

# Effect of Exercise on Depression, Anxiety and Mood: A Narrative Review

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## ABSTRACT

In contemporary times, many individuals experiencing depression and anxiety have opted for non pharmaceutical and non traditional interventions, notably exercise, to manage their conditions. This trend is gaining popularity among those seeking alternative ways to address their mental health concerns. Regular exercise provides a lengthy list of advantages for both physical and mental well-being. It can be a pleasurable method to treat mild to moderate mental health disorders, and its effects can be both immediate and long-lasting. Despite individuals with mental health problems often being less physically active, increased Aerobic Exercise (AE) has been shown to significantly reduce symptoms. Evidence suggests a complementary relationship between regular exercise and psychological well-being, indicating that exercise can alleviate anxiety and depression while promoting a positive outlook. The underlying processes behind these effects are not fully understood. The present review summarises research on the impact of exercise on mental well-being, with a focus on its potential to alleviate depression, mood swings, and anxiety when incorporated into mental health therapy.

**Keywords:** Aerobic exercise, Mental health, Mood swings

## INTRODUCTION

For a long time, exercise has been known to have various physical health benefits [1]. However, recent studies have shown that movement also significantly affects mental health [2-4]. Regular physical activity has been shown to enhance one's emotional well-being, reduce symptoms of anxiety and depression, increase self-confidence, and improve cognitive abilities [3,5]. These effects are due to exercise increasing the production of the neurotransmitter endorphin, which acts as a natural pain reliever and mood enhancer [6]. The beneficial effects of exercise on mental health are not limited to a specific type or intensity of exercise. Activities such as walking, swimming, and yoga have all been shown to improve mental health. The benefits of exercise are also not limited to a specific age group, as both young and older populations can experience its advantages [7].

According to established definitions, physical activity refers to the voluntary contraction of muscles resulting in energy expenditure above the basal metabolic rate. It involves bodily movement, which can vary in intensity, frequency, and duration, and encompasses a broad range of activities performed during daily life or structured exercise [8]. Physical exercise can be described as a structured and repetitive form of physical activity undertaken with a specific purpose in mind [8].

Regular exercise can serve as an effective means to enhance the psychological well-being and overall wellness of individuals, regardless of their age or physical fitness level [8-10]. Therefore, being aware of the influence of exercise on mental health can be a valuable resource for psychologists and psychiatrists in their clinical practice. This knowledge can help in preventing and treating psychiatric illnesses and promoting a higher quality of life for patients. However, exercise can also pose challenges, requiring accurate diagnosis and effective treatment methods [8, 11].

### Effect of Exercise on Depression

Depression is a prevalent mental health problem [8,12]. The primary approach for depression treatment is pharmacological and psychological therapy. While these approaches can be effective, not all individuals respond to them, and there is a need for alternative

strategies for prevention and treatment of depression in today's society [11].

Exercise has proven to be a highly effective first-line therapy for mild to moderate depression, comparable to antidepressant medication [8,13,14]. It has shown significant potential for improving depressive symptoms [8,13]. In a group of elderly individuals with depression who had not responded to six weeks of antidepressant medication alone, exercise combined with antidepressants led to significant symptom improvement [15].

Numerous studies have revealed that individuals with higher levels of physical activity show a decrease in depressive symptoms, and these findings are consistent across different countries and cultures [8,11,13]. High-intensity weight training has shown a greater impact on patients with depression compared to low-intensity weight training [8,16]. Both low-intensity weight training and attention from a family doctor have shown similar effects on depression [8,17]. Several studies have demonstrated the beneficial effects of AE on symptoms associated with depression [18-20].

However, further research is needed to determine the specific type of exercise required for treating depression. Current research suggests that the specific type of exercise may not be as crucial as achieving a certain level of physical activity intensity [21]. For example, research indicates that engaging in running or weightlifting can potentially alleviate symptoms of depression, with no significant difference between the effects of these two types of physical exercise [22,23]. Several studies have examined the relationship between physical activity and symptoms of depression, as shown in [Table/Fig-1] [15,17,24].

### Effect of Exercise on Anxiety

In contrast to the numerous studies on the positive effects of exercise on depression, there are fewer studies on anxiety [8,25]. Exercise is considered one of the best uncomplicated and cost-effective practices for treating anxiety [25]. It has been shown to reduce feelings of anxiety. Research findings indicate that engaging in physical activity for 20 minutes, three times a week, at a heart rate between 70% and 90% of the maximum pulse can significantly decrease anxiety levels [26]. According to a study by Cox RH et al., the most significant reduction in anxiety state was observed approximately 90 minutes

| Author/Year                     | Participants and interventions   | Primary outcome  | Inference   |
|---------------------------------|--|--|---|
| Mather AS et al., 2002 [15]     | In a clinical study, 86 individuals diagnosed with depression were randomly assigned to either a weight-lifting exercise group that lasted mainly 45 minutes and two-weekly for 10 weeks, or a control group that received health education.   | The percentage of people who have achieved the "reaction" criteria, defined by a 30% reduction in the Hamilton Depression Assessment Scale (HRSD), is evaluated. | At the end of 10 weeks, according to HRSD, the percentage of individuals suffering from a decline in depression was significantly higher in the exercise group (55%) than in the non exercise group (33%).  |
| Dunn AL et al., 2005 [17]       | A clinical trial was conducted in 80 groups diagnosed with moderate to Moderate Severe Depression (MDD-Major Depressive Disorder). These participants were randomly allocated to one of the four treatment groups to exercise on treadmills or stationary bicycles. Treatment groups differ in terms of total energy expenditure, with a lower dose of 7.0 kcal/kg/week and a higher dose of 17.5 kcal/kg/week, and frequency ranging from 3 days/week to 5 days/week. A control group was also included in the study, which participated in placebo control exercises, including 3 days/week flexibility exercises. | The variation in the Hamilton Depression Rating Scale (HRSD) compared to the initial assessment.   | After 12 weeks of energy expenditure, the HRSD scores were significantly reduced. In particular, adjusted average HRSD values in 12 weeks were reduced by 47% for a higher exercise dose, while reduced by 30% for a lower dose and 29% for the control group. However, no significant main effect of exercise frequency was observed in 12 weeks.  |
| Blumenthal JA et al., 2007 [24] | In this study, 202 people diagnosed with Major Depression (MDD) were randomly assigned to one of the four intervention groups: exercise supervised with treadmills, home exercise, treatment with antidepressants (sertraline, 50-200 mg daily), or placebo pill.  | The proportion of patients in remission is characterised by the absence of MDD criteria and a Hamilton Depression Rating Scale (HRSD) of less than eight.        | After four months of treatment, 41% of the patients were cured. It has been observed that the rate of remission is higher in patients receiving active treatment than in patients receiving placebo control. Remission rates for supervised exercise, home exercise, medications, and placebo were 45%, 40%, 47% and 31%, respectively (p=.057). After treatment, all groups reduced the HRSD scores. However, the score of the active treatment group was not significantly different from that of the placebo group (p=0.23). |

**[Table/Fig-1]:** Literature studies showing relationship of exercise and decline in depression scale [15,17,24].

Where %; percent, HRSD: Hamilton rating scale for depression; MDD: Major depressive disorder; kcal/kg/week for kilocalorie per kilogram per week, mg for milligram

after a 20-minute aerobic exercise session at 80% of maximal oxygen uptake. Both aerobic exercise and resistance training have been found to be effective in treating anxiety [27].

While exercise can reduce anxiety, it has not been able to achieve the same level of reduction as psychopharmaceuticals [8,24]. A study conducted on individuals with moderate to severe panic disorder found that clomipramine demonstrated a superior and faster reduction in anxiety symptoms compared to physical exercise [28]. Where % stands for percent and n stands for total [Table/Fig-2] [26,27,29].

### Effect of Exercise on Mood

Available evidence suggests that engaging in moderate exercise can elevate or maintain a positive mood state [30]. However, training at an extreme level can lead to a decline in mood [3]. Physical activity has been shown to increase the production of endorphins, which are neurotransmitters in the brain that contribute to feelings of pleasure and well-being. Endorphins also help reduce stress and anxiety levels, further positively impacting mood. Many individuals experience a "runner's high" after a workout, which is attributed to the release of endorphins that flood the brain and create a feeling of euphoria [30]. In addition to endorphins, exercise also promotes the production of neurotransmitters serotonin and dopamine, which

are known to regulate mood and feelings of happiness. Mood fluctuations in individuals often tend to lead to depression rather than anxiety [31]. Further research is necessary to establish the correlation between physical activity and mental health, particularly the relationship between physical movement and emotional well-being. Additional investigation is crucial to fully understand the effects of physical activity on an individual's emotional state. Therefore, a more comprehensive analysis is required before definitive conclusions can be drawn [3,31,32].

### Potential Drawbacks and Risks Associated with Exercise for Mental Health

Physical activity is widely recognised for its benefits, such as reducing stress, anxiety, and symptoms of depression. However, it is also important to be aware of the potential drawbacks and risks associated with exercise, especially if done improperly or excessively [33,34].

Individuals are recommended to engage in at least 30 minutes of moderate exercise per week; however, it is crucial to consider the potential risks associated with this activity [35]. The likelihood of injury increases in overweight conditions, and vigorous exercise can lead to musculoskeletal injuries, which are the most common type [36,37]. Injuries can limit body movements, cause pain, and contribute to frustration, anxiety, and depression.

| S. No. | Author/year                              | Participants and intervention   | Primary outcome   | Inference   |
|--------|--|---|---|---|
| 1      | Cox RH et al., 2004 [27]                 | A total of 24 individuals partook in a non exercise control trial, in addition to performing exercise sessions at intensities corresponding to 60% and 80% of their maximal oxygen uptake.  | Modification in the Spielberger State Anxiety Inventory.  | Over the course of the study, all three exercise conditions, which included the control group, exhibited a decrease in state anxiety.   |
| 2      | Smits JAJ et al., 2008 [26]              | A total of 60 individuals exhibiting heightened levels of anxiety sensitivity were subjected to a randomisation process, with the aim of dividing them into three groups: one group underwent a 2-week exercise intervention, another group underwent a 2-week exercise intervention in conjunction with cognitive restructuring, while the remaining participants were assigned to a waitlist control condition. | A shift in the level of apprehension towards sensations associated with anxiety, also known as anxiety sensitivity. | Both exercise interventions resulted in notable reductions in anxiety sensitivity that were more effective than the control group's waitlist condition. The incorporation of a cognitive element did not enhance the outcomes of the exercise intervention.   |
| 3      | Broman-Fulks JJ and Storey KM, 2008 [29] | A total of 24 participants with elevated anxiety sensitivity scores (Anxiety Sensitivity Index-Revised scores > 28) were selected at random to engage in either a no-exercise control condition or six 20-minute sessions of Aerobic Exercise (AE).   | Modification to the Anxiety Sensitivity Index Revised.  | The group assigned to engage in AE reported a noteworthy reduction in anxiety sensitivity following the exercise regimen. Conversely, anxiety sensitivity scores for the non exercise group did not display any significant changes. It can be inferred that AE may have a positive impact on anxiety sensitivity levels. |

**[Table/Fig-2]:** Literature studies showing relationship between exercise and anxiety [26,27,29].

Vigorous exercise also increases the risk of heart attack in individuals with underlying heart disease [37]. Overtraining can result in physical and mental exhaustion, leading to irritability and decreased motivation [38,39]. Some individuals may develop exercise addiction as a means to cope with stress. While exercise can be beneficial for mental health, it should not be relied upon as the sole means of support. A comprehensive approach with various strategies and resources is important for promoting optimal mental well-being. Excessive focus on appearance during exercise can contribute to poor self-esteem and body dissatisfaction [38]. Failure to achieve performance goals can lead to feelings of inadequacy and disappointment. It can also trigger or worsen eating disorders. Individuals with eating disorders may become fixated on the number of calories burned during workouts, leading to excessive exertion and changes in behaviour, with severe mental and physical health consequences [13].

However, these potential drawbacks and risks should not discourage individuals from engaging in exercise altogether. It is important to exercise in moderation, avoid overexertion, and seek professional help if needed [39,40]. Being mindful and prioritising self-care is essential to enjoy the mental health benefits of exercise while minimising the risks [39].

### Strategies for Incorporating Exercise into Mental Health Treatment Plans

Mental health providers can collaborate with healthcare professionals specialising in exercise to create personalised treatment plans [8,39]. However, this collaboration involves assessing patients' readiness and motivation to engage in exercise [41]. Educating patients about the benefits of exercise for mental health and providing them with resources such as fitness apps and workout plans can help them initiate their exercise routine [5,42,43]. Physicians can advise patients to engage in at least 30 minutes of moderate-level exercise (e.g., jogging at a faster pace) [43]. Healthcare professionals can use the five A's (Assess, Advise, Agree, Assist, Arrange) model to provide patient-specific exercise recommendations [43].

Group exercises can help patients stay motivated and committed to their exercise routine. Monitoring exercise intensity and mood fluctuations over time can enhance patients' understanding of the mental health benefits of exercise and foster a sense of achievement. This approach allows for the assessment of patients' progress and provides valuable insights into the positive impact of exercise on their mental well-being [32,43]. By integrating exercise into mental health treatment plans and collaborating with healthcare professionals, healthcare providers can help patients improve their overall well-being. This can be achieved through group exercises, patient education, provision of resources, and monitoring of progress [8].

### CONCLUSION(S)

Recent research highlights the efficacy of exercise in addressing mild to moderate mental health issues, in addition to its well-documented physical health benefits. There is substantial evidence supporting the role of regular physical activity in reducing anxiety and depression levels and enhancing emotional well-being. Exercise triggers the release of neurotransmitters such as endorphins, serotonin, and dopamine, which help reduce stress, induce feelings of euphoria, stabilise moods, and increase happiness. Integrating exercise into mental health treatment plans can improve overall well-being, reduce symptoms of anxiety and depression, and promote good physical health.

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