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The impact of physical activity on mental disorders

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Abstract

Introduction

According to the WHO, health includes mental and social well-being, not just the absence of disease. Mental disorders are common and burdensome, with primary treatments being antidepressants and antipsychotics. However, regular physical exercise improves mental well-being and helps prevent depression, anxiety, and sleep disorders. Given the high prevalence of psychiatric disorders and their association with sedentary behavior and physical illnesses, promoting physical activity is crucial. Exercise reduces the risk of major diseases and enhances cognitive and physical health, including reducing depressive symptoms and increasing neural plasticity.

Materials and methods

The literature available in the PubMed database was searched using terms such as ‘’physical activity’’ in mental disorders.

Results

Physical activity (PA) effectively reduces symptoms and enhances cognitive functions in depression, schizophrenia, bipolar disorder, anxiety disorders, and ADHD. Beneficial exercises include walking, jogging, strength training, and yoga. In schizophrenia, PA improves symptoms and cognitive functions, mitigates medication side effects, and enhances well-being. For bipolar disorder, PA reduces mood swings and aids long-term management. Anxiety disorders and ADHD also benefit from PA, with resistance training, yoga, aerobic exercise, and swimming reducing symptoms and improving cognitive functions.

Conclusions

Regular physical activity significantly benefits psychiatric disorders and should be included as a complementary therapy. Further studies are needed to optimize PA interventions for better mental health outcomes.

Keywords

physical activity in mental disorders, depression, schizophrenia, anxiety disorders, bipolar disorder

Introduction

According to the World Health Organization (WHO), health is not merely the absence of disease but also includes mental and social well-being.[1] Mental disorders are widespread and burdensome. Pharmacological treatments, including antidepressants and antipsychotics, continue to be the primary method for symptom management.[2] However, regular physical exercise has been demonstrated to enhance mental well-being and has preventive effects on depression, anxiety disorders, and potentially sleep disorders. Given the high global prevalence of psychiatric disorders and their correlation with sedentary behavior and comorbid physical illnesses, promoting physical activity among psychiatric populations is of paramount importance.[3] Physical exercise exhibits a dose-response relationship, indicating that individuals who attain cumulative activity levels significantly exceeding the currently recommended minimum experience markedly reduced risks of major diseases, including various cancers, cardiovascular diseases, and diabetes. Furthermore, the benefits of physical activity extend to cognitive and physical domains, with evidence supporting reductions in depressive symptoms, enhancements in neural plasticity, and improvements in overall well-being.[4]

Aim of the study

The aim of the study is to describe the impact of physical activity of the most common psychiatric disorders, such as depression, anxiety disorders, schizophrenia, bipolar disorder, ADHD and addictions.

Materials and methods

To compile this review paper, extensive searches were conducted across databases such as PubMed. The search terms encompassed "physical activity in mental disorders." Articles considered were those published in the last 5 years. This screening process aided in identifying articles pertinent to the paper's theme. Subsequently, a comprehensive analysis of the complete texts of potentially relevant articles was conducted, facilitating the extraction of the most relevant information. Clinical trials and meta-analyses were selected.

Description of the state of knowledge

Definition of physical activity

The World Health Organization (WHO) defines physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure". Therefore, physical activity includes not only structured sports but also activities such as walking, running, swimming, gymnastics, dancing, ball games, and martial arts.[4] Additionally, physical exercises are characterized by planning, organization, regularity, and the aim to achieve or maintain various aspects of physical well-being. These exercises are a crucial element that brings beneficial effects to both physical and cognitive functioning in humans.[5]

Epidemiology of Mental Disorders

Approximately 12% of the global population is estimated to suffer from mental disorders, contributing to about 5% of disability-adjusted life years (DALYs) and 16% of years lived with disability worldwide. The mental health burden is further compounded by the high prevalence of comorbid somatic disorders, leading to a reduction in life expectancy by 15 to 20 years compared to the general population.[2]

Risk factors for Mental Disorders

Risk factors associated with the high prevalence of comorbid physical illnesses in individuals with mental disorders include genetic predisposition, adverse effects of pharmacological treatments, and an unhealthy lifestyle. This encompasses poor dietary habits, substance abuse, inadequate sleep quality, low levels of physical activity, and prolonged sedentary behavior.[2]

Medical literature review

Physical activity in depression

Depression, classified as an affective disorder, is a psychiatric condition associated with chronic and disruptive mood disturbances.[6] Patients with depression experience alterations in several critical functions, including sleep, appetite, psychomotor activity, cognitive functions, and mood.[7] Depression represents the foremost burden among psychiatric illnesses and a significant cause of global disability, affecting around 280 million individuals and contributing to over 47 million disability-adjusted life years. Depression is also linked to premature mortality from other diseases and suicide. Effective prevention strategies for depression necessitate interventions targeting established risk factors. Narrative reviews suggest that physical activity may effectively prevent future episodes of depression.[8] In a meta-analysis conducted by M. Noetel et al., exercise showed moderate effects in treating depression compared to active controls, both as a standalone therapy and in combination with other established methods such as behavioral therapy. Walking or jogging were effective for both men and women, while strength training was more effective for women and yoga for men. Additionally, yoga demonstrated slightly greater effectiveness in older adults, whereas strength training was more effective in younger individuals. The benefits of exercise generally correlated with prescribed intensity, with vigorous activity yielding better outcomes. These benefits were equally effective across different weekly doses, for individuals with various comorbidities, and at different baseline levels of depression.[9] In another study conducted by F. Contreras-Osorio et al., the association between engaging in physical exercise and its influence on executive functions in adults with depression was investigated. This meta-analysis revealed that physical exercise interventions may enhance behavioral indicators of working memory in adults experiencing mild-to-moderate depression. This improvement was observed in comparison to passive control conditions (e.g., placebo) and active controls (e.g., group games).[10] Physical activity also has a beneficial impact on treating depression occurring in the course of somatic diseases. Depression is a common comorbidity in Parkinson's disease, affecting approximately 50% of PD patients. In a study conducted by J. Tian et al., the impact

of physical activity on depression in individuals with Parkinson's disease was investigated. The results of this meta-analysis indicate that physical activity reduces depression in patients with Parkinson's disease.

Subgroup analysis showed a significant impact of resistance training lasting 60 to 90 minutes, performed more than 4 times per week for up to 12 weeks, in individuals with Parkinson's disease duration of over 5 years.[11] Depression in older adults, defined as individuals aged ≥65 years, represents a significant concern. Within this demographic, depressive disorders exhibit notable diagnostic complexity, a broad array of clinical symptoms often coupled with somatic complaints, and a heightened risk of disability, substantially affecting quality of life. Antidepressant medications frequently induce undesirable side effects, particularly in older populations, where their usage is frequently prolonged or deemed unnecessary. Thus, there is a critical need to investigate novel non-pharmacological approaches for managing depression. In a randomized controlled trial conducted by J. López-Torres Hidalgo et al., the study compared the efficacy of physical activity versus pharmacological treatment on depression levels among older adults. Participants were randomly allocated into two groups: one engaged in supervised physical exercise sessions twice weekly for one hour over a period exceeding 6 months, while the other received pharmacological treatment during the same timeframe. The findings suggest that both interventions, when administered in group settings, effectively alleviate depressive symptoms in individuals aged ≥65 years diagnosed with mild-to-moderate depressive disorder in primary care. Although initial improvements in depressive symptoms were comparable between the two treatment modalities, pharmacological treatment demonstrated superior efficacy in the medium term. Nonetheless, the occurrence of adverse effects during pharmacological treatment influenced the perception that both interventions were satisfactory among participants and positively impacted their self-assessed health status.[12] Depressive disorders in pediatric and adolescent populations constitute a notable social concern. Early-onset depression is linked with significant adverse consequences, encompassing challenges in social functioning, compromised mental and physical health, and heightened suicide risk. Current clinical guidelines advocate for employing psychotherapy and/or pharmacotherapy to mitigate depressive symptoms in this demographic. Nonetheless, physical activity interventions present promising avenues as adjunct or alternative therapies for depression among young individuals, having demonstrated efficacy in alleviating depressive symptoms.[13] In a randomized controlled trial conducted by A. Philippot et al., the impact of physical therapy on depressive symptoms in adolescents was examined. A group of 52 adolescent inpatients was randomly assigned to either a structured physical exercise program or a control group, with sessions occurring three to four times per week over a six-week period (totaling 20 hours). The integration of structured physical exercise as an adjunct therapy during psychiatric hospitalization for adolescents resulted in a significant reduction in depressive symptoms, underscoring its efficacy in managing depression in this population.[14]

Physical activity in schizophrenia

Schizophrenia is a severe psychiatric illness characterized by positive, negative, and cognitive symptoms.[15] Schizophrenia is a psychiatric disorder characterized by alterations in multiple brain regions, impacting cognitive functions such as thinking, self-awareness, perception,

volition, and occasionally behavior disturbances. Additionally, these alterations often manifest alongside symptoms such as delusions, hallucinations, disorganized speech or behavior, and diminished emotional expression.

Prevalence data indicate that schizophrenia affected approximately 23.59 million people worldwide (0.32%) in 2019, with the prevalence in Europe being higher at 2.8 million people (0.35%).[16] Antipsychotic medications being relatively effective in alleviating the positive symptoms of schizophrenia but their efficacy in treating the negative symptoms of the illness is limited. There is evidence indicating that negative symptoms play a crucial role in the overall disability and quality of life of individuals diagnosed with schizophrenia.[17] Additionally, medications used in schizophrenia can cause various side effects, including extrapyramidal effects, cardiovascular effects, severe adverse effects affecting metabolism, as well as sexual dysfunction. Therefore, increasing attention is being paid to physical activity. Physical exercise and regular physical activity have been identified as a promising and effective intervention for attenuating side effects and ameliorating psychopathological and cognitive symptoms.[16] General physical activity in patients with schizophrenia is associated with the alleviation of symptomatic distress and improvement in overall well-being. Additionally, group exercise sessions facilitate interpersonal integration and the restoration of social functioning in individuals affected by schizophrenia.[18] A meta-analysis conducted by J. Firth et al. evaluated the impact of exercise on cognitive functioning in individuals with schizophrenia. Participants engaged in aerobic exercises. This study indicates that exercise improves cognitive functioning in individuals with schizophrenia, particularly in the domains of social cognition, working memory, and attention, all of which are predictive of socio-occupational outcomes.[19]

Physical activity in bipolar disorder

Bipolar disorder is characterized by significant mood swings, ranging from manic episodes (elevated mood) to bipolar depression. These mood fluctuations cause substantial personal distress or social dysfunction and are not induced by drugs or known physical conditions. The prevalence of the disorder is approximately 1%. Bipolar disorder is a recurring illness and one of the leading causes of disability worldwide, particularly in the 15-44 age group.[20] Bipolar depression is often challenging to manage. One strategy to enhance the efficacy of existing treatments may involve lifestyle interventions, such as incorporating regular physical activity. A randomized controlled trial conducted by M. M. Ashton et al. demonstrated that increasing physical activity in individuals with bipolar disorders provides health benefits, reducing the level of symptomatic manifestations.[21] Another study conducted by I. E. Bauer et al. indicated that a specific multi-modal intervention promoting a healthy lifestyle and focusing on behavioral changes in terms of physical activity and dietary habits may result in improved long-term management of bipolar disorder.[22]

Physical activity in anxiety disorders

Anxiety, a psychological state characterized by worry or fear, is one of the most frequently occurring psychiatric symptoms.[23] Approximately 30% of adults will experience an anxiety disorder (AD) at some point in their lives. Evidence indicates that these disorders are 2 to 3

times more prevalent than mood, impulse-control, or substance-use disorders. Women are particularly at risk, being 1.2 to 6.8 times more likely to develop an AD compared to men.[24] A randomized controlled trial conducted by B. R. Gordon et al. examined the impact of physical activity on the severity of symptoms in anxiety disorders.

Participants randomized to both groups were advised to maintain their current levels of physical activity throughout the trial. Anxiety symptoms were measured using the trait subscale of the State-Trait Anxiety Inventory. This study demonstrated that resistance exercise training improves symptoms of worry and anxiety among young adults.[25] Other types of physical activity are also beneficial in reducing symptoms of anxiety disorders. Another randomized controlled trial conducted by J.Y.Y. Kwok et.al compared the effects of mindfulness yoga versus conventional stretching and resistance training exercise on anxiety. This randomized clinical trial included 138 patients. One group practiced yoga for 90 minutes weekly in an organized group, and participants were additionally encouraged to practice independently for 20 minutes at home twice a week. The second group participated in 60-minute sessions once a week and were also encouraged to perform 20 minutes of exercise independently twice a week. The group that regularly practiced yoga showed greater improvement in psychospiritual outcomes, including anxiety and depressive symptoms, perceived hardship, and perceived equanimity. However, both groups demonstrated significant improvement in physical outcomes related to motor symptoms and mobility, with no statistically and clinically significant superiority noted.[26] Another randomized controlled trial conducted by B. R. Gordon et al. investigated the impact of resistance exercise training (RET) on anxiety and worry symptoms in young adults. The eight-week intervention, administered twice weekly, involved progressively increasing resistance. Participants performed two sets of 8-12 repetitions across eight different exercises until the point of fatigue, deterioration in exercise form observed by the investigator, or inability to complete a repetition. The resistance load was prescribed by the investigator in accordance with established guidelines, rather than being self-selected by the participants. RET sessions were meticulously supervised, conducted on a one-on-one basis in a private training facility, ensuring the presence of only the investigator and the participant. This study demonstrates that greater reductions in anxiety symptoms were observed following the initial familiarization phase in the first week and from the fourth week to the end of the intervention, compared to the period from the first to the fourth week. These progressive reductions suggest that participants experience immediate improvements in anxiety symptoms upon commencing the RET intervention, and even if these reductions temporarily plateau, continued engagement in RET results in further symptom alleviation.[27]

Physical activity in ADHD

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by a persistent pattern of inattention, hyperactivity, and impulsivity that is pervasive across various settings and leads to varying degrees of functional impairment. The prevalence rate is 5.29%.[28] Pharmacotherapy remains the most prevalent treatment for ADHD, though it frequently entails side effects such as headaches, gastrointestinal discomfort, and appetite suppression. Recently, there has been a growing interest among researchers and

clinicians in the application of physical activity and exercise interventions for individuals with ADHD. Empirical studies have indicated that moderate to high-intensity aerobic exercise can significantly enhance executive functions in ADHD patients to varying extents. Regular Tai Chi practice also positively impacts behavior, cognitive functions, and social interactions.[29]
The meta-analysis conducted by F. Zhu et al. assessed the effectiveness of various physical exercise interventions on executive functions and related symptoms in children and adolescents with attention deficit hyperactivity disorder (ADHD). The results of this network meta-analysis reaffirmed the beneficial effects of physical exercise interventions on executive functions and ADHD-related symptoms. The analysis provided limited but suggestive evidence that open-skill activities, which require participants to respond to a dynamically changing and externally paced environment, had the highest probability of being the most promising intervention for improving executive functions, particularly inhibitory control. Conversely, closed-skill activities primarily involving aerobic exercises were found to be the most effective in enhancing working memory, while multicomponent physical exercises were most effective in improving cognitive flexibility. Closed-skill activities dominated by aerobic exercises had the greatest likelihood of being the optimal intervention for alleviating ADHD-related symptoms.[30] A randomized controlled trial conducted by S. Hattabi et al. evaluated the efficacy of a swimming-based alternative treatment for children with attention deficit hyperactivity disorder (ADHD). The study involved school-aged children, ranging from 9 to 12 years, who were diagnosed with ADHD. Participants were randomly assigned to either an experimental group (exercise intervention) or a control group. Cognitive performance was assessed using the Hayling test, ADHD-related behaviors were evaluated with the Children Behavior Check List (CBCL), and changes in reading and numeracy proficiency were measured pre- and post-intervention. After 12 weeks of intervention, the results demonstrated significant improvements in behavior, inhibitory control, and academic performance in the experimental group compared to the control group. These findings suggest that tailored swimming activities may have beneficial effects on cognitive function, behavioral regulation, and academic achievement.[31] Another meta-analysis conducted by M. Wang et al. aimed to systematically evaluate the impact of physical activity (PA) on inhibitory function in children with ADHD. One of the primary deficits associated with ADHD is inhibition dysfunction. Inhibitory function encompasses the control of attention, thoughts, emotions, and behaviors, as well as the ability to overcome strong external temptations or internal impulses. It also facilitates focus, resistance to external distractions, and enhanced concentration. This meta-analysis demonstrated that physical activity (PA) can effectively enhance inhibitory functions in children with ADHD. However, further empirical studies are required to validate the effects of PA interventions. The most significant improvements in inhibitory function, specifically in interference suppression, were observed with long-term moderate-to-vigorous intensity open-skill exercises, conducted twice weekly for a minimum of 60 minutes per session.[32]

Physical activity in drug addictions

Drug addiction is one of the most serious global issues, recognized as a worldwide public health threat. Drugs such as heroin, methamphetamine, marijuana, cocaine, and other illegal substances, which are controlled by the state, can cause addiction. These substances can

induce abnormal excitatory or inhibitory effects in the human central nervous system, leading to various neurological and psychiatric symptoms. Currently, the primary treatment modalities for drug addiction encompass pharmacotherapy, cognitive behavioral therapy, and psychological interventions.

Despite their widespread use in substance abuse treatment programs, there is skepticism about the efficacy of these methods in addressing substance use disorders. Non-pharmacological interventions have become increasingly prioritized in the treatment of drug addiction, with exercise interventions being proposed as a significant component of physical therapy. A meta-analysis conducted by K. Ye and R. Liu aimed to estimate the effects of an aerobic exercise intervention on the physical fitness, emotional state, and mental health of drug addicts. This study demonstrated that aerobic exercise was significantly more effective than the control group in improving cardiorespiratory fitness, muscle strength, balance, and flexibility in individuals addicted to drugs. Additionally, this meta-analysis showed that aerobic exercise effectively alleviated anxiety and depressive symptoms and reduced drug cravings in addicted individuals. Drug craving is a primary symptom of drug addiction and an important diagnostic indicator. Anxiety and depression increase dependence on drugs and are the most common negative emotions associated with addiction. Finally, the results of this study indicated that aerobic exercise significantly improved the mental health of drug-addicted individuals, with the differences in SCL-90 scores being statistically significant.[33]

Summary

This comprehensive review paper explores the impact of physical activity (PA) on various psychiatric disorders, including depression, anxiety disorders, schizophrenia, bipolar disorder, ADHD and addictions. The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being, not merely the absence of disease. Physical activity (PA) effectively reduces symptoms and enhances cognitive functions in depression, schizophrenia, bipolar disorder, anxiety disorders, and ADHD. Exercises such as walking, jogging, strength training, and yoga are beneficial. In schizophrenia, PA improves symptoms and cognitive functions, mitigates medication side effects, and enhances well-being. For bipolar disorder, PA reduces mood swings and aids long-term management. Anxiety disorders benefit from PA, including resistance training and yoga, which reduce symptoms. In ADHD, aerobic exercise and swimming enhance executive functions and reduce symptoms. In conclusion, regular physical activity significantly benefits psychiatric disorders and should be included as a complementary therapy. Further studies are needed to optimize PA interventions for better mental health outcomes.

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