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# Physical Activity Levels, Sport Participation, and Exercise Outcomes in Individuals with Attention-Deficit/Hyperactivity Disorder: A Literature Review

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## Abstract

**Background.** Attention deficit hyperactivity disorder (ADHD) affects approximately 7.2% of children and adolescents internationally and is associated with functional impairment across

educational, social, occupational, and health behavioral domains. Despite evidence that physical activity benefits cognition and psychosocial functioning, participation remains markedly insufficient, with only 6.5% of adolescents with ADHD meeting all recommended movement guidelines.

**Aim.** To synthesize evidence on physical activity levels, sport participation, exercise types, barriers and facilitators, sex differences, and dose effects in individuals with ADHD.

**Material and methods.** PubMed search (January 2015 – May 2026); studies reporting physical activity, sport participation, or exercise outcomes in individuals with ADHD. Findings were synthesized narratively.

**Results.** Several forms of physical activity — aerobic exercise, martial arts, racket sports, swimming, equine-assisted activities, target shooting, exergaming, combined aerobic-cognitive exercise, and multicomponent school-based programs — were associated with improvements in cognitive, behavioral, or psychosocial outcomes. Barriers were primarily related to executive dysfunction, motivational difficulties, and low self-esteem; facilitators were largely tied to direct experience of the benefits of exercise.

**Conclusions.** Individuals with ADHD engage in physical activity at markedly insufficient levels and face distinctive barriers rooted in executive dysfunction and motivational dysregulation. Multiple forms of physical activity produced meaningful benefits, suggesting interventions need not be restricted to aerobic exercise alone. Sex-specific factors and exercise intensity warrant explicit consideration in intervention design.

**Key words:** ADHD, physical activity, sport participation, exercise, barriers, facilitators, neurodevelopmental disorder

## 1. Introduction

Attention deficit hyperactivity disorder (ADHD) is a highly prevalent neurodevelopmental condition whose clinical significance extends far beyond childhood. According to the International Classification of Diseases, 11th, ADHD is classified under the category of

neurodevelopmental disorders (code 6A05). It is characterised by persistent patterns of inattention and/or hyperactivity-impulsivity that are inconsistent with the developmental level of the individual, manifest in at least two settings (e.g., home and school), and cause clinically significant impairment in social, academic, or occupational functioning. ICD-11 distinguishes four clinical presentations: predominantly inattentive (6A05.0), predominantly hyperactive-impulsive (6A05.1), combined presentation (6A05.2), and other specified (6A05.Y) or unspecified (6A05.Z) presentations. The disorder is typically identified during the developmental period, although it often persists into adulthood, with remission or partial remission patterns varying across individuals [1].

ADHD affects approximately 7.2% of children and adolescents internationally and is associated with impairment across educational, social, occupational, and health behavioral domains [2].

Despite the well-documented benefits of physical activity for physical and mental health, individuals with ADHD engage in it at markedly insufficient levels — the physical activity criterion is the least commonly met among movement recommendations [2]. ADHD symptom profiles differentially predict engagement: inattention in childhood predicts lower physical activity in adolescence, while hyperactivity/impulsivity shows the opposite pattern [3].

Executive dysfunction, including forgetfulness, poor time management, and difficulty initiating behavior, may create a profound disconnect between the intention to be physically active and the capacity to follow through, compounded by poor self-esteem, perfectionism, and motivational deficits [4]. Moderate-to-vigorous physical activity is independently associated with better behavioral outcomes even after controlling for sleep duration [5], and early sport habits predict physical activity participation in adolescence [3]. Sex further moderates these relationships [3], with girls and women with ADHD representing a particularly underserved group in the context of physical activity support [4].

This review synthesizes available evidence on physical activity levels, sport participation patterns, exercise types and their outcomes, barriers and facilitators to engagement, sex differences, and dose effects in individuals with ADHD.

## 2. Material and Methods

This review examined physical activity levels, sport participation patterns, and exercise outcomes in individuals with ADHD through a structured search of the PubMed database, covering publications from January 2015 to May 2026.

The search strategy included combinations of the following terms: "ADHD physical activity," "ADHD sport participation," "ADHD exercise," "ADHD aerobic exercise," "ADHD sport preferences," "ADHD barriers physical activity," "ADHD facilitators exercise," "ADHD organized sport," "ADHD motor activity," "ADHD leisure activity," "attention deficit hyperactivity disorder exercise," "attention deficit hyperactivity disorder sport participation."

Eligible studies included randomized controlled trials, controlled trials, cross-sectional observational studies, longitudinal cohort studies, and qualitative investigations reporting primary empirical data on sport participation, physical activity levels, exercise types, or barriers and facilitators to exercise engagement in individuals with ADHD.

Studies were excluded if they focused on populations without a separately analyzed ADHD subgroup, examined exclusively pharmacological outcomes without a physical activity component, or were published before January 2015.

## 3. Research Results

### 3.1. Physical Activity Levels and Guidelines Adherence in Individuals with ADHD

Adherence to physical activity guidelines among adolescents with ADHD was substantially below recommended levels - only 6.5% of participants simultaneously met all three components of the 24-Hour Movement Guidelines (physical activity ≥60 minutes per day, screen time ≤2 hours per day, and age-appropriate nightly sleep duration), while 18.1% met none of the recommendations. The most common pattern was meeting only one guideline (46.8%), with sleep being the most frequently met single criterion (29.5%), whereas the physical activity guideline alone was met by only 3.6% of the sample [2] — meeting all three guidelines simultaneously was rarer than meeting none. This is clinically significant: moderate-to-vigorous physical activity is independently associated with better behavioral outcomes in adolescents with ADHD even after controlling for sleep duration [5], suggesting a functionally protective role beyond sleep behavior alone.

ADHD symptom profiles also differentially predicted physical activity in adolescence. Inattention symptoms in childhood were associated with a significantly lower likelihood of being physically active in adolescence, while hyperactivity/impulsivity symptoms showed the opposite pattern — higher levels of hyperactivity/impulsivity in childhood were associated with a greater likelihood of physical activity in adolescence [3].

### 3.2. Sport Participation Patterns

In a cross-sectional survey of Israeli adolescents aged 16–19 years, those with ADHD symptoms exhibited significantly lower resilience, lower well-being, and higher distress compared to adolescents without ADHD symptoms [6]. However, participation in structured group-based physical activities, particularly the psychosocially oriented 'Five Fingers' program was associated with significantly better outcomes in distress and well-being among adolescents with ADHD symptoms compared to those who did not participate in group activities. Furthermore, participation in any sport activity independently predicted greater resilience, alongside older age, male gender, and higher socioeconomic status [6].

In a case-control study with Polish adolescents aged 12–13 years, participants in a national after-school athletics program were compared with matched controls. While overall hyperactivity-inattention scores did not differ significantly between groups, analysis of specific symptom components revealed meaningful differences — among girls, positive attentional qualities (reflectiveness and attention) were more frequently observed in program participants (39.7%) than in non-participants (30.0%), and among boys from urban areas, fidgeting was less prevalent in those participating in the athletics program [7].

Early sport habits appear to be strongly predictive of physical activity in adolescence. Spare-time exercise occurring two to three times per week or more at age 9/12 was significantly associated with a higher likelihood of being physically active at age 15, even after controlling for sex, parental education, and neurodevelopmental comorbidities [3].

### 3.3. Specific Sport Types and Physical Activity Forms

#### 3.3.1. Aerobic Exercise.

Aerobic exercise was the most extensively studied modality in the included studies. A randomized trial assigned children aged 5–8 years with ADHD to a 30-minute-per-day before-school aerobic exercise program or a sedentary control condition over approximately 12 weeks — teacher-rated ADHD symptoms, including inattention, were significantly lower in the exercise group at the end of the program. Notably, the aerobic program allowed

children to choose from a variety of active games and sports, which may have contributed to high adherence [8]. A 12-week aerobic exercise program in children with ADHD reduced disruptive behavior symptoms, with improvements maintained throughout the intervention period [9]. A 6-week aerobic exercise program in adolescents with ADHD produced exercise-induced neurobiological changes in dopaminergic pathways alongside improvements in attention and impulse control [10].

#### 3.3.2. Acute Exercise.

Several studies examined the effects of a single bout of aerobic exercise on cognitive functioning in individuals with ADHD. In adult patients, 30 minutes of continuous cycling at moderate intensity significantly improved reaction times and processing speed compared to a control condition, with improvements observed specifically in patients with ADHD but not in healthy controls [11]. A second study with an overlapping sample of adults with ADHD reported further improvements in the ability to inhibit impulsive responses following acute aerobic exercise relative to a rest condition [12]. In children with ADHD aged 8–12 years, 15 minutes of acute exergaming at moderate intensity significantly improved reaction times in inhibition and task switching compared to a sedentary control condition, although no significant effects were observed for visual working memory [13]. Moderate-intensity acute aerobic exercise produced the greatest improvement in inhibitory control in children with ADHD compared to both low and high intensity conditions [14]. Even a single session of aerobic exercise therefore appears sufficient to produce immediate cognitive benefits, regardless of age or ADHD presentation.

#### 3.3.3. Martial Arts.

A one-and-a-half-year taekwondo intervention in adolescents with ADHD produced significant improvements in selective attention and attentional inhibitory control, as measured by the Stroop and Ruff 2 and 7 tests, with large effect sizes observed across all cognitive outcome measures compared to a control group [15]. The structured, discipline-oriented format of martial arts — requiring focused attention on movement sequences, rule-governed behavior, and stepwise skill acquisition — appears particularly compatible with the attentional and self-regulatory demands that are central to ADHD intervention goals.

#### 3.3.4. Racket Sports.

A 12-week table tennis intervention in children with ADHD, using a crossover design in which two groups of 16 children each received the intervention in alternating phases, produced improvements in executive functions in both groups following the intervention

period, alongside positive changes in motor skills and social behaviors [16]. The intervention effects achieved in the first phase were sustained in the follow-up phase, suggesting durable benefits of sport training. The open-skill, dynamic nature of table tennis — demanding rapid decision-making, perceptual accuracy, and whole-body coordination — may provide particularly well-matched stimulation for the neurological profile of individuals with ADHD.

#### 3.3.5. Swimming.

An 8-week swimming training program in 18 children aged 11–14 with ADHD resulted in significant improvements in depression and stress parameters, cognitive flexibility, and selective attention in the trained group compared to controls. Motor coordination and physical fitness also improved, with significant gains in lower limb coordination, flexibility, and abdominal resistance [17].

#### 3.3.6. Equine-Assisted Activities.

An RCT in 34 Korean children with ADHD compared 12 weeks of hippotherapy (24 sessions, twice weekly) to pharmacotherapy [18]. Both groups showed marked improvements in ADHD symptoms and quality of life. No significant between-group differences were detected in most outcome measures, suggesting that hippotherapy may produce improvements in attention, impulsivity, and hyperactivity of a comparable magnitude to pharmacotherapy, though the study was not powered to establish formal non-inferiority [18].

#### 3.3.7. Target Shooting.

A non-randomised controlled study examined the effects of practicing target-shooting sport in 128 Danish children aged 10–14 with ADHD symptoms, with the intervention group 64 children attending a local shooting association once per week for six months, compared to a control group receiving treatment as usual. Although no significant effect was found on the primary outcome of teacher-rated ADHD symptom severity, significant beneficial effects were observed on four secondary outcomes: parent-rated ADHD symptom severity, parent-rated overall difficulties, measures of reaction time variation and omission error [19]. The authors concluded that these findings indicate proof of concept that practicing target-shooting sport may have some beneficial effects on ADHD symptom severity in children.

#### 3.3.8. Exergaming.

An 8-week exergaming intervention in 51 children aged 8–12 diagnosed with ADHD, consisting of three sessions per week of 30 minutes each, produced significant improvements

in reaction times in inhibition and task switching, as well as in general psychopathology and motor abilities, compared to a waiting-list control group [20].

#### 3.3.9. Combined and Coordinative Exercise.

A 12-week combined aerobic and neurocognitive exercise program in 80 Hong Kong children with ADHD aged 6–12 years, consisting of three 60-minute sessions per week, produced significant improvements in executive functions and sleep quality compared to a waitlist control group [21].

#### 3.3.10. Multicomponent School-Based Exercise Training

A six-week multicomponent, school-based exercise program administered to 10 boys aged 8–12 years with ADHD consisted of 45-minute sessions three times per week (18 sessions total) [22]. The 30-minute exercise component included upper limb, lower limb, and trunk strengthening exercises, hopping, stepping, ball throwing, and rope jumping, with speed, repetition, and number of sets progressively increased every two weeks. An additional five minutes per session were devoted to fine motor training (stringing of beads), and ten minutes to attention training using a spot-the-difference activity. Following the intervention, significant improvements were observed in gross and fine motor skills, physical fitness (including grip strength, leg explosive power, and anaerobic capacity) and attention, with greater gains in the ADHD group than in typically developing children in most measures, including fine motor skills, grip strength, leg explosive power, anaerobic capacity, and attention. Teacher-rated inattention and hyperactivity scores reduced considerably, such that 50% of ADHD children could no longer be categorised as symptomatic post-intervention [22]. The authors concluded that structured, school-based exercise should be considered an essential treatment component for reducing disruptive behaviour in the classroom.

### 3.4. Barriers and Facilitators to Sport Participation

The ability to initiate and sustain physical activity represents a particular challenge for adults with ADHD. Executive dysfunction — manifesting as forgetfulness, difficulty with sustained focus, and time management problems — emerged as the most prominent barrier, with many individuals reporting a profound disconnect between their intention to be physically active and their capacity to translate this intention into action. Hyperfocus on non-PA tasks functioned as an additional ADHD-specific barrier, while coping strategies such as action planning and advanced preparation were identified as effective in overcoming these obstacles. Poor self-esteem, perfectionism, and lack of motivation — particularly in the absence of

immediate reward — were also identified as significant barriers. A further ADHD- specific barrier was the level of stimulation: being overstimulated prior to PA created a sense of overwhelm, yet the activity itself needed to be sufficiently mentally and physically stimulating to maintain engagement and avoid boredom [4].

Facilitators fell into several overlapping categories. Experiential benefits — improved mood, mental clarity, and physical fitness following exercise — were among the most commonly reported. Social factors also played a central role: body doubling, group or team participation, and a positive relationship with an instructor each supported sustained engagement. Motivational patterns characteristic of ADHD itself, including spontaneous bursts of motivation and hyper-fixation on physical activity, were identified as unexpected facilitators. Practical enablers such as advance preparation, proximity to activity spaces, and habitual routines established early in life further supported participation, as did the use of physical activity for stress management and emotional regulation [4].

### 3.5. Sex as a Moderating Variable in Physical Activity and ADHD

In a longitudinal cohort of Swedish twins, girls were significantly less likely than boys to be physically active in adolescence overall; however, the associations between childhood inattention and hyperactivity/impulsivity symptoms and adolescent physical activity were not attributable to sex differences, as these associations remained significant after controlling for sex [3]. In the Polish athletics program study, girls who participated more often demonstrated positive attentional qualities (reflectiveness, attention) compared to non-participating girls, while among boys from urban areas, fidgeting was less prevalent in program participants [7]. Women with ADHD appear particularly underserved: most participants in the qualitative study were women, many of whom had not received a formal diagnosis until adulthood [4]. Sex clearly matters in this context — though precisely how and why remains an open question.

### 3.6. Exercise Dose and Modality Effects

The question of optimal exercise intensity received direct attention in two studies. Using a within-subjects design, 25 children with ADHD completed an inhibitory control task after three intensities of treadmill running — low, moderate, and vigorous. Both low- and moderate-intensity exercises resulted in better inhibitory control relative to vigorous-intensity exercise, while cortical arousal measured by alpha power decreased following vigorous exercise, suggesting that vigorous-intensity exercise may not be optimal for cognitive performance in this population. The change in arousal following moderate-intensity exercise

was negatively correlated with reaction time, suggesting that moderate intensity may be optimal for enhancing inhibitory control in children with ADHD [23].

In adult patients with ADHD, 30 minutes of continuous cycling at moderate intensity (50–70% of maximum heart rate) significantly improved reaction times and reduced reaction time variability in a flanker task compared to a control condition, with significant improvements in reaction times observed specifically in the ADHD group but not in healthy controls. Notably, between-group differences in reaction times that were present in the control condition were no longer significant following exercise, suggesting that acute aerobic exercise may partially normalize attentional performance in adults with ADHD. Among patients with higher cardiorespiratory fitness, exercise additionally produced decreased brain activation in frontal and premotor regions, indicating more efficient neural processing following exercise in this subgroup [11]. A second study with an overlapping adult sample found no significant improvements in behavioral performance on a Go/No-go task of response inhibition following acute aerobic exercise; however, patients with ADHD showed exercise-related increases in brain activation in parietal, temporal, and occipital regions during correct inhibition trials, which were not observed in healthy controls [12].

## 4. Discussion

Across the included studies, three patterns emerge consistently: individuals with ADHD are insufficiently active, several forms of exercise produce meaningful benefits, and core ADHD symptoms create distinctive barriers to participation.

The most consistent finding across included studies was that individuals with ADHD engage in physical activity at markedly insufficient levels relative to established guidelines. Only 6.5% of adolescents with ADHD met all three components of the 24-Hour Movement Guidelines, with physical activity being the least commonly met single criterion, achieved by only 3.6% of the sample [2]. This pattern is particularly concerning given that moderate-to-vigorous physical activity was independently associated with better behavioral outcomes even after controlling for sleep duration [5], suggesting that the physical activity deficit in ADHD carries functional consequences beyond mere fitness.

The divergent relationship between ADHD symptom subtypes and physical activity warrants particular attention. Inattention symptoms in childhood predicted lower physical activity in adolescence, while hyperactivity/impulsivity symptoms predicted higher activity — a pattern that remained robust after controlling for sex, parental education, and neurodevelopmental comorbidities. In clinical terms, this matters: children with predominantly inattentive presentations are unlikely to self-select into physical activity and may require more proactive support than their hyperactive-impulsive peers. The finding that early sport habits were significantly predictive of physical activity in adolescence further reinforces the importance of early intervention — establishing physical activity routines before adolescence may serve as a protective factor for long-term sport participation in individuals with ADHD symptom profiles [3].

Structured sport participation appears to confer psychosocial benefits beyond physical fitness in this population. Participation in group-based physical activities was associated with better outcomes in distress and well-being among adolescents with ADHD symptoms, and sport participation independently predicted greater resilience [6]. Organized athletics participation was also associated with more favorable attentional profiles, particularly in girls [7]. These findings suggest that the social and structural dimensions of sport — rather than physical exertion alone — may be therapeutically meaningful for individuals with ADHD. This has practical implications for intervention design: sport programs that emphasize social integration, psychosocial support, and structured participation may be more beneficial than those focused exclusively on physical outcomes.

An important observation from this review is that beneficial outcomes were reported across several different forms of physical activity in individuals with ADHD. Aerobic exercise, martial arts, racket sports, swimming, equine-assisted activities, target shooting, exergaming, combined aerobic-cognitive exercise, and multicomponent school-based programs all produced meaningful improvements across cognitive, behavioral, and psychosocial outcomes [8,9,15,16,17,18,19,20,21,22]. What these modalities share — structure, novelty, attentional demands, and immediate feedback — may matter more than the specific movements involved. Notably, even activities characterized by focused stillness — such as target shooting — produced significant improvements on secondary outcomes [19], indicating that the mechanisms of benefit in sport for ADHD may be more heterogeneous than previously assumed.

Executive dysfunction — manifesting as forgetfulness, time management difficulties, and difficulty initiating behavior despite motivation — emerged as the most prominent barrier, creating a disconnect between intention and action that is characteristic of ADHD-related impairments in self-regulation. Poor self-esteem, perfectionism, motivational deficits, and difficulties with stimulation regulation further compound this challenge. In the qualitative evidence, facilitators were mainly linked to participants' own experiences of the benefits of physical activity, rather than to formal education about exercise and ADHD. A recommendation alone is insufficient. Effective interventions must actively address executive dysfunction through strategies such as body doubling, advance planning, and social accountability — and ensure that individuals have direct opportunities to experience the cognitive and emotional benefits of exercise [4].

The evidence also points to a consistent and underappreciated sex gap. Girls were less likely than boys to be physically active in adolescence [3], and women with ADHD appear particularly underserved in the context of physical activity support, with many not having received a formal diagnosis until adulthood [4]. At the same time, organized sport participation appeared especially beneficial for girls' attentional profiles [7]. Sex-specific barriers and facilitators therefore warrant explicit consideration in the design of physical activity interventions for individuals with ADHD, with girls and women representing a priority group for targeted support [3,4,7].

Regarding exercise dose, for children moderate intensity appears most reliably associated with cognitive benefit, as vigorous exercise was linked to decreased cortical arousal and poorer inhibitory control [23]. In adults, the picture is less settled, though moderate-intensity exercise normalized reaction time performance specifically in the ADHD group [11], and neuroimaging evidence points toward meaningful neural adaptations even after a single session [11,12].

This review has several limitations. The restriction to PubMed as the sole search database may have resulted in the omission of relevant studies indexed in other databases. The heterogeneity of study designs, populations, sport types, and outcome measures across the 23 included studies precluded formal meta-analysis, necessitating a narrative synthesis approach. The majority of included studies focused on children and adolescents, limiting the generalizability of findings to adult populations. Additionally, most studies measured sport and physical activity outcomes as secondary rather than primary endpoints, resulting in indirect evidence regarding sport preferences specifically. Future research should prioritize the direct assessment of sport preferences using validated instruments, employ longitudinal designs to examine sport participation trajectories across the lifespan, and address the underrepresentation of adult and female populations in the current evidence base.

Sample sizes in most included studies were modest, reducing statistical power and raising questions about the representativeness of samples. Publication bias—the overrepresentation of positive findings—is a standing limitation of narrative synthesis.

## 5. Conclusions

Individuals with ADHD engage in physical activity at markedly insufficient levels — only 6.5% of adolescents met all three components of the 24-Hour Movement Guidelines. Inattention symptoms in childhood represent a particular risk factor for physical inactivity in adolescence, while early sport habits appear protective for long-term participation. Structured sport participation confers psychosocial benefits beyond physical fitness, with group-based activities associated with greater resilience and well-being in adolescents with ADHD symptoms.

Several types of physical activity, including aerobic exercise, martial arts, racket sports, swimming, equine-assisted activities, target shooting, exergaming, combined aerobic-cognitive exercise, and multicomponent school-based programs — demonstrated meaningful clinical benefits in this population. This breadth of effective modalities indicates that sport recommendations for individuals with ADHD need not be restricted to aerobic exercise alone.

The primary barriers to physical activity in this population are executive dysfunction, motivational deficits, and poor self-esteem. Facilitators, by contrast, stem almost exclusively from direct experience of the benefits of exercise rather than formal education about them. Girls and women with ADHD remain particularly underserved in this regard, and their needs should be explicitly addressed in intervention design. Physical activity programs for individuals with ADHD are most likely to succeed when they are tailored to individual symptom profiles, embedded in social contexts, and experienced as genuinely enjoyable. For healthcare providers and sport practitioners, these findings underscore the need to move beyond generic exercise recommendations — effective physical activity support for individuals with ADHD must account for symptom subtype, sex, and the structural conditions that enable sustained participation.

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