



REVIEW

Impact of Exercise on Depression in Older Adults: Potential Benefits, Risks, and Appropriate Application Strategies

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ABSTRACT

As the global elderly population increases, depression within this group has become a significant public health concern. Although exercise has been recognized for its potential to improve depression in the elderly, the benefits, risks, and implementation strategies remain contentious. This review attempts to examine the impact of exercise on depression in older adults, including potential benefits, risks, and suggestions for application. Our analysis highlights the benefits of aerobic and resistance training, which can significantly alleviate depressive symptoms and enhance overall quality of life. Despite these benefits, the review acknowledges the complexity of the exercise-depression interaction in the elderly, necessitating personalized exercise regimens. Potential risks, such as muscle and joint pain, are pointed out, emphasizing the importance of tailored, supervised exercise programs. The review calls for future research to focus on identifying the most effective types of exercise and regimens for this population, considering factors such as age, gender, and existing health conditions. Lastly, it advocates for the inclusion of exercise in comprehensive treatment plans for depression in older adults, viewing it as a promising step toward achieving holistic mental health care in a growing demographic.

KEYWORDS

Exercise; depression; older adults; potential benefits; risks; application strategies

Introduction

With the continuous growth of the global elderly population, depression disorders among the elderly, as a vulnerable group in society, have become an increasingly prominent public health issue. Depression not only significantly impacts individuals but also poses a substantial burden on society and the healthcare system. Current data reports a global prevalence of depression in the elderly at 28.4%, though regional cultural differences and varying screening tools contribute to significant heterogeneity [1]. Another study found that over one-third of the elderly population suffers from depression, highlighting the critical need for effective prevention measures, regular screening, and timely intervention to address this public health issue [2].

In recent years, an increasing number of studies have focused on exploring non-pharmacological therapies, specifically exercise therapy, to address elderly depression. Notably, recent research has shed light on the positive effects of physical activity on elderly depression. A meta-analysis that included various studies, some of which specifically targeted the elderly population, showcased the beneficial impact of exercise, with commonly studied exercise types including aerobic and resistance training. However, the exact nature of the most effective exercise program still requires further exploration [3]. Conversely, some studies have found an inverse relationship between physical activity and elderly depression, underscoring the need for additional research to comprehend the dose-response relationship and identify the most beneficial types



of physical activity [4]. Furthermore, a systematic review investigating physical activity in depressed elderly individuals has identified promising findings, particularly in the combined use of physical activity and antidepressant medication for the treatment of elderly depression that is resistant to conventional therapies. Nevertheless, this review also highlights the limited progress made in the past two decades due to a lack of high-quality research and the complexity of managing late-life depression [5]. These articles collectively suggest that the advantages and risks of physical activity in managing depression in the elderly remain unclear, leaving uncertainties regarding the appropriate application of exercise for elderly individuals with depression.

Therefore, the objective of this review is to explore the effects of exercise on elderly depression, including its potential advantages, risks, and appropriate application strategies. We will comprehensively examine the relevant literature, particularly studies that focus on the impact of physical activity on elderly mental health and quality of life. This review holds potential value for understanding the potential advantages and risks of exercise therapy for depression and developing appropriate exercise prescriptions.

Depression in Older Adults

Depression is a significant public health concern among older adults, garnering considerable attention due to its high prevalence and intricate associations with physical health issues. Research indicates that the global prevalence of depression in older adults is approximately 28.4%. However, these figures vary across regions due to disparities in screening tools, sample sizes, and research methodologies [1]. Depressive symptoms frequently coexist with other medical conditions in the elderly population, leading to a detrimental impact on quality of life and increased healthcare utilization. Additionally, depression in this population is strongly correlated with a heightened risk of suicide, especially among men [6].

The challenges encountered in diagnosing and treating depression often result in under-identification and insufficient treatment in older adults. This problem is compounded by the overlapping symptoms of depression with other conditions such as cognitive decline, thereby making accurate diagnosis problematic [7]. Effective interventions for severe depression in older adults encompass pharmacotherapy, electroconvulsive therapy, psychotherapy, and exercise. The choice of treatment modality depends on various factors, including the severity of depression and patient preferences, particularly considering the vulnerable state of some elderly individuals [8].

Given the propensity of depression to recur among older adults, the implementation of maintenance strategies is crucial to prevent relapse. These strategies involve ongoing medication management and psychotherapy [6]. Depression in the elderly population commonly manifests with more physical symptoms and fewer cognitive manifestations, thereby presenting distinct challenges in terms of identification and management [6]. A study conducted in the United States suggests that varying rates of depression

are observed among different elderly populations, such as community residents and individuals with coexisting medical conditions. This implies the necessity of tailored considerations in drug therapy and psychotherapy for treating depression in older adults [9]. Furthermore, multiple studies have indicated that exercise exerts a measurable impact on depression in older adults, highlighting both advantages and risks, which will be explored in subsequent sections.

Potential Benefits of Exercise for Depressive Disorders in Older Adults

The potential advantages of exercise as a therapeutic method for depression in older adults have been extensively researched and recognized. Studies have shown that physical activity not only improves the mental health of older adults but also has a positive impact on their overall quality of life. One study found that sleep issues, lack of energy, and insufficient physical activity may contribute to depressed mood and emotional changes, which contradicts the previously held belief that depression leads to reduced physical activity [10]. Another study emphasizes that physical exercise, particularly moderate-intensity exercise combining aerobic and anaerobic activities, has significant effects in alleviating depressive symptoms [11]. Exercise is particularly effective for older adults, although there are methodological differences in related research [12]. Moreover, a meta-analysis conducted on older adults, adjusting for publication bias, revealed greater benefits of exercise in reducing depressive symptoms than previously estimated, suggesting that exercise should be regarded as a routine component of depression management in older adults [13]. These findings consistently demonstrate that exercise not only improves depressive symptoms but also brings other health benefits, such as improvements in the cardiovascular and musculoskeletal systems. In a study targeting elderly patients with depression in primary care, participants were divided into two groups: one received supervised physical exercise while the other received antidepressant medication. The results showed significant improvement in depressive symptoms during the treatment process for those in the exercise group [14].

Overall, exercise has been proven by multiple studies to be an effective method for improving depressive symptoms in older adults and is recommended as an important component of mental health management in the elderly. Although further high-quality clinical trials are needed to determine the extent of exercise's impact on improving depressive symptoms, the current evidence is sufficient to support the crucial role of exercise in the treatment of depression in older adults.

The Potential Risks of Exercise on Depressive Disorders in the Elderly

Most studies have not reported any adverse event during exercise therapy [15]. However, Danielsson et al. [16] found that approximately 3% of participants in the exercise group

experienced muscle and joint pain, which exacerbated their depressive symptoms. In a study involving the elderly [11,17], the exercise group experienced adverse reactions such as muscle pain, mild bruising, and exercise-related dizziness. More severe cases included radius fractures and syncope after falls. The overall incidence of adverse events was lower than that of the medication group. In some studies [17], participants had a low compliance with exercise therapy, with a high dropout rate. This suggests that not all patients are suitable for exercise therapy, and psychiatrists need to comprehensively assess patients' physical condition and treatment feasibility before implementation to prevent accidents.

It is worth noting that due to the influence of publication bias, the effectiveness of exercise therapy may be overestimated, and caution should be exercised when interpreting related research results [18]. Currently, only a few high-quality trials with low bias risk have demonstrated the effectiveness of exercise therapy [19]. A systematic review [20] showed that exercise therapy has a moderate effect on relieving depressive disorders; however, after limiting bias risk, the overall antidepressant effect of exercise therapy is minimal. Krogh et al. [21] also confirmed that exercise therapy does not show an antidepressant effect after limiting bias risk. The effectiveness of exercise therapy still needs to be further validated by more multicenter, large sample randomized controlled studies.

Development of Appropriate Exercise Regimens for Elderly Individuals with Depression Disorders

The previous section reviewed the potential benefits and risks of exercise for elderly individuals with depressive disorders. However, it is insufficient to have this knowledge alone, as it is necessary to develop appropriate exercise regimens based on these potential advantages and risks. Therefore, this section focuses on the development of appropriate exercise regimens for elderly individuals with depression disorders, specifically discussing the optimal types of exercise, optimal

duration of intervention, appropriate frequency of exercise, and optimal exercise frequency. The key points and remarks related to these aspects are presented in Table 1.

Optimal types of exercise

Aerobic exercise, characterized by continuous physical activity (such as running, swimming) at a moderate intensity—maintaining heart rate between 64% and 76% of its maximum—over a relatively extended period, is widely recognized as an effective intervention for treating depressive disorders [22]. However, the efficacy of other exercise modalities, such as resistance training [23], Tai Chi [24], Yoga [24], and High-Intensity Interval Training (HIIT) [25], remains a subject of debate, particularly regarding their positive impact on depression.

Studies indicate that HIIT may possess an antidepressant effect 1.37 times greater than that of aerobic exercises [25]. Notably, a Korean study [26] found divergent effects based on gender: resistance exercises were more effective in alleviating depressive symptoms in males, whereas aerobic exercises were more beneficial for females. Furthermore, psychophysical activities in elderly populations may yield superior outcomes compared to solely aerobic or resistance exercises [15].

It is critical to objectively consider these findings, as some of the referenced studies may suffer from limitations such as non-standardized experimental designs, small sample sizes, and inconsistencies in methodology and exercise programming.

Optimal duration of intervention

The optimal timing and duration of exercise therapy intervention to achieve peak clinical efficacy in the treatment of depressive disorders remains a subject of debate in current research. Comparative studies have been conducted to evaluate the outcomes of immediate vs. delayed (12-week) exercise therapy intervention in depressive disorders. The findings indicate a notably superior effect of immediate intervention [27]. Within the immediate intervention group, the first six weeks showed

TABLE 1

Key points and remarks of exercise programme development for depressive disorders in older adults

Section	Key points	Remarks	References
Optimal types of exercise	Efficacy of aerobic exercise is widely recognized. Effectiveness of resistance training, Tai Chi, Yoga, and HIIT debated.	Gender-specific effects noted. Aerobic beneficial for females, resistance exercises for males.	[22–26]
Optimal duration of intervention	Immediate exercise intervention shows superior effect. First six weeks crucial for significant improvement.	Therapeutic effects vary at different stages. Long-term effects and specific timing need more research.	[27,28]
Appropriate frequency of exercise	Positive effects on older adults. Inverse relationship between exercise and depression. Further research needed on exercise types and frequencies.	Study highlights benefits of balanced and resistance exercises in older adults with mental health issues.	[3–5,29,30]
Optimal exercise frequency	Exercise beneficial for mental health in older adults. More studies required to determine specific modalities and frequencies.	Variations in study outcomes; systematic review and longitudinal studies necessary for conclusive evidence.	[18,31–34]

significantly greater improvements in depressive symptoms than the subsequent six weeks. Additionally, another study highlights that the ameliorative effects of walking exercises on depressive symptoms were particularly pronounced in the initial four weeks [28].

These findings suggest that the therapeutic effects of exercise vary at different stages of the depressive disorder, with potential peak efficacy occurring at a specific phase. However, experimental designs focusing on the timing of exercise therapy intervention are currently limited, necessitating further research to corroborate these findings.

Appropriate frequency of exercise

Research has demonstrated the positive effects of exercise on alleviating depressive symptoms in older adults [4]. However, there still remains some unknowns regarding the influence of different exercise frequencies and types on depression. Nevertheless, existing evidence supports a significant inverse relationship between exercise and depression in older adults. A mixed-methods study conducted on a regional population in Australia found that exercise provided significant benefits for older adults with mental health issues in terms of their physical and mental well-being [29]. The study utilized adjusted balance and resistance exercises targeting older adults with psychiatric disorders.

In addition, a systematic review highlighted significant variations in the effectiveness of exercise interventions for preventing depression across different studies. Despite the potential value of exercise as an intervention for preventing depression, further experimental research is warranted to strengthen the theoretical foundation and evidence base in this field [3]. A longitudinal study from Japan also examined the impact of exercise frequency and patterns on depression in older adults. The results showed that older adults who engaged in regular exercise had a lower risk of depression compared to those who did not exercise. This study also took into account factors such as age, gender, education level, and family structure [30]. Furthermore, a meta-analysis of published studies, considering adjustments for publication bias, demonstrated that the effect of exercise on improving depressive symptoms in older adults was more significant than previously shown in meta-analyses. This further emphasizes the importance of incorporating exercise as a routine component in the management of depression in older adults [5].

Thus, existing research suggests that exercise has a positive impact on improving depressive symptoms in older adults. However, further experimentation and research are needed to establish a clear understanding and guidance regarding the specific types and frequencies of exercise and the dose-response relationship between exercise and depression.

Optimal exercise frequency

Emerging research delineates the salutary impact of physical exercise on ameliorating depressive symptoms in the elderly population [31]. The exact influence of varying exercise frequencies and modalities on depression, however, remains partially enigmatic. Nonetheless, the extant evidence robustly supports a significant inverse correlation between

physical activity and geriatric depression. A mixed-method study in an Australian cohort revealed pronounced benefits of exercise, particularly tailored balance and resistance training, for older adults grappling with mental health issues [32].

Moreover, a systematic review highlighted considerable heterogeneity across studies regarding the efficacy of exercise in preventing depression. While physical activity holds potential as a prophylactic intervention against depression, further empirical investigations are essential to fortify the theoretical underpinnings and evidential basis in this domain [33]. A longitudinal study from Japan also explored the impact of exercise frequency and patterns on depression among the elderly. The findings suggested a lower risk of depression in regularly exercising older adults compared to their sedentary counterparts, factoring in age, gender, educational background, and family structure [34]. A meta-analysis of published studies, accounting for publication bias, indicated that the effect of exercise on alleviating depressive symptoms in the elderly is more pronounced than previously reported, underscoring its critical role in the routine management of geriatric depression [18].

In summary, current research substantiates the positive influence of exercise on mitigating depressive symptoms in older adults. Yet, the specific exercise modalities, frequencies, and the dose-response relationship between physical activity and depression necessitate further experimental and longitudinal studies for a more definitive understanding and guidance.

Conclusion

This review underscores the significant role of exercise as a therapeutic intervention for depression in older adults. The evidence presented indicates that regular physical activity, including aerobic and resistance training, can markedly improve depressive symptoms and overall quality of life in this population. However, the relationship between exercise and depression in the elderly is complex and multifaceted, necessitating personalized exercise regimens tailored to individual needs and health profiles. Despite the promising benefits, the review also highlights potential risks associated with exercise in older adults, such as muscle pain and joint discomfort. These risks emphasize the need for careful planning and monitoring of exercise programs in this demographic.

Looking forward, it is crucial for future research to focus on identifying the most effective types, durations, and intensities of exercise for combating depression in older adults. Studies should aim to unravel the nuanced interactions between different exercise modalities and depression, taking into consideration factors such as age, gender, and coexisting medical conditions. Additionally, more research is needed to understand the long-term effects of exercise on depression in the elderly and to establish guidelines for safe and effective exercise prescriptions. Ultimately, incorporating exercise into treatment plans for elderly individuals with depression holds great promise. It is a step towards a more holistic approach to mental health

care in this vulnerable population, potentially reducing the reliance on pharmacological treatments and enhancing overall well-being.

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