

Depression in elderly individuals in physical exercise program: assessing the efficacy of the approach as a therapeutic strategy¹

Depressão em idosos em programa de exercícios físicos: avaliando eficácia da abordagem como estratégia terapêutica

Depresión en adultos mayores en un programa de ejercicio físico: evaluando la eficacia del enfoque como estrategia terapéutica

[Research Article]

Karollyni Bastos Andrade Dantas²
Francisco Prado Reis³
Marco Antônio Almeida Santos⁴
Carolina Barbosa Oliveira Rocha⁵
Crisdan Caina Costa Chagas⁶
Júlia Maria de Oliveira Santos⁷
Lúcio Flávio Gomes Ribeiro da Costa⁸
Maria Lívia de Andrade Menezes⁹
Raissa Pinho Morais¹⁰
Estélio Henrique Martin Dantas¹¹

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² Master and Doctor's Degree Program in Health and Environment - PSA, Tiradentes University - UNIT, Aracaju, Brazil. E-mail: karollbdantas@gmail.com . ORCID: <https://orcid.org/0000-0001-6886-6976>

³ Doctor's Degree Program in Health and Environment - PSA, Tiradentes University - UNIT, Aracaju, Brazil. E-mail: franciscopradoreis@gmail.com . ORCID: <https://orcid.org/0000-0002-7776-1831>

⁴ Doctor's Degree Program in Health and Environment - PSA, Tiradentes University - UNIT, Aracaju, Brazil. E-mail: marcosalmeida2010@yahoo.com.br . ORCID: <https://orcid.org/0000-0003-0622-6257>

⁵ Undergraduate Medical Program at Tiradentes University - UNIT, Aracaju, Brazil. E-mail: carolina.boliveira@souunit.com.br . ORCID: <https://orcid.org/0009-0006-5365-3453>

⁶ Undergraduate Medical Program at Tiradentes University - UNIT, Aracaju, Brazil. E-mail: crisdan.costa@souunit.com.br . ORCID: <https://orcid.org/0009-0000-6925-287X>

⁷ Undergraduate Medical Program at Tiradentes University - UNIT, Aracaju, Brazil. E-mail: julia.maria04@souunit.com.br . ORCID: <https://orcid.org/0009-0001-9226-9298>

⁸ Master and Doctor's Degree Program in Health and Environment - PSA, Tiradentes University - UNIT, Aracaju, Brazil. E-mail: luciojudo@hotmail.com . ORCID: <https://orcid.org/0000-0002-3437-8701>

⁹ Undergraduate Medical Program at Tiradentes University - UNIT, Aracaju, Brazil. E-mail: maria.livia03@souunit.com.br . ORCID: <https://orcid.org/0009-0009-6784-4041>

¹⁰ Undergraduate Program in Psychology at Tiradentes University - UNIT, Aracaju, Brazil. E-mail: raissamorais27@hotmail.com . ORCID: <https://orcid.org/0000-0001-5860-1712>

¹¹ Doctor's Degree Program in Nursing and Biosciences - PPgEnfBio, Federal University of the State of Rio de Janeiro - UNIRIO, Rio de Janeiro, Brazil. E-mail: estelio.henrique@souunit.com.br . ORCID: <https://orcid.org/0000-0003-0981-802>

Abstract

In contemporary society, population aging has become an increasingly relevant and complex reality. The care for the mental well-being of this population has become a priority in healthcare, in order to prevent the development of diseases such as depression. One of the tools used in mental health care is physical exercise, and this study aims to assess the influence of this type of activity on the levels of depression in the elderly in a city in Brazil. The research utilized a quasi-experimental methodology to examine the impacts of a physical fitness program on senior citizens served by the Basic Health Units of Aracaju, lasting for 16 weeks. The sample included 92 elderly participants (mean age: 68.24 ± 5.84), with a higher proportion of females (83.69%). The exercise program was supervised and personalized, with a focus on intensity controlled by perceived effort. The tool suggested by the Center for Epidemiologic Studies Depression Scale was employed to evaluate signs of depression prior to and following the intervention. The results revealed a reduction in depression levels ($\Delta\% = -1.64\%$, $p = 0.0032$). It is concluded that the exercise program had a beneficial effect on the depressive symptoms of the elderly, highlighting its relevance as a complementary intervention in improving mental health in this population. The results underscore the significance of physical exercise in enhancing the psychological well-being of elderly individuals receiving care in primary healthcare settings.

Keywords: depression, physical exercise, elderly.

Resumen

En la sociedad contemporánea, el envejecimiento de la población se ha convertido en una realidad cada vez más relevante y compleja. El cuidado del bienestar mental de esta población se ha convertido en una prioridad en el ámbito de la atención médica, con el fin de prevenir el desarrollo de enfermedades como la depresión. Una de las herramientas utilizadas en el cuidado de la salud mental es el ejercicio físico, y este estudio tiene como objetivo evaluar la influencia de este tipo de actividad en los niveles de depresión en los adultos mayores en una ciudad de Brasil. El estudio optó por un enfoque cuasi experimental para examinar los impactos de un plan de actividad física en individuos de edad avanzada que reciben atención de las Unidades Básicas de Salud de Aracaju, con una duración de 16 semanas. La muestra incluyó a 92 participantes mayores (edad promedio: $68,24 \pm 5,84$), con una proporción mayor de mujeres (83,69%). El programa de ejercicio fue supervisado y personalizado, con un enfoque en la intensidad controlada por el esfuerzo percibido. Se empleó el instrumento recomendado por la Escala de Depresión del Centro de Estudios Epidemiológicos para valorar los signos de la

depresión antes y después de la intervención. Los resultados revelaron una reducción en los niveles de depresión ($\Delta\% = -1,64\%$, $p = 0,0032$). Se concluye que el programa de ejercicio tuvo un impacto positivo en los síntomas depresivos de las personas mayores, destacando su relevancia como intervención complementaria para mejorar la salud mental en esta población. Los hallazgos refuerzan la importancia del ejercicio físico en la promoción del bienestar psicológico en las personas mayores que reciben atención en entornos de atención médica básica.

Palabras clave: depresión, ejercicio físico, personas mayores.

Introduction

In contemporary society, population aging has become an increasingly relevant and complex reality. Faced with advances in recent decades, including advances in medicine, better living conditions, reduced birth rates and increased life expectancy, the participation of the elderly in Brazil in 2023 reached 10.9% of the total inhabitants in the country (Demographic Census, 2023).

With the increase in life expectancy and changes in demographic patterns, attention to the care and well-being of the elderly has gained prominence, however, not all have prospects of healthy aging, associating this situation with loss of quality of life, little participation in daily activities, including leisure, and, consequently, greater vulnerability to diseases (SOUZA, N et al, 2019). In this sense, promoting healthy aging is interesting to ensure a good quality of life for this segment of the population (OLIVEIRA, L et al, 2020).

Depression is a psychiatric disorder characterized by a persistent combination of emotional, cognitive and physical symptoms that affect daily functioning and quality of life. Unlike sadness, depression is a disease that physiologically alters the depressed individual (HIDALGO, J. L et al, 2021).

This disease is characterized by several psychopathological changes that arise, which can be distinguished in terms of symptomatology, severity, course and prognosis. Its etiology is multifactorial, with the influence of genetic and environmental factors, whose pattern and course depend on variables such as age (RAMOS F. P et al., 2019).

In relation to the elderly, mood disorders are the most common psychiatric disorders. In this age group, these disorders tend to be chronic, and the complaints are not only of a physical nature, but also of a psychological and social nature (LEITE MENDES, G et al., 2020). There is a subjective feeling of decreased energy, disinterest, slowness and pessimistic thoughts, as well as delusions and hallucinations.

Thus, dealing with depressive disorder usually involves a multifaceted approach that may include lifestyle changes, such as the practice of physical activity (FERRETTI, F et al, 2019). In general, physical exercise has been shown to be interesting in the context of mental disorders, because it can mainly lead to the release of neurotransmitters such as serotonin, dopamine and endorphins, which are associated with a feeling of well-being. In addition, in the emotional sense, participating in physical activities in a group or in social environments can promote social interaction, suggesting significant benefits for mental health (PEARCE M et al., 2022). However, the specific characteristics of each individual in relation to the execution of the exercise should be considered.

In this sense, considering the prevalence of depression in the elderly age group and the complex course of this disease in this group, as well as the relevance that physical activity has assumed in the panorama of mental disorders, the objective of this study is to correlate this diagnostic framework with the practice of physical exercises in the elderly, in order to understand the value of this approach.

Methodology

Participants

An almost-experimental was made in a model with a 16 week intervention. Originated from an universe constituted by elderly people assisted by the Basic Health Units of the municipality (BHU) of Aracaju, Sergipe-Brazil, representing approximately 14,000 people.

The inclusion criteria used were: elderly people older than 60 years old who committed to participating in a physical exercise program by signing the Free and Informed Consent Form. Who presented motor limitations or comorbidities were excluded for the sample.

Previously it was made a pilot study from the results obtained from the pilot project in the months of september to december 2022 in three brazilian BHUs, with a sample of 39 elderly women. For this actual study, the S (variance based on the standard deviation of the pilot study) got 32 aleatory people, based in a pilot study made (TRIOLA, 2017). With a 95% confidence interval, the sample number (n) resulted in 92 participants, calculated using the formula for unlimited populations shown below, according to the figure 1.

$$n = \frac{s^2}{(\bar{x} - \mu)^2} \times (z_{\alpha / 2})^2$$

Figure 1: Sample number calculation. Removed from MASTERFITTS project.

The sample number calculated was 92 people. It uses variance variables based on the standard deviation of the pilot study. It was used variance variables based on the standard deviation of the pilot study which was 32 people; sample size (z) of 39 elderly population made by a previous study and a $z\alpha/2$ with the value of z in the normal curve according to the value α . This α was substituted for “s” that is the standard deviation; the “X” media and the maximum estimated difference between the sample mean and the true population mean, represented by the letter X bar, both calculated by the previous study as well.

The present study with the objective to keep the research scientificity have the significance level of $p < 0,05$ and the power of this experiment was available allowing an acceptance level corresponding to 80%

Ethical approval

Ethics approval for all experimental procedures was granted by Tiradentes University Human Research Ethics Committee (protocol number [CAAE]: 26524719.4.0000.5371). All the participants was instructed and explained about the Inform Consent Form, that contains the risks, benefits and social relevancy of the research with advantages of the study participants.

Study design

Participants answered an anamnesis to characterize the sample. After the diagnostic evaluation of the study group was carried out, focusing on the variable Depression.

Center for Epidemiological Studies Depression Scale (CESD)

The methodology employed adhered to the Center for Epidemiological Studies Depression Scale (CESD), which consists of 20 items, each scored between 0 and 3, resulting in a maximum total score of 60 points.

CESD is capable of assessing the presence of depression and gauging the severity of depressive symptoms (none to mild: ≤ 16 ; moderate: 16-23; severe: ≥ 24). It's important to note that this scale was properly validated and demonstrated acceptable internal consistency (Cronbach's $\alpha=0,80-0,86$) (PINEDA-ROA, 2019; GUSTAVO, et al., 2021).

Intervention

The intervention was made initially with the familiarization of older people with the program, devices and exercises for 2 weeks. After that, based on strength training protocols using resistance machinery, the sample group performed the recommended training twice a

week for 16 weeks, with the exercises shown in table 1. At the end of the intervention period, the formative evaluation was carried out, with the same instrument used in the diagnostic evaluation.

Order	Exercises
First	Barbell Biceps
Second	Front Foot Elevated Split Squats
Third	Straight Bar Tricep Extension
Fourth	Seated Leg Curl
Fifth	Standing Dumbbell Press
Sixth	Kettlebell Goblet Squat
Seventh	Machine Fly
Eighth	Leg Press
Ninth	Lat Pull Down
Tenth	Plank
Eleventh	Barbell Hip Thrust

Table 1: Circuits and Order of Exercises present in bodybuilding. Elaboration from MASTERFITTS Project,

Statistical analyses

Statistical analyses used outside the location measures, calculating the mean and median, both central tendency measures, and the dispersions one, estimating the existing variability in the data.

For the estimation of the standard error as used the coefficient of variation (CV%) and the standard deviation(s). Intra-group comparisons were conducted utilizing the Student's t-test at 5% and for intergroup comparisons The Scheffe's Post Hoc procedure was applied, with a chosen significance level of $p < 0.05$ and an acceptance level corresponding to 80%.

Results

Considering that the assessment conducted is based on intervention for elderly individuals, one of the most important variables to be addressed is age. The study sample had a mean age of $X = 68.24 \pm 5.84$ years, with a total range of 60 to 85 years. Table 2 illustrates the sociodemographic data of the participants, collected through anamnesis, presenting absolute numbers and their respective percentages.

GENDER	N	%
Female	77	83,69
Male	15	16,30
MARITAL STATE	N	%
Married	36	39,13
Single	23	25,00
Widowed	21	22,82
Divorced	11	11,95
NI	1	1,08
EDUCATIONAL LEVEL	N	%
Postgraduate	2	2,16
Attained a tertiary education degree	13	14,13
Incomplete Higher Education	5	5,43
Successfully finished secondary education	28	30,43
Incomplete High School	8	8,69
Successfully concluded primary education	7	7,60
Incomplete Elementary School	25	27,17
Never Studied	4	4,34
MONTHLY FAMILY INCOME	N	%
Up to 2 Minimum Wages (MW)	53	57,60
2 - 4 MW	23	25,00
4 - 10 MW	15	16,30
NI	1	1,08
PERSONAL HISTORY OF CHRONIC ILLNESSES OR USE OF CONTROLLED MEDICATION	N	%
Has a personal history	76	82,60

Do not has a personal history	18	19,56
CIGARETTES PER DAY	N	%
Do not smoke	83	90,21
Up to 10 cigarettes	5	5,43
11 to 20 cigarettes	1	1,08
More than 30 cigarettes	1	1,08
NI	2	2,16
“DRINKS” PER WEEK	N	%
Do not drink alcohol	64	69,56
Up to 5	27	29,34
More than 15	1	1,08

Table 2: Characteristics of the sample group. Self-made (2023).

Caption: N - Number of participants; % - percentage; NI - Did not disclose

Analyzing the results obtained from the application of the CESD protocol for depression assessment before and after the intervention, it was possible to ascertain the influence of exercise application on the variables' outcomes in this test. The information gathered has been organized in Table 3 , which contains the results obtained in the pre intervention and post intervention assessment.

	PRE-TEST	POS-TEST
Mín	0,00	0,00
Máx	36,00	42,00
Q1	5,75	4,00
Median	13,50	10,50
Q3	18,25	22,00
Máx	36,00	42,00
Mean	13,35	13,13
Q1-Mín	5,75	4,00
Med-Q1	7,75	6,5
Q3-Med	4,75	11,5
Máx-Q3	17,75	20,00

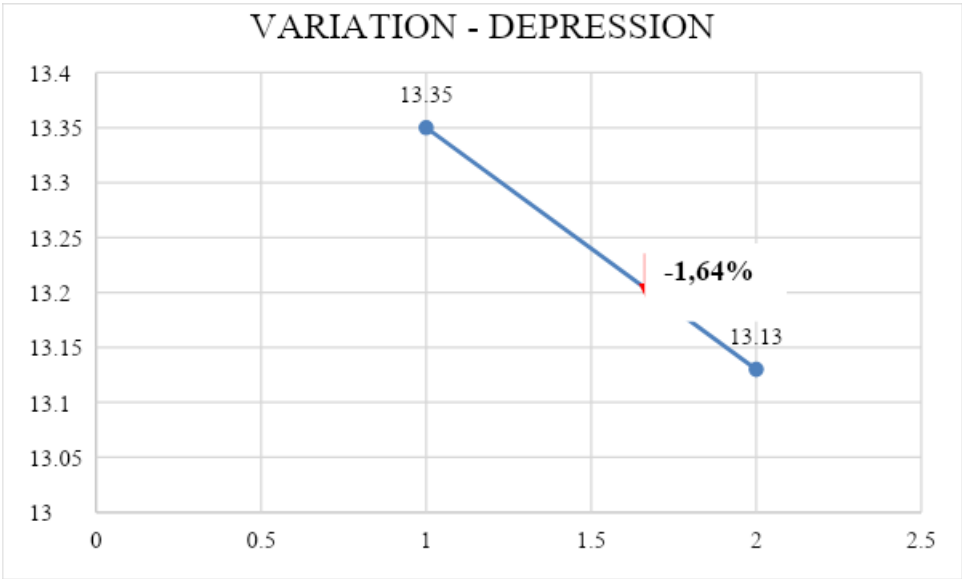
Table 3: Depression Diagnosis. Self-made (2023).

Caption: Min - Represents the minimum value; Max - Represents the maximum value; Q1 - Indicates the first quartile; Q3 - Represents the third quartile.

In this initial comparative assessment, one can observe changes in result patterns before and after the intervention. At first glance, there appears to be a pattern of reduction in questionnaire results in the lower percentiles. The mean of the obtained results also experienced a slight decrease of -1.67%.

Furthermore, using the same data, it was possible to construct a graph illustrating the variation in the coefficient of depressive symptoms to visualize the changes that occurred in the

variable in both assessments, as shown in Graphic 1.



Graphic 1: Coefficient of Variation. Self-made (2023)

By evaluating the changes that occurred in the graph between the pre and post intervention assessments, it is possible to observe a decrease in the coefficient of depressive symptoms.

To better understand the obtained data, a descriptive analysis of the statistics was conducted.

	PRE-TEST	POS-TEST
Mean	13,35	13,13
Standard Error	0,85	1,28
Median	13,5	10,50
Mode	5	4
Standard Deviation	8,76	10,63
Sample Variance	76,77	113,10
Kurtosis	-0,73	-0,33
Variation	36	42
Maximum	36	42
Minimum	0	0
Mean Absolute Deviation	7,35	7

Table 4: Descriptive Statistics. Self-made (2023).

The CESD protocol also allows for categorization of the interviewees into a risk situation for those who obtain concerning results regarding depression assessment. This tool helps identify individuals who may require greater attention and mental health care. Thus, in the evaluation of the collected data, it was noticed that: 37% of the interviewees were characterized as being at risk in the pre intervention assessment, and just over 38% received the same characterization in the post intervention assessment. It can be observed, therefore, that there was a slight increase in the percentage of individuals classified as being at risk.

The Shapiro-Wilk test was used to assess whether the obtained data followed the normal curve distribution pattern.

	PRE-TEST	POS-TEST
W-stat	0,95132	0,91921
p-value	0,00049	0,00027
Alpha	0,05	0,05
Normal	No	No

Table 5: Shapiro-Wilk Test. Self-made (2023).

The Shapiro-Wilk test indicated a non-normal distribution of the data obtained in both assessments.

Discussion

It is worth mentioning that depressive disorders are prevalent and debilitating in older adults (LAIRD, et al., 2023), however, it appears that physical activity is a much discussed alternative as a coadjuvant in the treatment of such disorders nowadays, since that lack of physical activity shows a public health concern and serves as a risk factor for chronic non-communicable diseases (NCDs, such as depression (CHAPARRO, et al., 2019).

The table 2, focused on the data collected in the anamnesis, identifies that the largest concentration of participants fell within the age bracket of 60 to 69 years (66.30%), which is explained by the fact that older elderly people (>70 years), are more likely to develop or progress chronic diseases, that physically limits them (MENDONÇA, et al., 2020).

Another characteristic revealed was in terms of sex, the prevalence of women in the study was 83.69%, which is explained by the phenomenon of the feminization of old age, this occurs because they tend to utilize healthcare services more frequently and are less prone to accidents, violence, and risky behaviors compared to men, thus explaining the lower female mortality (FERRETTI, et al., 2019).

In addition, there is a prevalence of the race variable, since 39.13% of the participants are white. Regarding to education and income, it is noted that 30.43% of the participants have completed high school and that 57.60% possess a monthly income that does not exceed twice the minimum wage, thus, it is noted that this social group has more impacts in the development of psycho-affective pathologies (ALVES, et al., 2021).

Regarding the personal history of chronic diseases and the use of controlled drugs, it is found that 82, 60% of these participants have these characteristics, which is very connected, considering that the strong relationship between chronic pain and depression, due to the relationship between the medulla reticular substances, the mesencephalon of the chronic pain pathway and the neuro transmissivity with the system limbic and insula.

Therefore, depression may precede the occurrence of chronic pain, being a consequence of chronic pain, or it may being a concomitant biological event with chronic pain, thus intensifying the painful experience (SOUSA, 2015).

According to the variables smoking and alcoholism, it is noted that 90.21% of the participants do not smoke, while 59.56% do not use alcoholic beverages. This is excellent, since the conditions of quality of life of this percentage will undoubtedly be higher, because, some cognitive and physiological disorders are developed with the prolonged use of alcohol (Carraro et al., 2005), in addition to the fact that the use of tobacco represents a risk factor for premature death and disability, and is also associated with cardiovascular diseases, chronic obstructive pulmonary disease (COPD), cancer, and various other ailments (BARBOSA, et al., 2021).

Finally, the percentage similarity between the marital status of the participants is noted, as 39.13% are married, 25% are single, 22.82% are widowed, which is explained by the country's statistics, since people are getting married less and, when it happens, marriages tend to last less time (IBGE, 2022)

According to current scientific studies, a conspicuous correlation exists between reduced levels of physical activity and the manifestation of anxiety and depression symptoms among elderly individuals residing in the community. It's known that the physiological factors that physical activity promotes, there is also a better integration in society, greater satisfaction with life and a reduced feelings of loneliness. Thus, providing a great improvement in well-being and life satisfaction (Souza et al., 2019) (ZHANG, et al., 2021).

Nevertheless, additional research acknowledges the complexity of examining the connections between physical activity and depression due to the diverse origins of depression, confounding variables such as social support, and alternative treatment approaches (ZHANG, et al., 2021).

Another systematic review (PÉREZ, et al., 2023) demonstrates moderate and substantial positive impacts in favor of physical activity.

Table 3 and graphic 1 shows a reduction in the mean, as the result of a physical exercise program, a result consistent with the literature. The most significant reduction was observed in the first quartile, which may suggest that physical exercise is even more beneficial when considered independently, particularly in cases of mild to moderate depression. Additionally, there was a noteworthy reduction in the median.

However, in the analysis of table 3, which demonstrates the results of the CESD protocol (score: no to mild: 16; moderate: 17-23; severe: 24) it is noted that half of the participants defined their symptoms as mild and the other half as moderate or severe. That way, only in cases with the lowest score according to the protocol, which is, cases with mild symptoms of depression, the symptoms improved with the practice of regular physical activity. So, it is clear that patients, in this case, who have moderate and severe symptoms of depression, did not improve their scores with activities.

In this way, we were able to infer from this study that the practice of isolated physical activity may be not responsible for the improvement of the severe symptomatology of depression in the elderly, thus, we noted that it is valid to study how multidisciplinary follow-up could work in these cases. This is proven by some studies already carried out, in which there was a difference in the symptoms of anxiety and depression that favor collaborative or multidisciplinary care, in a study in question, there was a difference in 6 months of – 5.9 points (according to the BDI-II scores), which was statistically significant and progressive (CURTH, 2020).

Thereby, we assume that the combination of pharmacotherapy, psychotherapy, building an important and careful relationship between the health care team and the patient, nutritional monitoring, performing physical activities that please the patient, in addition to monitoring and caring for the patient's family and caregivers are means of treatment that, together, may contribute to enhancing the clinical status and, overall, quality of life of our patients.

Conclusion

The study participants were mostly elderly between 60 and 69 years old, female, self-declared as white, with complete high school education, monthly income of up to 2 minimum wages, married, with a history of chronic diseases, non-smokers and non-alcoholics. Furthermore, we noticed that, despite not being expected, the participants with moderate and severe symptoms of depression did not evolve positively with the regular practice of physical activity alone, with a slight worsening of their scores, concomitantly, the participants with mild symptoms were able to obtain a small improvement of their frames.

In this way, it is inferred, in this study, the need for future research to investigate the relationship between depression and other multidisciplinary treatments.

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