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Original Article

Effects of a Group-Based Physical Activity Intervention on Resilience and Self-Esteem in Primary-School Female Students with Attention Deficit Hyperactivity Disorder (ADHD)

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Abstract

Background: It appears that the exacerbation of psychological symptoms associated with the Attention Deficit Hyperactivity Disorder (ADHD) necessitates the implementation of early and effective interventions. This study aimed to explore the impact of engaging in a physical activity intervention, specifically focusing on aerobic exercises, on the resilience and self-esteem of primary school girls diagnosed with ADHD.

Methods: This was a quasi-experimental study. The target population included female primary school students diagnosed with ADHD in Tehran, Iran, during the academic year 2023-2024. The purposive sampling technique was used to select a total of 40 participants, who were then randomly allocated to either the experimental group (Aerobic) or the control group through a simple randomization method, with each group consisting of 20 individuals. The aerobic training program was conducted over a period of eight weeks, featuring three sessions per week. For data collection, the Davidson & Conner Resilience Questionnaire (CD-RISC) and the Rosenberg Self-Esteem Scale (RSE) were used. Data analysis was carried out using paired and independent t-tests via SPSS version 27.

Results: Based on the findings, the participants demonstrated a moderate body mass index (BMI), with an average of 16.8±0.48. Additionally, there was a statistically significant difference in resilience scores observed between the aerobic group (54.20±11.82) and the control group (44.45±14.06) during the posttest (P=0.023). Furthermore, self-esteem scores also exhibited a significant difference between the aerobic group (16.80±3.07) and the control group (13.75±3.65) in the posttest (P=0.007).

Conclusions: The results of the present study suggested that policymakers in special education should formulate strategic initiatives aimed at promoting the active participation of children with ADHD in physical activities, which could subsequently improve psychological factors such as resilience and self-esteem.

Keywords: Exercise, ADHD, Psychological Resilience, Self-concept, Female

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1. Introduction

Childhood represents a critical developmental phase, and inadequate attention during this time can lead to lasting negative effects (1). Many behavioral issues and maladjustments that manifest later in life can be traced back to the familial environment, insufficient recognition of the unique needs of childhood, and a lack of appropriate guidance throughout the growth process (2). Such neglect can hinder a child's ability to adapt to their surroundings, resulting in various behavioral deviations across multiple dimensions (3). Consequently, it is vital to recognize and address disorders and maladjustments during childhood. Diagnosing issues in children poses significant challenges, primarily due to the expectation that they are still in the early stages of growth and learning, coupled with their underdeveloped psychosocial skills (4). The elementary school years present an opportune moment for identifying these issues, allowing for timely interventions that can mitigate potential emotional, social, and academic difficulties (4, 5). Early intervention and modification of maladaptive behaviors during this sensitive period can enhance social competencies and foster acceptance among peers and adults, thereby equipping the child to handle academic responsibilities effectively (3, 6).

Attention Deficit Hyperactivity Disorder (ADHD) ranks as one of the most prevalent neurobehavioral disorders for which children and adolescents seek treatment. Research indicated that ADHD affects approximately 3 to 5 percent of primary school-aged children, with a diagnosis rate in boys being three times higher than that in girls (7). Although the precise etiology of ADHD remains unclear, studies suggested that it has a biological basis, stemming from neurochemical imbalances within the brain (8). The disorder is characterized by a consistent pattern of inattention, which may include a short attention span, distractibility, impulsivity, difficulties in task completion, and poor concentration (7, 9). Additionally, hyperactivity is evident through perceptual motor challenges, emotional instability, and general coordination deficits, while impulsivity is marked by actions taken without forethought, abrupt shifts in activity, and restlessness in classroom settings (10). For a diagnosis of ADHD, these symptoms must persist for a minimum of six months and exceed what is typically expected for the child's developmental stage. In educational environments, children with ADHD may exhibit behaviors such as hastily responding to questions during tests but failing to complete them, an inability to wait for their turn, and difficulty remaining seated at home. These children often display explosive and irritable behavior (11, 12). While many children may exhibit similar behaviors during periods of anxiety or excitement, those with ADHD experience these symptoms consistently across various contexts.

Children diagnosed with ADHD often exhibit diminished resilience, a consequence of the inherent traits of the disorder (13). Resilience is crucial for fostering individual success and facilitating recovery from challenging life circumstances, as it enhances adaptability, problem-solving capabilities, and goal attainment (14). It is characterized by an individual's belief in their ability to manage stress, alongside possessing coping mechanisms, self-esteem, emotional stability, and personal traits that foster social support (15-17). Resilience signifies the ability to achieve positive developmental outcomes despite facing high-risk situations, ultimately allowing individuals to return to their baseline state following psychological distress. This construct serves as a protective factor against the emergence of psychological issues and mitigates the adverse psychological impacts of challenging events (15, 18). Resilience is recognized as a vital resource that aids individuals in navigating adversity, managing problems, resisting stress, and alleviating its psychological repercussions. Moreover, a fundamental aspect of resilience is self-fulfillment through which resilient individuals possess inner strength, a clear sense of purpose, and contribute positively to their relationships (19, 20). However, children with ADHD often struggle with patience in various situations, leading to a pronounced deficiency in resilience.

Furthermore, another influential psychological aspect in children diagnosed with ADHD is their self-esteem (21-24). Self-esteem plays a crucial role in understanding human behavior and is intricately linked to various mental health outcomes, particularly in the context of interpersonal relationships (21, 25). It can be characterized as an individual's personal assessment of their own worth, which influences their ability to manage daily stressors and fosters a sense of personal value. Empirical studies indicated that diminished self-esteem is associated with behavioral issues in children (22, 25-27). Additionally, low self-esteem acts as a crucial intermediary in the connection between anxiety and the habitual employment of suppression as a method for emotional regulation. Furthermore, studies concerning children with ADHD revealed that those diagnosed with this condition generally display diminished self-esteem relative to their neurotypical counterparts (25, 27-29).

Accordingly, children diagnosed with ADHD exhibit lower levels of resilience and self-esteem as compared with their neurotypical peers. Consequently, it appears that the exacerbation of psychological symptoms associated with the disorder necessitates the implementation of early and effective interventions for these children. While pharmacological treatments should be regarded as a primary and frontline approach to alleviating the symptoms of the disorder, long-term side effects of medication and variability in patient responses to these drugs underscore the importance of considering complementary methods. Research indicated that aerobic activities can significantly impact cognitive components, quality of life, self-esteem, and perceptual-motor abilities across all age groups (30, 31). These activities appear to activate various brain

structures that are crucial for neuroplasticity and cognitive functions. Furthermore, it seems that engaging in such exercises may notably enhance the psychological symptoms, such as lower levels of resilience and self-esteem observed in individuals with ADHD, although further research is required to substantiate this claim. Therefore, this study aimed to examine the impact of engaging in a physical activity intervention, specifically aerobic exercises, on the resilience and self-esteem of elementary school girls diagnosed with ADHD.

2. Methods

2.1. Design

This quasi-experimental study applied a pretest-posttest design with a control group. The Ethics Review Board of Islamic Azad University, Parand Branch, Tehran, Iran approved the present study with the code of IR.IAU.PIAU.REC.1403.010. Also, written informed consent was obtained from the parents of the children.

2.2. Selection and Description of Participants

The statistical population comprised primary school female students diagnosed with ADHD in Tehran, Iran, during the academic year 2023-2024. A purposive sampling method was employed to select a total of 40 participants, who were then randomly assigned to either the experimental group (Aerobic) or the control group, with each group consisting of 20 individuals (Figure 1). The randomization was executed using a simple random technique, which involved generating a table of random numbers. The participants were assigned to either the aerobic or control group in a sequential manner according to their corresponding numbers in the table. This method ensured that each participant had an equal chance of being allocated to either group, thereby reducing the likelihood of biases and confounding variables. A power analysis conducted with G*Power revealed that a minimum of 15 participants per group was required, based on an alpha level of 0.05 and a power of 0.95. Nevertheless, this study included 20 participants in each group. In the aerobic group, the mean resilience scores at the pretest and posttest were 63.29±8.71 and 78.38±12.67, while the control group recorded mean scores of 62.08±10.27 and 61.22±9.83, respectively. The inclusion criteria mandated that participants be primary school students diagnosed with ADHD, have no prior history of psychiatric medication use, and be free from any visual or auditory impairments. Additionally, participants were required not to have engaged in aerobic training or similar exercise programs before the study. Individuals who chose to withdraw from the study or those who missed more than three sessions of aerobic practice were excluded from the study.

2.3. Data Collection and Measurements

2.3.1. Resilience: In this study, resilience was measured using the Conner-Davidson Resilience scale (32), which contains 25 items assessed on a Likert scale ranging from 0 (completely false) to 4 (always true). The total score is calculated by aggregating the responses to all items, yielding a score between 0 and 100, where higher scores indicate greater resilience.

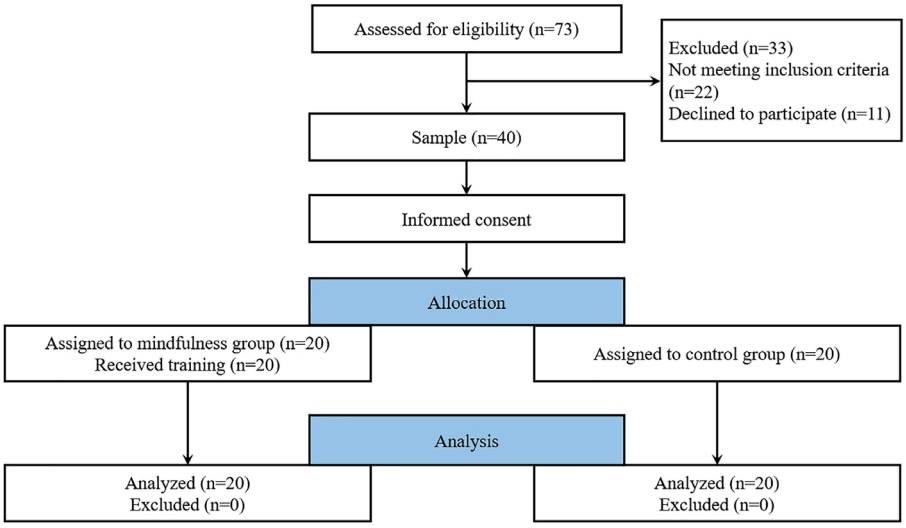

Figure 1: The figure shows the CONSORT flowchart of the study.

The validity of the scale was established through assessments by eight experts, resulting in a Content Validity Index (CVI) of 0.90 and a Content Validity Ratio (CVR) of 0.92. Furthermore, the scale demonstrated robust internal consistency, as indicated by a Cronbach's alpha coefficient of α=0.92.

2.3.2. Self-esteem: The evaluation of self-esteem was carried out using the Rosenberg Self-Esteem Scale (33). This tool consisted of ten items presented as four-point Likert scale questions, with response choices ranging from strongly disagree (0) to strongly agree (3). The validity of the instrument was confirmed through assessments by eight experts, resulting in a CVI of 0.92 and a CVR of 0.92. Additionally, the scale exhibited strong internal consistency, as evidenced by a Cronbach's alpha coefficient of α=0.94.

2.4. Procedure

Following the attainment of ethical approval and collaboration with the Education Department, the school principal, and the parents, written informed consent was obtained from both the students and one of their guardians. Subsequently, a cohort of 53 students diagnosed with ADHD in Tehran, Iran, during the academic year 2023-2024 was identified by a pediatrician. After obtaining informed consent, 40 of students chose to participate in the study. The participants were randomly allocated to either the experimental group (Aerobic) or the control group through a simple randomization method, with each group consisting of 20 individuals. The aerobic group engaged in structured aerobic exercises for eight weeks, participating three times a week under the supervision of a qualified instructor (Table 1). In contrast, the control group received no intervention during the study and was advised to refrain from any sports or therapeutic activities until the completion of the training sessions. Both groups were assessed prior to (i.e., pretest) and following the intervention (i.e., posttest) to measure their levels of resilience and self-esteem. The present study was carried out in strict accordance with established ethical standards.

2.5. Data Analysis

Data were analyzed using descriptive statistics (Mean±Standard Deviation) in SPSS version 27. To assess the normality of the dependent variables, the Shapiro-Wilk test was applied. An independent t-test was conducted to compare the pretest scores across the groups. Furthermore, a paired t-test was used to evaluate the impact of the aerobic intervention on resilience and self-esteem. The significance level was established at P<0.05.

Table 1: A summary of the aerobic training

Session	Content and Exercises
1, 2 and 3	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, marching in place and jumping rope (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
4, 5, and 6	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, hula hooping and frog jumping (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
7, 8 and 9	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, skipping rope and skater (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
10, 11 and 12	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, punching and inchworm (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
13, 14 and 15	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, step-up and jump squad (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
16, 17 and 18	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, flutter kicks and donkey kick (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
19, 20 and 21	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, burpee and jumping jacks (30 minutes) - Cool-down including slow walking and stretching (5 minutes)
22, 23 and 24	- Warm-up including walking and stretching (5 minutes) - Aerobic exercises including speed walking, squat side kick and Zumba (30 minutes) - Cool-down including slow walking and stretching (5 minutes)

3. Results

The present study included a cohort of 40 female students, aged between 9 and 11 years, diagnosed with ADHD. The study participants were selected from primary schools in Tehran, Iran, during the academic year 2023-2024. Demographic data for the participants can be found in Table 2. The analysis revealed that there were no statistically significant differences between the aerobic exercise group and the control group regarding age (P=0.306), height (P=0.668), weight (P=0.117), and BMI (P=0.151).

Table 3 presents attention scores recorded prior to and following the intervention for both the aerobic and control groups. The results indicated a statistically significant difference in resilience scores between the aerobic group and the control group during the posttest phase (P=0.023).

Table 4 presents the self-esteem scores recorded prior to and following the intervention for both the aerobic and control groups. Additionally, the results indicated a statistically significant difference in self-esteem scores between the aerobic and control groups at the posttest stage (P=0.007).

4. Discussion

The aim of this study was to investigate the effects of participation in a physical activity intervention, particularly aerobic exercises, on the resilience and self-esteem of primary school girls diagnosed with ADHD. Our findings revealed that participating in an aerobic intervention result in a significant increase in resilience. The findings aligned with earlier studies involving children (30-33) and suggested that physical activity interventions such as aerobic practices may be beneficial in enhancing resilience in children diagnosed with ADHD. To elucidate these findings, it can be asserted that fostering resilience necessitates enhancing one's' capacity to recover from ongoing challenges and their

Table 2: Demographic characteristics of the participants

Groups	Age (years)	Height (m)	Weight (kg)	BMI
Mindfulness	10.26±0.34	1.37±0.06	31.90±2.40	17.00±0.50
Control	10.20±0.29	1.39±0.05	32.05±2.25	16.60±0.48
Comparison	t=-1.030 P=0.306	t=0.432 P=0.668	t=1.612 P=0.117	t=-1.461 P=0.151

BMI: Body Mass Index

Table 3: Pre- and post-intervention resilience scores in the aerobic and control groups

Variables	Phase	Group		Inter-group Comparisons
		Aerobic	Control	
		M±SD	M±SD	
Resilience	Pretest	44.55±12.44	44.25±14.37	t=0.071 P=0.944
	Posttest	54.20±11.82	44.45±14.06	t=2.373 P=0.023
	Intra-group Comparisons	t=-7.781 P<0.001	t=-0.698 P=0.494	

M: Mean; SD: Standard Deviation

Table 4: Pre- and post-intervention self-esteem scores in the aerobic and control groups

Variables	Phase	Group		P (Inter-group Comparisons)
		Aerobic	Control	
		M±SD	M±SD	
Self-esteem	Pretest	13.45±3.64	13.65±4.01	t=-0.165 P=0.870
	Posttest	16.80±3.07	13.75±3.65	t=2.857 P=0.007
	P (Intra-group Comparisons)	t=-5-805 P<0.001	t=-0.400 P=0.694	

M: Mean; SD: Standard Deviation

ability to self-repair (30). Consequently, resilience augments mental faculties, enabling individuals to adapt more effectively to their environmental circumstances (34). Physical activities, such as aerobic exercises, contribute to this process by enhancing various psychological and mental attributes, thereby increasing one's resistance to confronting existing challenges. In essence, engagement in physical activities, such as aerobic exercise, bolsters mental fortitude and behavioral adaptability, which are crucial components in the development and manifestation of resilience (35, 36). Furthermore, the nature of participation in such physical activities creates an environment conducive to the promotion and enhancement of resilience, particularly among children diagnosed with ADHD. Participation in physical activities, such as aerobic exercise, by virtue of its inherent stress-inducing nature, enhances the capacity to cope with stress (33-35). Specifically, engaging in competitive sports fosters skills in managing stress and addressing associated challenges. Even in physical activities such as aerobic, the competitive elements introduce a manageable level of stress that can facilitate optimal performance (34, 35). Consequently, physical activities, including aerobic exercises, have been shown to bolster resilience among participants.

Moreover, the findings of this study revealed that participating in an aerobic intervention has resulted in a significant increase in self-esteem. The findings aligned with earlier studies involving children (37-40) and suggested that physical activity interventions such as aerobic practices may be beneficial in enhancing self-esteem in children diagnosed with ADHD. To elucidate these findings, it can be asserted that engagement in sports activities facilitates avenues for self-assessment, interpersonal communication, and peer comparison, all of which contribute to the enhancement of self-esteem (37, 38). Specifically, involvement in physical activities fosters self-reflection and encourages interaction with peers, thereby aiding in the development of a positive self-concept and realistic self-acceptance, as well as enhancing satisfaction with one's physical attributes. Furthermore, it can be posited that children diagnosed with ADHD who participate in regular physical exercise experience an increase in their overall sense of well-being, leading them to perceive themselves as more valuable and healthier individuals. This shift in perception ultimately promotes a more realistic acceptance of their identity and the challenges associated with their condition (38, 39). In addition, it can be asserted that the presence of children with ADHD in sports settings such as aerobic reveals numerous similarities in both physical and psychological traits. This environment fosters an enhancement in their self-acceptance and self-confidence through engagement in physical activities, likely leading to a more favorable perception and comprehension of their own bodies (37, 40). In essence, by promoting improved muscle balance and enhancing physical performance, exercise and physical activity serve to mitigate feelings of inadequacy and diminished self-confidence that often stem from muscle inactivity. This inactivity can lead to increased body fat, imbalance, and suboptimal body composition, ultimately contributing to a boost in their overall efficiency and self-esteem (38, 39).

4.1. Limitations

This study had some limitations. First, the present study only addressed elementary school children which may hinder the applicability of the results to other age groups within the ADHD population. Furthermore, the focus of the study on female participants limits its implications for male individuals. Also, using convenience sampling method, while being practical, may introduce biases that affect the external validity of the results. Additionally, the study does not consider the socioeconomic status of the participants, which could impede a thorough understanding of how aerobic interventions influence psychological factors in children with ADHD. Finally, the lack of follow-up assessments restricts the capacity to assess the long-term effects of aerobic activities on the measured variables.

5. Conclusion

The beneficial impacts of physical activity and sports, such as aerobic exercises, on children diagnosed with ADHD have been substantiated across various psychological and physiological domains. Engagement in sports not only enhances resilience and self-esteem among these children but also contributes to the development of their physical abilities and a positive psychological status. Individuals involved in sports typically

exhibit greater self-confidence and a more favorable perception of their physical skills. Moreover, a significant role of sports is to foster the mental and physical development of individuals within society, enhance social interactions, and promote both individual and collective responsibility. Given the influence of physical activities, including aerobic exercises, on psychological factors, it is advisable for policymakers in the realm of Special Education to devise strategic plans that encourage the active involvement of children with ADHD in physical activities, thereby enhancing psychological attributes such as resilience and self-esteem.

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Authors' Contribution

Monir Rostamabadi: Substantial contributions to the conception and design of the work, acquisition and interpretation of data for the work; drafting the work and reviewing it critically for important intellectual content. Sedigheh Khajeh Aflatoon Mofrad: Contribution to the design of the work; drafting the work. Amineh Sahranavard: Substantial contributions to the conception and design of the work; drafting the work and reviewing it critically for important intellectual content. Ali Sadeghian: Design of the work, acquisition, analysis, interpretation of data for the work; drafting the work. Valiollah Shahedi: Design of the work, interpretation of data for the work; drafting the work. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such as the questions related to the accuracy or integrity of any part of the work.

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Ethical Approval

The Ethics Review Board of Islamic Azad University, Parand Branch, Tehran, Iran approved the present study with the code of IR.IAU.PIAU.REC.1403.010. Also, written informed consent was obtained from the parents of the children.

References

1. Ogundele MO. Behavioural and emotional disorders in childhood: A brief overview for paediatricians. World J Clin Pediatr. 2018;7(1):9-26. doi: 10.5409/wjcp.v7.i1.9. PubMed PMID: 29456928; PubMed Central PMCID: PMC5803568.
2. Kiff CJ, Lengua LJ, Zalewski M. Nature and nurturing: parenting in the context of child temperament. Clin Child Fam Psychol Rev. 2011;14(3):251-301. doi: 10.1007/s10567-011-0093-4. PubMed PMID: 21461681; PubMed Central PMCID: PMC3163750.
3. Musa S, Dergaa I. A Narrative Review on Prevention and Early Intervention of Challenging Behaviors in Children with a Special Emphasis on COVID-19 Times. Psychol Res Behav Manag. 2022;15:1559-1571. doi: 10.2147/PRBM.S354428. PubMed PMID: 35769177; PubMed Central PMCID: PMC9234312.
4. Dana A, Ranjbari S, Chaharbaghi Z, Ghorbani S. Association between Physical Activity and Motor Proficiency among Primary School Children. Int J School Health. 2023;10(3):128-135. doi: 10.30476/intjsh.2023.98237.1295.
5. Baniasadi T, Ranjbari S, Abedini A, Dana A, Ghorbani S. Investigation the Association of Internet Addiction with Mental Health and Physical Activity in Teenage Girls: The Mediating Role of Parental Attitude. Women Health Bull. 2022;9(4):243-250. doi: 10.30476/whb.2022.96915.1197.
6. Carroll SL, Mikhail ME, Burt SA. The development of youth antisocial behavior across time and context: A systematic review and integration of person-centered and variable-centered research. Clin Psychol Rev. 2023;101:102253. doi: 10.1016/j.cpr.2023.102253. PubMed PMID: 36758465; PubMed Central PMCID: PMC10073285.
7. Faraone SV, Bellgrove MA, Brikell I, Cortese S, Hartman CA, Hollis C, et al. Attention-deficit/hyperactivity disorder. Nat Rev Dis Primers. 2024;10(1):11. doi: 10.1038/s41572-024-00495-0. PubMed PMID: 38388701.
8. Popit S, Serod K, Locatelli I, Stuhec M. Prevalence of attention-deficit hyperactivity disorder (ADHD): systematic review and meta-analysis. Eur Psychiatry. 2024;67(1):e68. doi: 10.1192/j.eurpsy.2024.1786. PubMed

PMID: 39381949; PubMed Central PMCID: PMC11536208.
9. Peterson BS, Trampush J, Maglione M, Bolshakova M, Rozelle M, Miles J, et al. Treatments for ADHD in Children and Adolescents: A Systematic Review. Pediatrics. 2024;153(4):e2024065787. doi: 10.1542/peds.2024-065787. PubMed PMID: 38523592.
10. Lewczuk K, Marcowski P, Wizła M, Gola M, Nagy L, Koós M, et al. Cross-Cultural Adult ADHD Assessment in 42 Countries Using the Adult ADHD Self-Report Scale Screener. J Atten Disord. 2024;28(4):512-530. doi: 10.1177/10870547231215518. PubMed PMID: 38180045.
11. Baniasadi T. The Relationship between Self-reported and Device-measured Physical Activity among Children with ADHD. Phys Act Child. 2024;1(1):1-5. doi: 10.61186/pach.195747.
12. Khajeaflaton Mofrad S. Impact of a Novelty-based Intervention in Physical Education on Motivation and Physical Activity of Children with ADHD. Phys Act Child. 2024;1(1):6-13. doi: 10.61186/pach.198541.
13. Dangmann CR, Skogli GKW, Holthe MEG, Steffenak AKM, Andersen PN. Life Gets Better: Important Resilience Factors When Growing Up With ADHD. J Atten Disord. 2024;28(8):1198-1209. doi: 10.1177/10870547241246645. PubMed PMID: 38616640; PubMed Central PMCID: PMC11107134.
14. Dvorsky MR, Langberg JM. A Review of Factors that Promote Resilience in Youth with ADHD and ADHD Symptoms. Clin Child Fam Psychol Rev. 2016;19(4):368-391. doi: 10.1007/s10567-016-0216-z. PubMed PMID: 27747466.
15. Najafzadeh F, Ranjbari S, Shafaei H, Ghorbani S. Correlation between Participation in Physical Activity and Psychological Well-being among Elderly Women: The Mediating Role of Resilience. Women Health Bull. 2024;11(3):188-194. doi: 10.30476/whb.2024.102534.1291.
16. Chan ESM, Groves NB, Marsh CL, Miller CE, Richmond KP, Kofler MJ. Are There Resilient Children with ADHD? J Atten Disord. 2022;26(5):643-655. doi: 10.1177/10870547211025629. PubMed PMID: 34167380; PubMed Central PMCID: PMC8702568.
17. Charabin E, Climie EA, Miller C, Jelinkova K, Wilkins J. "I'm Doing Okay": Strengths and Resilience of Children With and Without ADHD. J Atten Disord. 2023;27(9):1009-1019. doi: 10.1177/10870547231167512. PubMed PMID: 37032551; PubMed Central PMCID: PMC10291108.
18. Regalla MA, Guilherme P, Aguilera P, Serra-Pinheiro MA, Mattos P. Attention deficit hyperactivity disorder is an independent risk factor for lower resilience in adolescents: a pilot study. Trends Psychiatry Psychother. 2015;37(3):157-60. doi: 10.1590/2237-6089-2015-0010. PubMed PMID: 26630407.
19. Chan ESM, Dvorsky MR, Green CD, Breaux R, Becker SP, Langberg JM. Predictors and Mechanisms of Resilience for High School Students with ADHD: A Prospective Longitudinal Study. Child Psychiatry Hum Dev. 2024. doi: 10.1007/s10578-024-01704-3. PubMed PMID: 38748322.
20. Ünver H, Rodopman Arman A, Nur Akpunar Ş. Metacognitive Awareness and Emotional Resilience in Children with Attention Deficit Hyperactivity Disorder. Scand J Child Adolesc Psychiatr Psychol. 2022;10(1):33-39. doi: 10.2478/sjcapp-2022-0003. PubMed PMID: 35799976; PubMed Central PMCID: PMC9204392.
21. Hosseini FB, Charbaghi Z, Poshtiban K, Gholidahaneh M, Ghorbani S. Self-Esteem, Goal Orientation, Physical Self-Efficacy, and Health- Related Physical Fitness among Athletic and Non-Athletic Middle-School Students: a Comparative Study. Int J School Health. 2021;8(4):234-240. doi: 10.30476/intjsh.2021.92872.1179.
22. Newark PE, Elsässer M, Stieglitz RD. Self-Esteem, Self-Efficacy, and Resources in Adults With ADHD. J Atten Disord. 2016;20(3):279-90. doi: 10.1177/1087054712459561. PubMed PMID: 23074301.
23. Pedersen AB, Edvardsen BV, Messina SM, Volden MR, Weyandt LL, Lundervold AJ. Self-Esteem in Adults With ADHD Using the Rosenberg Self-Esteem Scale: A Systematic Review. J Atten Disord. 2024;28(7):1124-1138. doi: 10.1177/10870547241237245. PubMed PMID: 38491855; PubMed Central PMCID: PMC11016209.
24. Harpin V, Mazzone L, Raynaud JP, Kahle J, Hodgkins P. Long-Term Outcomes of ADHD: A Systematic Review of Self-Esteem and Social Function. J Atten Disord. 2016;20(4):295-305. doi: 10.1177/1087054713486516. PubMed

PMID: 23698916.
25. Atique J, Weerawardhena H, Climie EA, Callahan BL. Distracted, hyperactive, and thriving: factors supporting everyday functioning in adults with ADHD. BMC Psychiatry. 2025;25(1):418. doi: 10.1186/s12888-025-06804-5. PubMed PMID: 40269791; PubMed Central PMCID: PMC12020315.
26. Sürig L, Kerbage H, Courtabessis E, Diaz E, Visier A, Fongaro E, et al. Attention deficit hyperactivity disorder, self-esteem and the impact of treatments. Encephale. 2024;50(6):603-609. doi: 10.1016/j.encep.2023.11.009. PubMed PMID: 38311473.
27. Dan O, Raz S. The relationships among ADHD, self-esteem, and test anxiety in young adults. J Atten Disord. 2015;19(3):231-9. doi: 10.1177/1087054712454571. PubMed PMID: 22930792.
28. Betancourt JL, Alderson RM, Roberts DK, Bullard CC. Self-esteem in children and adolescents with and without attention-deficit/hyperactivity disorder: A meta-analytic review. Clin Psychol Rev. 2024;108:102394. doi: 10.1016/j.cpr.2024.102394. PubMed PMID: 38286088.
29. Yuen HK, Spencer K, Kirklin K, Edwards L, Jenkins GR. Contribution of a virtual magic camp to enhancing self-esteem in children with ADHD: A pilot study. Health Psychol Res. 2021;9(1):26986. doi: 10.52965/001c.26986. PubMed PMID: 34746492; PubMed Central PMCID: PMC8567820.
30. Hoza B, Smith AL, Shoulberg EK, Linnea KS, Dorsch TE, Blazo JA, et al. A randomized trial examining the effects of aerobic physical activity on attention-deficit/hyperactivity disorder symptoms in young children. J Abnorm Child Psychol. 2015;43(4):655-67. doi: 10.1007/s10802-014-9929-y. PubMed PMID: 25201345; PubMed Central PMCID: PMC4826563.
31. Shafaei H. The Effects of Aerobic Training on Depression and Resilience among Healthcare Workers. J Modern Psychol. 2024;4(4):12-22. doi: 10.22034/jmp.2024.453959.1103.
32. Martinez S, Jones JD, Brandt L, Hien D, Campbell ANC, Batchelder S, et al. Factor structure and psychometric properties of the Connor-Davidson resilience scale (CD-RISC) in individuals with opioid use disorder. Drug Alcohol Depend. 2021;221:108632. doi: 10.1016/j.drugalcdep.2021.108632. PubMed PMID: 33621807; PubMed Central PMCID: PMC8026692.
33. García JA, Y Olmos FC, Matheu ML, Carreño TP. Self esteem levels vs global scores on the Rosenberg self-esteem scale. Heliyon. 2019;5(3):e01378. doi: 10.1016/j.heliyon.2019.e01378. PubMed PMID: 30963120; PubMed Central PMCID: PMC6434180.
34. Sampedro-Piquero P, Moreno-Fernández RD. Building Resilience with Aerobic Exercise: Role of FKBP5. Curr Neuropharmacol. 2021;19(8):1156-1160. doi: 10.2174/1570159X19666210408124937. PubMed PMID: 33829973; PubMed Central PMCID: PMC8719288.
35. Gioscia-Ryan RA, Battson ML, Cuevas LM, Zigler MC, Sindler AL, Seals DR. Voluntary aerobic exercise increases arterial resilience and mitochondrial health with aging in mice. Aging (Albany NY). 2016;8(11):2897-2914. doi: 10.18632/aging.101099. PubMed PMID: 27875805; PubMed Central PMCID: PMC5191877.
36. Ochmann DT, Philippi KFA, Zeier P, Sandner M, Hillen B, Neuberger EWI, et al. Association of Innate and Acquired Aerobic Capacity With Resilience in Healthy Adults: Protocol for a Randomized Controlled Trial of an 8-Week Web-Based Physical Exercise Intervention. JMIR Res Protoc. 2021;10(11):e29712. doi: 10.2196/29712. PubMed PMID: 34847062; PubMed Central PMCID: PMC8669579.
37. Choi JW, Han DH, Kang KD, Jung HY, Renshaw PF. Aerobic exercise and attention deficit hyperactivity disorder: brain research. Med Sci Sports Exerc. 2015;47(1):33-9. doi: 10.1249/MSS.0000000000000373. PubMed PMID: 24824770; PubMed Central PMCID: PMC5504911.
38. Mehren A, Reichert M, Coghill D, Müller HHO, Braun N, Philipsen A. Physical exercise in attention deficit hyperactivity disorder - evidence and implications for the treatment of borderline personality disorder. Borderline Personal Disord Emot Dysregul. 2020;7:1. doi: 10.1186/s40479-019-0115-2. PubMed PMID: 31921425; PubMed Central PMCID: PMC6945516.
39. Seiffer B, Hautzinger M, Ulrich R, Wolf S. The Efficacy of Physical Activity for Children with Attention Deficit Hyperactivity Disorder: A Meta-Analysis of Randomized Controlled Trials. J Atten Disord. 2022;26(5):656-673.

doi: 10.1177/10870547211017982. PubMed PMID: 34041952; PubMed Central PMCID: PMC8785285.

40. Yang G, Liu Q, Wang W, Liu W, Li J. Effect of aerobic exercise on the improvement of executive function in children with attention deficit hyperactivity disorder: a systematic review and meta-analysis. Front Psychol. 2024;15:1376354. doi: 10.3389/fpsyg.2024.1376354. PubMed PMID: 38952825; PubMed Central PMCID: PMC11216162.