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THE INFLUENCE OF PHYSICAL EXERCISE ON THE MENTAL HEALTH OF ELDERLY PEOPLE WITH DEPRESSION: A SYSTEMATIC REVIEW

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ABSTRACT
This study aimed to conduct a systematic review of the literature to investigate the influence of physical exercise on the mental health of elderly people with depressive conditions. The review was prepared following the methodological recommendations proposed by The Cochrane Collaboration. The terms used were "elderly", "physical exercise", "mental health" mediated by the Boolean operator AND. Searches were carried out in the Scielo, Pubmed, and Line Universitet databases. The searches covered the period from 2019 to 2024 and were carried out in May 2024. A total of 10,504 studies were found in these databases and in the end 13 articles were included in the results of the present systematic review. The main findings of the present systematic review of the literature indicate a predominance of conventional training methods, variable in the intervention periods, positive score after application of the intervention methods. Thus, through these findings, different methods of intervention with physical exercises were identified, where all of them are effective when they demonstrate that the participants obtained improvements in depressive symptoms after the participation periods, which proves the effectiveness of physical exercise, in this sense, having a positive influence reducing depressive symptoms and consequently improving the mental health of the elderly.

Keywords: Aging, Quality of life, Physical activity, Psychological, Depression.

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INTRODUCTION

The world is already realizing the effects of the aging of the population and it is important to find ways for the elderly to have a healthy life. So, one of the alternatives to think about is physical exercise. According to Neri (2001), physical activity contributes to a good mood by reducing symptoms of depression. The elderly who have a physically active life can prevent many mental health problems.

According to Viana (2010), research indicates that the stress level of active people is lower than that of non-active people. The WHO – World Health Organization (2022) says that any activity that moves muscles and spends energy is called physical activity. Staying active is good for the body, helps prevent diseases, and contributes to quality of life (WHO, 2022).

With advancing age, there is a natural tendency for loss of muscle mass, strength, and motor function, in addition to bone fragility, damage to cartilaginous structures, reduced elasticity, fatty infiltration, and stiffening of joints and ligaments, which can lead to a reduction in quality of life and increase the risk of chronic diseases (Silva, 2021; Xerente et al., 2020).

According to Perez (2022), Xerente et al. (2020), and Soares et al. (2019), musculoskeletal diseases (MSD) are a threat to healthy aging, the term musculoskeletal disorders (MSD) is used to characterize any injuries to muscles, tendons, joints, ligaments, bones, nerves and the vascular system, so when impaired they cause functional imbalance that in turn can trigger a sedentary lifestyle, frailty, loss of independence and depressive symptoms.

Silva (2021), brings that physical exercise for the elderly is an excellent ally for adhering to a healthy lifestyle and reducing the risk of diseases, as it is associated with numerous benefits for physical and mental health. In this sense, it can be used both for the prevention and treatment of diseases arising from age.

To get along well with people, you need to take care of your mind, be able to make your own decisions and choices, and learn to deal with everyday problems. (WHO, 2022). Depression is a mental disorder that can affect this coexistence, as it causes people to experience some feelings such as apathy, sadness, changes in sleep and appetite, tiredness, difficulty concentrating, and low self-esteem (Galán-Arroyo, C et.al, 2022).

In Europe, depression is one of the greatest public health concerns, being classified as the fourth cause of death among the population (Galán-Arroyo, C et.al, 2022). It is

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understood that public policies should have this role of welcoming and developing programs to help and also subsidize treatment for these people. Think about physical activities that help health, and physical exercise positively affects the central nervous system, and can reduce depressive symptoms (Cui, 2021).

With the growth in the number of elderly people, it is important to understand what brings them better living conditions, and how this changes as they age (Netto and Ponte, 2002). By the year 2050, there are expected to be many more elderly people in the world, representing a fifth of the population (Luz et.al, 2008).

In this sense, the objective of the present study was to conduct a systematic review of the literature to investigate the influence of physical exercise on the mental health of elderly people with depressive conditions.

METHODOLOGY

SEARCH STRATEGIES

This review was prepared following the methodological recommendations proposed by The Cochrane Collaboration (Cochrane, 2012). To determine the databases, keywords and syntaxes used in the present research, a series of meetings involving the team of researchers responsible for data collection were held.

Based on the meetings, it was decided to use the terms elderly, physical exercise, mental health, mediated by the Boolean operator AND. Searches were carried out in the Line Universitet, Pubmed, and Scielo databases. The syntaxes used in each database are presented in Chart 01. The searches covered the period from 2019 to 2024 and were carried out in May 2024.

Table 01: Database and the respective search syntaxes.

Database	Search syntax
Line University	*Any field contains Elderly AND Any field contains physical exercise AND Any field contains mental health*
Pubmed	*((Elderly) AND (physical exercise)) AND (mental health)*
Scielo	*(slderly) AND (physical exercise) AND (mental health)*

Source: survey data.

INCLUSION CRITERIA

The following were included in this review: a) original articles; b) Elderly participants with depressive disorder c) intervention with physical exercise d) comparative analysis of physical exercise and depression f) carried out in the period from 2019 to 2024; g)

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published in Portuguese, English or Spanish. Articles published in conferences, abstracts, dissertations, theses, and book chapters were not included.

SELECTION OF ARTICLES

In the first stage of the searches, all studies found in the databases based on the syntaxes used were included. At this stage, a total of 10.504_estudos were found in the following databases: Line Universite n= 2,448, Pubmed n=8,023 and Scielo n=33, as can be seen in Figure 01. After applying the filters on the type of document (articles) of the languages (Portuguese, English or Spanish) and search period (2019 to 2024), 9,059 documents were excluded, and the number of documents was reduced to 1,445 (Line Universite n= 987, Pubmed n=453 and Scielo n=15), which were extracted from the databases and included in the Rayyan QCRI system for management of the selection process.

After the searches, at the first consensus meeting, the researchers identified and excluded 39 duplicate studies, leaving 1,406 for the title reading phase. A total of 1,317 articles were excluded after reading the titles, leaving 89 articles for reading the abstracts. After reading the abstracts, a total of 59 articles were discarded because they did not meet the inclusion criteria, leaving 30 articles for reading in full. After the full reading was completed, 17 articles were discarded because they did not meet the objectives of the study or because they did not present sufficient information for their inclusion. In total, 13 articles were included in the results of the present systematic review. The entire process of selecting articles is presented in Figure 01.

DATA EXTRACTION

The authors independently extracted data from the articles included in the review. A standard data extraction form was used, which included the characteristics of the study: authors and date of publication, place of publication, experimental sample, method of intervention, period of intervention, instruments, objective, results, and conclusion.

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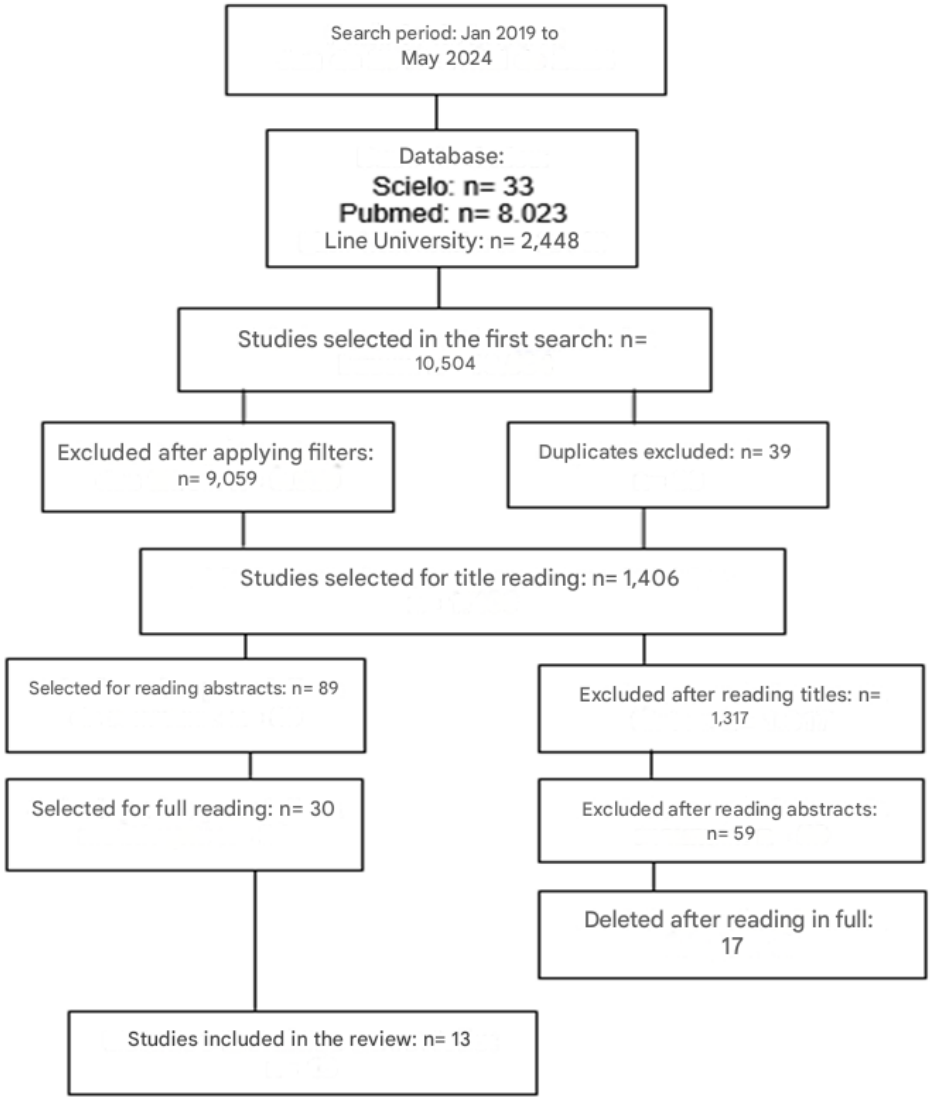
Figure 1 - Organizational chart of the searches: period of the searches, databases used, reading criteria and selection of studies.



Source: survey data.

RESULTS

After applying all the inclusion and exclusion methods, the present systematic review had thirteen articles included. These studies have different origins, three from Brazil (E1, E3 and E4), three from Korea (E2, E6 and E9), three from Spain (E7, E10 and E13), one from Saudi Arabia (E5), one from Iran (E8), one from China (E11) and one from Malaysia (E12). The study with fewer participants had a sample of 12 elderly women (E4), while the study with more participants had a sample of 377 elderly people (E7), if added together, the thirteen studies have a total of 1,157 participants.

Regarding the intervention with physical exercises, seven methods were used by the studies: aerobic training, strength training, aquatic exercise, recreational training, flexibility

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and balance exercises, Taekwondo training and home physical activity. The duration of intervention varied, with studies with a shorter period of 12 weeks and a longer period of 12 months.

For the assessment of depression levels in the elderly, the studies present a total of 8 instruments, where the Hamilton Depression, Mood States Profile (POMS) and Geriatric Depression Scale (GDS 15) scales appear in more than one study.

According to the results and conclusions of the included studies, all the elderly showed improvements in depressive symptoms after the interventions with physical exercises.

Table 01: Study identification, author, date, location, experimental sample, intervention methods, intervention period, and data collection instruments. (N= number of participants).

Study (E)	Author/ Date	Local	Amostra Experimental	Method of intervention	Intervention period	Instruments
1	Moraes et al., 2019	Brazil	Elderly n = 27	Aerobic training (AT), strength training (TF) and control group (CG).	24 sessions in 12 weeks	Hamilton Depression
2	Jin et al., 2019	Korea	30 elderly women were assigned to the exercise (n = 15, age 80.8 to 3.8 years) or control group (n = 15, age 78.6 to 3.2 years)	The exercise group was subjected to resistance exercise plus walking	5 times a week - for 6 months	Korean version of the Short form of the Geriatric De-pressure Scale (SGDS-K)
3	Silva et al., 2019	Brazil	30 elderly people were included in the study and allocated to the depression (n=16) and non-depression (n=14) groups.	Water exercise	24 sessions in 12 weeks	Hamilton depression
4	Sanches et al., 2020	Brazil	Elderly n = 12	Recreational training	Sessions were held on Mondays, Wednesdays, and Friday mornings (8-9 AM) for 12 weeks.	Hospital Anxiety and Depression Scale' (HADS)
5	Algharir A Gabor, 2020	Saudi Arabia	80 individuals of both sexes, aged between 65 and 95 years. Control group (n= 30) and depressive group (n= 50)	Aerobic training	12 weeks, 3 times per week - 45 to 60 min per session	Profile of Mood States (POMS)
6	Lee, Lim e Kim, 2020	Korea	Elderly n = 20	Water exercise	12 weeks, 3 days a week - 60 min per session	Profile of Mood States - Brief (POMS-B)

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7	Perez-Souza et.al, 2020	Spain	Sample of 377 middle-aged and older adults	Brisk walking with intermittent flexibility, strength, and balance activities/exercises.	3 days per week in 12 months - 50 to 60 min per session	Geriatric Depression Scale
8	Motamandi E Mostajabodavati, 2021	Iran	61 elderly people were divided into two groups: intervention group (IG) and control group (CG).	Home physical activity	3 months of daily activities	Geriatric Depression Scale (GDS 15)
9	Baek, et.al, 2021	Korea	24 seniors aged 65 or older	Taekwondo Training	3 sessions – 60 min per week for 12 weeks.	Geriatric Depression Scale - Korea
10	Hidalgo, *et. al* 2021	Spain	347 seniors aged 65	Randomized clinical trial in 2 groups: physical activity (PA) group or antidepressant (AT) treatment. Aerobic exercises, muscle strength, and flexibility, as well as exercises designed to improve balance	2 sessions of 1 hour per week over a period of 6 months (a total of 48 sessions in groups of 10-12 people)	Montgomery-Åsberg Depression Rating Scale (MADRS).14-15
11	Cunha, *et.al, 2021*	China	41 elderly women	Resistance Training (RT)	12 weeks, 3 days a week - three sets of 8 to 12 reps	15-item Eryatric Depression Scale - GDS-15
12	Maung et al., 2022	Malaysia	39 elderly people	Strengthening and aerobic exercises	12 weeks, 3 days per week	Depression, Anxiety, and Stress Scale (DASS-21)
13	Ruiz-Comellas et al., 2022	Spain	69 idos: CG n= 35, VA n=34	Aerobic physical activity	4 months 2 times a week	Beck Depression Inventory (BDI-II)

Source: survey data.

Table 02: Study identification, objective, results, and conclusions.

Study (E)	Objective	Results	Conclusion
01	The present study aimed to compare the effects of aerobic training (AT), strength training (FT) and low-intensity exercise (contact/social control group, CG) as adjunctive treatments to pharmacotherapy in reducing depressive symptoms in elderly people with major depressive disorder (MDD).	Symptom remission was higher in the TA and TS groups when compared to the CG (Table 2). The CG did not show remission according to the scale (HAM-D or BDI). The response to treatment was higher in the AT and ET groups, while the CG did not show a response after the intervention.	Based on these results, it can be interpreted that regular physical activity brings clinical benefits to elderly people diagnosed with MDD. People with mental illness have an increasing risk of physical illness, as well as reduced access to appropriate care. Therefore, physical exercise is an additional treatment to reduce the costs of physical comorbidities [39]. In clinical applications, the two training methods applied during the same session can increase the likelihood of a response to treatment [40, 41]. However, it is necessary to determine the intensity and method of training to optimize the efficiency of the treatment.

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02	This study aimed to investigate the effect of a long-term exercise intervention on depressive symptoms in older Korean women	Participants in the exercise group had a significant decrease in GDS-K scores ($p < 0.001$), while participants in the control group did not. In addition, there was significant time per group interaction for mean values in body fat percentage ($F(1.23) = 6.122$, $p=0.021$), lean body mass ($F(1.23) = 5.662$, $p=0.026$) and waist circumference ($F(1.23) = 4.330$, $p=0.049$) and pre- between the two groups.	In this study, we show that long-term exercise interventilation combined with resistance exercise and walking reduces symptoms of depression, body fat, and improves physical functional capacity in older women, implying a therapeutic role of regular exercise to promote mental health in geriatric populations.
03	The aim of this study was to investigate the effects of aquatic exercise on mental health, autonomy parameters, and oxidative stress in depressed older adults.	The patients were 63.5 to 8.8 years old. The following scores were decreased after training in the depressed group: depression (53%), anxiety (48%), and Timed Up & Go (33%). The following scores increased: Berg Balance Scale (9%) and flexibility (44%). Regarding blood-based parameters, there was carbonylation of proteins (46%) and nitric oxide (60%) and increases in glutathione (170%) and superoxide dismutase (160%) in the depression group (po0.005).	The aquatic exercise program reduces depression and anxiety, improves functional autonomy, and decreases oxidative stress in depressed older adults.
04	To develop a standardized exercise protocol in terms of frequency, duration, intensity, and type of exercise for elderly women with T2DM	The HADS questionnaire revealed that 12 weeks of RET reduced the levels of anxiety and depression induced by T2DM (Figure 3 a, b).	Our results show the clinical relevance of RET in terms of metabolic and cardiovascular adaptations. In addition, the unconventional activities of a RET protocol appear to improve diabetes-induced mental disorders.
05	To evaluate the effects of a 12-week moderate-intensity supervised aerobic training program on the mood profile and hormone levels of the hypothalamic-pituitary-adrenal axis (HPA axis) of older adults	Older adults with higher depressive scores showed a notable change in the level of adrenal hormones compared to the control. There was a significant increase in the level of ACTH, CORT, cortisol, and cortisol:DHEA/S ratio, and decrease in DHEA/S. Compared to women, men showed an improvement in depressive mood score along with an increase in LPTA, DHEA/S, and decrease in ACTH, CORT, cortisol, cortisol:DHEA/S	The findings of this study showed that 12 weeks of supervised exercise interventions are promising non-drug therapeutic strategies in improving depression among the elderly. Potential performance in a psychological state occurs physiologically through the optimization of the levels of the hormones of the HPA axis.

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		ratio after 12 weeks of supervised aerobic training, respectively.	
06	Our aim was to investigate the effect of aquatic exercise on the immune system Response in prefrailty elderly women	Immunoglobulin changes in IgA, IgG, IgM, and IgE were measured at baseline and after 12 weeks are presented in Table 2. Two-way ANOVA revealed group-time interaction for IgA (p = .049), IgG (p = .047), and IgM (p = .014). Intragroup analyses showed that IgA, IgG, and IgM were significantly increased in the exercise group, and IgE was significantly decreased in the exercise group after 12 weeks from baseline. However, IgA, IgG, IgM, and IgE decreased significantly in the control group after 12 weeks.	This study indicates that an aquatic rehabilitation exercise is an effective lifestyle intervention strategy to improve immune function and mood status in prefrailty older women. In addition, continuation of aquatic rehabilitation exercise for 12 weeks led to increased serum levels of IgA, IgG, and I M. And positive-changed POMS scores of tension-anxiety, depression, confusion, anger-hostility. Therefore, these findings provide preliminary evidence indicating that an aquatic rehabilitation exercise may represent an effective intervention strategy to improve quality of life and delay frailty in pre-frailty older women.
07	To analyze the effects of 12 months of participation in a public physical activity program linked to primary care on the level of depression and physical fitness, and to determine which components of physical fitness were responsible for the improvement of depression using mediation analysis	A considerable reduction from mild, moderate or severe depression to non-depression was obtained for the exercise group (68%) P<0.05 The parallel mediation analysis showed that flexibility and cardiorespiratory fitness were mediators of depression reduction.	It was effective in improving depression in the elderly. Integrating aerobic and flexibility exercise into a group-based physical activity program could improve the severity of depression in this population.
08	This study aimed to investigate the effect of the home physical activity scheme on the quality of life (QoL), sleep quality and mood of elderly people at risk of depression in relation to the control group	Depression scores at 1 and 3 months during the intervention and 1 month after the intervention were significantly lower in the intervention group, with a mean of 3.60, 3.91, 2.03, 2.43, and 2.66, 3.37 compared to the control group, with averages of 5.39, 2.88, 4.96, 2.77, and 5.13, 3.14, respectively (P < 0.05). In addition, QoL and total PSQI scores in the physical and mental dimensions at 3 months during and 1 month after the intervention were higher in the intervention group	Conclusion: According to the findings of the study, the addition of the home physical activity schedule to the routine care of the elderly can play a significant role in reducing the severity of depression and improving the physical-psychological quality and quality of sleep.

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		compared to the control group (P < 0.05)	
09	To identify the correlations between improved functional fitness through a long-term Taekwondo training program and the physical characteristics and risk factors of dementia among older women with depression	Improvements in a number of indices of functional fitness, the arteriosclerosis index and cognitive function improve with an increase in brain-derived neurotrophic factor, a significant decrease in ÿ-amyloid – a risk factor for dementia – as a result of improvements. serum lipids and adiponectin	The Taekwondo training program improved functional fitness, leading to improved depression and physical characteristics of the elderly participants. The correlation with dementia risk factors was thus identified based on improved cognitive functions and reduced ÿ-amyloid level
10	To compare the efficacy of physical exercise with that of treatment with antidepressants routinely used in clinical practice, in terms of reducing depressive symptoms in patients aged 65 years who meet clinical criteria for depressive episodes.	When using the intention-to-treat analysis, logistic regression showed that, at the end of the follow-up period, the probability of improvement in depressive symptoms was higher in the TA group	It is concluded that both AT and PA, performed in group sessions, are capable of reducing depressive symptoms among people aged 65 years diagnosed in primary care with mild to moderate depressive disorder.
11	To analyze the effect of resistance training (RT) on depressive and anxious symptoms and to examine the possible consequences of age, cognitive changes, and muscle strength on such symptoms	Significant improvements (P < 0.001) induced by the RT in total muscle strength were observed Depressive and anxiety symptoms (even when adjusted for chronological age and changes in muscle strength or cognitive function) were reduced with the RT according to GDS-15 Time-group interactions were significant for depressive and anxious symptoms.	The results suggest that a 12-week RT program reduces depressive and anxiety symptoms regardless of age, muscle strength, and cognitive function in older women
12	The study aimed to determine the effect of exercise on the QoL and mental health of older adults living in nursing homes during the COVID-19 pandemic.	After 12 weeks of the exercise program, the scores of the physical domain increased from 53.1 to 61.8, the psychological domain from 51.8 to 59.3, the social domain from 53.2 to 60.5, and the environmental domain from 67.2 to 72.1. In addition, there was a significant reduction in the depression score from 6.2 to 4.4, in the anxiety score from 3.5 to	Performing aerobic and strengthening exercises for a minimum of 12 weeks may have helped improve the mental health of older adults during the COVID-19 pandemic, and may also improve the quality of life of those living in nursing homes.

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		2.2, and in the stress score from 4.6 to 2.8.	
13	The aim of this study was to evaluate whether a 4-month program of moderate PA in a group would improve emotional state, levels of social support, and quality of life in a sample of individuals aged > 64 years.	Table 2 shows that both groups had better results in the anxiety and depression questionnaires, but the intervention group improved more, in the sense that their mean scores were below the diagnostic cut-off points for depression (Beck Scale < 14 points: no depression) and anxiety (GAD7 Scale < 10: no anxiety), in contrast to the control group with scores above the cut-off points.	The PA program of the moderate group improved clinical anxiety, depression, social support, and perceptions of health status in the patients studied.

Source: survey data.

DISCUSSION

This systematic review sought to investigate the literature records of the last 5 years that have applied physical exercise programs to analyze their effects on the mental health of the elderly, specifically depression. A total of thirteen articles were included in the review, the main findings show: A) Predominance of conventional training methods; B) Variables in the intervention periods; C) Positive score after application of the intervention methods.

The intervention methods with aerobic training and strength training were the ones that appeared the most, with aerobic training and strength training together in five studies (E1, E2, E7, E10 and E12) and aerobic training appears alone in two studies (E5 and E13) and strength training in one study (E11), then we have aquatic exercises that appear in two of the studies (E3 and E6), flexibility and balance exercises that also appear in two of the studies (E7 and E10) and the rest of the methods appear only in one study, recreational training (E4), home physical activity (E8) and Taekwondo training (E9). Aerobic training and strength training are the most conventional today, they are among the most practiced and the tendency is for their practice to increase even more, their application is safe and their variables can be controlled and adapted to the participants, this may be one of the reasons for their predominance in the findings (Schoenfeld, 2016; ACSM, 2023).

Of the intervention periods, most of the intervention periods are proposed 3 months of training in nine of the studies (E1, E3, E4, E5, E6, E8, E9, E11 and E12), ranging from 2 to 3 training sessions per week, only two studies (E2 and E10) worked with 6-month protocols, where the first works with 5 sessions per week and the second uses 2 sessions per week. Study E7 proposes a 12-month intervention with 3 sessions per week, while E13 performs the study with an intervention of 4 months and 2 sessions per week.

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Although there are variations regarding the periods of application of the exercises and their training methods, it is possible to observe that in all proposals the scores improve after their application and according to the shortest intervention period presented in some of the findings, which would be two sessions of 60 min per week for 3 months, It can be said that this minimum period was enough to improve the depressive conditions of the elderly. In this sense, the WHO, 2020 indicates that for the elderly, the minimum should be 150 min of moderate-intensity aerobic activity and moderate-intensity muscle strengthening activities twice a week.

CONCLUSION

The aim of this study was to conduct a systematic review of the literature to investigate the influence of physical exercise on the mental health of elderly people with depressive conditions. Through the findings, different methods of intervention with physical exercises were identified, where all of them are effective when they demonstrate that the participants obtained improvements in depressive symptoms after the participation period, which proves the effectiveness of physical exercise, in this sense, having a positive influence reducing depressive symptoms and consequently improving the mental health of the elderly.

The intervention methods have their own characteristics in relation to the number of participants, experimental method, period, frequency and duration of the interventions and instruments used, which was decisive for the results. All methods bring results with a reduction in the depressive condition of the elderly, reduction of stress, anxiety, improvements in mental health as a whole. It is possible to say that physical exercise is a strategy to improve the lifestyle of the elderly, who due to their advanced age often end up becoming sedentary, which harms physical and mental health.

This study brings important evidence that associates good mental health with physical exercise, and thinking about treatment methods to avoid depressive conditions in the elderly or even reduce existing cases could be considered in a public health sphere, requiring effective subsidies and programs that serve the elderly population.

This review suggests that further studies can be carried out comparing exercise/physical training styles and their efficacy in relation to depressive conditions in the elderly, in order to determine whether or not there is a modality that has the greatest influence on the treatment of depression.

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