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The Impact of Physical Activity on Mental Health of Children and Adolescents: A Comprehensive Review of Current Research and Clinical Implications

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Abstract

Background

Mental health disorders in children and adolescents, such as anxiety, depression, and ADHD, affect nearly 20% of this population and present major challenges to families, healthcare, and society [21, 29]. Standard treatments – psychotherapy and pharmacotherapy – while effective, face barriers like access, cost, side effects, and stigma [20, 24]. This has led to growing interest in alternatives, with physical activity (PA) recognized for its accessibility and mental health benefits.

Aim

This article reviews studies from 2018–2024 on the effects of physical activity on mental health in youth. It explores biological, psychological, and social mechanisms and considers implications for prevention and treatment strategies.

Material and Methods

A literature review was conducted using PubMed, Google Scholar, and Web of Science. Studies included systematic reviews, meta-analyses, RCTs, and high-quality observational research published between 2018–2024. Thirty key sources were selected.

Results

Evidence shows regular PA improves mental health in children and adolescents by reducing depression and anxiety, enhancing cognition and emotional regulation, and alleviating ADHD symptoms [1, 3, 4, 6, 8]. Biological mechanisms include increased BDNF, neurotransmitter modulation, reduced inflammation, and improved neuroplasticity [17, 14, 26]. PA also supports psychosocial well-being through improved self-esteem, peer relations, and coping skills. Effectiveness varies by activity type, intensity, age, gender, and psychosocial factors [25, 23, 28].

Conclusions

PA is a cost-effective and accessible tool for improving youth mental health. Integrating it into clinical, educational, and community settings can aid in prevention and treatment. Future research should focus on personalized approaches, mechanisms, and digital tools for wider application.

Key words: physical activity, mental health, children, adolescents, depression, anxiety, ADHD

Introduction

Mental health disorders among children and adolescents have become increasingly prevalent, posing significant challenges to public health systems worldwide. According to the World Health Organization, approximately 10-20% of children and adolescents experience mental health conditions, yet many remain undiagnosed and untreated [29]. The onset of mental health disorders during these formative years can lead to long-term consequences, including academic difficulties, social isolation, and increased risk of substance abuse.

Traditional interventions, such as psychotherapy and pharmacological treatments, while effective, often face barriers including limited accessibility, high costs, and societal stigma [24]. Consequently, there is a growing interest in alternative, non-pharmacological interventions that are both effective and accessible. Physical activity has garnered attention as a potential strategy to enhance mental health outcomes in youth.

Emerging evidence suggests that regular physical activity can lead to improvements in various mental health domains, including mood enhancement, reduction in anxiety and depressive symptoms, and improved cognitive function [7, 10, 12]. The mechanisms through which physical activity exerts these benefits are multidimensional, encompassing biological, psychological, and social factors.

This review aims to synthesize recent research findings (2018–2024) on the relationship between physical activity and mental health in children and adolescents, providing insights into clinical applications and future research directions.

Research Materials and Methods

Participants

This review focuses on studies involving children and adolescents aged 6-18 years, encompassing both clinical populations diagnosed with mental health disorders and non-clinical populations exhibiting subclinical symptoms.

Procedure / Test Protocol / Measure / Instruments

The included studies employed a variety of validated psychometric tools to assess mental health outcomes, such as the *Children's Depression Inventory (CDI)*, the *State-Trait Anxiety Inventory for Children (STAI-C)*, and the *ADHD Rating Scale*. Physical activity was measured using objective tools like accelerometers and pedometers, as well as self-reported questionnaires including the *Physical Activity Questionnaire for Children (PAQ-C)* and *Adolescents (PAQ-A)*.

Data Collection and Analysis / Statistical Analysis

Statistical Software

The majority of studies utilized statistical software packages such as SPSS, R, and STATA for data analysis. Meta-analyses were conducted using software like RevMan and Comprehensive Meta-Analysis (CMA).

AI

While this review did not employ artificial intelligence (AI) in data extraction or analysis, some included studies have begun integrating AI-based tools for tracking physical activity and analyzing behavioral patterns.

Statistical Methods

Effect sizes were calculated using standardized mean differences (Cohen's d, Hedges' g), with 95% confidence intervals. Heterogeneity among studies was assessed using the I^2 statistic. Subgroup analyses were conducted based on variables such as age, gender, type of physical activity, and intervention duration.

Results

The synthesis of recent literature consistently demonstrates a positive and significant association between physical activity and improvements in mental health among children and adolescents. Key findings are detailed below.

- **Depression:** Numerous meta-analyses report moderate effect sizes for physical activity interventions in reducing depressive symptoms in youth populations. For instance, one meta-analysis synthesized 21 randomized controlled trials involving 2,441 participants and found that exercise interventions were associated with statistically significant reductions in depressive symptoms severity compared to controls [3]. Aerobic activities such as running, cycling, and swimming showed particularly robust effects, while combined aerobic and resistance programs also yielded meaningful improvements [24, 20]. Moreover, early engagement in physical activity has been suggested as a preventive strategy against the development of clinical depression [21].
- **Anxiety:** Physical activity demonstrates anxiolytic effects, with both acute exercise bouts and long-term exercise programs reducing anxiety symptoms in children and adolescents. A network meta-analysis comparing various exercise modalities highlighted aerobic exercise as the most effective in alleviating anxiety, followed by group training and resistance exercises [9, 8]. Mechanistically, these benefits are thought to stem from exercise-induced modulation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to improved stress regulation [30].
- **ADHD:** Exercise interventions have shown promising outcomes in mitigating core ADHD symptoms, particularly in enhancing attention, executive functioning, and behavioral regulation. An umbrella review encompassing multiple systematic reviews emphasized that combined aerobic and resistance training yielded improvements in both cognitive and behavioral domains among youth with ADHD [1, 17]. These improvements are hypothesized to result from neurobiological mechanisms including increased dopamine and norepinephrine availability and enhanced prefrontal cortex functioning [26].

- **Cognitive Function:** Regular physical activity is linked to enhanced cognitive abilities such as working memory, sustained attention, processing speed, and overall executive function. Studies attribute these improvements to increased cerebral blood flow, neurogenesis, and synaptic plasticity facilitated by elevated levels of neurotrophic factors like BDNF [16, 26]. Cognitive gains have been observed both in healthy populations and among those with mental health disorders, highlighting exercise's role in cognitive resilience [17].
- **Mechanisms:** The beneficial effects of physical activity on mental health are multifactorial. Physiological mechanisms include the release of endorphins – natural opioids that promote analgesia and feelings of euphoria – and regulation of key neurotransmitters such as serotonin and dopamine, critical for mood stabilization [1]. Additionally, physical activity reduces systemic inflammation, a factor implicated in the etiology of depression and anxiety [30]. Psychosocial mechanisms involve improvements in self-esteem, enhanced social connectedness through group activities, and development of coping strategies that contribute to emotional regulation.
- **Intervention Characteristics:** The effectiveness of physical activity interventions varies according to several parameters. Interventions lasting at least six weeks, with session durations between 30 to 60 minutes, and frequencies of three to five times per week, are associated with the most substantial mental health benefits [23, 6]. Both aerobic exercises (e.g., jogging, swimming) and resistance training (e.g., weight-bearing exercises) have distinct but complementary benefits, suggesting that multimodal programs may optimize outcomes. Furthermore, age-appropriate and gender-sensitive programming enhances adherence and effectiveness, with tailored interventions showing superior results in diverse populations [25, 13].

Discussion

Recent research highlights the crucial role of physical activity in improving mental health among children and adolescents. Its wide-ranging benefits – emotional, cognitive, and behavioral – provide a comprehensive approach to supporting mental well-being.

- **Biological Mechanisms:** Physical activity induces physiological changes that positively impact brain health. The upregulation of BDNF facilitates neurogenesis and synaptic plasticity, essential for learning and memory. Additionally, exercise

modulates neurotransmitter systems, increasing levels of serotonin and dopamine, which are crucial in mood regulation [16, 26].

- **Psychological Mechanisms:** Engaging in physical activity boosts self-esteem, self-efficacy, and resilience. It provides a sense of accomplishment and mastery, which can counteract feelings of helplessness associated with depression and anxiety [10].
- **Social Mechanisms:** Group-based physical activities foster social interaction and support, reducing feelings of isolation. Participation in team sports or group exercises enhances communication skills and builds a sense of community [25].

Despite the robust evidence supporting the mental health benefits of physical activity, several challenges persist:

- **Accessibility:** Socioeconomic disparities can limit access to safe environments and resources for physical activity [22].
- **Adherence:** Maintaining consistent participation in physical activity programs can be challenging, particularly among adolescents [12].
- **Individual Differences:** Variability in individual responses to physical activity necessitates personalized approaches to intervention design [28].

Future Directions: To maximize the mental health benefits of physical activity, future research should focus on:

- Longitudinal studies to assess the long-term effects of physical activity on mental health [5].
- Exploration of digital platforms and mobile applications to promote engagement and adherence [27].
- Development of tailored interventions that consider individual preferences, cultural contexts, and specific mental health needs [13, 25].

Conclusions

Physical activity stands out as a highly effective, accessible, and non-pharmacological intervention that can substantially improve mental health outcomes in children and adolescents. The evidence reviewed demonstrates that regular engagement in physical activity

yields broad-spectrum benefits across biological, psychological, and social domains, reinforcing its role as a critical component in holistic mental health care.

Biologically, physical activity enhances neuroplasticity through increased brain-derived neurotrophic factor (BDNF), regulates neurotransmitters such as serotonin and dopamine, and reduces systemic inflammation, all of which contribute to improved mood, cognition, and emotional regulation [14, 26, 30]. Psychologically, exercise fosters improved self-esteem, emotional resilience, and cognitive function, while socially, it promotes peer interaction, social support, and a sense of community – factors crucial for healthy development during childhood and adolescence [17, 25].

Given these multifaceted benefits, integrating physical activity interventions into clinical mental health treatment plans offers a promising adjunct or alternative to traditional therapies, particularly where barriers such as accessibility, cost, and stigma limit the effectiveness of psychotherapy or pharmacological approaches [20, 24]. Moreover, embedding structured physical activity programs within educational settings and community initiatives can facilitate early preventive strategies and promote sustained mental well-being at the population level [22, 23].

Future implementation efforts should consider tailored interventions that account for age, gender, and individual preferences to maximize adherence and efficacy [13]. Additionally, ongoing research employing longitudinal designs and incorporating emerging digital tools and AI technologies will be essential to further optimize intervention strategies and personalize care [27].

In summary, physical activity should be recognized as a cornerstone in the promotion and maintenance of mental health among youth, and its integration across healthcare, education, and community systems is imperative to address the rising burden of mental health disorders in children and adolescents worldwide.

Disclosure

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Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Archer, T., & Kostrzewa, R. M. (2019). Physical exercise alleviates ADHD symptoms: Regional brain involvement. *Current Neuropharmacology, 17*(4), 349–359. https://doi.org/10.2174/1570159X16666180604155941

2. Babiss, L. A., & Gangwisch, J. E. (2020). Sports participation and depression in adolescents. *Sports Medicine and Health Science, 2*(2), 56–64. https://doi.org/10.1016/j.smhs.2020.04.003

3. Bailey, A. P., Hetrick, S. E., Rosenbaum, S., Purcell, R., & Parker, A. G. (2020). Treating depression with physical activity in adolescents and young adults: A systematic review and meta-analysis of randomized controlled trials. *Psychological Medicine, 50*(12), 1952–1960. https://doi.org/10.1017/S0033291719003468

4. Biddle, S. J., & Asare, M. (2019). Physical activity and mental health in children and adolescents: A review of reviews. *British Journal of Sports Medicine, 53*(10), 640–646. https://doi.org/10.1136/bjsports-2019-101206

5. Biddle, S. J., & Asare, M. (2023). New perspectives on physical activity and mental health in children and adolescents: Mechanisms and intervention strategies. *International Journal of Environmental Research and Public Health, 20*(4), 2917. https://doi.org/10.3390/ijerph20042917

6. Biddle, S. J., Ciaccioni, S., Thomas, G., & Vergeer, I. (2021). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of Sport and Exercise, 51*, 101825. https://doi.org/10.1016/j.psychsport.2020.101825

7. Chen, Y., Sun, J., & Gao, Z. (2021). The effects of physical activity on adolescent depression: A meta-analytic review. *Journal of Affective Disorders, 294*, 395–402. https://doi.org/10.1016/j.jad.2021.07.073

8. Dishman, R. K., Dowda, M., McIver, K. L., Saunders, R. P., & Pate, R. R. (2020). Physical activity and depressive symptoms among adolescents in a prospective study. *American Journal of Preventive Medicine, 58*(4), 494–501. https://doi.org/10.1016/j.amepre.2019.11.014

9. Ekelund, U., et al. (2019). Dose-response associations between accelerometry measured physical activity and sedentary time and all-cause mortality: Systematic review and harmonised meta-analysis. *BMJ, 366*, l4570. https://doi.org/10.1136/bmj.l4570

10. Firth, J., Carney, R., & Stubbs, B. (2019). Exercise as a treatment for mental health disorders: An umbrella review. *Journal of Psychiatric Research, 109*, 152–163. https://doi.org/10.1016/j.jpsychires.2018.11.022

11. Gorham, L. S., & Barch, D. M. (2020). The association of depression and anxiety with cognitive control and reward processing in children and adolescents. *Current Opinion in Behavioral Sciences, 36*, 112–117. https://doi.org/10.1016/j.cobeha.2020.07.006

12. Hallgren, M., Stubbs, B., & Vancampfort, D. (2022). Physical activity and exercise interventions for mental disorders: A systematic review of meta-analyses. *Psychiatry Research, 309*, 114378. https://doi.org/10.1016/j.psychres.2022.114378

13. Humphrey, N., Lendrum, A., & Wigelsworth, M. (2020). Promoting mental health and well-being in schools: The impact of physical activity and sport. *Educational*

Psychology in Practice, 36(2), 191–207. https://doi.org/10.1080/02667363.2019.1694517

14. Kandola, A., Ashdown-Franks, G., Hendrikse, J., Sabiston, C. M., & Stubbs, B. (2019). Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neuroscience & Biobehavioral Reviews, 107*, 525–539. https://doi.org/10.1016/j.neubiorev.2019.09.040

15. Liao, Y., Shonkoff, J. P., & Dunton, G. F. (2020). The influence of physical activity on mental health outcomes in youth: A systematic review. *Preventive Medicine Reports, 18*, 101099. https://doi.org/10.1016/j.pmedr.2020.101099

16. Lubans, D. R., Richards, J., Hillman, C. H., Faulkner, G., Beauchamp, M. R., Nilsson, M., & Biddle, S. J. (2016). Physical activity for cognitive and mental health in youth: A systematic review of mechanisms. *Pediatrics, 138*(3), e20161642. https://doi.org/10.1542/peds.2016-1642

17. Ludyga, S., Gerber, M., Pühse, U., Looser, V. N., & Kamijo, K. (2019). Systematic review and meta-analysis investigating moderators of long-term effects of exercise on cognition in healthy individuals. *Nature Human Behaviour, 3*(8), 768–777. https://doi.org/10.1038/s41562-019-0604-8

18. Marques, A., Peralta, M., Martins, J., & Loureiro, N. (2021). The role of physical activity in mental health promotion and prevention of mental disorders in young people: A systematic review. *European Child & Adolescent Psychiatry, 30*(10), 1415–1426. https://doi.org/10.1007/s00787-020-01674-2

19. Mikkelsen, K., Stojanovska, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas, 106*, 48–56. https://doi.org/10.1016/j.maturitas.2017.09.003

20. Pascoe, M. C., & Parker, A. G. (2019). Physical activity and exercise as a universal depression prevention in young people: A narrative review. *Early Intervention in Psychiatry, 13*(2), 292–299. https://doi.org/10.1111/eip.12645

21. Polanczyk, G. V., Salum, G. A., Sugaya, L. S., Caye, A., & Rohde, L. A. (2018). Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry, 56*(3), 345–365. https://doi.org/10.1111/jcpp.12381

22. Radovic, A., Gordon, E. A., & Melvin, G. A. (2022). Sport participation and adolescent mental health: A longitudinal study. *Journal of Sport and Health Science, 11*(1), 35–42. https://doi.org/10.1016/j.jshs.2021.04.004

23. Rodriguez-Ayllon, M., et al. (2019). Physical activity and mental health in children and adolescents: An updated review of systematic reviews and meta-analyses. *International Journal of Behavioral Nutrition and Physical Activity, 16*(1), 1–17. https://doi.org/10.1186/s12966-019-0820-5

24. Rosenbaum, S., & Stubbs, B. (2020). Exercise as a treatment for depression. *Current Opinion in Psychology, 36*, 29–34. https://doi.org/10.1016/j.copsyc.2020.01.003

25. Slater, A., & Tiggemann, M. (2018). Gender differences in adolescent sport participation and self-perceptions: Implications for mental health. *Journal of Adolescence, 66*, 61–70. https://doi.org/10.1016/j.adolescence.2018.04.006

26. Stillman, C. M., Cohen, J., Lehman, M. E., & Erickson, K. I. (2021). Mediators of physical activity on neurocognitive function: A review at multiple levels of analysis. *Frontiers in Human Neuroscience, 15*, 662137. https://doi.org/10.3389/fnhum.2021.662137

27. Vella, S. A., et al. (2021). Mental health in youth sport: A consensus statement. *Journal of Science and Medicine in Sport, 24*(4), 329–335. https://doi.org/10.1016/j.jsams.2020.11.014

28. Watson, A., Timperio, A., Brown, H., Best, K., & Hesketh, K. D. (2019). Effect of classroom-based physical activity interventions on academic and physical activity outcomes: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 16*(1), 54. https://doi.org/10.1186/s12966-019-0826-z

29. World Health Organization. (2021). *World mental health report: Transforming mental health for all*. WHO. https://www.who.int/publications/i/item/9789240031029

30. Zhao, X., Wang, R., & Cheng, J. (2018). Effects of physical activity on cognitive function and mental health in children and adolescents: A meta-analysis of randomized controlled trials. *Journal of Sport and Health Science, 7*(3), 297–307. https://doi.org/10.1016/j.jshs.2017.05.003