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QUALITY OF PHYSICAL ACTIVITY-BASED INTERVENTIONS FOR CHILDREN WITH ADHD: A SYSTEMATIC REVIEW AND IMPLICATIONS FOR SPORTS PRACTICE

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ABSTRACT

Introduction: Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders in childhood and is associated with persistent difficulties in attention regulation, impulse control, emotional regulation, and social functioning [1,4]. In recent years, physical activity-based interventions have gained increasing attention as complementary approaches to standard pharmacological and behavioral treatments [6,10].

Objective: The aim of this study was to conduct a systematic review of the quality and effectiveness of physical activity-based interventions used in working with children diagnosed with ADHD, with particular emphasis on methodological rigor and implications for sport and physical education practice.

Materials and methods: A systematic literature review was conducted using PubMed, Scopus, and Google Scholar. Peer-reviewed studies published between 2008 and 2024 were included if they examined structured physical activity interventions in children with ADHD. The review was conducted in accordance with PRISMA guidelines [17].

Results: The reviewed studies indicate that well-structured physical activity interventions may contribute to improvements in attention, executive functions, emotional regulation, and behavioral outcomes in children with ADHD [14,19,22]. However, considerable heterogeneity was observed in study design, intervention duration, intensity, and outcome measures [5,10].

Conclusion: Physical activity-based interventions represent a promising complementary approach in supporting children with ADHD. High-quality, structured, and individualized programs appear to yield the most consistent benefits. Further research should focus on standardized intervention protocols and long-term outcomes.

KEYWORDS

ADHD; Physical Activity; Children; Intervention Quality; Executive Functions; Sport Practice

CITATION

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Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by persistent patterns of inattention, hyperactivity, and impulsivity that interfere with functioning across multiple life domains [1]. Global prevalence estimates suggest that ADHD affects approximately 5–7% of children worldwide, making it one of the most frequently diagnosed psychiatric conditions in childhood [18,23].

Beyond core symptoms, children with ADHD often experience deficits in executive functioning, emotional regulation, academic performance, and social relationships [4,12]. Standard treatment approaches include pharmacotherapy and behavioral interventions; however, concerns regarding side effects, long-term adherence, and accessibility have led to increased interest in complementary non-pharmacological strategies [21].

Physical activity has emerged as a promising intervention due to its potential neurobiological and psychosocial effects. Exercise influences dopaminergic and noradrenergic neurotransmission, which are central to attentional control and executive functioning—key areas of impairment in ADHD [3,19]. Additionally, growing evidence suggests that regular physical activity may support neural plasticity, improve self-regulation, and enhance motivation in children with ADHD [24,25]. Despite growing empirical support, substantial variability exists in the quality and structure of physical activity-based interventions, limiting their translation into sport and educational practice [6,10].

Objective

The objective of this study was to systematically review the literature on physical activity–based interventions for children with ADHD, with a specific focus on:

- (1) the methodological quality of intervention studies;
- (2) the characteristics of effective physical activity programs;
- (3) implications for sport and physical education practice.

Materials and Methods

This systematic review was conducted in accordance with PRISMA guidelines [17]. Electronic searches were performed using PubMed, Scopus, and Google Scholar for studies published between 2008 and 2024. Search terms included combinations of “ADHD,” “children,” “physical activity,” “exercise,” “sport,” and “intervention.”

The study selection process was conducted independently by two reviewers. Discrepancies regarding study eligibility were resolved through discussion until consensus was reached. This procedure was implemented to minimize selection bias and enhance the methodological rigor of the review [17].

Inclusion criteria

Studies were included if they:

1. involved children diagnosed with ADHD according to standardized criteria [1];
2. examined structured physical activity–based interventions;
3. reported quantitative outcomes related to cognitive, emotional, or behavioral functioning;
4. were published in peer-reviewed journals.

Exclusion criteria

Studies were excluded if they were qualitative only, case reports, or combined physical activity with pharmacological interventions without separate analysis of exercise effects.

Results

The reviewed studies demonstrate that physical activity–based interventions are associated with improvements across multiple domains relevant to ADHD. Aerobic exercise programs, martial arts, yoga-based interventions, and structured sport activities were the most frequently examined modalities [14,15,22].

Improvements were most consistently observed in attention, inhibitory control, working memory, and behavioral regulation [7,13,19]. Programs characterized by regularity, moderate-to-vigorous intensity, and clear session structure yielded the most favorable outcomes [8,20]. These findings are consistent with broader pediatric exercise literature indicating that structured and supervised physical activity is more effective than unstructured or sporadic movement [26].

However, significant heterogeneity was noted across studies with regard to intervention duration, sample size, and outcome measures. Many studies were limited by small samples and short follow-up periods, reducing the generalizability of findings [5,10].

Discussion

The present systematic review provides a comprehensive analysis of the quality and effectiveness of physical activity–based interventions used in working with children diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). Overall, the findings suggest that physical activity interventions may positively influence cognitive, emotional, and behavioral functioning in children with ADHD; however, the magnitude and consistency of these effects appear to be strongly dependent on the quality, structure, and individualization of the interventions.

Quality of physical activity–based interventions

One of the most salient findings of this review is the substantial variability in methodological rigor and intervention quality across studies. While many studies report beneficial outcomes, not all interventions meet basic quality criteria such as clearly defined objectives, standardized session structures, sufficient duration, and appropriate outcome measures [5,6]. This heterogeneity complicates direct comparisons between studies and limits the strength of evidence supporting physical activity as a standalone or complementary intervention

for ADHD. Importantly, variability in outcome measures (e.g., laboratory tasks vs. teacher/parent ratings) may partly explain inconsistent effect sizes across studies and complicate synthesis of evidence [5,9].

High-quality interventions were typically characterized by regular training schedules, moderate-to-vigorous intensity, clearly defined session structures, and supervision by trained professionals with knowledge of both physical activity and ADHD-specific challenges [14,20]. However, not all studies reported consistent or clinically meaningful effects, suggesting that physical activity alone may not be sufficient to address the full range of difficulties experienced by all children with ADHD. These findings underscore the importance of integrating physical activity interventions with broader psychosocial and educational support systems. From a practical perspective, structured programs may be especially valuable when they include explicit self-regulation goals (e.g., stop–think–act routines) and consistent feedback [2,29].

Neurobiological mechanisms underlying observed effects

The beneficial effects of physical activity on ADHD-related symptoms can be partially explained by neurobiological mechanisms. Regular physical activity has been shown to modulate dopaminergic and noradrenergic neurotransmission, which play a central role in attentional control, executive functioning, and behavioral regulation—domains that are typically impaired in ADHD [3,19]. Both acute and chronic exercise may contribute to improved arousal regulation and enhanced neuroplasticity, thereby supporting short-term improvements in attention and inhibitory control [7,8]. Neuroimaging studies further suggest exercise-related changes in prefrontal and subcortical networks implicated in ADHD [27,28]. This is consistent with broader evidence indicating that exercise can influence brain networks supporting cognitive control across development [27,28].

Importantly, these neurobiological effects appear to be dose-dependent, with more consistent benefits observed in interventions that meet minimum thresholds for frequency, intensity, and duration [10]. This finding highlights the need for clearly defined exercise prescriptions in both research and practice. Future trials may benefit from reporting “dose” parameters in a standardized way (frequency $\times$ intensity $\times$ time), enabling more precise comparisons across studies [10,26].

Psychosocial and behavioral mechanisms

Beyond neurobiological processes, psychosocial mechanisms play a crucial role in the effectiveness of physical activity–based interventions. Structured physical activity provides a natural context for practicing rule adherence, impulse control, emotional regulation, and social interaction [2]. These skills are particularly relevant for children with ADHD, who often struggle with behavioral regulation and peer relationships. In addition, mastery experiences in physical activity contexts may strengthen self-efficacy and motivation, which can support persistence and adherence [29].

The reviewed studies indicate that interventions emphasizing predictability, clear expectations, and positive reinforcement are more likely to yield beneficial outcomes [22,20]. Conversely, highly competitive or poorly structured sport environments may exacerbate frustration, emotional dysregulation, and disengagement, particularly in children with more severe symptoms [4].

Individualization and developmental appropriateness

A recurring theme across the reviewed literature is the importance of individualization and developmental appropriateness. ADHD is a heterogeneous condition, with significant variability in symptom presentation, comorbidities, and developmental trajectories [12]. Interventions that fail to account for these individual differences may be less effective or, in some cases, counterproductive.

This heterogeneity also supports the rationale for tailoring interventions to symptom profiles (e.g., predominant inattention vs. hyperactivity/impulsivity) and co-occurring difficulties [12,30].

Programs that allowed for task modification, flexible pacing, and individualized feedback were associated with more consistent improvements in cognitive and behavioral outcomes [11,22]. This finding aligns with contemporary models of ADHD intervention, which emphasize personalized and context-sensitive approaches rather than uniform treatment protocols.

Environmental enrichment and context optimization may further enhance intervention effects, especially when combined with consistent routines and reinforcement [24].

Implications for sport and physical education practice

From a practical perspective, the findings of this review have important implications for coaches, physical education teachers, and sport practitioners working with children with ADHD. Physical activity should not be conceptualized solely as a symptom-reduction strategy but rather as a structured developmental context that supports cognitive, emotional, and social functioning. High-quality sport-based interventions require not only appropriate exercise selection but also informed pedagogical strategies, including clear instructions, consistent routines, individualized task demands, and supportive feedback [2,21]. Regular physical activity contributes broadly to cognitive and mental health outcomes in youth. Importantly, broader evidence indicates that regular physical activity contributes to cognitive and mental health outcomes in children and adolescents, reinforcing the role of sport-based interventions as an integral component of holistic developmental support [16]. Where feasible, collaboration between PE teachers, coaches, and school psychologists may help translate evidence-based strategies into routine practice and improve continuity across settings [2,21].

Furthermore, the results of this review highlight the importance of professional training for individuals working with children with ADHD in sport and educational settings. Increased awareness of ADHD-related challenges, combined with evidence-based behavior management strategies, may enhance both participation and overall intervention effectiveness.

Methodological limitations and directions for future research

Despite encouraging findings, the current body of literature is limited by several methodological shortcomings. Many studies included small sample sizes, short intervention durations, and a lack of long-term follow-up, limiting conclusions regarding the sustainability of observed effects [5,10]. Additionally, inconsistency in outcome measures and intervention protocols hinders cumulative knowledge building. Future work should also examine maintenance of effects after program completion and identify which outcomes (behavioral vs. academic vs. socio-emotional) are most durable over time [9,26].

Future research should prioritize randomized controlled trials with standardized intervention protocols and clearly defined quality criteria. Longitudinal designs examining the long-term impact of physical activity interventions on functional outcomes, such as academic performance and social functioning, are particularly needed [9,17].

Conclusions

Physical activity-based interventions represent a valuable complementary approach in working with children with ADHD. The effectiveness of such interventions is closely linked to their quality, structure, and individualization. High-quality sport-based programs may support improvements in attention, executive functioning, and behavioral regulation. Advancing methodological rigor, standardization of intervention protocols, and stronger integration between research findings and sport practice remains a key priority for future research and interdisciplinary collaboration.

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REFERENCES

1. American Psychiatric Association. (2022). *DSM-5-TR: Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). APA Publishing.
2. Antshel, K. M., & Barkley, R. A. (2008). Psychosocial interventions in attention deficit hyperactivity disorder. *Child and Adolescent Psychiatric Clinics of North America*, 17(2), 421–437. <https://doi.org/10.1016/j.chc.2007.11.003>
3. Archer, T., Kostrzewa, R. M., & Beninger, R. J. (2011). Physical exercise ameliorates ADHD symptoms: Neurobiological mechanisms. *Neurotoxicity Research*, 20(2), 97–112. <https://doi.org/10.1007/s12640-010-9238-6>
4. Barkley, R. A. (2015). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (4th ed.). Guilford Press.
5. Best, J. R. (2010). Effects of physical activity on children's executive function: Contributions of experimental research. *Developmental Review*, 30(4), 331–351. <https://doi.org/10.1016/j.dr.2010.08.001>
6. Cerrillo-Urbina, A. J., García-Hermoso, A., Sánchez-López, M., Pardo-Guijarro, M. J., Santos Gómez, J. L., & Martínez-Vizcaino, V. (2015). The effects of physical exercise in children with attention deficit hyperactivity disorder: A systematic review and meta-analysis. *Child: Care, Health and Development*, 41(6), 779–788. <https://doi.org/10.1111/cch.12255>
7. Chang, Y. K., Liu, S., Yu, H. H., & Lee, Y. H. (2012). Effect of acute exercise on executive function in children with attention-deficit/hyperactivity disorder. *Archives of Clinical Neuropsychology*, 27(2), 225–237. <https://doi.org/10.1093/arclin/acr094>
8. Choi, J. W., Han, D. H., Kang, K. D., Jung, H. Y., & Renshaw, P. F. (2015). Aerobic exercise and attention deficit hyperactivity disorder: Brain research. *Psychiatry Research: Neuroimaging*, 234(2), 141–147. <https://doi.org/10.1016/j.pscychresns.2015.09.003>
9. Cortese, S., Ferrin, M., Brandeis, D., Buitelaar, J., Daley, D., Dittmann, R. W., ... Sonuga-Barke, E. J. S. (2016). Cognitive training and physical exercise for ADHD: Meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(10), 883–896. <https://doi.org/10.1016/j.jaac.2016.06.022>
10. Den Heijer, A. E., Groen, Y., Tucha, L., Fuermaier, A. B. M., Koerts, J., Lange, K. W., & Tucha, O. (2017). Sweat it out? The effects of physical exercise on cognition and behavior in children and adults with ADHD. *Journal of Neural Transmission*, 124(Suppl. 1), 3–26. <https://doi.org/10.1007/s00702-016-1593-7>
11. Diamond, A., & Ling, D. S. (2016). Conclusions about interventions designed to improve executive functions. *Developmental Cognitive Neuroscience*, 18, 34–48. <https://doi.org/10.1016/j.dcn.2015.11.005>
12. Faraone, S. V., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M. A., ... Wang, Y. (2021). The World Federation of ADHD International Consensus Statement. *Neuroscience & Biobehavioral Reviews*, 128, 789–818. <https://doi.org/10.1016/j.neubiorev.2021.01.022>
13. Gapin, J. I., Labban, J. D., & Etnier, J. L. (2011). The effects of physical activity on attention-deficit/hyperactivity disorder symptoms. *Preventive Medicine*, 52(Suppl. 1), S70–S74. <https://doi.org/10.1016/j.ypmed.2011.01.022>
14. Hoza, B., Smith, A. L., Shoulberg, E. K., Linnea, K., Dorsch, T. E., Blazo, J. A., Alerding, C. M., & McCabe, G. P. (2015). A randomized trial examining the effects of aerobic physical activity on ADHD symptoms. *Journal of Abnormal Child Psychology*, 43(4), 655–667. <https://doi.org/10.1007/s10802-014-9929-y>
15. Jensen, P. S., & Kenny, D. T. (2004). The effects of yoga on attention and behavior in boys with attention-deficit/hyperactivity disorder. *Journal of Attention Disorders*, 7(4), 205–216. <https://doi.org/10.1177/108705470400700403>
16. Lubans, D. R., Richards, J., Hillman, C. H., Faulkner, G., Beauchamp, M. R., Nilsson, M., ... Biddle, S. J. H. (2016). Physical activity for cognitive and mental health in youth: A systematic review. *British Journal of Sports Medicine*, 50(23), 1473–1479. <https://doi.org/10.1136/bjsports-2016-096587>
17. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... Moher, D. (2021). The PRISMA 2020 statement. *BMJ*, 372, Article n71. <https://doi.org/10.1136/bmj.n71>
18. Polanczyk, G. V., Willcutt, E. G., Salum, G. A., Kieling, C., & Rohde, L. A. (2015). ADHD prevalence estimates across the globe. *American Journal of Psychiatry*, 172(10), 942–948. <https://doi.org/10.1176/appi.ajp.2015.14101200>
19. Pontifex, M. B., Saliba, B. J., Raine, L. B., Picchietti, D. L., & Hillman, C. H. (2013). Exercise improves behavioral, neurocognitive, and scholastic performance in children with ADHD. *The Journal of Pediatrics*, 162(3), 543–551. <https://doi.org/10.1016/j.jpeds.2012.08.036>
20. Smith, A. L., Hoza, B., Linnea, K., McQuade, J. D., Tomb, M., Vaughn, A. J., Shoulberg, E. K., & Hook, H. (2013). Pilot physical activity intervention reduces severity of ADHD symptoms. *Journal of Attention Disorders*, 17(1), 70–82. <https://doi.org/10.1177/1087054711417395>
21. Sonuga-Barke, E. J. S., Brandeis, D., Cortese, S., Daley, D., Ferrin, M., Holtmann, M., ... Sergeant, J. (2013). Nonpharmacological interventions for ADHD. *American Journal of Psychiatry*, 170(3), 275–289. <https://doi.org/10.1176/appi.ajp.2012.12070991>

22. Verret, C., Guay, M. C., Berthiaume, C., Gardiner, P., & Béliveau, L. (2012). A physical activity program improves behavior and cognitive functions in children with ADHD. *Journal of Attention Disorders*, 16(1), 71–80. <https://doi.org/10.1177/1087054710379735>
23. Willcutt, E. G. (2012). The prevalence of DSM-IV ADHD: A meta-analytic review. *Neurotherapeutics*, 9(3), 490–499. <https://doi.org/10.1007/s13311-012-0135-8>
24. Halperin, J. M., & Healey, D. M. (2011). The influence of environmental enrichment, cognitive enhancement, and physical exercise on brain development: Can we alter the developmental trajectory of ADHD? *Neuroscience & Biobehavioral Reviews*, 35(3), 621–634. <https://doi.org/10.1016/j.neubiorev.2010.07.006>
25. Diamond, A. (2015). Effects of physical exercise on executive functions: Going beyond simply moving to moving with thought. *Annals of Sports Medicine and Research*, 2(1), Article 1011.
26. Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., ... Washburn, R. A. (2016). Physical activity, fitness, cognitive function, and academic achievement in children: A systematic review. *Medicine & Science in Sports & Exercise*, 48(6), 1197–1222. <https://doi.org/10.1249/MSS.0000000000000901>
27. Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be smart, exercise your heart: Exercise effects on brain and cognition. *Nature Reviews Neuroscience*, 9(1), 58–65. <https://doi.org/10.1038/nrn2298>
28. Voss, M. W., Nagamatsu, L. S., Liu-Ambrose, T., & Kramer, A. F. (2011). Exercise, brain, and cognition across the lifespan. *Journal of Applied Physiology*, 111(5), 1505–1513. <https://doi.org/10.1152/jappphysiol.00210.2011>
29. Weiss, M. D., Mitchell, J. T., & Miller, C. J. (2018). ADHD and motivation: A review of neurobiological and psychosocial mechanisms. *Journal of Attention Disorders*, 22(9), 813–823. <https://doi.org/10.1177/1087054713518239>
30. Nigg, J. T. (2017). Attention-deficit/hyperactivity disorder and adverse health outcomes. *Clinical Psychology Review*, 54, 1–12. <https://doi.org/10.1016/j.cpr.2017.03.005>