**Review Article**

**The Impact of Physical Activity on Mental Health: An Integrated Review**

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**ABSTRACT**

This comprehensive review delves into the multifaceted relationship between physical activity and mental health. In addition to its well-documented advantages for physical well-being, this study illuminates the manifold positive effects of physical activity on mental health. A discernible link is established between physical inactivity and elevated morbidity rates, along with increased healthcare expenditures. As a commonly recommended therapeutic approach, exercise therapy emerges as a pivotal strategy for mitigating these challenges and preserving mental wellness. Empirical investigations consistently demonstrate a positive correlation between engagement in physical activity and specific mental health attributes. Notably, non-clinical studies underscore the pronounced impact of physical exercise on self-concept and body image. This review endeavours to provide a contemporary understanding of the intricate physiological and psychological mechanisms through which exercise fosters mental health. The benefits of regular physical activity extend to the enhancement of the hypothalamus-pituitary-adrenal axis, albeit with varying degrees of influence on depression and anxiety in the general population compared to clinical cohorts. Several hypotheses are posited to elucidate the intricate nexus between physical fitness and mental well-being. Furthermore, empirical evidence attests to the positive effects of physical activity on sleep patterns and its potential in ameliorating diverse psychiatric disorders. The broader spectrum of exercise is associated with improved mood and an elevated quality of life. This review also underscores the potential of physical exercise and yoga as tools for managing substance cravings, particularly among individuals with limited access to alternative therapeutic modalities. Moreover, evidence suggests that increased physical activity can mitigate certain psychotic symptoms and address medical comorbidities frequently accompanying psychotic disorders. Despite the wealth of research in this area, the scarcity of literature highlights the pressing need for further investigation aimed at evaluating and implementing culturally tailored interventions for physical activity.

**Keywords:** Wellbeing; physical activity; Review; Mental Health.

**INTRODUCTION**

Physical activity has deep-rooted historical origins, with evidence suggesting that the groundwork for modern yoga, as we know it today, was laid by the Indus Valley civilization around 3000 B.C. during the early Bronze Age.1 The literature extensively documents the advantageous role of physical activity in promoting overall well-being and preventing and managing various health conditions. Physical activity yields a multitude of substantial health advantages. The application of mechanical stress and repeated exposure to gravitational forces through regular physical exercise leads to enhancements in numerous attributes, including physical strength, endurance, bone mineral density, and neuromusculoskeletal fitness, all of which contribute to fostering functional independence. Exercise, characterized by its planned, systematic, and repetitive nature, enhances athletic performance by enhancing body composition, overall fitness, and motor skills.2

The pivotal role of physical activity in averting a wide spectrum of chronic ailments and premature mortality has been subject to extensive scrutiny and investigation. Compelling evidence links medical conditions like cardiovascular disease to individual lifestyle behaviours, with exercise playing a significant role.3 Consistent engagement in physical activity has been shown to reduce the incidence of cardiometabolic disorders, breast and colon cancer, and osteoporosis.4 Furthermore, aside from enhancing the quality of life for individuals dealing with non-psychiatric diseases such as peripheral artery occlusive disease and fibromyalgia, regular physical activity may alleviate the discomfort associated with these specific conditions.5 Physical exercise also proves beneficial in addressing various substance use disorders, including reducing or quitting smoking. Given the profound impact of physical exercise on health, global guidelines recommend a weekly allocation of "150 minutes" of moderate to vigorous physical activity for both clinical and non-clinical populations.6 Adhering to these guidelines can result in a notable reduction in the incidence of many chronic diseases, ranging from 20% to 30%. Furthermore, comprehensive assessments of worldwide research have revealed that even a modest amount of physical activity can confer significant health benefits.7

**METHODS**

In this comprehensive review article, we present a contemporary comprehension of the underlying physiological and psychological mechanisms involved in enhancing mental health through exercise or physical activity. We conducted literature searches using keywords such as "exercise" or "physical activity" combined with "mental health," "depression," "stress," "anxiety," "psychosis," and "addiction" on reputable databases, including PubMed, Google Scholar, and Medline. The majority of references cited in this review are derived from publications within the last ten years.

**RESULTS**

***The Impact of Physical Health on Mental Health***

An increasing body of evidence substantiates the favourable effects of physical activity on mental health, encompassing investigations into the impact of both short exercise sessions and more prolonged periods of physical engagement. Systematic assessments consistently reveal improved outcomes in mental health conditions associated with physical activity. Various psychological aspects, including self-esteem, cognitive function, mood, depression, and overall quality of life, have undergone rigorous examination.8 In line with general findings, exercise demonstrates the capacity to elevate mood and bolster self-esteem while mitigating stress, a known exacerbating factor for both mental and physical health ailments.9 It is worth noting, however, that a definitive and consistent correlation between mood enhancement and exercise in healthy individuals remains to be firmly established. Furthermore, engagement in physical activity triggers the increased production of two neurochemicals within the human body, namely opioids and endocannabinoids. These neurochemicals are associated with sensations of pleasure, anxiolytic effects, drowsiness, and heightened pain tolerance.10 Research indicates that exercise can enhance attention span, focus, memory retention, cognitive abilities, language fluency, and decision-making for a duration of up to two hours post-exercise.11 Researchers have posited that regular physical activity optimizes the functioning of the hypothalamus-pituitary-adrenal (HPA) axis, resulting in reduced cortisol secretion and the restoration of equilibrium in leptin and ghrelin levels (see Figure ​1).12

**Figure 1:** The effects of physical activity on the HPA axis

Regular exercise exhibits immunomodulatory effects, including the optimization of catecholamine levels, reduction in cortisol levels, and attenuation of systemic inflammation. Furthermore, physical activity has demonstrated the capacity to elevate plasma levels of brain-derived neurotrophic factor (BDNF), which is believed to mitigate amyloid-beta toxicity associated with the progression of Alzheimer's disease.13

While no causative links have been definitively established, methodologically rigorous research has identified notable improvements in both mentally and physically ill populations. These findings are derived from comprehensive investigations conducted on a global scale, with a particular emphasis on research in Western countries. To address the prevalent health challenges, it is pertinent to conduct a literature review that encompasses diverse research settings. Additionally, conducting a meta-analysis of studies can illuminate the prevalence of these mental health disorders and underscore the potential benefits of exercise as an adjunct therapy.14

This review also examined published literature to gain insights into the influence of exercise on mental health and its implications for disease management and treatment. The results from studies consistently align with those reported in global meta-analyses. The government has made publicly available data on interventions, including the impacts of varying levels of physical activity. Both exercise and yoga have emerged as effective complementary therapies for a range of mental health conditions.12 While yoga may not demand strenuous physical exertion, its other components, such as breathing and relaxation exercises, can concurrently exert a positive impact on an individual's mental well-being. Given its cultural significance as a prevalent physical practice and its suitability for individuals engaging in low to moderate levels of physical activity, yoga represents a relevant focus for this assessment.15

***Yoga as a supplementary therapeutic approach***

While yoga is an ancient Hindu practice, its potential therapeutic benefits have gained recent attention in the Western world. Mind-body approaches, a subject of extensive research, suggest their potential to address mental health issues within the neurosis spectrum. As defined by the National Center for Complementary and Alternative Medicine, "mind-body interventions" aim to harness the mind's capacity to influence bodily functions.16 Yoga, owing to its positive impact on the mind-body connection, is employed as a treatment modality for a wide array of conditions. The potential therapeutic advantages of yoga encompass the activation of opposing neuromuscular systems, stimulation of the limbic system, and reduction in sympathetic tone.

Individuals dealing with anxiety and depression may find value in incorporating yoga into their wellness practices. Yoga is generally considered safe for most individuals and rarely results in adverse side effects. Supplementing conventional treatments for mental health concerns with yoga may offer potential benefits. Many studies examining the effects of yoga also incorporate meditation as an integral component of their methodology. Meditation and various forms of focused mental practice can trigger a physiological response known as the relaxation response. Functional imaging studies have implicated specific brain regions exhibiting activity during meditation. Supported by extensive anatomical and neurochemical evidence, meditation has demonstrated profound physiological impacts, including alterations in attention and modulation of the autonomic nervous system.17 During meditation, there is a significant increase in left anterior brain activity, associated with feelings of happiness. Nevertheless, there is some limited evidence suggesting that meditation might exacerbate psychosis by elevating dopamine levels.18-20 It is important to note that our understanding of potential drawbacks of meditation for individuals with mental illnesses remains incomplete due to the absence of randomized controlled trials in this area.

***Physical Activity and Schizophrenia***

Schizophrenia is a profoundly incapacitating mental disorder that frequently emerges during an individual's early years of productive adulthood, typically in the late second decade of life. Achieving full remission from this disorder is a rare occurrence, with more than 60% of individuals experiencing relapses, whether accompanied by noticeable impairments or not. In addition to delusions, hallucinations, and formal thought disorders, many patients exhibit cognitive deficits that manifest in the early stages of the illness and often do not respond effectively to available therapies.21

Managing schizophrenia poses considerable challenges. First-generation antipsychotic medications are associated with extrapyramidal side effects, while second-generation drugs have been linked to issues such as obesity and dyslipidemia, which they may either induce or exacerbate. Attaining complete remission remains elusive for the majority of patients, with many not even experiencing satisfactory relief from their symptoms. Although certain antipsychotic medications may offer some relief from negative and cognitive symptoms, such responses are infrequent. Consequently, patients may benefit from cognitive rehabilitation. Additionally, they may contend with depressive symptoms, either due to their condition itself or as a result of adverse reactions to their medications, further complicating their overall well-being. Many patients also grapple with various clinical and emotional complications, including tardive extrapyramidal syndromes, metabolic issues, cognitive impairment, and suicide attempts. Nonadherence to treatment plans is a prevalent issue among patients, placing a significant burden on caregivers who often experience considerable stress and exhaustion as a result.

The available evidence indicates that increased physical activity can play a role in mitigating certain psychotic symptoms and addressing the medical conditions that often co-occur with psychotic disorders, especially those susceptible to the metabolic side effects of antipsychotic medications. Individuals who are physically inactive and have mental disorders tend to experience heightened morbidity and increased healthcare expenses. Consequently, exercise interventions are frequently recommended to mitigate these challenges and promote both mental and physical well-being.22

The inadequacy of current pharmaceutical treatments in effectively managing schizophrenia, along with the limited improvement in cognitive and negative symptoms through medication alone, underscores the rationale for considering yoga as a complementary therapeutic approach for schizophrenia. It is noteworthy that individuals with schizophrenia may experience co-occurring psychosis and conditions such as obesity or metabolic syndrome, even in the absence of concurrent medication therapy. Drug abuse can also induce subtle alterations in the endocrine and reproductive systems. Several studies have suggested that yoga may enhance endocrine function, resulting in benefits such as improved weight management, cognitive function, and menstrual regularity, among others. In this context, the potential role of yoga in the treatment of schizophrenia has been postulated. However, it is crucial to acknowledge that research on the efficacy of yoga as a therapeutic intervention for schizophrenia is limited, possibly due to several factors. Firstly, many yoga institutions discourage its incorporation into a medical framework. Secondly, there is a misconception that individuals with schizophrenia may not derive mental and physical benefits from yoga practices as recommended. Lastly, researchers may exhibit reluctance to recommend yoga to these patients due to a lack of knowledge and concerns regarding treatment adherence.

In a randomized controlled trial involving a yoga group (n = 21) and an exercise group (n = 20), the yoga group demonstrated a statistically significant decrease in negative symptoms.2 This research aligns with the latest guidelines from the National Institute for Health and Care Excellence (NICE), offering substantial support for the inclusion of yoga as a therapeutic approach in schizophrenia treatment. Additionally, a meta-analysis encompassing 17 separate studies23 on this topic affirms that regular physical activity significantly diminishes the negative symptoms linked to schizophrenia.

***Physical Activity and Alcohol Dependence Syndrome***

Substance abuse, particularly alcohol abuse, can inflict severe harm on both an individual's mental and physical well-being. Notable indicators of alcoholism encompass the development of tolerance and an inability to regulate alcohol consumption. Research has underscored the value of physical activity as an effective adjunct in combating alcohol use disorder. In addition to its potential impact on central neurotransmitter systems, physical exercise has the capacity to ameliorate the adverse health consequences associated with alcohol misuse. Existing evidence suggests that individuals grappling with alcohol use disorder often exhibit low levels of physical activity and diminished cardiorespiratory fitness. This population is also prone to a spectrum of medical comorbidities, including conditions such as diabetes mellitus, hypertension, and other cardiovascular ailments. Physical exercise holds substantial promise in contributing to the management of these co-occurring health issues.24

Physical exercise and yoga can be valuable tools for managing substance cravings, particularly when other therapeutic options such as counseling or medication for craving control are impractical or unacceptable. Physical exercise has been demonstrated to yield positive effects on mental well-being, alleviating stress and providing a satisfying alternative to substance use. However, it is essential for the patient to actively engage in physical activity-based therapies, as they require a proactive role, which differs markedly from the passive approach often associated with conventional medicine. Given that many individuals struggling with substance use lack intrinsic motivation and commitment to change, it is advisable to complement physical activity-based therapies with interventions that target motivation for change to optimize therapeutic outcomes.

In an exploratory trial involving 117 individuals with alcohol use disorder, a 12-minute fitness test using a cycle ergometer as an intervention led to a statistically significant reduction in cravings experienced by 40% of participants [24]. Furthermore, a meta-analysis and comprehensive review of the effects of exercise programs on individuals with alcohol use disorder demonstrated significant reductions in alcohol consumption and binge drinking.25

***Physical Activity and Sleep***

Despite a widespread consensus emphasizing the importance of prioritizing their well-being through regular exercise and adequate sleep, many individuals struggle to incorporate these practices into their lives. Sleep deprivation exerts adverse effects on various facets of health, including immune system functionality, mood regulation, glucose metabolism, and cognitive performance. Sleep is a fundamentally glycolytic process that serves to replenish glucose stores in neurons, contrasting with the waking state, which is primarily geared toward the cyclic utilization of glycogen. In light of these insights, it becomes evident that sleep exerts endocrine effects on the brain that extend beyond its role in hormonal regulation of metabolism and cellular waste clearance.

Multiple factors have been posited as potential instigators of this intricate cascade of events, encompassing alterations in core body temperature, cytokine concentrations, energy expenditure, metabolic rate, central nervous system fatigue, mood fluctuations, anxiety symptoms, heart rate, heart rate variability, secretion of growth hormone and brain-derived neurotrophic factor, individual fitness levels, and body composition.26

Following 12 weeks of dedicated fitness training, one study revealed notable enhancements in both the quantity and quality of sleep among adolescents. Utilizing polysomnography, these investigations demonstrated that regular exercise led to a reduction in NREM stage N1 (characterized by very light sleep) and an increase in REM sleep, along with improvements in REM sleep continuity and overall sleep performance.22

As individuals age, the impact of both short- and long-term physical activities on sleep tends to become increasingly detrimental. Generally, both short- and long-term exercise interventions have been associated with improved sleep quality; however, the extent of these benefits can vary significantly across different aspects of sleep. Notably, acute exercise did not demonstrate an impact on various sleep quality measures, including total sleep time, slow-wave sleep, sleep onset latency, and REM sleep reduction. Conversely, both moderate and strenuous exercise regimes have shown promise in enhancing sleep quality.27

Furthermore, a meta-analysis of randomized controlled trials underscored the statistically significant influence of exercise on sleep quality in adults dealing with mental health challenges.28 These findings underscore the crucial role that exercise plays in ameliorating outcomes for individuals grappling with mental illnesses.

***Physical activity in Depressive and Anxiety Disorders***

Depression, according to the World Health Organization, stands as the primary cause of global disability and a significant contributor to the overall global disease burden. Remarkably, only a modest fraction, ranging from 10% to 25%, of individuals grappling with depression actively seek therapeutic intervention. This underutilization of therapy may be attributed to various factors, including financial constraints, a shortage of qualified healthcare professionals, or the lingering social stigma associated with depression.29

For individuals contending with milder forms of mental health issues like depression and anxiety, regular physical exercise can emerge as a vital component of their treatment and ongoing management. Exercise and physical activity have the potential to ameliorate depressive symptoms, offering an approach that can rival, and in some cases surpass, the effectiveness of traditional antidepressant medications. However, comprehensive exploration of the relationship between exercise and reduced depression risk remains somewhat limited.30

Endorphins, akin to opiates, represent opioid polypeptide compounds generated within the hypothalamus-pituitary system in vertebrates. They are triggered by instances of intense physical exertion, emotional arousal, or physical pain. This opioid system may play a role in processes such as analgesia, social bonding, and the development of depressive symptoms, given the connection between β-endorphins and depression.30

The "endorphin hypothesis" posits that engaging in physical activity triggers an increased production of endogenous opioid peptides within the brain. These natural compounds serve to alleviate pain and elevate mood, consequently diminishing feelings of anxiety and despair. Recent research has not only supported these theories but has also demonstrated that endorphins can indeed have a positive impact on mood during exercise. This suggests the need for further investigation into the endorphin theory.31

Physical activity and exercise have been shown to ameliorate depressive symptoms and enhance overall mood across various age groups, including children and adolescents.32 Global research synthesis has consistently revealed that physical exercise outperforms control groups, offering a viable therapeutic option for individuals contending with depression.33 Additionally, many forms of yoga that commence with a focus on breathing exercises, self-awareness, and relaxation techniques have exhibited a positive influence on depression and overall well-being.34 Despite the assertion that exercise has mood-boosting effects, the optimal type and duration of exercise required to achieve these benefits remain somewhat ambiguous and appear to be influenced by various factors.35

The efficacy of exercise as a therapeutic approach for unipolar depression was scrutinized in a meta-analysis encompassing 23 randomized controlled trials involving a total of 977 participants. The impact of exercise on depression, while initially moderate, displayed a small and statistically insignificant effect at follow-up. However, when compared to the absence of intervention, exercise yielded a substantial and statistically significant effect size. Furthermore, when contrasted with standard care, exercise demonstrated a moderate yet noteworthy effect.36

In a systematic assessment of randomized controlled trials evaluating exercise interventions for anxiety disorders, the findings suggested that exercise could serve as a beneficial adjunct treatment for anxiety disorders. However, it was found to be less effective than antidepressant treatment in managing these conditions.37

**CONCLUSION**

The positive impact of exercise on mental health has been well-established. In individuals with schizophrenia, yoga has demonstrated particularly favourable effects when combined with exercise compared to no intervention. Maintaining a regular physical activity routine can also lead to significant improvements in sleep quality. For individuals with alcohol dependence syndrome, a combination of medical treatment and consistent exercise proves beneficial, as it not only reduces cravings but also serves as a motivating factor in the battle against addiction. Additionally, there exists substantial evidence supporting the ability of physical exercise to ameliorate symptoms of depression and anxiety.

Translating the wealth of evidence regarding the mental health benefits of physical exercise into clinical practice is of utmost significance. This entails the development of structured exercise therapy programs and the training of professionals to administer them effectively. Moreover, the scarcity of literature pertaining to the Indian context underscores the imperative need for further research to assess and implement interventions involving physical activity tailored to the specific needs of the population.

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