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Effectiveness of a multicomponent physical activity program on depressive symptoms in elderly people in Brazil's Family Health Strategy

Efetividade de um programa de treinamento multicomponente nos sintomas depressivos em idosos da Estratégia de Saúde da Família

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Abstract – The practice of regular physical activity may be able to prevent and reduct the depressive symptoms in the elderly population. Therefore, it is important to consider strategies that favor a more active lifestyle to avoid and control psychological morbidities in older adults. Therefore, the purpose of the present study is to evaluate the effectiveness of a multicomponent training program on the depressive symptoms in physically independent elderly people. This is a community-based intervention carried out in Brazilian Family Health Units with 26 elderly participants of both sexes, who were divided into two groups: a multicomponent training program (G1; n=11) and a control group (G2; n=15). G1 consisted of 16 exercise sessions, held twice a week for a total of 8 weeks. G2 had 4 health education meetings. Depressive symptoms were assessed using the Geriatric Depression Scale (GDS-15). The significance level adopted was 5%. Repeated measures ANOVA was used to compare the groups, time (pre and post intervention) along with the interaction between groups and time, as well as the effect size related to the differences between the variables, which was calculated using the generalized partial Eta (η^2G). No significant differences were found concerning the depressive symptoms and the level of physical activity among the groups, time or the interaction between groups and time. It can be concluded that multicomponent training, despite lessening the overall manifestation of the disease, was not able to significantly reduce the depressive symptoms in the elderly population.

Key words: Aged; Exercise; Mental Health; Primary Care.

Resumo - *A prática de atividade física regular pode ser capaz de agir na prevenção e redução de sintomas depressivos em idosos. Nesse sentido, é importante adotar estratégias que favoreçam um estilo de vida mais ativo para evitar e controlar as morbidades psíquicas na população idosa. Portanto, o objetivo do presente estudo é avaliar a efetividade de um programa de treinamento multicomponente nos sintomas depressivos de idosos fisicamente independentes. Trata-se de uma intervenção do tipo comunitária realizada em unidades de saúde da família, com 26 idosos de ambos os sexos, os quais foram divididos em dois grupos: o grupo de programa de treinamento multicomponente (G1; n=11) e o grupo controle (G2; n=15). O G1 foi composto por 16 sessões de exercícios, realizadas 2 vezes por semana, durante o período total de 8 semanas. No G2 ocorreram 4 encontros de educação em saúde. Os sintomas depressivos foram avaliados pela Escala Geriátrica de Depressão (GDS-15). O nível de significância adotado foi de 5%. Para comparar os grupos e o tempo (pré e pós-intervenção), bem como a interação entre grupos e tempo, foi utilizado o ANOVA de medidas repetidas e a magnitude do efeito das diferenças entre as variáveis foi realizada através do Eta parcial generalizado ($\eta^2 G$). Não foram encontradas diferenças significativas com relação aos sintomas depressivos e o nível de atividade física entre os grupos, tempo ou a interação entre grupos e tempo. Pode-se concluir que o treinamento multicomponente, apesar de reduzir a média dos sintomas, não foi capaz de reduzir significativamente os sintomas depressivos dos idosos.*

Palavras-chave: *Pessoa idosa; Exercício; Saúde Mental; Atenção Básica.*

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INTRODUCTION

Psychiatric morbidities are increasing along with the population ageing process in Brazil. This situation emphasizes the need to adapt the current health care model in the country to provide an adequate support for this population. Among these problems, those associated with mental health are one of the most prevalent[1], especially after the Covid-19 pandemic[2,3].

It is estimated that more than 300 million people worldwide suffer from some form of depressive disorder[4] and, in Brazil, around 13.2% of the elderly are affected[5]. Furthermore, social, psychological and biological factors may increase the likelihood of this condition[4].

Among the strategies for preventing and treating depressive symptoms, regular physical activity is an important non-drug therapeutic modality[6]. Regular physical activity reduces oxidative stress and the production of pro-inflammatory cytokines[7] and increases the levels of Brain-Derived Neurotrophic Factors (BDNF)[8], providing psychological and social benefits, such as a better self-esteem, quality of life as well as a stronger sense of well-being[9,10].

Despite the number of studies that have already evaluated the effect/effectiveness of exercise programs on mental health[11,12], it is still necessary to determine the effectiveness of different exercise types coupled with programs that are feasible for primary health care implementation and that can be offered in an effective as well as sustainable way. The purpose of the present study was to assess the effectiveness of a Multicomponent Training (MT) program on the depressive symptoms of physically independent elderly people.

METHODS

Study design

This is a short-term community-based intervention study, derived from a master project entitled Elderly Health Intervention Study (EHIS), in the municipality of Jequié - Bahia (Brazil), which took place between September and December 2022, after the COVID-19 pandemic.

Study participants

Elderly people registered in the Family Health Strategy (FHS) participated in the present study. To be included, individuals had to be considered as: a) not currently partaking in any physical exercise programs (self-reported); b) physically independent (performing daily activities independently); c) aged 60 years or over; d) male or female; e) not diagnosed with the SARS-CoV-2 virus for at least 3 months prior to the screening, according to the participant's medical record; f) without any cognitive impairment (recorded in the participant's medical record); and g) having completed the vaccination strategy against COVID-19 (in conformance with the dose made available by the government at the time of the study).

The following exclusion criteria was adopted: a) uncontrolled arterial hypertension; b) acute or severe heart failure; c) acute or severe respiratory failure; d) abnormal orthostatic hypotension; e) decompensated or uncontrolled

diabetes mellitus; f) recent fractures; g) cognitive impairments that could impair the participant's test performance; h) any other circumstance that would prevent physical activity.

Data collection procedures

The study consisted of 40 individuals of both sexes (female and male), divided into two groups: the multicomponent training group (G1) (20 participants), and the control group (G2) (20 participants); for a period of 8 weeks. The organization of sample recruitment is described in Figure 1.

Two health units in different regions of the studied municipality were selected by convenience sampling to compose the G1 and G2 groups. The elderly were recruited in each micro-area to participate in the study through the community agents' recommendations and information sheets attached to the health units' premises. The participants were then instructed on the procedures of the programs they would be taking part in.

All the G1 and G2 activities were performed at Family Health Units (FHU) and conducted by two trained instructors. The multicomponent protocol followed the main exercise prescription guidelines recommended by the American College of Sport Medicine Science for the elderly[13].

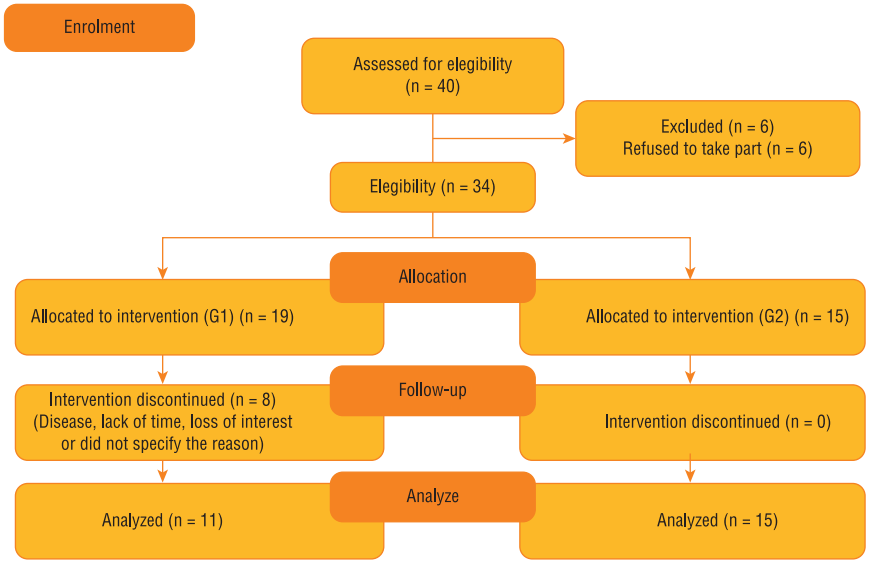

Figure 1. Sample recruitment organization.

Assessment of the depressive symptoms

The Geriatric Depression Scale (GDS-15)[14] validated for the Brazilian population, in its abbreviated form of 15 items, was used. The scale consists of 15 questions with dichotomous answers (yes/no) related to depressive symptoms, with the score ranging between 0 and 1, depending on the obtained answers[15]. The information was collected pre and post intervention and analyzed continuously.

Assessment of the total physical activity level

To evaluate the total physical activity level, the International Physical Activity Questionnaire (IPAQ), adapted and validated for the elderly population, was

applied[16]. The questionnaire includes 15 questions spread over four domains, covering the dimensions of the physical activities related to work, transport, household chores and recreational activities. To determine the total weekly physical activity, the sum of the results from the four domains was calculated in minutes.

Co-variables

Self-reported data was collected on age, gender, marital status, education, race/color, housing situation, body mass index and cognitive function using the Mini Mental State Examination (MMSE).

Experimental protocol

Multicomponent training program

Sixteen exercise sessions were held twice a week for two months. each one lasted 50 minutes and were divided into three blocks. The first block consisted of 10 minutes of aerobic and balance exercises, the second block, 30 minutes of neuromuscular exercises and, finally, the third block with 10 minutes of cool-down with stretching exercises (Table 1). The exercises were performed using the individuals' body weight and with low-cost recyclable equipment.

The intensity of the activities was increased according to the training variables and monitored by applying the adapted Borg's Rating of Perceived Exertion (RPE) scale to aid the elderly participants' understanding of the tasks. Perceived exertion was checked at the end of each exercise session, after returning to calm. Before the intervention began, a familiarization session was held to address the proposed exercises and the use of the Borg's Scale.

Table 1. Description of exercises, sets, repetitions, intervals and perceived exertion.

	WEEK 1	WEEK 2 and 3	WEEK 4 and 5	WEEK 6 and 7	WEEK 8
Strength exercises	Standing bent-over row; sit to stand; lateral raise; standing calf raise; Wall push-up	Standing bent-over row; Sit to stand; Lateral/ frontal raise; Wall push-up; Standing calf raise	Biceps curl; Sit to stand/squat; Shoulder press; Standing calf raise; Standing trunk flexion; Towel twist	Bent-over row; Squat; Shoulder development + biceps curl; One-sided standing calf raise; Inclined push-up; Knee extension	Bent-over row; Squat; Shoulder press + biceps curl; One-sided standing calf raise (2T); Inclined push-up; Seated trunk flexion
Series/ Repetitions	3x12	3x12	3x15	3x15 + 10 sec isometry	3x20 + 15 sec isometry
Interval	1 min	50 sec	40 sec	30 sec	30 sec
RPE (Borg)	1 - 2	2 - 4	3 - 5	5 - 6	6 - 8
Aerobic, balance and coordination exercises	Walking with obstacles; walking in 8s; lateral movement	Hip and shoulder flexion; Hip + shoulder flexion; Lateral shift	Hip and shoulder flexion; Alternating hip + shoulder flexion	Walking with obstacles; Walking with shoulder lift; Running (forwards and backwards)	Walking in circles with high knee + shoulder lift; Running (forwards and backwards)
Time	1 min	1.5 min	1.5 min	2 min	2.5 min
Interval	1 min	1 min	1 min	1 min	1 min
RPE (Borg)	1 - 2	2 - 4	3 - 5	5 - 6	6 - 8

Note. RPE= Rating of Perceived Exertion; 2T= Execution of the concentric phase in two stages; Sec= Seconds; Min= Minutes.

Control group

The control group was based on the VAMOS program[17]. Four health education meetings were held, lasting between 60 and 90 minutes, consisting of discussions on the topics of physical activity, healthy eating, identifying social support for an active lifestyle and the impact of an active lifestyle on the mental health. The final 10 minutes of each encounter were reserved for integrative body practices, breathing exercises and relaxation techniques.

At each meeting, guiding questions were asked to start the discussion. The following topics were asked - on the 1st meeting: how can I incorporate physical activity into my daily life? And what are my self-perceived barriers to performing physical activities?; on the 2nd meeting: what strategies can I use to eat healthily? And what are the health impacts of a diet high in sodium and sugar?; on the 3rd meeting: which people in my social circle can I count on to keep me more physically active?; on the 4th meeting: what is my perception of my mental health? And how can daily physical activity have a positive impact on my mental health?

Statistical analysis

Initially, the normality of the data was assessed using the Shapiro-Wilk test. Continuous data considered normal was expressed using the mean and standard deviation, while non-normal data (total physical activity level) was expressed using the median and interquartile range. Categorical variables analyzed as normal were described using relative and absolute frequencies, with the Fisher's exact test applied to evaluate the differences between the groups due to the expected frequency of <5.

For the comparisons of the continuous variables, the independent t-test was employed to determine whether there was any difference between the groups. Repeated measures ANOVA was used to perform the comparisons between the groups G1 and G2, between the pre- and post-intervention times, as well as the interaction between time and group variables.

The significance level adopted was 5%. The data was analyzed using Stata, version 12, software (StataCorp LP, College Station, Texas) and JAMOVI 2.3.28.

The effect size was used to assess the magnitude of the effect of the differences between the means. The effect size was classified as small (0.01), moderate (0.06) and large (0.14) based on the values of the generalized Eta squared (η^2G).

Ethical aspects of the research

The present project was submitted to and approved by the Research Ethics Committee of the Universidade Estadual do Sudoeste da Bahia (CEP/UESB), CAEE - 60974222.2.0000.0055.

RESULTS

In total, approximately 68.0% of the subjects remained in the study (15 in G1 and 11 in G2). The adverse events reported by some participants were mostly mild muscle pain after training.

The characteristics of the participants can be seen in Table 2. The average age was 70.08 (5.75) years for G1 and 73.4 (6.99) years for G2. Most of the participants were women, married, with a low level of education, self-declared brown/black, living alone and with a Body Mass Index (BMI) considered overweight.

Table 2. Characterization of participants by group, Jequié - BA, 2022.

Variables	G1 (n=11)	G2 (n=15)	p
	n (%)	n (%)	
Gender			
Male	5 (45.4%)	2 (13.3%)	
Female	6 (54.6%)	13 (86.7%)	0.085
Marital status			
Married	8 (72.7%)	5 (33.3%)	
Single	2 (18.2%)	5 (33.3%)	
Widowed	1 (9.1%)	5 (33.3%)	0.173
Education			
Non-literate	3 (27.3%)	6 (40.0%)	
Primary education	6 (54.5%)	9 (60.0%)	
High school/superior education	2 (18.2%)	------	0.282
Race/color			
White	3 (27.3%)	2 (13.3%)	
Brown	6 (54.5%)	10 (66.7%)	
Black	2 (18.2%)	3 (20.0%)	0.852
Living situation			
Accompanied	9 (81.8%)	11 (73.3%)	
Alone	2 (18.2%)	4 (26.7%)	0.491
Age			
Mean (SD) #	69.36 (5.44)	73.4 (6.99)	0.125
BMI			
Mean (SD) #	24.75 (4.08)	27.50 (5.23)	0.161
MMSE			
Mean (SD) #	20.8 (10.4)	23.1 (4.85)	0.44

Key: G1=Multicomponent training program; G2=Control group; SD=Standard Deviation; MMSE= Mini Mental State Examination; BMI=Body Mass Index; p=p-value obtained by Fisher's exact test for categorical variables and independent T-test (#) for continuous variables. The sum of the totals differs due to loss of information in some variables.

Regarding the depressive symptoms, G1 had an average of 2.82 ± 1.94 and, G2, 4.07 ± 3.06 for GDS at pre-intervention. Post-intervention, the average was 2.77 ± 1.96 for G1 and 3.73 ± 4.01 for G2. Table 3 shows the effect size values, F-test and statistical significance for the Geriatric Depression Scale (GDS) results related to the groups, times and interactions. No statistically significant differences were found for the groups (G1 and G2), times (pre- and post-intervention) and interactions between group and time. The effect size observed was classified as low in all results.

Table 3. Effect size values (η2G), F and P values for GDS tests evaluated according to the groups, intervention time and interaction.

	Groups	Time	Groups*Time
	η^2G F p	η^2G F p	η^2G F p
GDS	0.02 0.61 0.43	0.00 0.01 0.89	0.00 0.76 0.39

Key: GDS= Geriatric Depression Scale; η2G= Effect size; F= F-test; p= p value; *= Interaction between group and time.

The median and the Interquartile Range (IQR) of total physical activity levels pre-intervention for G1 was 900 (IQR: 610-1320) minutes/week and 680 (IQR: 200-1680) minutes/week for G2. Post-intervention, the median for G1 was 930 minutes/week (IQR: 680-1235) and 265 minutes/week (IQR: 150-855) for G2. When analyzing the pre-intervention results, it was clear that there were no differences between the groups (p= 0.95). However, G1 showed higher levels of total physical activity in post-intervention when compared to G2 (p= 0.02) (Figure 2).

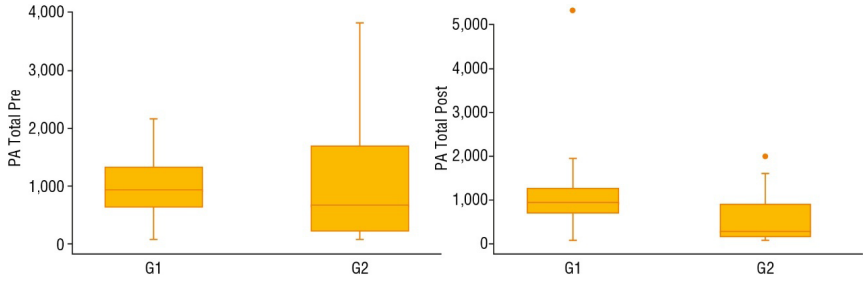

Figure 2. Description of total Physical Activity (PA) levels according to the groups, pre- and post-intervention. Key: PA Total Pre= Total Physical Activity Pre-intervention; PA Total Post= Total Physical Activity Post-intervention.

DISCUSSION

This study sought to assess the effectiveness of a Multicomponent Training (MT) program on the depressive symptoms of physically independent elderly people. The results indicated that there was a reduction in the mean levels of depressive symptoms in both groups, although the differences were not statistically significant. It is important to emphasize that the average depressive symptoms identified in the pre-intervention period were considered normal for the usual symptoms of depression[14].

The effectiveness of a MT approach to reduce depressive symptoms in the elderly is still a controversial issue[18-24]. Evidence suggest that Multicomponent Training has generated reductions[22,25] or no significant improvement[18,21,24] in the depressive symptoms of the older population.

The present findings corroborate the results of Ugartemendia-Yerobi *et al.*[18], who conducted an intervention with Multicomponent Training three times a week for 12 weeks and did not observe significant reductions in the participant's depressive symptoms. The authors reported that they found no clear explanation to justify these findings.

Ansai *et al.*[24] have likewise found no significant differences that would indicate benefits in relation to depressive symptomatology, after performing TM for 16 weeks. Nevertheless, their results were justified by the participants' low adherence to the training protocol, given that the effect was only evaluated in the participants who completed at least half of the protocol[24].

In addition, Caldo-Silva et al.[26], when comparing different groups (Multicomponent Exercise [ME]; BCAA; ME+BCAA; Control group), found no superiority of the multicomponent exercise over the other groups in terms of reducing depressive symptoms, as in the present study. However, it is important to highlight that the abovementioned article implemented a combination of exercise and supplementation in some of the groups, which differs from the methods used herein.

The mechanisms related to the exercise benefits on the mental health of the elderly are diverse, such as increased levels of BDNF, which is a mediator of neuroplasticity able to trigger improvements in cognitive function, mood and depressive symptoms[7,8]. Moreover, after exercise, the increase in serotonin levels, which are important neurotransmitters for regulating mood, reduces symptoms related to depression and other mental disorders[7]. It is also essential to note the importance of the older adults' socialization, since activities performed in groups can generate positive social interactions that can help with depression, reducing depressive symptoms in this population[9,27].

Previous literature findings have shown the presence of antidepressant effects related to physical exercise on individuals with depression, associated with the performance of aerobic exercise (a different modality to the one used in this study), with a moderate and vigorous intensity, in supervised sessions and in groups[6,11].

Given this scenario, the present results can be justified by a) absence of depressive symptoms at baseline: it can be hypothesized that higher scores of depressive symptoms could lead to greater reductions; b) short time period: despite the controversial results regarding depressive symptoms, most studies have a duration of more than 8 weeks[22,24,25,28]; c) the need to adjust the training variables (such as a greater increase in intensity) for a greater maintenance phase, in order to promote physiological changes[6,11].

On the other hand, it is important to consider that the present research proposal was designed to implement activities that could be sustainably incorporated by the FHUs, which are health care facilities that are more accessible to a significant contingent of elderly Brazilians. Finally, the proposed program has a short duration (8 weeks) and uses an exercise modality that is still scarcely seen in Brazil, especially in the context of primary health care.

Another point to be addressed is the control group that underwent health education meetings. Although it was not possible to find any significant differences, a reduction could be identified in the average number of depressive symptoms in this group. The findings herein may reinforce the study conducted by Borges *et al.*[17], who, when comparing a physical exercise program with a behavior change program carried out for 3 months with elderly people in Primary Care, observed positive results in relation to the effectiveness and maintenance of depressive symptoms in the elderly, only for the group that did not exercise[17].

Therefore, counselling programs that encourage the adoption of healthy habits, as well as the practice of physical activity, can be considered important strategies for health promotion within the Primary Care.

The limitations of the present study are related to the lack of control of other variables such as the use of antidepressants and other medications, as well as the depression diagnosis. Further issues to be considered are the load control during training, due to the absence of equipment or any external loads greater than the participant's body weight, and the memory bias that may have compromised the participant's answers in the self-reported GDS.

Additionally, this intervention was carried out in a Family Health Unit, which brings a certain familiarization among the environment and the users, as many participants already had established routine visits to the FHU. Furthermore, the choice of using low-cost, recyclable materials in this study is a strategic decision to better disseminate the program proposed herein.

CONCLUSION

The results of the present study showed that, although the TM program reduced the average number of manifestations, it was not able to significantly improve the depressive symptoms of elderly people registered in Brazil's Family Strategy.

Compliance with ethical standards

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee – State University of Southwest Bahia and the protocol (no. 60974222.2.0000.0055) was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: AFC, CAS, BMPF, GEF, SVR. Performed the experiments: AFC, BMPF. Analyzed the data: AFC, CAS. Contributed reagents/materials/analysis tools: AFC, CAS, GEF. Wrote the paper: AFC, GEF, SVR.

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