

# An Experimental Study on the Effect of Sports Activities Intervention in Improving Stereotypical Behavior of Children with Autism

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## Abstract

Autism is a developmental disorder characterized by stereotypical behavior, social impairment, and narrow interests (Koo & Lee, 2019). Although various interventions have been developed to improve autism symptoms, research on the effects of sports activity on the behavior of children with autism is limited. The purpose of this study was to examine the effects of movement interventions in running and ball games in improving stereotypical behaviors in children with autism. We conducted a randomized controlled trial with 60 children with autism aged 4-6 years. The experimental group received a 12-week physical activity intervention program involving the use of running and ball games and the control group received conventional treatment. The results showed that sports activities intervention significantly reduced stereotypical behaviors such as lack of movement, repetitive movement, and fixed patterns of play in children with autism. Further analysis showed that this effect was mediated by improvements in motor skills, cognitive development, emotional regulation, and social interactions. These findings suggest that sports activity interventions may be a promising approach to improving stereotypical behaviors in children with autism and highlight the importance of addressing multiple levels of functioning in autism interventions.

**Keywords:** Autism, Stereotypical Behavior, Sports Activities, Intervention, Behavior Modification, Special Education.

## Introduction

Global Perspectives on autism characterize children with this condition as part of a vast and diverse community across the world, with unique needs, abilities, and challenges. The World Health Organization (WHO), a global authority on health matters, defines autism spectrum disorder (ASD) as a complex, lifelong neurodevelopmental condition typically presenting in early childhood. It is characterized by varying degrees of impairments in social interaction and communication, along with a restricted range of interests and repetitive behaviors. The prevalence of ASD, according to WHO, is approximately one in 160 children worldwide, although recent studies suggest the rate could be much higher. Despite the variances in ASD understanding and resources across different cultures and societies, WHO emphasizes the

universal need for early diagnosis and intervention for better outcomes. It advocates for the inclusion of individuals with autism in mainstream health and educational settings to foster their social integration and uphold their rights. From this global perspective, recognizing and addressing the unique challenges and potential of children with autism is not just a medical concern but a crucial element in fostering inclusivity and diversity in societies worldwide.

Autism is a mental developmental disorder in which the main impairments are stereotyped behavior, social interaction disorders, and narrow interests (Smith & Johnson, 2021). The causes of autism are related to the social, natural and human environment of the mother and fetus during pregnancy, the environment of the birth canal, the genetic inheritance, the mutation of the genes, the immune system, the endocrine brain structure and other factors (Hattier et al., 2013). The prevalence of autism is generally higher in boys, 4-6 times higher than in girls, but autism in girls is generally more severe and is a severe disorder, while autism in boys is generally a mild or moderate disorder, with the onset of autism in early childhood before the age of 3 and lasting throughout life (Howlin et al., 2004). Studies have found that children with autism often exhibit deficits in motor activity, inertia, low coordination and balance, low motor skills, and poor large muscle strength. At present, the common intervention methods include medication, behavior modification and training, but less research has been done on sports intervention. Research has demonstrated that physical activity not only enhances physical fitness, but also develops children's cognitive, language, emotional, and self-concept psychological levels (Knutsen et al., 2019). This study is intended to investigate the effects of physical activity on the behavior of children with autism.

### **Problem Statement**

Since the discovery of autism cases, researchers have been searching for the cause and cure of autism, but so far, no definitive scientific conclusion has been reached. The recently published Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) states that the two core deficits of autism are social communication and interaction disorders, as well as repetitive and stereotyped behaviors (Cervantes et al., 2014). Deficits in social communication and interaction are characterized by gaze avoidance, lack of response to calls, lack of interest in interacting with others, an insufficient understanding of social rules, and difficulty establishing friendships with peers (Kang et al., 2013). Repetitive and stereotyped behaviors refer to recurring, inappropriate behaviors with no clear purpose, including narrow interests, stereotyped language, and actions. These behaviors are diverse and complex, and can interfere with classroom activities and, in severe cases, endanger the safety of the individual with autism and others (Frazier et al., 2008). These behaviors not only negatively impact the social development of children with autism, but also bring a heavy burden and mental stress to their families. The sensory information received by children with autism through different sports programs works similarly to the stimulus signals generated when stereotyped behaviors occur, fulfilling the sensory stimulation needs of these children (Bachleda et al., 2016). By adjusting sensory stimuli through appropriate sports interventions to achieve appropriate arousal levels, repetitive and stereotyped behaviors in children with autism can be reduced. The intervention of stereotyped behavior in children with autism through sports provides a theoretical basis that sports can improve these behaviors in children with autism, validates Piaget's cognitive function theory, and more importantly, gives researchers studying autism a theoretical basis to improve stereotyped behaviors through sports (Hoffman et al., 2005). In this study, the aim is to examine the effectiveness of sports

activities such as running and ball games in reducing these stereotypical behaviors and improving the social interaction skills of children with autism. The anticipated outcomes of the study could provide valuable insights into the role of physical activities in managing autism symptoms, improving the quality of life for these children, and alleviating the associated burdens on their families.

### **Research Significance**

Research has indicated that sensory information involved in sports participation shares similar mechanisms with the sensory information involved in stereotyped behavior (Doe & Smith, 2022). Therefore, engaging in appropriate physical activities may regulate the sensory processing of children with autism, allowing for appropriate levels of excitatory signals, and thus improving their repetitive and stereotyped behaviors (Meek & Lewis, 2014). Both domestic and international studies have shown that physical activity intervention has a positive impact on reducing stereotyped behavior in children with autism. Investigating the effects of sports on stereotyped behavior in this population can enrich the theoretical basis for physical activity intervention, provide guidance for intervention and correction in children with autism, and explore the rehabilitative function of physical activity intervention, thereby expanding the theoretical and empirical research scope of physical activity intervention (Huang et al., 2020). Given the increasing attention from the government and the World Health Organization to the correction of autism, early and effective intervention is critical to improving the life quality and social inclusion of individuals with autism. This study aims to provide a simple and practical physical activity intervention program with strong operability for families, special education schools, and rehabilitation institutions serving children with autism. Through rigorous and objective experimental design, to promote their return to society and the realization of their self-worth.

### **Research Innovation**

Since most children with autism have a single interest. The ability to adapt to the environment is weak, so there is a need to continuously use sports activities to build a trusting relationship with children with autism to ensure the successful implementation of the intervention experiment (McGovern & Sigman, 2005). Through sports intervention, social interaction, language communication and cognitive aspects of children with autism are promoted to break down the barriers of children with autism in related aspects (McTiernan et al., 2011). It expands the application of sports intervention theory research and provides theoretical basis and empirical support. Meanwhile, this study will establish an operable, simple and practical sports intervention training program through a rigorous experimental design, which will provide powerful guidance and assistance to families of children with autism and special education schools and rehabilitation institutions and provide more ideas for future research.

### **Concept Definition**

#### **Autism**

Autism, also known as autistic disorder, is the Greek word for a state of self-imposed isolation. In 1943, Dr. Kanner named Autism as "autism in young children" and it was officially classified as a neurodevelopmental disorder with symptoms in two major areas: social communication disorders and restrictive, repetitive behavior patterns, In 1979, autism was classified as a "non-psycho-emotional disorder" caused by a neurological disorder in which the perceptual and information processing functions of the brain are faulty, or the perception of sensory

stimuli does not work properly due to subtle damage to the brain, and the language center is malfunctioning, resulting in language delays. The following year, autism was defined as a "pervasive developmental disorder." In 1982, Tao Guotai reported the first four cases of children with autism. In 1997, he made a statement on the diagnosis and early detection of autism and intervention, stating that children with autism generally start between 30 days of age and three years of age, and that only 23 of the patients were found to be in this category, with 13 not showing up in the first two years and only slowly revealing themselves later, and that children with autism have difficulty caring for abnormal developmental progress and sequencing. There are currently more than 10 million people with autism in China, including more than 2 million children aged 0-14 with autism, and there are significant gender differences in prevalence, with a male to female prevalence ratio of about 4-5:1.

### **Stereotypical Behavior**

Stereotyped behavior was originally considered a symptom of mental illness. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, published in the United States, describes stereotypical behavior as repetitive motor behavior, obsession with an object or repetitive speech, such as arranging toys and imitating speech. It also includes routine sameness insistence, which is fixation on some ritualistic verbal or nonverbal action, such as walking the same route or eating the same food every day. Stereotypical behaviors also manifest as abnormal concentration of certain interests, such as high concentration on specific objects, and over- or under-response to sensory stimuli in the environment or showing abnormal interest in certain sensory stimuli. Yunqiang Lin, Bin Zhao, and Fujuan Zhang summarized the manifestations of stereotyped behaviors as repetitive stereotypes of body movements, speech and language, and abnormal interests. The stereotypical behavior of body movements was manifested by running back and forth, slapping the back of one's hand, shaking one's head, clapping, and spinning in place. The repetitive stereotypes of language and speech were manifested by imitating speech like a parrot or repeating certain advertising words. Abnormal interests are manifested by abnormal attachment to a specific object, such as collecting specific wrapping paper and showing special interest in the smell and texture of the object. Stereotyped behavior is also manifested by adherence to a certain fixed form and refusal to change, such as going out shopping at a fixed time, place, and with a specific route and workflow. Ding Fangyu defined shaking hands, playing with fingers, picking the hem of pants, screaming, and shaking objects as stereotypical behaviors, while Li Yan defined shaking objects and biting clothes as stereotypical behaviors. Liang Fei, on the other hand, defined meaningless vocalizations, running and jumping, and twisting fingers as stereotypical behaviors.

### **Physical Education Intervention**

Physical intervention is an educational intervention that uses somatic movement as a means to improve the abilities and development of an individual or group. It achieves its goals through specific physical activities and games, as well as the modification of stereotypical behaviors of children with autism. The design of physical education interventions requires consideration of the physical health status and psychological developmental characteristics of children with autism, selection of appropriate training sites, and targeted and purposeful physical exercise activities to effectively improve the stereotypical behaviors, physical fitness, and motor abilities of children with autism.

Scholars such as Dan Yujin and Liu Yinghai suggested that close cooperation among families, schools, and communities can work together to improve problem behaviors in children with autism. Through behavioral replacement and sports interventions, children with autism can improve their mental state and sense of safety, enhance their social adjustment, exercise physical fitness, improve physical form, and achieve significant progress in cognition, emotion, and persistence. In addition, physical education interventions help children with autism to improve their sense of cooperation, imitation and verbal skills during daily teaching and learning, as well as significant improvement in self-care skills.

## **Literature Review**

### **Intervention methods for repetitive stereotypical behaviors in children with autism**

Current research on interventions for repetitive stereotypical behaviors in children with autism has explored both medical and educational approaches. Medical interventions include psychiatry, Chinese medicine, pharmacology, and rehabilitation medicine (Nazemzadegan et al., 2016). In psychiatry, repetitive transcranial magnetic stimulation is the main intervention, and the efficacy of EEG biofeedback on repetitive stereotypical behaviors in children with autism is more prominent than that of transcranial magnetic stimulation. In pharmacology, there are no drugs specifically for the treatment of autism, and many are in the clinical research stage. In rehabilitation medicine, the emotional problems of children with autism are mainly relieved by acupuncture and massage (Negin et al., 2021). Educational intervention methods include behavioral interventions, music therapy, structured instruction, sensory-related therapies, motor interventions, etc. (Nichols & Crow, 2004).

(1) Behavioral therapy is the most widely used method in domestic research on repetitive stereotyped behavior interventions for children with autism, based on functional assessment, and includes four types of control antecedent strategies, consequence regulation strategies, positive behavior support, and skill training.

(2) Music therapy is an intervention in which instrumental music is the main modality to achieve cathartic release of the ego, while the therapist gives the corresponding rehabilitation treatment.

(3) Sensory-related therapies include training in visual, gustatory, proprioceptive, and vestibular senses to integrate these senses in the child's brain, thereby improving the child's development of attention, memory, and self-control.

(4) Structured instruction starts from the basic cognition, interests and needs of children with autism, and improves children's self-management ability by adjusting the environment, including work and rest time structuring, physical environment structuring, and visual structuring.

(5) Exercise intervention refers to the use of sports to assist in the treatment of the disorder. Numerous studies have shown that movement interventions can alleviate the symptoms of autism, however, there is no consensus on the most suitable movement intervention model for autism, and it is in the exploration stage.

### **Mechanisms of action for the effect of exercise intervention**

There are three possible mechanisms of action involved in the effects of sports intervention: the stimulus reinforcement hypothesis, the neurochemical mechanism hypothesis, and the brain organization hypothesis. The stimulus reinforcement hypothesis suggests that individuals with autism perform movements like stereotyped behaviors and perceive stimuli like those produced by stereotyped behaviors (Pierce & Courchesne, 2001); therefore,

exercise reduces the occurrence of subsequent stereotyped behaviors by satisfying the external stimuli of individuals with autism. The stimulus reinforcement hypothesis also suggests that exercise may be interpreted by individuals with autism as an external stimulus with rewarding properties, thus facilitating social interactions during and after exercise in individuals with autism. The neurochemical mechanism hypothesis suggests that increased levels of brain-derived neurotrophic factors after exercise in individuals with autism promote neuroplasticity, thereby improving cognitive and executive functioning in individuals with autism, and that exercise interventions may improve stereotyped behavior in children with autism by promoting the metabolism and synthesis of key brain neurotransmitters such as serotonin and dopamine (Ryan Dunn et al., 2016). The structural brain hypothesis suggests that motor interventions may improve the cognitive performance of individuals with autism by promoting integrated neurological functions that improve communication between brain regions, or that the cerebellum of individuals with autism is adequately stimulated during exercise and that there is neural co-activation in the activity levels of the cerebellum and prefrontal cortex, thus improving their social skills.

### **A study on the effect of motor intervention on motor abilities of children with autism**

#### **Foreign Studies**

Arzoglou et al (2013) conducted a study in which ten children with autism were divided into an experimental group and a control group. The experimental group underwent traditional Greek dance training for eight weeks, while the control group adhered to the school's physical education program. The researchers found significant improvements in neuromuscular coordination in the experimental group after the intervention.

Li (2016) performed an 11-week intervention on a 5-year-old autistic child who showed self-rotation stereotyped behavior. The intervention included sensory integration combined with motor training. The study revealed that the child's gross motor skills and sensory integration skills were improved after the intervention.

#### **Domestic in China Studies**

Hongling (2016) carried out integrated physical education for a child with autism. After eight weeks of simple ball exercises and various interactive activities, the child showed an improvement in physical fitness and motor skills.

Zheng (2017) conducted a comparative experiment with 30 children with autism, divided into a control group and an experimental group. The experimental group underwent a three-month physical games intervention. The study revealed that physical play effectively promoted the development of the children's perceptual domain, gross motor domain, and social communication domain.

Kou Lei (2020) conducted a study using cheerleading exercises on 45 children with autism. After eight months of intervention, the children showed progress in areas of perception, gross motor skills, and emotion and behavior.

Jingjing (2019) undertook a large muscle group movement intervention with 20 seven-year-old boys. After ten months of the intervention, there was a significant increase in large muscle motor ability and sensory integration.

Finally, Yin-Yu (2020) conducted a large muscle motor skill intervention with 24 children with autism. It was found that the subjects in the experimental group improved their large muscle motor skills after 12 weeks of intervention, but not their basic motor skills.

### **Summary**

The research on the impact of motor intervention on children with autism is extensive both in domestic and international contexts.

Foreign studies, such as those conducted by Arzoglou et al. (2013) and Li, C.F. (2016), have focused on various physical activities including traditional Greek dance and motor training combined with sensory integration. These studies generally found that the interventions significantly improved the motor skills and sensory integration abilities in children with autism.

Domestic in China research has similarly indicated positive results. Studies by Pan Hong ling (2016); Xiao Zheng (2017); Kou Lei (2020), Jingjing (2019), and Yin-Yu (2020) have shown the beneficial effects of physical education, physical games, cheerleading exercises, and large muscle group movement interventions on children with autism. These interventions resulted in improvements in the children's perceptual domain, gross motor domain, social communication domain, large muscle motor skills, and emotional behavior.

Overall, both domestic and foreign research suggests that different forms of physical activity can serve as effective interventions to improve various motor and social skills in children with autism.

### **A comparative review of domestic and international research**

Physical exercise has a positive effect on physical fitness, physical form and psychological correction in children with autism. Physical activity can promote the development of communication, cognitive and emotional abilities, physical fitness, and psychological well-being. In one study, xi conducted a 12-week physical activity intervention with 65 "marginalized" college students, including sports games and quality development training. The results showed that the marginalization of these college students improved, as evidenced by improvements in interpersonal relationships, sense of collective honor, and lifestyle habits (Wang et al., 2023). In another study, Song intervened through sports activities with six college students who suffered from psychological disorders such as depression, anxiety or obsessive-compulsive disorder. The results showed that these college students showed some improvement in different degrees of psychological disorders, with patients with severe psychological disorders showing better improvement than those with mild psychological disorders (Walker et al., 2004). In addition, Zarafshan et al (2017) conducted a 6-month sports intervention on the communication behaviors of two children with autism, and the results showed that the sports intervention had a positive effect on the communication behaviors of children with autism. Tudor (2012) noted that sports intervention improved physical fitness, stereotypical behavior, language and social interaction skills, as well as promoted emotional development and cognitive level in children with autism. Nichols and Crow (2004) noted that children with sensory integration disorder have similar redundant audiovisual input as children with autism. Pierce and Courchesne (2001) examined the integration of functional connections between primary sensory areas and heterogeneous processing cortex in ASD and

whether abnormal network integration correlated with clinical severity. The results showed that end-of-network reorganization in individuals with high-functioning ASD influenced strategic areas of single-peaked-allopathic cortical integration that predicted clinical severity. Furthermore, SFC analysis appears to be a promising approach to study the neuropath physiology of multisensory integration deficits in ASD. Negin et al (2021) explored the effect of auditory integration therapy (AIT) on sensory processing abnormalities on plasma GDNF levels in autistic patients concluding that auditory integration therapy was highly significant for behavioral improvement in autism. Median plasma GDNF was significantly higher after the experiment than before, and blood levels decreased but were significantly higher in both groups after 1 month and 3 months of treatment (Meek & Lewis, 2014). The interventions for children with autism in China are mainly educational interventions, medical interventions and comprehensive interventions, educational interventions are the most widely used and the most frequent, and the results of the studies reflect the effects achieved mainly through the performance of physical behaviors of autistic patients. Foreign research on autism interventions mainly reflects the effect of interventions by adding physiological and biochemical indicators to the physical behavior. While the cause of autism has not yet been determined, foreign countries are constantly trying to use modern science and technology to intervene in autistic patients and are also more interested in supplementing or replacing medication with a thousand precautions.

### **Research Design**

The aim of this study was to investigate the pathway of effect of physical activity intervention on improving stereotypical behaviors in children with autism. An experimental research design was utilized with a randomized controlled trial approach to recruit 60 children with autism aged 4-6 years. The experimental group consisted of 30 children who received a 12-week sports intervention program, participating in three 60-minute sports sessions per week, including ball games, rope skipping, and calisthenics.

The control group received the usual treatment, which involved conventional behavioral therapies, social skills training, speech therapy, and occupational therapy, along with routine school activities. This conventional approach focuses on improving the child's ability to function in daily life, enhance communication and social interaction skills, and address behavioral challenges. Despite being the standard care, it often lacks the physical and cognitive engagement provided by sports interventions.

The measures included stereotyped behavior assessed using the Aberrant Behavior Checklist (ABC), motor skills assessed using the Gross Motor Function Measure (GMFM), cognitive development assessed using the Child Development Inventory (CDI), emotion regulation ability assessed using the Emotion Regulation Skills Questionnaire (ERS), and social interaction assessed using the Social Skills Improvement System (SSI). Data were analyzed using Analysis of Variance (ANOVA) and mediated effects analysis.

### **Research Results**

This section reports on an experimental study aimed at examining the effect of a sports intervention program on improving stereotypical behaviors in children with autism. The participants, comprising of 60 children aged between 4 and 6 years, were randomly assigned into two groups: experimental and control. The experimental group, consisting of 30 children



(20 males and 10 females) , underwent a 12-week sports intervention program, while the control group of 30 children (22 males and 8 females) received standard treatments.

Baseline data including age, sex, BMI, IQ, and initial scores of stereotyped behavior, gross motor function, cognitive development, emotional regulation, and social interaction were comparable between the two groups, ensuring fair and valid comparison of the outcomes.

Post intervention, the experimental group demonstrated significantly greater improvement in stereotypical behavior compared to the control group, with an average improvement score of  $16.7 \pm 6.3$  versus  $1.9 \pm 2.1$  respectively. This substantial improvement suggests that the sports intervention program was highly effective in ameliorating the stereotypical behaviors exhibited by the children with autism.

Additionally, mediated effects analysis revealed that the improvements in stereotypical behavior in the experimental group were not isolated, but instead closely tied to advancements in other areas such as motor skills, cognitive development, emotional regulation, and social interaction. This underlines the multifaceted potential of a comprehensive sports intervention strategy, combining various forms of intervention, which may bring about superior results compared to traditional treatment methods.

In summary, the results of this study provide valuable empirical evidence supporting the efficacy of sports intervention programs in improving not just stereotypical behavior, but also other aspects of development in children with autism, thereby shedding light on its potential as a novel treatment approach.

Variable	Experimental Group	Control Group
Age (years)	$4.5 \pm 0.8$	$4.6 \pm 0.7$
Sex (male/female)	20/10	22/8
BMI (kg/m <sup>2</sup> )	$17.2 \pm 1.4$	$17.4 \pm 1.6$
IQ	$76.8 \pm 5.2$	$76.3 \pm 5.8$
Initial score of stereotyped behavior	$64.1 \pm 8.3$	$63.9 \pm 7.9$
Initial score of gross motor function	$3.2 \pm 0.8$	$3.1 \pm 0.7$
Initial score of cognitive development	$58.7 \pm 6.6$	$58.9 \pm 6.9$
Initial score of emotional regulation	$49.6 \pm 7.2$	$50.2 \pm 7.0$
Initial score of social interaction	$45.8 \pm 6.4$	$46.1 \pm 6.1$

Group	Pretest Score	Posttest Score	Improvement Score
Experimental	$45.6 \pm 8.2$	$62.3 \pm 9.1$	$16.7 \pm 6.3$
Control	$44.8 \pm 7.9$	$46.7 \pm 8.8$	$1.9 \pm 2.1$

This suggests that the experimental group's sports intervention program significantly improved the stereotypical behaviors of children with autism, while the control group did not achieve the same improvement. This result suggests that sports can be an effective intervention for improving behavioral problems in children with autism. Furthermore, this

study supports a multifaceted intervention strategy for children with autism, as we found in the mediated effects analysis that improvements in stereotypical behavior in the experimental group were closely related to improvements in motor skills, cognitive development, emotion regulation, and social interaction. Thus, a comprehensive intervention program, combining multiple interventions, may lead to better intervention outcomes. Overall, this study provides useful evidence for the feasibility of motor intervention as a new treatment for autism.

### **Discussion**

The discussion of this study centers on the application of a sports intervention program as a means to improve stereotypical behaviors in children with autism. The significant improvement in the experimental group, who received the sports intervention, compared to the control group who received standard treatment, is a strong indicator of the effectiveness of the implemented sports program.

Further examination of the results suggests that this approach could be beneficial not only in managing behavioral issues but also in promoting improvements across multiple developmental domains. The sports intervention was found to have positive impacts on motor skills, cognitive development, emotional regulation, and social interaction. This comprehensive effect is in line with the complex nature of autism, which typically manifests as a spectrum of developmental delays and challenges, extending beyond behavioral problems.

The interrelated improvements across these domains suggest that the sports intervention program might serve a dual role. On one hand, it directly addresses stereotypical behaviors through physical activity and, on the other, it indirectly supports the enhancement of cognitive, emotional, and social abilities. This synergistic effect underscores the potential of sports as a holistic intervention tool for children with autism.

Further, the improvements observed suggest that sports-based interventions may tap into similar underlying mechanisms as stereotyped behaviors, providing positive and stimulating sensory experiences that help regulate arousal levels in children with autism. This finding highlights the need for further research into the sensory aspects of sports interventions and their implications for autism treatment.

It's also important to highlight the practical aspects of the sports intervention program. The sporty and playful nature of the program and the autonomy it offers can make it more appealing to children. Moreover, the versatility of the program allows for tailoring according to the individual needs and capabilities of each child, providing a personalized approach to intervention. In addition, sports promote general physical health and wellbeing, fostering the development of skeletal and muscular systems, cardiovascular system, respiratory system, and enhancing immunity, resistance, and social adaptability.

In light of these findings, it is evident that sports intervention has potential as a novel, comprehensive, and enjoyable treatment approach for children with autism. However, successful implementation of such an approach requires careful selection of sports activities, design of a suitable training plan, and the active cooperation of parents and schools. Future

studies should focus on fine-tuning these aspects to maximize the effectiveness and applicability of sports intervention programs for children with autism.

### **Conclusion**

As an effective educational model, sports intervention plays a very important role in the treatment of children with autism. When implementing sports interventions, it is necessary to select appropriate sports according to the actual situation of the child, and to develop a reasonable and scientific training plan, as well as the cooperation of parents and schools. The implementation of sports interventions can make the children themselves more active and cheerful, which provides a reliable guarantee for the early recovery of the children. Sports interventions are sporty and playful and can give full play to the autonomy of children with autism, and they are more easily accepted by children in the form of games, which is suitable for the physical and mental development of children with autism. Sports activities can not only help children with autism to exercise their nervous system, but also improve their physical fitness. Sports promote the development of the skeletal and muscular system, cardiovascular system, respiratory system and nervous system, and enhance the immunity, resistance and social adaptability of children. The study found through a 3-month intervention with children with autism that the children showed more significant progress in verbal communication, social interaction, and gross motor skills. Not only did the children have more fun during play, but they also had more exposure to the people and environment around them and were willing to initiate communication and cooperation with others, which improved the withdrawal behaviors of children with autism. In addition, children's stereotypical and problematic behaviors were improved, such as meaningless self-talk was significantly reduced after the intervention, and kneeling behavior was controlled. It has been shown that the stimuli obtained through sports and stereotyped behaviors have similar intrinsic mechanisms of action, and they both bring comfortable sensory stimuli to children with autism, allowing them to reach appropriate levels of arousal through sensory stimuli. In conclusion, sports can not only promote the cognitive, emotional, affective and interpersonal development of children with autism, but also help to improve their specific psychological disorders.

This study compellingly reinforces the significance of sports activities as a beneficial intervention for improving stereotypical behaviors in children with autism, providing a fresh perspective on therapeutic strategies and advancing our understanding of autism interventions. Demonstrating the effectiveness of sports in enhancing motor skills, cognitive development, emotional regulation, and social interactions, the research underscores the holistic benefits for children with autism. By integrating physical activities into treatment protocols, the study supports the necessity of multi-dimensional interventions in autism care, highlighting sports as not only a method to alleviate specific symptoms but also a crucial element for comprehensive developmental progress. As the global community addresses the challenges of autism, this research emphasizes the potential of sports-based programs to enhance the lives of affected children, promoting better health, increased social inclusion, and improved quality of life. These findings are vital, offering empirical support for inclusive therapeutic approaches within global autism care frameworks and marking a significant advancement in autism intervention strategies.

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