



International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE

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DEPRESSION: A NARRATIVE REVIEW

DOI

[https://doi.org/10.31435/ijitss.2\(50\).2026.5903](https://doi.org/10.31435/ijitss.2(50).2026.5903)

RECEIVED

11 April 2026

ACCEPTED

10 June 2026

PUBLISHED

23 June 2026

LICENSE



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AEROBIC VS RESISTANCE EXERCISE IN THE TREATMENT OF DEPRESSION: A NARRATIVE REVIEW

Aleksandra Marzec (Corresponding Author, Email: marzec.aleksandra00@gmail.com)

Szpital św. Wojciecha, Gdansk, Poland

ORCID ID: 0009-0007-7885-948X

Natalia Krupa

Szpital Specjalistyczny w Koscierzynie, Koscierzyna, Poland

ORCID ID: 0009-0007-6691-0073

Natalia Marzec

Szpital św. Wojciecha, Gdansk, Poland

ORCID ID: 0009-0008-4722-7321

Weronika Praska

Szpital Morski im. PCK, Gdynia, Poland

ORCID ID: 0009-0004-1544-1404

Joanna Zajęczkowska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0003-4912-9809

Natalia Domańska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0008-6378-8903

Dominika Galińska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0004-8037-2679

Anna Roman

Faculty of Medicine, Medical University of Gdansk, Poland

ORCID ID: 0009-0008-7152-9880

Małgorzata Cherek

Szpital św. Wincenta a Paulo w Gdyni, Poland

ORCID ID: 0009-0007-4116-1854

Stanisław Wardęcki

Szpital Morski im. PCK, Gdynia, Poland

ORCID ID: 0009-0008-7703-490X

ABSTRACT

Introduction. Depression is one of the most significant global health concerns and a leading cause of disability worldwide [1]. Approximately 4% of the global population is affected by depression, including 5.7% of adults (4.6% among men and 6.9% among women), as well as 5.9% of adults aged 70 years and older [2]. Depression is closely associated with physical health, and growing evidence suggests that physical activity, including aerobic and resistance exercise, may play an important role in reducing depressive symptoms [3-8].

Purpose. The study aimed to review and compare the effects of aerobic and resistance exercise on depressive symptoms and to evaluate their potential role in the treatment of depression.

Methods. This narrative review was conducted using electronic databases such as PubMed. Relevant studies, including randomized controlled trials, systematic reviews, and meta-analyses, were selected based on their focus on physical activity interventions in individuals with depression. Both aerobic and resistance exercise modalities were analyzed and compared.

Results. Both aerobic exercise and resistance training were found to reduce depressive symptoms. Aerobic exercise demonstrated consistent effectiveness, particularly in individuals with mild to moderate depression [5,6], while resistance training also showed beneficial effects, potentially through distinct physiological and psychological mechanisms [6,9,10]. Current evidence does not clearly indicate the superiority of one type of training over the other, although some studies suggest that combined training may provide the greatest benefits.

KEYWORDS

Depression; Physical Activity; Aerobic Exercise; Resistance Training; Strength Training; Mental Health; Non-Pharmacological Treatment

CITATION

Aleksandra Marzec, Natalia Krupa, Natalia Marzec, Weronika Praska, Joanna Zajączkowska, Natalia Domańska, Dominika Galińska, Anna Roman, Małgorzata Cherek, Stanisław Wardęcki. (2026) Aerobic vs Resistance Exercise in the Treatment of Depression: a Narrative Review. *International Journal of Innovative Technologies in Social Science*. 2(50). doi: 10.31435/ijits.2(50).2026.5903

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1.Introduction

Depression is a common and serious mental disorder that significantly contributes to the global burden of disease and is one of the leading causes of disability worldwide [1,2]. It is characterized by persistent low mood, feeling of anger and frustration, loss of interest or pleasure, and impaired cognitive and physical functioning. Some people feel more tired than usual or they are unable to sleep, which together negatively affect quality of life. According to global estimates, approximately 4% of the population suffers from depression [2].

Depression is also associated with a range of negative physical health outcomes, including an increased risk of cardiovascular disease [11], metabolic disorders and premature mortality [12]. In addition to its clinical consequences, depression imposes a substantial economic burden on healthcare systems and society as a whole [13,14]. Therefore, both the treatment and prevention of depression remain important public health priorities.

The etiology of depression is complex and multifactorial, involving biological, psychological, and social factors. Although pharmacological treatment and psychotherapy remain the primary approaches to management, their effectiveness may be limited by side effects, accessibility issues, and poor adherence [15,16]. On this account, increasing attention has been given to non-pharmacological interventions that may complement standard treatment.

Physical activity has appeared as a promising strategy in this context. It is defined as any bodily movement produced by skeletal muscles that results in energy expenditure [17]. A significant amount of evidence indicates that higher levels of physical activity are associated with a lower risk of depression, while physical inactivity increases this risk [18,19,20]. Physical activity is especially beneficial due to its availability, safety, and multidimensional health benefits.

Despite growing evidence that supports the beneficial effects of exercise on depressive symptoms, it remains unclear whether different types of exercise provide comparable outcomes. In particular, the relative effectiveness of aerobic exercise and resistance training has not been fully established and compared.

2. Aerobic Exercise And Depression

Aerobic exercise is one of the most investigated forms of physical activity in the context of depression. It involves continuous, rhythmic movements engaging large muscle groups, such as running, cycling, swimming or walking. Many published randomized controlled trials and meta-analyses involving this type of training, prove its effectiveness in reducing depressive symptoms [5,7,21,22].

Some of the large-scale analyses have shown that regular aerobic exercise is associated with a significant reduction in depressive symptoms, particularly in those with mild to moderate depression. For example, a comprehensive meta-analysis found that exercise interventions are an effective treatment, with walking or jogging, yoga, and strength training more effective than other exercises, mainly when intense [7]. Analysis proved that clinically meaningful effects were also present when exercise was combined with pharmacotherapy, such as SSRIs or aerobic exercise was combined with psychotherapy. Compared with active control those results have shown clinically important differences, all these treatments were significantly stronger than the standardised minimum [7].

The effects of aerobic training vary depending on the population. For example, they seem to be stronger in men than in women when aerobic exercise is used together with psychotherapy. Aerobic exercise also appears to work better in older people than in younger ones [7].

One of the most significant randomized controlled trials has shown that aerobic exercise can help reduce depressive symptoms, but its effectiveness depends on the dose. A higher amount of exercise was effective and led to meaningful improvement and remission, while a lower amount did not work better compared to the control group. The frequency (3 vs 5 days per week) did not make a notable difference [21].

The antidepressant effects of aerobic exercise are explained by multiple biological mechanisms. One of the most important is the increase in brain-derived neurotrophic factor (BDNF), which plays a crucial role in neuroplasticity and neuronal survival [5,18]. In addition, aerobic exercise influences neurotransmitter systems, including serotonin, dopamine, and norepinephrine, which are directly involved in mood regulation [18]. It also contributes to the normalization of the hypothalamic–pituitary–adrenal (HPA) axis, leading to better stress response and reduced level of cortisol [5,18].

Additionally to biological factors, psychological mechanisms also play an important role. Regular participation in aerobic exercise may enhance self-efficacy, improve self-esteem, and provide a sense of structure and achievement [4,23]. Moreover, engagement in physical activity may reduce social isolation and promote behavioral activation, both of which are important components in the treatment of depression [3,4].

Despite strong evidence supporting its effectiveness, the problem exists in terms of optimal exercise intensity, frequency, and duration. Nevertheless, current findings consistently support aerobic exercise as an important and accessible non-pharmacological intervention in the management of depressive symptoms.

3. Resistance Exercise And Depression

Resistance training is increasingly recognized as an effective intervention for reducing depressive symptoms. It involves exercises that aim at improving strength of the muscles and endurance. Different forms of resistance exercise include using free weights, machines, bands and your own body weight.

Evidence from randomized controlled trials and meta-analyses indicates that resistance training significantly reduces depressive symptoms across diverse populations, including individuals with both clinical and subclinical depression [6,7,10]. These effects appear to be consistent regardless of training intensity or baseline health status.

Due to a large meta-analysis of randomised controlled trials, strength training (alongside yoga) appeared to be the most acceptable modality. The odds of participants quitting the study were significantly lower [7]. Similarly to aerobic training, the effects of strength training vary depending on the population. For strength training effects appeared larger for women than men and more effective when prescribed to younger participants than older participants [7].

The underlying mechanisms are likely both physiological and psychological. Resistance exercise has been associated with changes in neurobiological and inflammatory pathways linked to depression [6,18], while also improving physical function. In addition, increases in self-efficacy, body image, and perceived control may contribute to improved mood and overall well-being [10,23]. Additionally, the effect does not appear to

be related to gaining muscular strength, suggesting that the benefits appear from engaging in this form of training itself [10].

Resistance training may improve adherence in individuals who do not like aerobic exercise, making it a good option for non-pharmacological treatment.

4. Comparison Of Aerobic And Resistance Exercise

Both aerobic and resistance exercise have been shown to be effective in reducing depressive symptoms; however, their relative effectiveness remains a subject of ongoing research. Current evidence suggests that both modalities produce comparable antidepressant effects, although the underlying mechanisms and additional benefits may differ [5,6,18].

Importantly, several studies indicate that aerobic training is not superior to resistance exercise in terms of antidepressant effects [6,7]. Instead, the effectiveness of the intervention may depend on individual preferences, baseline fitness level, adherence to the exercise program or combination with pharmacological and psychotherapy [4,6]. This outcome helps us understand that a personal approach is very important and may improve treatment effectiveness.

There are more studies involving treating depression with aerobic training therefore this form of activity is often considered the standard form of non-pharmacological treatment in the context of reducing depressive syndromes [5,7]. Its effects are strongly associated with improvements in cardiovascular fitness, regulation of neurobiological processes, and reduction of physiological stress markers [18,22].

In contrast, resistance training, although less frequently studied, has demonstrated similar effectiveness in reducing depressive symptoms [6,10]. Its benefits appear to be particularly related to improvements in muscular strength, body composition, and psychosocial factors such as self-efficacy and self-esteem [10,23]. These differences suggest that resistance training may be especially beneficial for individuals who do not like to engage in aerobic exercise or prefer alternative forms of physical activity.

As mentioned before, the antidepressant effect of specific types of exercise differs between population groups. Although walking or jogging were effective for both men and women, strength training was more effective for women. It also seemed to be more effective in younger people [7]. Overall, the benefits of exercise increased with higher intensity, although the effects were similar regardless of weekly exercise dose, existing health conditions, or the initial severity of depression [7].

Furthermore, some analysis suggests that combined exercise programmes, including both aerobic and resistance training, may provide the greatest benefits [7]. Such approaches may simultaneously target multiple physiological and psychological pathways, potentially leading to more comprehensive improvements in mental health outcomes. However, other studies indicate that combined training may be less effective than committing to a single exercise modality [6].

Overall, both aerobic and resistance exercise represent effective non-pharmacological strategies in the treatment of depression [4,5,6,7,10]. The most important finding of this study is that the positive impact of exercise remained significant across different levels of risk of bias, depression classification, exercise type, group setting, supervision, and sample size [6]. Rather than identifying a single superior modality, current evidence supports the integration of different forms of exercise matching individual needs and preferences.

Table 1. Comparison of Aerobic and Resistance Exercise in the Treatment of Depression

Feature	Aerobic Exercise	Resistance Training
Type of activity	Continuous, rhythmic movement with elevated heart rate (running, cycling, swimming, walking)	Exercise performed against external force (free weights, weight machines, body weight)
Effect on depressive symptoms	Consistently associated with reductions in depressive symptoms [5,7,10]	Shown to reduce depressive symptoms across different populations [6,10]
Main mechanisms	Thought to be mediated by neurobiological mechanisms, including increased BDNF levels, modulation of neurotransmitters, and regulation of the HPA axis [5,18]	Involves both neurobiological and psychosocial mechanisms, including improvements in neuromuscular function, self-efficacy, and perceived control [6,10,23]
Psychological effects	Associated with improved mood, reduced stress, and enhanced psychological well-being [3,4]	Associated with improved self-efficacy, self-esteem, and feeling powerful [10,23]
Physical benefits	Improvements in cardiovascular fitness and endurance [22]	Improvements in muscular strength, functional capacity, and increased muscle weight [10]
Limitations	Variability in optimal dose (intensity, frequency, duration) and adherence [5,7]	Variability in optimal dose, fewer studies compared to aerobic exercise [6,10]
Individuals likely to benefit most	Individuals with low baseline physical activity and those preferring continuous, moderate-intensity exercise.	Women, young adults (7), those who do not like to engage in aerobic activity.

Based on evidence from systematic reviews and meta-analyses [3,5–7,10,18,22,23].

5. Conclusions

Both aerobic and resistance exercise have been shown to be effective non-pharmacological interventions in the treatment of depression. A growing body of evidence supports their role in reducing depressive symptoms, improving overall mental well-being, improving quality of life, and preventing future relapse. Alongside psychotherapy and pharmacotherapy, physical activity represents an important component contributing to antidepressant effects. While aerobic exercise remains the most extensively studied training approach, resistance training has also demonstrated significant and clinically relevant benefits.

The available literature does not clearly show the superiority of one form of exercise over the other. However, the effectiveness of physical activity appears to depend on individual factors, including personal preferences, starting level of physical condition, adherence to the intervention and social factors. Therefore, an individualized approach to exercise prescription may be the most appropriate strategy in the management of depression.

Furthermore, emerging evidence suggests that combining aerobic and resistance training may provide the most broadspectrum benefits by targeting both physiological and psychological mechanisms. Future research should focus on identifying optimal exercise protocols, including intensity, duration, and frequency, as well as appropriate resistance load and number of repetitions in strength training, while exploring long-term effects of different training modalities.

In conclusion, both aerobic and resistance exercise should be considered valuable components of holistic, non-pharmacological approaches to depression management.

6. Clinical Implications

The findings of this review have important implications for clinical practice. Both aerobic and resistance exercise may be considered effective additional interventions in the management of depression and can be added into standard treatment plans alongside pharmacotherapy and psychotherapy.

Due to the comparable effectiveness of different exercise forms, clinicians should prioritize an individualized approach when recommending physical activity as additional treatment. Factors such as patient preferences, physical condition, comorbidities, and prior exercise experience should be taken into consideration to improve adherence and long-term engagement.

From a practical perspective, healthcare providers should consider promoting structured and supervised exercise programs, especially in the early stages of treatment, to improve safety, motivation, and adherence. Additionally, adding physical activity to routine care may help reduce the impact of depression and improve mental and physical health.

Overall, exercise should be recognized as a valuable, accessible, and affordable component of comprehensive depression management.

Author's contribution:

Conceptualization: A.M., N.K.

Methodology: A.M., N.K., N.D.

Investigation: A.M., N.K., N.D., N.M., D.G., S.W.

Data curation: N.M., D.G., S.W., M.C., W.P., A.R.

Writing – original draft preparation: A.M., N.K., N.D., J.Z.

Writing – review and editing: N.M., D.G., S.W., M.C., J.Z., A.R., W.P.

Visualization: M.C., J.Z., A.R., W.P.

All authors have read and agreed with the published version of the manuscript.

Funding Statement: The article did not receive any funding.

Acknowledgements: This research has not received any administrative or technical support.

Conflict Of Interest: The authors declare no conflict of interest.

Declaration of the use of generative AI and AI-assisted technologies in the writing process: In the preparation of this manuscript, the authors used ChatGPT (OpenAI) solely for grammar correction and organizational support. All generated content was carefully reviewed and edited by the authors, who take full responsibility for the final version of the manuscript.

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