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The Effect of Physical Activity on Anxiety Symptoms in Adults: A Literature Review

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ABSTRACT

Anxiety disorders are among the most prevalent mental health conditions globally, substantially impairing quality of life and social functioning. Although psychotherapy and pharmacotherapy remain the primary treatment modalities, there is a growing interest in non-pharmacological adjunctive interventions, including physical activity. The aim of this review is to assess current scientific evidence regarding the impact of physical activity on the reduction of anxiety symptoms in adults. The findings of the analyzed studies indicate that physical activity is an effective method for alleviating anxiety symptoms and, due to its additional health benefits, should be recommended to the majority of patients. The greatest therapeutic effects have been observed in mind–body activities such as yoga, as well as in exercises of moderate to high intensity. Further research is required to determine optimal exercise dosage, duration, and modality, as well as to develop clinical guidelines tailored to the specific needs of individual patient groups.

Keywords: Physical Activity, Anxiety Symptoms

INTRODUCTION

Anxiety disorders are one of the most common mental health challenges worldwide. The World Health Organization (WHO) estimates that approximately 359 million people suffer from anxiety disorders, which are a major contributor to global disability. Symptoms of anxiety, such as excessive worry, restlessness, muscle tension, and autonomic hyperarousal, significantly impair social functioning and overall quality of life. Traditional methods of managing anxiety rely primarily on psychotherapy and pharmacotherapy. Although effective, these interventions can be limited by availability, cost, side effects, and patient compliance. Therefore, alternative interventions are being explored to alleviate anxiety symptoms in adults.

Because physical activity is inexpensive and widely available, it has emerged as a promising nonpharmacological intervention for promoting and treating mental health. Based on evidence from recent decades, we know that regular physical activity can alleviate symptoms of anxiety through numerous biological and psychological pathways.

Recent systematic reviews and meta-analyses support the anxiolytic effects of exercise. An umbrella review by Singh et al. (2023) found that exercise can reduce anxiety symptoms in adults. Similarly, Lin and Gao (2023) demonstrated that aerobic exercise and mind-body exercises resulted in clinically significant reductions in anxiety symptoms. Of note, more recent randomized controlled trials suggest that internet-based interventions may also be beneficial, which is particularly relevant given the increasing digitalization of healthcare services.

Therefore, the aim of this literature review is to provide a comprehensive overview of contemporary research on the impact of physical activity on anxiety symptoms in adults. The review summarizes evidence from randomized controlled trials, systematic reviews and meta-analyses.

2. REVIEW METHODS

This review was conducted using multiple databases, including

PubMed, Scopus and Google Scholar. The following search terms were used: "*physical activity", "exercise", "anxiety", "young adults", "mental health"*. Articles included in the review were selected based on relevance to the topic, study design (randomized controlled trials, meta-analyses, and systematic reviews) and publication in peer reviewed journals.

Inclusion criteria were: adult population, interventions based on physical activity, and quantitative assessment of anxiety symptoms. Exclusion criteria included studies without full text, research, animal studies, and interventions unrelated to physical activity. The review covers studies from 2023 to August 2024.

3. RESULTS & DISCUSSION

Mechanism of action

Proposed biological mechanisms contributing to clinical improvement include increased expression of brain-derived neurotrophic factor (BDNF), increased serotonin concentration and its release from presynaptic terminals into the synaptic cleft, modulation of the hypothalamic-pituitary-adrenal (HPA) axis, changes in the immune system, and increased neuroplasticity. Psychological factors include improved self-esteem and increased resilience to stress and anxiety. (Fang et al., 2025).

A total of eight studies meeting the inclusion criteria were identified, including randomized controlled trials (RCTs), systematic reviews, and meta-analyses published within the last decade. The studies included sample sizes ranging from 12 to over 128,119 adults. Interventions included aerobic exercise, resistance training, yoga, and tai chi. Outcomes were assessed using validated scales, including the Generalized Anxiety Disorder-7 (GAD-7), the State-Trait Anxiety Inventory (STAI), and the Hospital Anxiety and Depression Scale–Anxiety Subscale (HADS-A).

Overall Effect of Physical Activity on Anxiety Symptoms

All included studies demonstrated a positive effect of physical exercise on clinical outcomes. Singh et al. (2023) found that higher intensity physical activity was associated with greater symptom improvement. Similarly, Lin and Gao (2023) demonstrated that various types of physical activity, particularly those with moderate to high intensity are effective in reducing anxiety.

Effects Across Exercise Modalities

Aerobic Exercise

Ewuzie et al., 2024 Aerobic exercise has been shown to be an effective intervention for reducing anxiety symptoms and improving psychological well-being. It appears to be particularly effective in individuals with generalized anxiety disorder. (Ewuzie et al., 2024)

Singh et al., 2023 (BJSM) also finds aerobic exercise beneficial.

Physical activity significantly reduces anxiety symptoms, with yoga showing the greatest effectiveness, followed by aerobic exercise. (Lin & Gao, 2023)

In the study conducted by Chen et al. (2024), the effect of aerobic exercise was not statistically significant, likely due to the small number of included studies; however, the authors reported notable psychological benefits associated with physical activity.

The effects of aerobic exercise may be enhanced when conducted in group settings, as such environments facilitate social engagement, foster interpersonal bonds, and promote a sense of belonging, all of which are crucial for counteracting the feelings of isolation and loneliness often associated with anxiety disorders (Ewuzie et al., 2024).

Resistance Training

RCT conducted by Gordon et al., 2021 demonstrated a reduction in anxiety symptoms following resistance training; however, this study was performed on a small sample (12 participants). According to Lin and Gao (2023), resistance training does not produce a statistically significant improvement in anxiety reduction, and their findings further suggest that excessively intense resistance training may exacerbate anxiety symptoms. Similarly, Marinelli et al. (2024) indicated that the therapeutic effects of resistance training alone require further investigation with long-term follow-up to fully understand the outcomes. Resistance training showed promise in addressing disorder-specific symptoms and enhancing distress tolerance (Ewuzie et al., 2024).

In summary, the therapeutic effect of resistance training on anxiety disorders remains uncertain; therefore, if resistance training is implemented to reduce anxiety symptoms, it is recommended to combine it with aerobic exercise for optimal outcomes.

Mind–Body Exercise

Yoga has been shown to regulate multiple biological systems, including the autonomic nervous system, the hypothalamic–pituitary–adrenal (HPA) axis, and heart rate variability, supporting its beneficial effects on mental and emotional health (Castellote-Caballero et al., 2024). It has also been identified as the most effective form of physical activity for reducing anxiety (Lin & Gao, 2023; Singh et al., 2023), and online yoga interventions have likewise demonstrated efficacy (Brandão et al., 2024).

Digital and Remote-Based Interventions

Digital and remote interventions have been shown to be effective in reducing anxiety symptoms in adults (Brandão et al., 2024); however, the impact of online exercise on mental health appears to be somewhat lower compared to other intervention modalities (Chen et al., 2024).

Consistency of Findings

Despite differences in methodology and population characteristics, the included studies consistently demonstrate:

- physical exercise is effective in reducing anxiety disorders
- statistically significant improvement in symptoms in the yoga group
- Minimal adverse effects (incorrect training protocols may result in injury, while excessively intensive exercise may exacerbate anxiety symptoms).
- Digital and remote interventions are also effective in reducing anxiety.

A detailed overview of study characteristics, sample sizes, interventions, and key outcomes is provided in Table 1.

4. CONCLUSION

Physical activity represents an effective strategy for reducing anxiety symptoms; however, it cannot replace established therapeutic approaches such as pharmacotherapy or psychotherapy. Mind–Body Exercise modalities appear to be the most effective in anxiety reduction. The majority of studies also indicate that moderate to high-intensity exercise contributes to significant improvements in anxiety outcomes. Nevertheless, further research is required to determine the optimal duration, intensity, and type of physical activity tailored to specific patient populations. The development of clinical guidelines that individualize exercise-based interventions for distinct clinical groups would be optimal. Importantly, physical activity confers additional benefits for physical health and, therefore, should be recommended to the majority of patients.

Table 1. Table Summary of Key Studies

Author, Year	Study Design	Population (Age)	Type of Exercise Intervention	Duration / Frequency	Anxiety Measure	Main Findings
Gordon et al., 2021	RCT	Young adults, 18–40 y	Resistance training (moderate intensity, supervised)	8 weeks, 2×/week	State–Trait Anxiety Inventory (STAI) Penn State Worry Questionnaire (PSWQ)	RET significantly improved AGAD severity, and elicited large, clinically meaningful improvements in worry and anxiety symptoms
Castellote-Caballero et al., 2024	RCT	university students	Yoga training	12 weeks 2×/week	State–Trait Anxiety Inventory (STAI)	12-week yoga intervention can significantly reduce perceived stress and anxiety, and improve emotional wellbeing
Brandão et al., 2024	RCT	university students	Online Kundalini Yoga program	6 weeks 1x week	DASS-21	Significant reduction in state and trait anxiety in the intervention group

Chen et al., 2024	Metanalysis	20-59.3 y	Internet-based structured exercise	Varies duration (4-12; 12-24; >24 weeks)	DASS-21	Internet-based exercise showed a statistically significant reduction in depression and anxiety symptoms
Lin & Gao, 2023	Meta-analysis	college students	Aerobic exercise, yoga, resistance training	Varies duration (≤8, 8–14, >14 weeks) Varies frequency ((≥5; (3–4; 1-2 times/week)	Various anxiety scales	Physical activity interventions were shown to have a positive effect on alleviating anxiety in college students..
Marinelli et al., 2024	Systematic review	26 years or younger	Resistance training & combined training	at least 4 weeks	Various anxiety scales	Resistance training is an effective intervention for reducing anxiety symptoms in young people, but further research examining the effectiveness of resistance training interventions with long-term follow-up is needed to understand the outcomes.
Ewuzie et al., 2024	Systematic review	18 to 65	high-intensity interval training, resistance training, Pilates, walking.	Varies duration Varies frequency	Various anxiety scales	The results indicate that aerobic exercise interventions demonstrate efficacy in reducing anxiety symptoms and improving overall well-being across diverse populations,
Singh et al., 2023 (BJSM)	Umbrella review	adult population	All exercise modalities	Varies duration Varies frequency	Various anxiety scales	Physical activity is highly beneficial for improving symptoms of depression, anxiety and distress across a wide range of adult populations,

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Data and materials availability All data associated with this work are present in the paper.

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