

Comparison of Physiological and Psychological Contributions of Autism Exercise Methods to Autistic Individuals

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ABSTRACT

Background: Autism spectrum disorder (ASD) is increasing due to several reasons, such as digitalization, an increase in ready-made food consumption, and difficult living conditions.

Materials and Methods: This review assesses the significant benefits of different physical activities for people with ASD. This review assesses the significant benefits of different physical activities for people with ASD. A comprehensive search of six databases (CINAHL, Clinical Trials, Cochrane, PEDro, PubMed, and Web of Knowledge) was conducted using the following medical keywords and phrases: effects of exercise on ASD, ASD and exercise interventions, ASD and motoric development.

Results: The developmental problems experienced by these individuals who cannot participate in the education system and the fact that they move further away from social life with each passing day without education create intense concern for both families and authorities. On the contrary, studies continue at an increasing pace to more effectively increase the quality of life of individuals with ASD.

Conclusion: It has been proven that different exercise studies carried out by different branches provide development in ASD both physically and mentally.

Keywords: Autism Spectrum Disorder; Physical Development in Autism; Training Methodology on Autism; Psychological Development

Abbreviations: ASD: Autism Spectrum Disorder; ADDM: Autism and Developmental Disability Monitoring; BOMYT: Brüninks-Oseretsky Motor Proficiency Test

Introduction

Autism Spectrum Disorder (ASD) is defined as conditions that cause people's quality of life to decrease and cause impairments in their social relationships, time periods, communication, and physical and mental development (Cottenceau, et al. [1,2]). The general view of ASD overlaps with problems in verbal or non-verbal communicative

and social communication (Centelles, et al. [1]). Problems such as lack of social communication skills, deficiency or deprivation in simple vital activities, lack of development in educational life, and disorders in speaking ability can be observed in people with autism. However, association may occur in the presence of obsessive movements or actions (Loukusa, et al. [3]). Individuals with OBS have significant developmental problems in gross and fine motor skills. It has been found

that the participation of individuals with autistic spectrum disorders in social and physical activities is achieved through well-designed, purposeful studies to regulate stereotyped behaviors, increase appropriate responses, enhance their perceptual development, and establish eye contact, which will increase their social skills. When physical activities are individually designed, they play an important role in the development of physical activity behavior in children with ASD (Obrusnikova & Miccinello [4]).

Despite intensive research, the causes of ASD are still unclear, but although researchers have focused on the fact that the condition may be genetically based, they believe that environmental and biological factors significantly outweigh this. The effectiveness of early intervention in treating ASD is very high. However, they also report that intervention at any age makes a difference in the quality of life of the individual. There is no single best treatment for ASD to improve quality of life. On the other hand, trials of different treatments [e.g., physiotherapy, behavioral intervention, speech/language therapy, or occupational therapy] have shown significant effects on quality of life and adjustment to life in clinical practice (Cottenceau, et al. [1]). The main purpose of these therapeutic interventions has been measured to be beneficial in the control of generalized or difficult-to-control situations [aggression, atypical behaviors, repetitive behaviors, and self-harm] often seen in children with ODD. Symptoms of ASD usually appear before the age of 3. Studies have shown that since the early 1990s, reports of much higher than expected ASD prevalence estimates, as a result of growing public concern and a steady increase in the number of children receiving services for ASDs, have led to the need for systematic public health surveillance and monitoring of the development and increase of ASDs (Rice, et al. [5]). The Autism and Developmental Disability Monitoring (ADDMM) Network is an active surveillance system that records and analyzes the prevalence of ASDs in the United States and identifies the conditions of parents or guardians and other characteristics of children with ASDs. In the ADDMM network data on the prevalence of ASD among 8-year-old children in 2004 (eight regions) and 2006 (11 regions), the general estimate for all these regions is that the prevalence of ASD was one in 125 children aged 8 years in 2004 and one in 125 children aged 8 years in 2006. In the United States, there has been a significant increase in the number of children with ASD over the past two years, to one in 110 children (CDC, [6]; ADDMM, [7]).

Autism and Physical Activity

Physical activity provides physiological and psychological benefits to people, but conscious and regular exercise can help control psychological problems in all people without the need for medication. It is emphasized that this exercise provides its effective thanks to the positive effects such as reducing oxidative stress, as well as increasing the blood levels of happiness hormones such as endorphins and serotonin in the body (C, et al. [8]). Autism is still considered a disease with physiological and psychological effects that cannot be treated with medication. In addition, combined approaches such as pharma-

cological, psychotherapeutic interventions and educational treatment to control certain behavioral symptoms such as ASD treatment, aggression and insomnia, hyperactivity, repetitive stereotyped behaviors, and repetitive speech are beneficial to some extent. Depression, anxiety, and conditions associated with additional psychiatric comorbidities are more prominent and visible in individuals with ASD, however, such conditions are proportionally 4 times higher in individuals with ASD (Zhao, et al. [9]).

There is evidence that many different approaches to the provision of high-quality physical education for people with autism have positive outcomes, rather than one proven method of success. However, there is little doubt that physical education and physical activity contribute to a positive school experience. It can be difficult to provide high standard physical education to a student with ASD, but effectively planned physical education plays an active role in developing creativity, planning, perseverance, achievement, and a sense of worth. Organized, varied training programs can be an effective and necessary way of improving skills and increasing the transfer of basic skills. A quality program that is well-designed, planned, delivered, evaluated, and adapted can be more effective than many other studies. It is believed that changing teaching approaches and applying intervention strategies to ensure the full integration of students with autism into their educational and living environments, coupled with peer awareness, will also contribute to integration and the effectiveness of the exercise (Özen & Havadar [10]).

In their study (Bueno, et al. [11]) stated that it is an accepted fact that, as a result of intervention with physical activities, mild to moderate depression is controlled compared to cognitive behavior therapy and basic antidepressant drugs, and symptoms such as aggression, insomnia, hyperactivity, and repetitive stereotypic behaviors, which are now generally seen, decrease and disappear in some individuals. Planned and continuous physical exercise stimulates many organs necessary for the secretion of cytokines or metabolic hormones that affect the healthy functioning of the whole body and the brain. Cytokine release stimulated by exercise has a significant effect on modulating neuroinflammation and neuronal metabolism caused by false brain function (Bueno Antequera & Munguía Izquierdo [11]).

(Dewey, et al. [12]) compared and evaluated the motor performance of 49 children with autism, developmental coordination disorder, and hyperactivity disorder, with an average age of 10.2 years, and typically developing children using the Brüninks-Oseretsky Motor Proficiency Test (short form) (BOMYT). As a result of the research, while the total BOMYT score for autistic children was 38.6, it was 43.6 for the children with developmental coordination disorder, 59.8 for the children with attention deficit hyperactivity disorder, and 62.1 for the typically developing children. This study has shown us that a person with ASD lags other people in terms of motor disability. In this measure, the BOMYT motor disability criterion is scored if the total score is below 42 points. They reported that 80% of all children with autism have motor disabilities, depending on their habits. (Derew,

et al, 2007) Parents of people with autism spectrum disorder can be just as withdrawn from social life as people with ASD. This situation affects families as well as individuals with ASD. It limits the lives of parents and other family members and can cause financial and moral problems. In short, the quality of life of the whole family can be negatively affected when there is an individual with ASD in the family.

A well-planned training plan will help the individual develop skills such as ordering, paying bills, developing social relationships, participating in group games, and speeding up the process of adapting to life by increasing the individual's self-confidence. It provides. The contribution of physical education to academic skills is considerable. Studies emphasize that thanks to sports training, the problems of the autistic person, such as concentration and following instructions, are solved, and the coordinators in special and inclusive education listen more and contribute to his development. In addition, through sports training, the ability to recognize colors, know and distinguish grain and number concepts, or receive multiple instructions can be improved thanks to these educational games and exercises. It is well known that developmental differences in academic, social, and self-care skills are interrelated. A person who lacks academic skills cannot pay bills, cannot use traffic lights, and may have difficulty completing social tasks, which can lead to problem behavior. Therefore, sports training is an important tool to improve the quality of life of individuals with ASD and their family members.

(Taner, et al. [13]) conducted a study with six autistic individuals aged 16–23 who were found to have weak basic motor skills and were given basic sports training according to their characteristics. In this study, tests of the self-care and social and academic skills of individuals with autism were applied to a 16-week sports training program. Data from the pre-tests was input into pre-designed information forms. Based on these tests and needs, a sports training program was prepared. The exercise training consisted of training 4 days a week for 7 hours a day for 16 weeks. In addition to evaluating the pre- and post-test results of the vertical jump, standing long jump, flexibility, and paw strength (left and right) parameters, the study also determined self-esteem scores. As a result of the study, a significant improvement in their physical abilities was achieved, and an increase in their self-esteem scores was also observed. It was found that the development of academic skills and self-esteem in individuals, even in this short period, is related to physical development. Therefore, physical growth, skill growth, personal growth, and social skill growth in life are reported to improve the quality of communication in relationships with family and the environment (Taner, et al. [13]).

Effects of Physical Activity Methods on Autism

Physical activity plays an important role in the quality of life of individuals with ASD and is widely regarded as an effective strategy for improving physical fitness. It is recognized that physical activity is of great importance in reducing maladaptive and stereotyped behavior and aggressive and antisocial behavior, as well as improving physio-

logical and psychological health. A well-organized exercise program makes a significant contribution to individuals with ASD in terms of attention, perception, and communication, as well as academic performance (Chen, et al. [6]). In (Bahrami, [14]) study, stereotypic behaviors of individuals with ASD using a martial arts program were assessed with a 60-minute program, four days per week, for 14 weeks. As a result of the study, a significant reduction in stereotypic behaviors was observed. (The Gilliam Autism Rating Scale, 2nd Edition, was used) (Bahrami, [14]). Similarly, in another study, a significant decrease in stereotypic behaviors of children with ASD was observed in measurements of stereotypic behaviors of children with ASD with horse riding practice (60-minute session/week/10 consecutive weeks) (Aberrant Behavior Checklist—community scale was used).

It has also been measured that riding significantly improves adaptive behavior, including social sensitivity and social interactions, as well as communication and daily living skills in children with ASD, as measured by parental reports in studies (Gabriels, et al. [15]). (Keskin, et al. [16]) designed a training program with different levels and types of land and pool exercises to improve motor performance and reduce stereotypic behaviors in children aged between 4 and 11. 39 children with autism participated in the study, and a statistically significant increase in upper and lower extremity coordination, reaction time, visual motor control, and BOTMY total score was observed after training. The exercise program was found to have a positive effect on gross and fine motor skills in all autistic children. Comparisons were made with study and exercise programs. It has been shown (Keskin, et al. [16]) that the study of children with special needs who have been diagnosed with autism and learning disabilities, together with interactive movement activities, contributes more to their development. In their study (Lourenco, et al. [17]) conducted a study on 16 children (13 boys and 3 girls) diagnosed with ASD, aged 4-8, in two groups of eight children each.

The study found significant improvements in motor skills throughout the intervention program because of trampoline training (1 session per week, 30 minutes for 45 days) in a fully equipped gym with various types of trampolines. While no significant difference was observed between the experimental and control groups at the beginning of the study, when compared at the end of the study, it was observed that there was significant progress in fine motor integration, bilateral coordination, agility, and balance between the experimental and control groups. Considering the results described in this study, trampoline-based training significantly contributed to the improvement of both motor proficiency and the strength of the lower limbs. Considering that children with ASD have balance problems, it is necessary to improve them. It has been observed that trampoline training makes a significant contribution both to eliminating the weaknesses in the muscle development of these children and to the active endurance and development of the abdominal area, which is important for balance (Lourenco, et al. [17]).

Discussion

The consensus is that ASD causes an observable decrease in the social interactions and social sensitivity of individuals. Many studies, including the land and pool studies conducted by (Keskin, et al. [16]), the trampoline studies conducted by (Lourenco, et al. [17]) and the studies conducted by (Bahrami, [14]) show us that exercise improves the physical condition of individuals with ASD. In addition, it provides improvements in behavioral patterns related to social interaction and social sensitivity. Concentration is a major barrier to learning and perception for people with ASD. Without healthy focus, the work required to develop other skills cannot be carried out properly. In studies conducted by (Nicholson, [18]) it was observed that individuals diagnosed with autism increased their focus time by approximately 7.5% on average with a 15-minute running exercise performed with the subjects (Nicholson, [18]).

(Tse, [19]) performed exercise with brisk running in his 12-week study on 27 children with ASD in the 8–12 age group, including 15 subjects and 12 control groups. The exercise consisted of a 5-minute warm-up, a 20-minute run, and a 5-minute cool-down. The study, a family survey on emotion regulation and behavioral functioning, found that the study resulted in positive developments in the children's emotion regulation and behavioral functioning (Tse, [19]). In their study (Sarabzadeh, [20]) randomized 18 individuals with ASD between the ages of 6 and 12 into experimental and control groups. The experimental group underwent a six-week Tai Chi Chuan program, each session lasting 60 minutes, for a total of 18 sessions. Their study, which used pre-and post-test scores and the M-ABC test to assess motor skills, found that the Tai Chi Chuan training program provided individuals with physical characteristics such as hand-foot coordination, muscle tone, sensory homogeneity, and body awareness, as well as psychological development such as self-confidence. Studies show that physical exercise has a recognized contribution to the treatment of many existing psychiatric disorders.

It stimulates molecular effects that induce an anti-inflammatory state resulting from a chronic pro-inflammatory state in the central nervous system, as well as its positive contribution to many physiological muscles. Due to the potential for pro-inflammatory events in ASD, positive development from exercise has proven its effectiveness both theoretically and practically through many studies. Because the anti-inflammatory formations that occur because of the effects of exercise affect the regulation of neurotransmitters, physical exercise has an important role to play in regulating the inflammatory conditions that cause psychological distress as well as reduced body mass in children with ASD (Tse, et al. [19,21-23]).

Conclusion

As a result, human beings need physical activity for their health, even if it is a little more than their daily routine for their physiolog-

ical and structural health. Therefore, exercise makes a positive contribution to both healthy individuals and individuals with ASD. The introversion of individuals with autism in social and communicative communication forces them to participate in sports activities and communicate socially with people. This makes them more open to the sedentary lifestyle of autistic patients. This not only affects the overall health of autistic patients but also deprives them of social adaptability. Physical activities provide individuals with autism the opportunity to communicate with others, whether done in a group or with an instructor. As people with ASD are less skilled than non-autistic children of the same mental age, particularly in play-based education, research can help these children to approach other children's play levels, use play as a means of communication with other children, and provide guidance on how to set up play with other children. Stereotyped behavior is one of the fundamental deficits of autistic patients, consisting of a series of repetitive, purposeless, and meaningless behaviors.

The effect of physical activity in reducing stereotyped behaviors of autistic patients is that the stimulation obtained by the physical activities of autistic patients has a similar internal effect mechanism as the stimulation produced by stereotyped behaviors, and this can bring comfortable sensory stimulation to individuals with autism. This also contributes to preventing children from being distracted by stereotyped movements and behaviors during their education period. ASD creates many developmental delays in individuals. Many studies have shown that exercise contributes to all these goals in terms of keeping these conditions stable and improving, allowing individuals to continue their lives comfortably and reducing the care burden on their families. In summary, the literature recognizes a wide range of benefits of physical exercise studies on symptomatology in the ASD population. The effectiveness of many working styles in exercise has been observed and their contributions are obvious. However, ASD is a condition that encompasses many different conditions. Monotonous work reduces developmental standards. It seems that organizing the exercises in a way that provides both psychological and physiological effects to all parts of the brain makes the exercises more effective. It is seen that having equipment such as a trampoline in addition to standard body activities such as walking in the working methodology will contribute to getting rid of monotony with its physiological contribution. We also believe that integrating intelligence-training arguments and tasks-related studies into the studies within the program will contribute significantly to the individual in terms of success and self-confidence.

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Author's Contributions

All authors read and approved the final version of the manuscript.

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