

## Research Article

# Effects of Physical Exercise on Adults with Autism Spectrum Disorder

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Autism Spectrum Disorders (ASD) is a neurodevelopmental condition characterized by impairments in communication and social interactions. Despite the numerous studies regarding interventions for individuals with ASD, most of them have been on children and adolescents. Considering the established benefits of physical exercise within general populations, this review evaluates the effects of physical exercise interventions on adults with ASD.

**Keywords:** Autism Spectrum Disorders; Adult; Physical Exercise**Introduction**

Autism Spectrum Disorder (ASD) is a condition characterized by impairment in social communication and the presence of repetitive behaviors and restricted interests [1], with symptoms range from mild to severe and usually persisting throughout the lifespan. Poor social interaction skills represent the primary source of impairment in ASD, regardless of the individual's intelligence or language ability [2]. Furthermore, findings have indicated that many adults with ASD, including those with normal IQ, are at a significant disadvantage in terms of employment, social relationships, physical and mental health, and quality of life [2,3].

Although majority of the interventions have focused on children and adolescents, most individuals suffering from ASD encounter significant challenges well into adulthood, resulting in unemployment or underemployment, poor academic performance, limited social functioning, and a poor quality of life [4]. Individual treatment goals for different patients vary and may include a combination of therapies. Despite advancements in early detection and interventions attempting to limit the impact of ASD on individual and their families, limited effort has been dedicated toward advancing treatment among adults with ASD [5]. Moreover, psychological methods designed for treating children with ASD are difficult to adapt to adult with ASD, as they either involve parental participation or are too time-consuming. Thus, identifying suitable treatment options for adults with ASD is urgently needed. On the other hand, the benefits of physical exercise have been widely recognized recently [6-13]. Physical inactivity has been considered a significant public health problem due to its documented negative impact on quality of life. Moreover, physical exercise has been shown to play a key role in enhancing the well-being of young adults [6,11] and conferring positive effects on not only physical but also psychological health. While majority of the research has been conducted on the general population and the positive effects of physical exercise on cognitive performance, only a few have investigated physical exercise as a health behavior or its impact among adults with ASD [10-13].

The current review aimed to investigate the effects of physical exercise intervention on adults with ASD. Although not a systematic review, published studies have been selected following a detailed

search on MEDLINE. Publications reviewed herein were selected studies involving physical activities for adults with ASD.

**Methods****Search procedure**

An electronic search of the MEDLINE database was conducted to identify relevant studies based on key terms present in their title and abstract. Three search sets were used. The first search set was related to autism and used the terms "ASD" or "autism". The second search set was related to physical activities and used the terms "physical activity" or "physical exercise". The final search set was related to adulthood and used the terms "adult" or "adulthood". The three search sets were linked with the instruction 'AND'.

**Inclusion criteria**

The search sets included all papers published in English from January 2013 to May 2020 and excluded dissertation abstracts. Accordingly, a total of 44 articles were identified, the abstracts of which were then manually reviewed to ensure that the studies investigated physical activity and ASD. After excluding some studies whose samples were less than 18 years old, a total of three studies that satisfied the inclusion criteria were analyzed.

**Results****Over view of reviewed studies**

Table 1 provides an overview of the included articles. All studies were conducted in the United States and sample sizes that ranged from 3 to 143.

After studying the motivational process for physical activity among 143 adults with ASD, Hamm et al [10] reported that the three basic psychological needs explained 39% of the variance within respondents' self-determined motivation, while self-determined motivation explained 8% of the variance in physical activity levels. Savage et al [12] reported that three adults with ASD were also to increase number of laps they did during intervention and concluded that praise statements can be used to increase physical activity levels among adults with ASD. Buchanan et al [13] reported that intrapersonal factors, interpersonal relationships, and community factors were essential for keeping adults with ASD engaged in physical

**Table 1:** Summary of articles included in this study.

References	Sample size	Age (mean)	Exercise	Measurement tool
Hamm J, et al. [10]	143	18-35 (25)	Yoga, golf, walking, tennis running, soccer, swimming	PNSE Scale, BREQ, Godin Leisure-time Exercise Questionnaire
Savage MN, et al. [12]	3	20-22 (21)	Running, walking, jogging	Number of laps heart rate
Buchanan AM, et al. [13]	7	18-42 -27.5	Walking, swimming, treadmill walking	Phenomenological interview

PNSE: Psychological Need Satisfaction in Exercise

BREQ: Behavioral Regulation in Exercise Questionnaire

activity.

### Summary of evidence for physical exercise

The results of the included studies indicated that physical exercise interventions were somewhat effective for adults with ASD. However, difference in various factors, such as duration of interventions, number of sessions, varieties in physical exercises, comparison treatment, and outcomes post-intervention and follow-up, several common findings emerged, did exist among the included studies. As an adjunct to medication, physical exercise appears to have been particularly effective in helping adults address the psychopathology associated with ASD. Furthermore, nonspecific therapy may be more effective for adults with ASD who are socially isolated and lack support.

### Discussion

Despite ASD leading to lifelong disabilities and the increased need for services among adults with ASD, most of research on ASD has focused on children and adolescents. Considering the reported physiological and psychological health benefits associated with physical exercise among children and adolescents [6-9], the three studies included herein examined whether physical exercise was effective in treating mental health problems among adults with ASD.

Accordingly, the current review suggested that physical exercise exhibited varying benefits for adults with ASD following intervention. Several published studies involving the general population had reported that physical exercise had positive effects on cognitive performance [14,15], thereby providing evidence of the feasibility and acceptability of physical exercise. Nonetheless, the effect of exercise varies among individuals [14].

Several studies have shown that physical exercise improved social skills, self-regulation, behavioral skills, and academic performance among children and adolescents with ASD [16-17]. Tan et al [7] reported that physical exercise interventions promoted a small to medium improvement in cognitive function among individuals with ASD and/or attention deficit hyperactivity disorder. Although the aforementioned study was a meta-analysis based on a random-effects model of data reported in 22 studies with 579 participants aged 3-25-year-old, only a limited number of participants with ASD were included (106, aged 3-18-year-old). Thus, this review was excluded from this article. Despite the efficacy of physical exercise on cognitive function, additional research is needed to determine whether physical exercise improves social skills and cognitive impairments among adults with ASD.

ASD is characterized by impairment in social communication and the presence of repetitive behaviors and restricted interests [1]. Several studies have reported that individuals with ASD are typically less physically active compared to typically developing peers [6-10]. This

can be attributed to several reasons, such as lack of motivation [10], low interest in physical exercise [6], low perceived motor skill [11], and low enjoyment of physical exercise [6-8]. Moreover, symptoms associated with ASD, such as impaired communication, limit social interaction required for organized sports, while confidence and competence are important for willingness of individuals with ASD to participate in physical exercise. The higher levels of competence have been found to be associated with greater enjoyment in physical exercise among children and adolescents with and without ASD [6,7,15-17].

The current review therefore suggests that the physical exercise could be potentially beneficial for adults with ASD. However, sample size, age group, type of control group, the type of exercise, and duration of intervention seemed to moderate the relationship between exercise and cognition. As such, further research is needed to definitively determine whether physical exercise did benefit adults with ASD and identify its most effective components and the best methods for delivery.

### Conclusion

This study analyzed the studies investigating the effects of physical exercise on adults with ASD. Accordingly, future directions for research on physical exercise should include more robust and well-designed studies to determine the effective components of physical exercise. Moreover, studies need to focus on a component analysis to evaluate the mechanisms by which change occurred, ultimately leading to more efficient or effective intervention for adults with ASD. Furthermore, future physical exercise trials should consider extending the follow-up durations, which may provide additional information about the natural course of symptoms.

### References

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders- V. Washington, DC. 2013.
2. Carter AS, Black DO, Tewani S. Sex differences in toddlers with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. 2007; 37: 86-97.
3. Barnhill T. Asperger Syndrome: An Overview of Characteristics. *Focus Autism Other Developmental Disability*. 2002; 17: 132-137.
4. Howlin P, Goode S, Rutter M. Adult outcome for children with autism. *Journal of Child and Psychiatry*. 2004; 45: 212-229.
5. Fitzpatrick P, Diorio R, Richardson MJ. Dynamical methods for evaluating the time-dependent unfolding of social coordination in children with autism. *Frontiers in Integrative Neuroscience*. 2013; 7: 1-13.
6. Stanish HI, Curtin C, Must A, Phillips S, Maslin M, Bandini LG. Physical Activity Levels, Frequency, and Type Among Adolescents with and Without Autism Spectrum Disorder. *J Autism Dev Disord*. 2017; 47: 785-794.
7. Tan BW, Pooley JA, Speelman CP. A Meta-Analytic Review of the Efficacy of Physical Exercise Interventions on Cognition in Individuals with Autism

- Spectrum Disorder and ADHD. *J Autism Dev Disord.* 2016; 46: 3126-3143.
8. García-Villamizar DA, Dattilo J. Effects of a leisure programme on quality of life and stress of individuals with ASD. *J Intellect Disabil Res.* 2010; 54: 611-619.
  9. Garcia-Pastor T, Salinero JJ, Theirs CI, Ruiz-Vicente D. Obesity Status and Physical Activity Level in Children and Adults with Autism Spectrum Disorders: A Pilot Study. *J Autism Dev Disord.* 2019; 49: 165-172.
  10. Hamm J, Yun J. The motivational process for physical activity in young adults with autism spectrum disorder. *Disabil Health J.* 2018; 11: 644-649.
  11. Hamm J, Yun J. Influence of physical activity on the health-related quality of life of young adults with and without autism spectrum disorder. *Disabil Rehabil.* 2019; 41: 763-769.
  12. Savage MN, Taber-Doughty T, Brodhead MT, Bouck EC. Increasing physical activity for adults with autism spectrum disorder: Comparing in-person and technology delivered praise. *Res Dev Disabil.* 2018; 73: 115-125.
  13. Buchanan AM, Miedema B, Frey GC. Parents' Perspectives of Physical Activity in Their Adult Children with Autism Spectrum Disorder: A Social-Ecological Approach. *Adapt Phys Activ Q.* 2017; 34: 401-420.
  14. Kramer AF, Erickson KI. Capitalizing on cortical plasticity: Influence of physical activity on cognition and brain function. *Trends in Cognitive Science.* 2007; 11: 342-348.
  15. Tomporowski PD, Lambourne K, Okumura MS. Physical activity intervention and children's mental function: An introduction and overview. *Preventive Medicine.* 2011; 52: 3-9.
  16. Sowa M, Muelenbroek R. Effects of physical exercise on autism spectrum disorders: a meta-analysis. *Research in Autism Spectrum Disorders.* 2012; 6: 46-57.
  17. Sorenson C, Zarrett N. Benefits of physical activity for adolescents with autism spectrum disorders: A comprehensive review. *Review J of Autism and Dev Disord.* 2014; 1: 344-353.