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Title: The Impact of Running on Mental Health - A Literature Review

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Abstract

This literature review explores the relationship between running and mental health, synthesizing findings from empirical studies, clinical trials, and meta-analyses. Running has been shown to improve mood, reduce symptoms of anxiety and depression, and enhance self-esteem, emotional stability, and overall psychological well-being. Biological mechanisms underlying these effects include increased neuroplasticity, improved mitochondrial function, and modulation of key neurotransmitters such as serotonin, dopamine, and endorphins. Psychological and social mechanisms such as enhanced self-efficacy, sense of agency, and social connectedness further contribute to long-term mental health benefits. Despite methodological and demographic limitations in current research, the evidence suggests that running is a practical, accessible, and low-cost approach to promoting mental well-being. Future directions include developing personalized exercise programs and integrating running into public health and therapeutic frameworks.

Keywords: *running, mental health, mental condition, depression, anxiety, well-being, exercise therapy*

Introduction

Mental health is one of the most common topics discussed in global public health, with depression, anxiety, and stress-related disorders affecting hundreds of millions of people worldwide. According to the World Health Organization (WHO), promoting mental well-being and preventing mental disorders require multisectoral approaches that include lifestyle-based strategies alongside clinical interventions. Physical activity, particularly aerobic exercise, has been identified as a key factor in improving overall health and reducing the burden of mental and neurological diseases. Beyond its physical benefits, regular exercise contributes to emotional balance, resilience and improved cognitive functioning.

Among various forms of physical activity, running occupies a unique position due to its accessibility, usually low cost, and adaptability across populations. Recent studies have emphasized that running not only enhances cardiovascular health but also helps alleviate symptoms of depression and anxiety by stimulating neurochemical and psychological mechanisms such as endorphin release, improved self-efficacy, and reduced physiological stress responses. Moreover, research on recreational and outdoor physical activity underscores the positive effects of exercising in natural environments, which may further augment mental well-being through exposure to sunlight, fresh air, and sensory relaxation.

Aim of the study

Given the growing evidence connecting running to improved psychological outcomes, a systematic understanding of this relationship is essential. This review aims to synthesize the current scientific literature on the impact of running on mental health, identify potential biological and psychosocial mechanisms underlying these effects, and outline implications for public health and clinical practice. By consolidating knowledge from diverse studies, this paper seeks to clarify how running can serve as an effective, accessible, and sustainable tool in promoting mental well-being.

Methodology of the literature review

A literature search was conducted in the PubMed database to identify studies examining the relationship between running and mental health. The search covered the years 2010–2026 and used the following keywords and their combinations: “running”, “jogging”, “exercise”, “aerobic exercise”, “mental health”, “depression”, “anxiety”, “stress”, and “well-being”.

Inclusion criteria comprised peer-reviewed research articles published in English, focusing on adult or adolescent populations and addressing psychological outcomes such as mood, anxiety, or mental health conditions and disorders.

The review incorporated quantitative studies (randomized controlled trials, cohort and cross-sectional studies), qualitative research exploring subjective experiences of running, and systematic reviews or meta-analyses providing synthesized evidence.

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1. The Relationship Between Running and Mental Health

Running demonstrates a multifaceted relationship with mental health, encompassing both therapeutic benefits and potential risks. Evidence synthesized from various studies indicates that bouts of running ranging from single sessions to long-term interventions are consistently associated with improvements in mood, reductions in stress, anxiety, and depressive symptoms, and enhancements in self-esteem and psychological well-being. These effects appear across diverse populations and intensities of running, suggesting broad applicability of running as a mental health-promoting behavior. Neurobiological mechanisms such as endorphin release, psychosocial factors including social connectedness, and behavioral reinforcement through goal attainment may underlie these benefits. However, some studies also highlight possible adverse outcomes at extreme levels of engagement, such as exercise addiction and disordered eating behaviors, which may lead to more specific mental disorders. Despite methodological heterogeneity and limited demographic diversity in the literature, the collective findings suggest that running, as a form of moderate-to-vigorous physical activity, is a promising, accessible strategy for improving mental health and well-being.

2. Mood and Well-Being Improvement

Research consistently shows that running has a direct and measurable impact on enhancing overall well-being. Both short bouts of running and long-term participation are associated with increased feelings of happiness, vitality, and relaxation, as well as a reduction in stress and emotional tension. Studies indicate that running can trigger immediate mood improvements through physiological mechanisms such as endorphin release and the regulation of stress hormones, while regular running contributes to sustained psychological benefits, including

greater life satisfaction and emotional stability. Participants frequently report feeling calmer, more energetic, and more mentally balanced after running sessions, suggesting that this form of physical activity serves as an effective, natural means of improving overall well-being.

3. Reduction of Anxiety and Depressive Symptoms

Research on recreational running provides substantial evidence that this form of physical activity can help reduce symptoms of anxiety and depression. Several studies have demonstrated an inverse association between running frequency and depressive symptoms, with regular runners reporting lower scores on standardized depression measures compared to non-runners. Similarly, randomized controlled trials have found that consistent participation in running programs is linked to decreases in anxiety, indicating both immediate and long-term psychological benefits. Evidence further suggests a sustained reduction in anxiety levels and general neuroticism among habitual runners over time. Findings support the notion that running is an effective, low-cost, and accessible behavioral intervention for mitigating symptoms of anxiety and depression, contributing to improved emotional balance and resilience.

4. Running as a Protective Factor and a Treatment for Psychiatric Disorders

Evidence suggests that running may serve as both a protective factor against the onset of depression and an effective complementary treatment for individuals already affected by mood disorders. In a controlled study involving adult male psychiatric patients diagnosed with major psychiatric disorders, participants who engaged in structured running sessions—three 30-minute runs per week over an eight-week period—exhibited a significant reduction in depressive symptoms compared with those receiving corrective therapy or placed on a waiting list. Although reductions in anxiety were not statistically significant, the observed improvement in depression highlights the therapeutic potential of running as an adjunctive, non-pharmacological intervention. The physiological effects of regular aerobic activity, combined with the psychological benefits of goal attainment and routine, likely contribute to the observed mood enhancement. These findings support the view that running can play a valuable role in both preventing depressive episodes and aiding recovery in clinical populations.

Findings from another study involving individuals diagnosed with depressive disorders, participants who engaged in a structured 12-week running program demonstrated a significant

increase in self-efficacy after 6 weeks of training, indicating early psychological improvement and a growing sense of control over their condition. However, by the end of the twelve-week intervention, the changes in both depression levels and self-efficacy were no longer statistically significant compared to baseline values. This pattern implies that the positive effects of running may emerge relatively quickly but require consistent reinforcement to be sustained over time. The initial improvement in self-efficacy highlights running's potential as an empowering, active coping strategy in the management of depression, even if long-term maintenance of its benefits depends on factors such as motivation, intensity, and continued engagement in physical activity.

5. Impact on Stress Resilience

Evidence from multiple observational and experimental studies suggests that running can strengthen psychological resilience and enhance coping mechanisms in response to stress. Reductions in perceived stress and improvements in emotional regulation consistently emerged as positive outcomes of regular running. These effects appear to be mediated not only by physiological responses, such as improved cardiovascular fitness and neurochemical regulation, but also by psychological factors including increased self-efficacy, perceived control, and positive attitudes toward exercise. Regular runners frequently report greater emotional stability and a heightened ability to manage daily stressors, possibly due to the repetitive, rhythmic nature of running that facilitates relaxation and cognitive processing. The evidence indicates that engaging in running promotes effective stress coping and long-term mental resilience, making it a valuable behavioral tool for psychological well-being and self-awareness of coping with daily life stressors.

6. The relationship between running endurance, Body Mass Index and mental well-being

Recent research among Chinese university students underscores the important relationship between running performance, body composition, and mental well-being. Endurance running emerged as a significant predictor of psychological health. Higher endurance running scores were associated with a reduction in the likelihood of developing abnormal psychological symptoms, indicating that better aerobic capacity - often enhanced through regular running—correlates with improved mental health outcomes. Conversely, each one-point increase in body

mass index (BMI) was linked to a higher risk of poor psychological status, suggesting that maintaining a healthy weight may amplify the mental health benefits of running. Together, these findings highlight that consistent engagement in endurance running not only improves physical fitness but also serves as a protective factor against psychological distress, reinforcing the interdependence between physical and mental well-being.

7. Running and the Role of Community in Enhancing Psychological Well-Being

Participation in organized community running events, such as parkrun, has been shown to foster both social connectedness and psychological well-being. In a study on participants in parkruns life satisfaction significantly increased over a six-month period, with the greatest improvements reported among individuals who had previously been the least physically active. The findings emphasize that collective running experiences not only enhance physical health but also create meaningful social bonds - both strong and weak that contribute to a broader sense of belonging and purpose. The community atmosphere of such initiatives provides consistent motivation, emotional support, and shared identity, all of which are associated with improved mental health outcomes. Moreover, the structure of parkrun being free, regular, and inclusive makes it an effective and accessible public health intervention, offering measurable benefits for psychological well-being while promoting social connections and sustainable physical activity habits.

8. Potential Mechanisms of Action How Running Influences Mental Health

8.1 Biological Mechanisms: Neurochemical and Neural Adaptations Underlying the Psychological Benefits of Running

Emerging evidence indicates that the psychological benefits of running are closely linked to a range of neurobiological adaptations involving mitochondrial function, neuroplasticity, and key neurotransmitter systems. Regular aerobic exercise, including running, enhances mitochondrial efficiency and stimulates mitochondrial biogenesis, processes essential for maintaining neuronal health and supporting cognitive and emotional regulation. These changes are accompanied by reductions in oxidative stress and neuroinflammation—two mechanisms strongly implicated in the development of depressive symptoms. Running also influences several critical signaling pathways, such as brain-derived neurotrophic factor, AMP-activated

protein kinase, active peroxisome proliferator-activated receptor- γ coactivator-1 α , and Ca²⁺/calmodulin-dependent protein kinase, all of which contribute to improved neuroplasticity and synaptic functioning. Additionally, exercise-induced modulation of neurotransmitters—including increased availability of endorphins, serotonin, and dopamine—plays a central role in mood elevation, stress reduction, and enhanced emotional resilience. Collectively, these biological processes provide a mechanistic explanation for why running serves as an effective intervention for improving mental health, including in individuals with major depressive disorder or treatment-resistant depression.

8.2 Psychological Mechanisms: Enhanced Self-Esteem, Sense of Agency, and Healthy Behavioral Patterns

Psychological research highlights several mechanisms through which running contributes to improved mental well-being, including increases in self-esteem, perceived control, and positive body image, as well as the cultivation of healthy lifestyle habits. Regular participation in running fosters a sense of mastery and personal agency, as individuals experience measurable progress in endurance, performance, and physical fitness. This perceived competence strengthens self-efficacy and resilience against stress and negative affect. Moreover, running supports the development of a more positive body image by enhancing satisfaction with physical appearance and bodily function, which in turn promotes emotional stability and confidence. Studies on recreational runners have demonstrated that such psychological gains are particularly pronounced among individuals who engage in structured, community-based events, where social support and shared achievement reinforce intrinsic motivation and self-worth. Additionally, the routine and goal-directed nature of running encourages the formation of adaptive health behaviors and constructive use of leisure time, providing long-term benefits for psychological functioning and overall life satisfaction.

9. Social Aspects: Group Running and the Sense of Belonging

Running often extends beyond individual physical activity, serving as a platform for building social connections and fostering a sense of community. Participation in organized running groups or community events - such as parkrun has been shown to strengthen social integration, enhance feelings of belonging, and contribute to improved mental well-being. Empirical studies indicate that shared physical activity environments promote the formation of both strong and

weak social ties, which in turn reinforce motivation, commitment, and long-term adherence to healthy behaviors. The social dimension of group running also provides emotional support, reduces loneliness, and serves as a source of collective empowerment, particularly for individuals seeking to improve their mental health through sustainable lifestyle changes. These findings emphasize that the psychological benefits of running are amplified when embedded within social contexts that encourage cooperation, meetings and mutual support.

10. Limitations of Research and Future Directions

Current research on the effects of running on mental health is promising but not without methodological limitations. Many existing studies lack adequate control groups, which limits the ability to draw causal inferences about the direct impact of running compared to other forms of physical activity.

Additionally, the majority of samples are demographically homogeneous - often composed of young, healthy, and predominantly Western participants reducing the generalizability of findings across age, cultural, and socioeconomic groups. Another limitation involves insufficient attention to potential adverse consequences, such as exercise dependence or compulsive running behaviors, which may counteract the otherwise beneficial effects of physical activity on mental health.

Future research should aim to address these gaps through more rigorously designed, evidence-based investigations that include randomized controlled trials, diverse participant cohorts, and standardized measures of psychological outcomes. Moreover, there is a growing need to develop individualized running-based interventions tailored to specific mental health profiles, enabling healthcare professionals to integrate running into personalized treatment frameworks for conditions such as anxiety and depression. Such targeted approaches will help clarify not only the mechanisms linking running and mental health but also the optimal intensity, frequency, and social context needed to maximize therapeutic outcomes.

11. Conclusion

The collective body of evidence indicates that running exerts a generally positive influence on mental health, contributing to reductions in symptoms of anxiety and depression, improvements in mood and self-esteem, and the enhancement of overall psychological well-being. Both

physiological mechanisms - such as neurochemical regulation and improved mitochondrial function and psychosocial factors, including social connectedness and a sense of personal achievement, appear to mediate these beneficial effects.

From a practical perspective, these findings underscore the value of running as an accessible and cost-effective component of public health promotion and therapeutic intervention. Incorporating structured running programs into community and clinical settings may enhance mental resilience, improve emotional regulation and serve as an effective complementary approach in the prevention and treatment of mental disorders.

In conclusion, the strategic integration of physical activity, particularly running, into health policy and individual care plans holds significant potential for improving population mental health. Encouraging regular, enjoyable, and sustainable engagement in running can serve as a vital link between physical activity and psychological well-being, establishing it as an essential element in comprehensive strategies for mental health promotion and prevention.

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