balance, and cognition) (Dasso, 2019). Therefore, it is an efficient intervention to delay or even reverse some changes in physical/functional and mental health during aging (Fossati et al., 2021). Moreover, concerning physical exercise, multicomponent physical exercise programs (ME) has shown positive effects on functional capacity (Caldas, 2018; Caldas et al., 2019; Chiu & Yu, 2022; Monteiro, Bartolomeu, et al., 2019; Monteiro et al., 2022; Monteiro, Silva, et al., 2019), biochemical (Caldas, 2018; Leitão et al., 2021a), and cognitive function of older people (Wang et al., 2020).

It is also known that increasing energy expenditure through non-systematized interventions also produces improvements in the health parameters of older people (Eckstrom et al., 2020; Izquierdo et al., 2021), however, in the literature review carried out by this research, were found only studies about the effects of periodized or non-periodized resistance training interventions on functional and health parameters of older people (Coelho-Júnior et al., 2019; Vargas-Molina et al., 2022; Williams et al., 2017), and until the moment, no studies were found verifying the effects of systematized (ME) vs. non-systematized interventions, seeking can be more effective in producing improvements in physical, biochemical, and mental health/QoL of the older people. Investigating this subject would help to understand if ME is superior to other types of interventions to improve the functional, biochemical, mental, and QoL of older people.

Thus, the objective of this study was to compare physical and mental health and biochemical health indicators of older women who practice and do not practice ME.

Methods

Study Design

It was an observational study, which aimed to relate a prospective intervention. The ME group "ME" (n = 24) consisted of older women participating in the "Saúde e Vida" extension project of the Department of Physical Education of the Universidade Federal de Viçosa (UFV) who performed a periodized protocol of ME for 6 months prior to the experiment. The ME took place every Monday, Wednesday, and Friday from 7:00 am to 7:50 am.

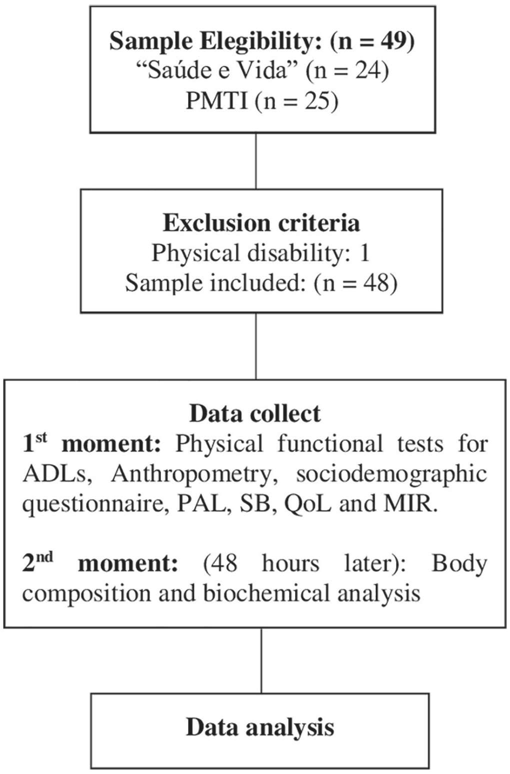

Figure 1. Flowchart of the study.

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All ME sessions included exercises that addressed the capabilities of muscle strength, cardiorespiratory endurance, flexibility, and balance/agility, performed using free weights, elastic bands, and the woman's body weight. The volume of exercises was controlled (number of sets x repetitions x execution time), as well as the complexity of the exercises performed. The training intensity was controlled by the OMNI-PSE perceived exertion scale (Borg, 2000).

The study had a control group called the self-selected physical activity group "PA" (n = 24), which consisted of older women selected from a project by the city of Viçosa MG, Municipal Project for the Third Age. PA had been participating for the last 6 months in low-intensity aerobic gymnastics, every Tuesday and Thursday from 09:00 to 09:50. The sessions consisted of typical local dance exercises, aerobic gymnastics, and group walks, with the exercise intensity self-selected by each woman. In addition, the sessions were not periodized throughout the year.

The collections were divided into 2 days. On the first day of evaluation, at the UFV sports gym, sociodemographic variables, PAL, SB, physical function in activities of daily living (ADLs), QoL, and MIR were collected (Benedetti et al., 2004; Chachamovich et al., 2008; de Jesus Mari & Williams, 1986; Rikli & Jones, 2013). On the second day of evaluation, 48 hours after the first, a densitometry test was performed to assess body composition, and blood was collected for analysis of biochemical variables at the UFV Health Division.

Inclusion criteria included women aged 60 years or older, who maintained at least 70% attendance in their respective physical exercise programs, and who had no physical, functional, or cognitive limitations that prevented them from participating in the collections. The exclusion criteria were older women who did not maintain the minimum attendance of 70% of the training or who presented some clinical impediment to participating in the collections. The sample and collection eligibility process is described in the flowchart in Figure 1 below.

The volunteers gave their consent to participate in the study. The project was approved by the Ethics Committee in Research with Human Beings of the Federal University of Viçosa (UFV) (CAAE: 60303716.1.0000.5153). All study procedures were conducted by properly trained people, considering the specificity of each task.

Data Collect

The monitors of the "Saúde e Vida" project were trained to apply the instruments used in the research. The evaluators who applied the QoL instruments and MIR underwent specific training carried out by a psychologist from the Psychosocial Division of the UFV.

The outcomes of interest in the study were defined based on physical function variables in ADLs, anthropometrics and body composition, biochemical profile, blood pressure and resting heart rate, PAL, SB, QoL, and MIR (Chachamovich et al., 2008; de Jesus Mari & Williams, 1986; HÉLIO JÚNIOR, 2016a).

Lower extremities' physical function

10 m walk test (W10m): A distance of 10 meters was defined between two cones. The evaluator started the stopwatch as soon as the evaluated person crossed the starting line. The evaluator encouraged the subject to walk the 10 meters in a straight line as quickly as possible, being allowed to decelerate only after the final cone. As soon as the evaluated person crossed the line of the last cone, the evaluator stopped the stopwatch. Three attempts were performed with a one-minute interval between each one, and the shortest time for completion was recorded. The stopwatch used was accurate to 0.01 seconds. Maximum walking speed was determined by dividing the distance covered by the time spent and adopting the test standardization according to the Latin American Development Group for Maturity (Dantas & de Souza Vale, 2004).

To assess the LL power, the 5 times sit-to-stand test (STS) was used. The test was carried out in a standardized 0.49 m highchair. The evaluator started the stopwatch when the subject lost contact with the chair, and the subject performed five repetitions as quickly as possible. The evaluator stopped the timer at the end of the fifth repetition as soon as the evaluated person sat down in the chair for the fifth time. The evaluator encouraged each woman throughout the test to ensure that she was performing the movement at maximum speed and preserving the technique. Two attempts were performed with an interval of 60 seconds between each one, and the shortest time was recorded (Alcazar et al., 2018). The stopwatch used was accurate to 0.01 seconds. The average speed of movement of the LL (1), the average power (2), and the relative power of the LL (3) were obtained through the STS results (seconds) and anthropometric measurements of body mass (Kg), height (m), chair height (m), and gravity acceleration (g = 0.9 m/s^{-2}). These are described in the respective equations below:

$$\text{STS mean velocity} = \frac{[Height\ x\ 0{,}5 - Chair\ height\ ]}{Five\ STS\ time\ x\ 0{,}1}$$

$$\text{STS mean force} = \frac{Body\ mass\ x\ 0{,}9\ x\ g\ [Height\ x\ 0{,}5 - Chair\ height\ ]}{Five\ STS\ time\ x\ 0{,}1}$$

$$\text{STS mean power} = \frac{Body\ mass\ x\ 0{,}9\ x\ g\ [Height\ x\ 0{,}5 - Chair\ height\ ]}{Five\ STS\ time\ x\ 0{,}1}$$

Functional Capacity

For the evaluation of functional capacity, the Senior Fitness Test battery (Rikli & Jones, 2013) was used, which combines the following tests:

(1) 6-minute walk: a rectangular course of 50 meters was set up, delimited by cones every 5 meter. The subject was instructed to walk as fast as possible for 6 minutes. At the end of the test, the distance traveled in meters was recorded.

(2) Sit to stand: the subject was positioned standing in front of a chair 43 cm high. At the evaluator's signal, the subject performed the movement of sitting and standing as many times as possible for 30 seconds, and the number of repetitions was recorded. The stop-watch used was accurate to 0.01 seconds.

(3) Arm Curl: the evaluated was seated in a chair 43 cm high, holding a 2 kg dumbbell. At the evaluator's signal, the subject performed as many elbow flexions and extensions as possible for 30 seconds, and the number of repetitions was recorded. The stopwatch used was accurate to 0.01 seconds.

(4) Time up and go (TUG): the evaluated was seated in a chair 43 cm high, facing a cone positioned at 2.44 m. At the evaluator's signal, the subject walked as fast as possible around the cone and returned to the starting position. Two attempts were made and the shortest time was recorded. The stopwatch used was accurate to 0.01 seconds.

(5) Sit and reach: the evaluated was seated in a chair 43 cm high, barefoot, with one leg extended. The subject was instructed to reach the toes with the hands together. The distance (in cm) between the tips of the fingers, hands, and soles of the feet was recorded. The positive distance was assigned when the older women surpassed the foot, null distance (equal

to zero) when she placed her hands on the foot, and negative distance when she did not reach the foot.

(6) Back Scratch: With one hand over her shoulder, the subject tried to reach the other hand placed below, attempting to find the fingers or place one hand on the other, behind her back. The distance (in cm) between the tips of the middle fingers was recorded. The positive distance was assigned when the older woman placed one hand over the other, null distance (equal to zero) when she touched one hand to the other, and negative distance when her hands did not meet.

Body composition

Body mass was measured with a precision of 0.1 kg, using an electronic scale of Bioimpedance up to 150 kg, Omron HBF® - 514 brands. The subjects were barefoot and wearing light clothes. Height was measured using a Sanny® brand stadiometer with a precision of 1 mm, in which the women were in an upright position with their feet together, and the stadiometer arm was positioned at the vertex (highest point of the head) of the older women. The Body Mass Index (BMI) was calculated using the ratio: body mass (kg)/height² (m).

Waist and hip circumferences were measured using a tape measure with an accuracy of 1 mm. Through the waist and hip measurements, the waist-hip ratio (WHR): waist circumference/hip circumference was obtained. Cut-off points ≥ 0.80 were considered for increased cardiometabolic risk for females (Barroso et al., 2020).

For the evaluation of body composition, the densitometry method by double X-ray absorption (DEXA) was used, and the Lunar Prodigy Advance DXA System device (analysis version: 13.31) was manufactured by GE Medical, model 8743, Madison, WI, USA. Through it, bone mineral density (BMD) of the lumbar spine (L1 –L4) and femoral neck, lean mass, and body fat were measured. The total appendicular muscle mass (AMM) (Kg) was verified; upper limb muscle mass (ULM) plus lower limb muscle mass (LLM) and relative appendicular mass (AMM/Height): upper limb muscle mass (MMSS) + lower limb muscle mass (LLM/Height). AMM < 15 kg and AMM/Height < 5.5 kg/m were considered as the risk cut-off point for low muscle mass. All evaluations with DEXA were performed at the UFV Health Division by the same technician.

Biochemical analyses

Biochemical analyses were performed at the Clinical Analysis Laboratory of the UFV. For blood collection, the older women fasted for 12 hours and did not perform physical exercises for at least 24 hours prior to the exam following laboratory protocols. Total cholesterol, triglycerides, glycated hemoglobin, mean fasting glucose, urea, creatinine, and albumin were measured.

Physical Activity Level

The long-form International Physical Activity Questionnaire (IPAQ) was used, adapted, and validated for the Brazilian older population (Benedetti et al., 2004). The instrument was applied in the form of an individual interview. To classify the PAL through the IPAQ, three categories were used, adopting the criteria suggested by the Guidelines for data processing and analysis of the International Physical Activity Questionnaire. The categories adopted were:

(1) High - those who perform vigorous-intensity activity for at least 3 days, reaching a minimum total physical activity of at least 1500 METs/minutes/week, or; those who perform 7 or more sessions per week of any combination of these activities, achieving a minimum of 3000 METs/minutes/week.

(2) Moderate - those who perform 3 or more days of vigorous activity of at least 20 minutes a day or; those who perform at least 5 days or more of moderate-intensity activity or walking for at least 30 minutes a day or; those who performed 5 or more sessions per week of any combination of walking, moderate or vigorous-intensity activities, completing a minimum of 600 METs/minutes/week.

(3) Low - those not included in either of the two aforementioned categories.

Sedentary behavior

The Longitudinal Aging Study Amsterdam – Sedentary Behavior Questionnaire (LASA-SBQ) was proposed by (Visser & Koster, 2013a). The instrument consists of 10 questions to assess SB (sitting or lying down), comprising "snooze" activities (nap); "reading"; "saying a prayer or listening to music"; "watching television" (TV); "use the computer"; "hobbies"; "administrative activities"; "talk" (speak); "transportation" and "going to church or theater", determining the time spent in hours and minutes of a typical weekday (Monday to Friday) and a typical weekend day, adapted and validated for the Brazilian older population proposed by (HÉLIO JÚNIOR, 2016a).

Quality of Life

The assessment of QoL was performed by applying the Portuguese version of the WHO QoL scale - version for the older population (WHOQOL-OLD) adapted and validated for Brazil (Chachamovich et al., 2008).

Mental illness risk

The SRQ-20 (Self-Reporting Questionnaire) questionnaire was used to assess MIR, validated for Brazilian patients (de Jesus Mari & Williams, 1986). The questionnaire contains 20 dichotomous questions (yes or no), and when the subject presents seven or more positive answers, it means the presence of the MIR. For the application of the questionnaire, the evaluators were trained by a psychologist from the psychosocial division of the UFV.

Statistical analysis

Initially, the normality assumption was verified using the Shapiro-Wilk test. Data that presented a normal distribution were described as mean and standard error, and data that did not present a normal distribution were described as median and interquartile range. Normal data were submitted to Levene's test for homogeneity of variances and then the T-test for independent samples was applied. For normal and non-normal continuous data, the effect size was calculated using Cohen's r. For the analysis of nominal independent variables, the chi-square test was used for two simple proportions (X^2). Additionally, were performed a covariance analysis (ANCOVA), aimed to exclude possible covariates that could influence the differences between groups. For the ANCOVA model, were considered as covariates, the "older woman's age" and the "total training minutes" of both groups during the 24 weeks of intervention. Regarding the "total training minutes", was

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not possible to perform the analysis, because there was found multicollinearity between the covariate "total training minutes" and the independent variable (IV) "training group", characterizing a direct effect of the total training minutes in the training type, then, due to these disruptions in the statistical assumption, only the "older woman's age" was included in the ANCOVA model. For the effect size in the ANCOVA model were used the eta partial square (η2). To calculate the relative frequencies of dichotomous categorical variables between groups, the chi-square test of independence (X^2) was used to assess the existence or not of a correlation between the group and the subjects' MIR. For the post-hoc analysis, the limits of standardized residuals were adjusted according to the new alpha, and through that, the limits of – 2.49 and 2.49 were considered so that significance between any of the comparisons was considered. The effect size for the categorical variables was calculated using Cramér's V. The results are presented in tables and figures. All statistical analysis were performed using the R, programming language. The effect sizes cut-offs were 0.10 = small, 0.30 = moderate, and 0.50 = large were defined according to the second cut-off points (Cohen, 2013). The significance level adopted was $p < 0.05$ (Field et al., 2012).

Results

Regarding the results of ANCOVA, was possible to identify that "older woman's age" cause a statistically significant influence in only creatinine, f (1) 7.099, p = 0.001, small ES, η2 = 0.13, in which were found a positive interaction between group and gender, where the PA present statistically significant higher age than ME (ME: 64 ± 4 years old; PA: 68.5 ± 5.0 years old). Table 1 shows the anthropometric and body composition characteristics of the ME group and the PA group. Only a trend toward greater lean mass was found in ME compared to PA (p = 0.07, moderate ES, r = 0.48). There was no difference between the groups in the other variables (p > 0.05).

Table 2 shows the test results for the assessment of functional capacity, physical function, and ADLs between ME and PA. It was observed that ME had a shorter mean gait time than the PA (ME: 4.77 ± 0.1 seconds vs. PA: 5.26 ± 0.1 seconds; p = 0.001, large ES, r = 0.50). However, no difference was observed for LL power between groups (p > 0.05). It was observed that ME had a higher average aerobic capacity than PA (ME: 604 ± 8.07 meters vs PA: 551 ± 9.46 meters; p = 0.0001, large ES, r=1). ME had a shorter mean time for agility/dynamic balance than PA (ME: 5.01 ± 0.8 seconds vs. PA: 7 ± 0.11 seconds; p = 0.0001, large ES, r = 0.68). ME had a mean closer to positive values in UL flexibility than PA (ME: -1.74 ± 1.8 cm vs. PA: -9.56 ± 1.8 cm; p = 0.0003, large ES, r = 1). ME had a higher median LL flexibility PA [(ME: 5.5 (10) cm vs PA: 0 (9) cm, p = 0.004, large ES, r = 1)]. No differences were found between the average repetitions of the UL (ME: 23 ± 1 repetitions vs PA: 21 ± 0 repetitions) and between the average

Table 1 - Comparison of anthropometric variables of older women practicing multicomponent physical exercise or self-selected physical activity.

	ME	PA	p^t	r
Age (Years)	67.4 ± 1.1	68.1 ± 0.9	0.62	0.09
Height (m)	1.55 ± 0.1	1.52 ± 0.1	0.88	0.40
Body weight (Kg)	67.3 ± 1.62	67.7 ± 1.8	0.88	0.02
IMC (Kg/m)	27.9 ± 0.7	29.1 ± 0.7	0.26	0.20
Waist circumference (cm)	89.5 ± 2.3	89.8 ± 1.7	0.90	0.02
Waist/hip ratio	0.85 ± 0.014	0.87 ± 0.01	0.26	0.02
Body fat (%)	41.4 ± 0.9	41.5 ± 1.1	0.94	0.01
Lean mass (Kg)	36 ± 0.6	34.3 ± 0.4	0.07	0.48
AMM (Kg)	15.1 ± 0.3	15.3 ± 0.4	0.63	0.10
AMM ($Height^2$)	6.2 ± 0.1	6.64 ± 0.1	0.10	0.35
BMD/L1-L4 (g/cm^2)	1.06 ± 0.03	1.05 ± 0.04	0.92	0.02
BMD/femoral neck (g/cm^2)	0.926 ± 0.02	0.974 ± 0.02	0.22	0.21

Note. Data are means and standard deviation, median and standard error; p^t: p-value; r: effect size; m: meters; Kg: kilograms; Kg/m: kilograms per meter; cm: centimeters; %: Body fat %: body fat percentage; $Height^2$: height squared; g/cm^2: grams per square centimeter.

Table 2 - Comparison of functional capacity, physical function in ADLs, and biochemical markers of older women who practiced multicomponent physical exercise or self-selected physical activity.

	ME	PA	p^t	p^w	r
Senior Fitness test					
6 min walk	604 ± 8.0	551 ± 9.4	0.0001***	NA	1
Arm curl	23 ± 1	21 ± 1	0.07	NA	0.31
Sit to stand	18 ± 1	18 ± 1	0.97	NA	0.0
Time up and go	5.01 ± 0.12	7 ± 0.11	0.0001***	NA	0.68
Sit and reach	5.5 (10)	0 (9)	NA	0.004***	1.0
Back Scratch	- 1.7 ± 1.8	- 9.5 ± 1.8	0.003 ***	NA	0.49

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Table 2 - Comparison of functional capacity, physical function in ADLs, and biochemical markers of older women who practiced multicomponent physical exercise or self-selected physical activity.

	ME	PA	p^t	p^w	r
LE physical function					
W10m (s)	4.7 ± 0.1	5.26 ± 0.1	0.001**	NA	0.50
Five-time STS (s)	5.25 ± 0.12	5.45 ± 0.15	0.32	NA	0.18
UL Mean velocity (m/s)	0.76 ± 0.009	0.75 ± 0.01	0.41	NA	0.14
LL Mean force (N/m)	389 ± 9.7	384 ± 10.3	0.72	NA	0.08
LL Mean power (W)	462 ± 11.8	456 ± 13.7	0.73	NA	0.06

Note. Data are means and standard deviation, median and standard error. p^t: p-value for the independent t-test; p^w: p-value for the Wilcoxon test; r: effect size; NA: not applicable; *: p < 0.05 , **: p < 0.01, ***: p < 0.001; s: seconds; UL: upper limbs; LL: lower limbs; m/s: meters per second; N/M: Newtons meter; W: watts; W/kg: watts per kilogram; mg/dl: milligram per deciliter; g/dl: gram per deciliter; % percentage value.

repetitions of the LL in both groups (ME: 18 ± 1 repetitions vs PA: 18).

Table 3 shows the results of the biochemical tests, the biochemical tests of the older women of ME and PA, as well as the percentage of older women outside the reference values established according to the standards of the update of the Brazilian Directive on Dyslipidemia and Prevention of Arteriosclerosis (Faludi et al., 2017), and the Guidelines of the Brazilian Society of Diabetes (Forti et al., 2020). It is possible to observe that ME had a higher mean value of total cholesterol than PA (ME: 201, ± 7.14 mg/dl vs PA: 171 ± 8.45 mg/dl; p = 0.009, large ES, r = 0.61), as well as a higher percentage of subjects outside the reference values (ME: 60% vs PA: 46%). The ME had lower mean triglycerides than the PA [(ME: 104 (75) mg/dl vs PA: 130 (76) mg/dl, p = 0.003, large ES, r = 1)]. The ME had a lower median creatinine than the PA [(ME: 0.77 (0.1) mg/dl vs PA: 0.89 (0.15) mg/dl; p = 0.007, large ES, r = 1)], and the PA presented one subject above the reference values.

In addition, it was possible to observe that ME had a lower mean value of glycated hemoglobin than PA (ME: 5.81 ± 0.04 mg/dl vs PA: 6.17 ± 0.11 mg/dl; p = 0.007, large ES, r = 0.57). As for the glycated hemoglobin test, ME also had a lower percentage of diabetic women than PA [(ME: n = 3 (12%) vs PA: n = 7 (29%))]. Similarly, it was possible to observe that ME had a lower mean fasting glucose value than PA (ME: 120 ± 1.4 mg/dl vs PA: 130. ± 3 mg/dl; p = 0.008, large ES, r = 0 .78), and the ME had a lower percentage of older women above normoglycemic values than the PA (ME: 36% vs PA: 67%). However, no differences were observed between the groups for the albumin variables, and urea p > 0.05.

Table 3 - Comparison of functional capacity, physical function in ADLs, and biochemical markers of older women who practiced multicomponent physical exercise or self-selected physical activity.

Biochemical analyses	ME	PA	p^t	p^w	r	ME % Out.	PA % Out.
Trilgycerids (mg/dl)	104 (75)	130 (76)	NA	0.50	1	7 (28%)	10 (42%)
Albumin (g/dl)	4.3 (0.30)	4.2 (0.40)	NA	0.17	32.4	1 (4%)	0 (0%)
Creatinine (mg/dl)	0.77 (0.07)	0.89 (0.15)	NA	0.007**	1	0 (0%)	1 (4%)
Urea (mg/dl)	33.9 ± 1.36	33.8 ± 2.02	0.99	NA	0	5 (20%)	5 (21%)
glycated Hemoglobin (%)	5.81 ± 0.04 **	6.17 ± 0.11	0.007**	NA	0.57	3 (12%)	7 (29%)
Mean fasting glucose (mg/dl)	120 ± 1.37**	130. ± 3.29	0.008**	NA	0.78	9 (36%)	16 (67%)

Note. Data are means and standard deviation, median and standard error; p^t: p-value for the independent t-test; p^w: p-value for the Wilcoxon test; r: effect size; % Out: values of biochemical tests that are outside the values reference; NA: not applicable; *: p < 0.05 , **: p < 0.01, ***: p < 0.001; mg/dl: milligram per deciliter; g/dl: gram per deciliter; % percentage value.

Table 4 shows the results of the assessment of PAL, SB, and QoL. It is possible to observe that there was no statistically significant difference in PAL between the groups p > 0.05, (ME: 13% vs PA: 0%), moderate PAL (ME: 50% vs PA: 54 %) and high PAL (ME: 36% vs PA: 45%). The results in table 4 reveal that there was no difference between the groups in the SB measured on weekdays and weekends p > 0.05. There were no differences between the medians of the groups in the global QoL and in the facets of sensory functioning, autonomy, past, present, and future activities, social participation, death and dying, and intimacy (p > 0.05). However, it was possible to observe that the women in ME presented more satisfactory values in each facet than the women in PA, for sensory functioning/very good classification (ME: 25% vs. PA: 10%), autonomy/very good classification (ME: 50% vs PA: 35%) and intimacy/good rating (ME: 64% vs PA: 45%). Regarding the MIR measured by the SRQ-20, no significant differences were observed for older women with seven or more positive responses between the groups [(older women with MIR in ME: n = 4 (15%) vs. older women with MIR in the PA: n = 3 (14%); p > 0.01)]. In addition, figure 2 below summarizes the study results.

Discussion

The objective of this study was to compare physical and mental health indicators of older who practiced ME practitioners (ME) and older women who practiced self-selected physical activity (PA). The main findings showed no differences in body composition, PAL, SB, MIR, and QL between the groups, however, ME showed better results in aerobic capacity, agility/dynamic balance, the flexibility and strength of UL and LL, gait speed, lower glycated hemoglobin, lower

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Table 4 - Comparison of physical activity levels, sedentary behavior, and quality of life of older women who practiced multicomponent physical exercise or self-selected physical activity.

PAL	ME	PA	X^2	gl	p	V
Down	3 (11%)	0 (0%)	0.96	1	0.32	0.05
Moderate	15 (54%)	12 (55%)	2.82	1	1	0.10
High	10 (3%)	10 (45%)	0.16	1	0.68	0.02
	ME	PA	p^t	p^w	r	NA
SB - week days (min)	360 (136)	375 (148)	NA	0.96	1	NA
SB - weekends (min)	360 (190)	326 (310)	NA	0.09	1	NA
	ME	PA	p^w	df	p^w	r
Global QoL	97.5 (8.25)	95 (10)	374	55	0.61	1
Sensory functinoning	19 (2.25)	18 (2)	358	55	0.43	1
Autonomy	15.5 (2)	15 (2)	339	55	0.27	1
Past, presente, and futures activ.	16 (2.25)	16 (2)	410	55	0.94	1
Social participation	16 (2)	16 (0)	357	55	0.42	1
Death and dying	16.5 (5)	17 (2)	429	55	0.71	1
Intimacy	16 (2.25)	15 (2)	355	55	0.41	1
MIR						
	Positives	Negatives	X^2	gl	p^{x2}	V
ME	4	23	0.003	4	> 0.01	0.002
PA	4	24				

Note. Data are medians and interquartile ranges, and absolute values. PAL: physical activity levels; SB: sedentary behavior; QoL: quality of life, MIR: mental illness risk; X^2: chi-square test; df: degrees of freedom; % percentage value; p^t: p-value for the independent t-test; p^w: p-value for the Wilcoxon test; p^{x2}: p-value for the chi-square test; r: effect size; V: size of the Cramer's V effect.

fasting glucose, and lower creatinine levels, and these adaptations occurred with large ES in the major part of the results. Despite these results, one factor that must be pointed out was the multicollinearity between the "total minutes of training" with the "training group", revealing a direct association of the time spent training with the training group, which means that possibly, the higher total number of minutes also should contribute in part for the better results in the ME.

On the other side, PA of the study neither did a systematized physical exercise program nor performed higher intensity aerobic and resistance exercises during any moment of the program, which brings poor power to induce some significant adaptations in the sample (WHO, 2020). Despite our findings in this study, the evidence regarding the benefits of periodized or non-periodized exercise in the health parameters of older people is still inconclusive, which some trials reveal positive effects of periodized exercise training such as resistance training (Coelho-Júnior et al., 2019), or in combined training (Bertazone et al., 2022). In contrast, other trials have shown non-significant differences between periodized or non-periodized methods, such as in resistance training trials (Conlon et al., 2016), as well as in combined (Tozetto et al., 2022), or aerobic training (Strohacker et al., 2015).

One important point that differed in this study was that training sessions in PA were not only non-periodized, but also the older women did not perform the exercises with any kinds of overloads (i.e., dumbbells, kettlebells, elastic bands), resistance exercises, nor continuous aerobic training, thus, characterizing a poorly intervention. Therefore, PA was not considered as a control group by the researcher due to its characteristics of group classes, and not because of the type of movements, which little characterized a type of intervention. In this sense, having an idea of the higher discrepancies among the training organization and intensity between groups, the higher total number of minutes in the training sessions of the ME must not be interpreted as one big influencing factor.

Regarding functional capacity outcomes, was possible to verify that ME showed better results, with large ES in aerobic capacity, agility/dynamic balance, the flexibility of UL and LL, and gait speed than the PA The ME was performed systematically in the subjects evaluated in the present study was capable of producing a stimulus that allows positive adaptations to occur in functionality parameters and biochemical variables of the older people. In addition, looking at the characteristics of the two interventions was perceived that being a training methodology that produces stimuli at the level of various physical capacities such as strength, resistance aerobic activity, balance, and flexibility, the systematized character causes the magnitude of the stimuli to progressively increase in volume, intensity, and complexity, which from an adaptive point of view is positive in combating the advance of the aging process (Izquierdo et al., 2021).

In the present study, there was no significant difference in the PAL between ME and PA, with similar percentage values in the three PAL categories between the groups. A positive fact found in both groups was the similar number of older women with low PAL classification (ME: 13% vs PA: 0%), showing that although there were no differences, the body movement provided by both practices made it possible for the older women to reduce the risk of physical inactivity. The literature reports the importance of adequate PAL, as it helps to control a healthy weight, which in turn is associated with reduced risk of cardiovascular diseases and several non-communicable chronic diseases, such as diabetes, hypertension, and chronic kidney disease(Gaesser & Angadi, 2021), thus, reinforcing the idea that at least some body movement is essential to prevent metabolisms deregulations and damages (Zając-Gawlak et al., 2021).

Regarding the SB measured on weekdays and weekends, no difference was observed between the groups. Both groups did not exceed 450 minutes (7.5 hours) of SB on weekdays and weekends, a raw value that was lower than the one found in the study of (Galvão et al., 2018), who analyzed a sample of 473 older people from both sexes, and noticed that the group of physically inactive older women aged 60-69 presented a value of 680 minutes (11.3 hours).

These SB findings point to a beneficial effect of both systematic physical exercise and physical activity in reducing SB in older women, revealing that regardless of the nature of the physical practice, there is a reduction in SB. These findings are interesting from a cardiometabolic point of view, however, just observing the SB reduction in an isolation manner may not be an ideal option, as it is also necessary to consider other benefits, such as functionality, independence, and QoL that each type of exercise provides the older people (Fanning et al., 2022). Interestingly, the groups did not differ in some variables, and these results may have been due to the similar PAL and SB that the older women of both groups presented, showing that although one group performed ME, the similarity in the total volume of ours of PAL and SB between groups may be in part a plausible explanation why this occurred, but is not possible to make this statement due to the lack of additional analysis investigating the association of the different expositions in the non-differences between groups.

In the present study, no significant differences were found in the body composition of the two experimental groups, however, a tendency ($p = 0.07$) for greater lean mass was found in ME to PA. The ME performed systematically is capable of inducing progressive stimulus on various components of physical fitness, and among them is body composition. Increasing muscle mass in older people is essential to prevent the onset and progression of sarcopenia, disability, and frailty, thus enabling them to maintain their independence throughout life (Barros et al., 2021).

During the aging process, it is common for metabolic imbalances to occur that lead to the development of dyslipidemia, which contributes to the emergence and worsening of cardiovascular diseases, obesity, hypertension, and diabetes. In addition, there is a decline in physical fitness and functional capacity, thus reducing QoL and the well-being of older people (Nishikawa et al., 2021). Evidence shows that ME performed in a periodized manner can improve the lipid profile, control glycemic levels, improve the balance between protein synthesis and degradation in muscle, as well as regulate blood pressure and improve cardiovascular fitness (Li et al., 2022).

In the current study, it was observed that ME presented significantly lower, and with larger ES glycated hemoglobin and fasting glucose than PA, indicating the positive effects of ME performed in a periodized manner on the glycemic levels of the older people. Exercise plays an important role in glycemic regulation, through the activation of the GLUT-4 receptor translocation mechanism to the cell membrane, causing an increase in glucose uptake from the bloodstream, thus controlling glycemic levels, which is a positive factor to reduce the risk of diabetes, targets in organ damage, metabolic syndrome and cardiovascular diseases (Kanaley et al., 2022).

With aging, there is a reduction in kidney function, and in more severe cases it can lead to chronic kidney disease, and when there are high levels of urea and creatinine and low levels of serum albumin, it is an indicator of problems in kidney function (Evans et al., 2022). The results of this study revealed that ME had significantly lower values, with large ES in the serum creatinine levels when compared to PA, which revealed a beneficial effect of ME performed in a periodized manner on the parameter of renal function in older women. Physical exercise regulates the renal function of older people, through one of the main mechanisms, which is the improvement of the glomerular filtration rate, and this mechanism improves the functioning of the kidneys and helps in the prevention and treatment of chronic kidney disease (Wu et al., 2022). A counterpoint of this analysis was that the group B age showed a positive interaction with the higher creatinine, revealing that the higher ages in PA also contributed to the significantly higher levels of creatine. During the oldest ages is more common to observe a worsened renal function, due to the natural process of cellular senescence, so, in this sense, the little high age of PA (ME: 64 ± 4 years old; PA: 68.5 ± 5 years old) could influence the higher creatinine levels (McClure et al., 2017).

No differences were found between the values of QoL between the groups, both groups presented high QoL classification, which proved to be a positive factor for both ME and PA. In the literature, the importance of group exercise is reported to improve the QoL older people, as several psychosocial aspects are stimulated, and this is positive in the sense of increasing the feelings of companionship, friendship, strengthening good feelings, and self-esteem of the older people (Ferreira et al., 2022). Considering the MIR, no differences were found between the groups, represented by a low incidence of MIR in ME with 15%, and PA with 14%. Therefore, it is known that the energy expenditure caused by body movement both present in physical activity and physical exercise is capable of modulating several biochemical mechanisms, such as increased endorphins release and reduced inflammation levels, being an important preventive factor against the development and aggravation of MIR (Hartmann et al., 2021).

Study limitations and perspectives

The study has several such as the lack of a control group that did not perform any type of physical exercise, as well as the retrospective character, which did not possibility analyze pre and post-intervention, which could be to explain better the effects of the two types of interventions, and the lack of dietary control of the older women. Another limitation of this study that must be pointed out is the total number of minutes spent in each training group enrolled in the intervention, in which ME presented a higher number of minutes than group B (ME: 3,600 minutes; PA: 2,400 minutes), which should contribute the better results in favor of the ME. Despite these differences in total time spent in training, as cited above, PA performed at very low intensity and besides, being non-periodized, it was also noted as non-systematized physical exercise types, preconizing slow speeds of walking and dancing in a comfortable intensity perception, without previous ordination or programation, which also were accompanied by the researcher, which characterized the physical activities practiced in the PA, having a low powerful to stimulate some positive effects in functional/ biochemical, variables, and QoL of the older women (very similar with a control group). As perspectives, is expected future studies with better and more elabo-

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rated experimental designs, such as controlled and randomized controlled trials, comparing ME and PA, are important to understand how the different training variables e.g., volume, intensity, frequency, duration, equalizing or not this variables, thus maying understanding and measure more precisely the influence of these different confounding factorsin the physical and mental health responses of the different aged and health condition groups, such as independent older people and frail elderly people. Thus, it will help to clarify the extent to which periodized interventions can be more efficient than non-periodized interventions for the physical and mental health of older people.

Conclusion

The results indicate that the practice of PA is similar to ME for elevating PAL levels of older women. However, through ME brought greater benefits in parameters such as gait speed, functional capacity (aerobic capacity, agility, dynamic balance, flexibility of UL and LL), and biochemistry (fasting glucose, glycated hemoglobin, and creatinine). Despite the differences in the total amount of training minutes between groups, the ME presented large ES in the major results, at least, initially, being positive for stimulating the variables that presented better outcomes. This study also brings practical applications for coaches, which could adapt and use creativity to develop different types of systematized ME, aiming to enhance positive adaptations in older people at multilevel outcomes.

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