

Study on the Effects of Sports Game Intervention on Social Communication Ability of Children with Autism

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Abstract: Through literature, field observation, experimental method, mathematical statistics, the article provides intervention training on sports, gaming, and social skills for 20 eligible children with autism in a rehabilitation institution in Linyi City. Tracking experiment observation for 6 months on 20 children, training content is special sports activities, rhythmic exercises, and collective cooperation game. With the help of evaluation tools for 20 autistic children social communication ability before and after intervention evaluation and analysis. **Research results:** comparative analysis of scales showed that 10 children with autism in the experimental group had significantly improved social skills in sports games 6 months after intervention, while the social skills of 10 children with autism in traditional physical education courses did not change compared to the intervention. By comparing the scale scores of the experimental group and the control group after 6 months, it was found that there was a significant difference in social communication skills between the two groups of children with autism. Thus, the **conclusion:** sports game intervention for autistic children social communication ability development has improved effect.

Keywords: Sports Game Intervention; Autistic Children; Social Communication Ability

Autism, as a pervasive developmental disorder, exhibits abnormalities in social interaction, language communication, and interest behaviors, seriously affecting their integration into social life. The two core obstacles of autism are related to their social interaction abilities. Social dysfunction, as the core of

cognitive ability, integrates and regulates various cognitive activities and behaviors of individuals to complete target tasks. In the context of social integration and the development of social adaptability, it is inevitable to explore how to improve the social communication function of children with autism. Games are widely used as an intervention method to enhance children's social communication function, such as sports games and pretend games. Sports games integrate physical development, intellectual development, and physical and mental entertainment, and are a comprehensive means of sports. Sports games create a friendly, equal, and joyful collective environment and atmosphere for people, which can actively and flexibly adjust the exercise load, allowing people to freely exercise during the process of participating in sports games. However, existing research on sports game intervention mostly focuses on ordinary children, with less attention paid to children with autism. Based on this, this study summarizes and analyzes the current situation of social interaction ability exercise intervention in children with autism. Based on the current situation of social communication and physical exercise abilities of children with autism, design precise sports game interventions that are suitable for the characteristics of children with autism. Through traditional, fun, and cooperative sports game content, mobilize the enthusiasm of children with autism to participate in sports activities, thereby promoting the development of their social communication abilities. Further enrich the methods of intervention for social communication skills in children with autism. Empirical research on the improvement of social communication skills in children with autism through the design and verification of innovative sports game intervention programs.

1. Research Status and Development Trends

1.1 Research on Intervention of Autistic Children through Sports in Foreign Countries

Kern (1982) intervened with an 8-year-old autistic child through jogging and found that jogging can improve repetitive stereotyped behavior in autistic children; In 2000, Bodfish intervened with Kata training on 8 individuals aged 9 to 21 with autism and found that Kata training could reduce repetitive behavior by 42.54%; Bremer designed a 12 week one hour daily basic motor intervention course for 5 4-year-old autistic children, and found that children showed significant improvement in both fine and gross motor skills. Powers (1992) conducted roller skating intervention on children with autism and found that roller skating can effectively improve their stereotyped behavior; Watters (1980) found through experiments that jogging activities can improve stereotyped behavior in children with autism; Pan et al. (2010) conducted a 10 week intervention on children with autism through water exercise and found that physical and language interaction between autistic children and teachers significantly improved.

From the above related studies, it can be found that there are various sports and sports interventions for children with autism in foreign countries, and the intervention content for children with autism focuses on stereotyped behavior, exercise ability, and social interaction ability. This viewpoint is consistent with the research of Liu Xin and others in China. Liu Xin et al. (2020) conducted a meta-analysis of relevant literature on foreign sports activities intervening in autism from 2010 to 2019. It can be seen from the article that there are more sports activities intervening in children with autism abroad, including horse riding, water activities, and basic sports skills. The combined effects of physical activity intervention, yoga exercise, Kata training, etc., showed that physical activity intervention can improve the perceptual ability, language ability, motor skills, and self ability of individuals with autism, and reduce negative behaviors.

In recent years, with the development of technology, researchers have begun to use somatosensory games (electronic games operated through physical changes) to

intervene in children with autism. Edwards J et al. (2017) conducted a pre - and post control experiment with Xbox Kinect intervention six times a week, and found that sensory games did not improve motor skills in children with autism, but could enhance their perception of skills; Milajerdi H R et al. (2021) conducted three sets of pre - and post control experiments for 8 consecutive weeks, three times a week, with SPARK (Sports, Play Active Recreation for Kids) and Kinect interventions. They found that structured sports activities can improve the motor ability of autism, and Kinect games are effective in enhancing the executive function of autism. From the experiments of the above individuals, it can be found that the results of different studies on whether somatosensory games can improve the motor ability of children with autism are not the same. However, it can be confirmed that there is relatively little research on the effect of somatosensory games on the social communication ability of children with autism. Najafabadi M et al. (2018) conducted a repeated measurement quasi experimental design and SPARK intervention three times a week for 12 consecutive weeks. They found that SPARK can improve the balance ability, bilateral coordination ability, and social communication ability of children with autism. The researchers of this experiment believe that the motor and gaming activities in SPARK may improve the changes in brain neurotransmitters, thereby affecting the social ability of children with autism; Sansi A et al. (2021) conducted a 12 week, twice weekly IPA (Inclusive Physical Activity) intervention through a two group pre - and post test experiment, and found that the IPA program improved the motor and social skills of ASD students, enhanced the motor skills of TD students, and positively influenced their attitudes towards ASD students. This experiment emphasized the use of collaborative learning methods between autistic and normal children in the intervention process, Actively guiding peers to help each other during activities can help autism achieve greater benefits in terms of physical and social abilities. The above two experiments improved the social communication ability of autism through gamified and inclusive sports activities.

In summary, through reviewing relevant

literature, it has been found that foreign countries have relatively early and complete development in the intervention of social communication ability in children with autism through exercise methods. The forms of exercise are flexible and diverse, and the age range is large. The degree of autism is not limited to moderate to mild, and there is increasing attention to the social communication ability of children with autism. In terms of experimental design, multi baseline experimental design is adopted, while monitoring the accuracy of the experimental process is emphasized, It is conducive to better verifying the effectiveness of the experimental plan. Moreover, significant breakthroughs have been made in sports intervention methods, and a relatively systematic integration has been carried out, forming a relatively complete sports intervention system

1.2 Research on Sports Games Intervention for Autism in China

Yu Zhenfeng, Zhao Zongyue, and Meng Gang (2016) proposed that sports games are a combination of games and sports, with many comprehensive characteristics. From a physical perspective, sports games can enhance the physical fitness, athletic ability, and perceptual ability of children with autism through basic motor skills and training in sports activities; From an educational perspective, sports games can enhance the comprehensive development of moral, intellectual, physical, artistic, and labor skills of children with autism through organized, planned, and purposeful physical education activities; From an entertainment perspective, sports games increase the learning interest of children with autism, enhance their participation in activities, and increase their entertainment options through the form of games; From the perspective of regularity, sports games enhance the regularity of autistic students by setting certain rules for sports activities, enhance their communication and cooperative behavior with other peers, and enhance their social adaptability. The 2007 "Review of Research Results on Sports Intervention in Autistic Children under the PRECEEDE PROCESS Model" emphasized the positive impact of sports intervention on the physical and mental development of autistic children. Sports intervention is an effective auxiliary means of rehabilitation

training for autistic children. Sports intervention can fill the gap in current autism children's physical activity, and it is recommended to work together through "home kindergarten community" efforts, Provide a good intervention environment for children with autism.

In recent years, many experts and scholars have intervened in various abilities of children with autism through sports games. The following is a summary: Zhang Zhiyong (2010), Tang Lanfang (2016), and Peng Huan (2019) respectively intervened in children with autism through sports game classes, and found that sports games can improve the overall level of children with autism and play an important role in the psychological ability of children with autism; Li Xu (2016), Yuan Youchao (2017), and Pan Hongling (2012) intervened in children with autism through sports games. Through single group pre - and post tests, it was proven that sports games can improve the motor ability of children with autism; Xiao Zheng (2016) and Zheng Yongbin (2020) demonstrated through comparative experiments that sports games can enhance the perception and social communication abilities of children with autism; Cui Shuang (2017) found that repetitive and stereotyped behaviors in a child with autism were reduced through physical game intervention; Zhu Jiang (2017) found through sports game intervention on a child with autism that their communication skills improved and problem behaviors decreased. Wang Hao et al. (2018) conducted sports game intervention on 17 children with different degrees of autism and found that their social communication abilities were improved. Among them, children with mild autism showed significant improvement in social communication abilities compared to children with moderate autism, and boys showed significant improvement compared to girls. Deng Shuhong (2011) and Tan Hui (2017) used a single subject experimental design to intervene in social communication skills of children with autism through sports games. They found that after intervention, the frequency of active communication, eye contact, and expression in children with autism significantly increased, communication skills improved, and inappropriate behavior decreased.

Yang Xiang and Zhan Xiaomei (2021)

summarized the research literature on using sports games to intervene in children with autism in China from 2009 to 2021, and found that sports games have good intervention effects on four aspects of social communication ability, repetitive stereotyped behavior, physical ability, and mental health of children with autism. However, most studies lack early experimental observation stage, The lack of targeted sports game design and the need for improvement in research methods. Meanwhile, it is pointed out that there are three possible mechanisms involved in sports game intervention: the hypothesis of brain tissue structure, the hypothesis of neurochemical mechanisms, and the hypothesis of stimulus reinforcement, but there is a lack of in-depth theoretical research.

In summary, through reviewing relevant domestic literature, it has been found that research on autism in China started relatively late and lags behind. In terms of research methods, a single subject research method is often used, lacking comparability. In terms of sample size selection, case analysis is often used, with a small sample size and no systematic integration, which is not representative. In terms of intervention effects, immediate effects are often used, and there is a lack of monitoring of effect stability, There is relatively little research on the tracking of intervention effects, and the sample selection is mainly focused on children with autism. The age is too concentrated, and there are very few interventions for older children with autism. Especially in the study of social communication ability in children with autism, although most journal articles point out that social communication ability defects are the core symptoms of autism, there are very few intervention measures for improvement.

2. Research Objects and Methods

2.1 Research subjects

Taking the social communication ability of children with autism as the research object and precision sports games as the intervention method, 20 eligible autistic children were selected as the experimental subjects in a rehabilitation institution in Linyi City to investigate the impact of different types of sports game interventions on the social communication ability of autistic children.

2.2 Research Methods

2.2.1 Literature materials

This study uses keywords such as "sports game intervention", "social interaction ability", and "autism" as relevant research literature, and organizes and analyzes the literature to provide a scientific theoretical basis for this study.

2.2.2 Experimental research methods

(1) Inclusion criteria for experimental subjects Diagnosed by a professional pediatric physician to meet the DSM-5 diagnostic criteria for autism; Parental consent; Having basic language and athletic abilities; No need for medication treatment; Children with autism aged 5-8 years old.

(2) Exclusion criteria for experimental subjects Children with physical, eye, ear, and other health issues who are unable to participate in intervention; Children with severe intellectual disabilities, cerebral palsy, and developmental delays; Children with severe heart, liver, spleen, and kidney organ diseases; Those who do not meet the diagnostic criteria for autism are not included in the experimental subjects.

(3) Experimental grouping design

20 children were randomly divided into an experimental group and a control group, with 10 children in the experimental group and 10 children in the control group. A sports game intervention plan was designed for the actual situation and basic characteristics of 10 children with autism in the experimental group for a period of 3 months. 10 children in the control group received traditional physical education courses, and before the experiment, the Autism Behavior Checklist ABC and Child Autism Rating Scale (CARS) were used The Autism Treatment Evaluation Checklist ATEC was used to conduct a pre-test on 20 children with autism. After the experiment, three scales were used again to conduct a post test on 20 children with autism. The scale data before and after the experiment were compared to analyze the impact of precision sports games on the social communication ability of children with autism.

2.2.3 Mathematical Statistics

Perform t-tests and routine statistics on the data obtained before and after the experiment using SPSS 20.0. $P < 0.05$ indicates significant differences, while $P < 0.01$ indicates very significant differences.

3. Results and Analysis

Choose and create sports games based on the cognitive and social communication abilities of children with autism. For example: whole body rotation, grabbing chairs, ants crawling, kittens playing with balls, little rabbits jumping, little turtles crawling, elephant trunks rotating, flexible feet, happy little crabs, animal trains, cat and mouse catching, kangaroo jumping, ball holding relay games, etc. Traditional physical education classes include jogging, jumping obstacles, walking on balance beams, walking obstacles, crossing a single plank bridge, skateboarding, walking combinations, hand knee climbing, standing on a balance table, controlling the ball, stepping on the ball with feet, climbing, hand support, hanging cables, jumping steps, continuous agile circles, rhythmic exercises, and other sports activities. Among them, the content of sports game intervention is divided into three parts: preparation activities, basic content, and recovery and relaxation

3.1 Comparison and Analysis of ABC Scale Test Results

Before and after the experiment, the ABC scale was used to pre test and post test the social communication abilities of children in the experimental group and control group. The results are as follows:

Table 1. Comparative Analysis of Differences in ABC Scales between the Experimental Group and the Control Group before and after Intervention

types of	experimental group	control group	Tvalue	Pvalue
Before intervention	22.56±1.12	22.590 ± 0.10	0.42	0.67
After intervention	18.50±1.30	22.30 ± 1.16	-8.55	0.00

Using the ABC scale, a pre-test and a post test were conducted on the social communication ability of 20 children with autism in a group. Through independent sample t-test, the results showed that the pre intervention mean of the ABC scale in the experimental group was 22.56±1.12, while the pre intervention mean of the ABC scale in the control group was 22.590±0.10, T=0.42, P=0.67, P>0.05. This indicates that there is no significant difference in the pre intervention ABC scale scores between the experimental group and the

control group, and they belong to the same level, Eligible for intervention. After 6 months of physical game intervention, the experimental group and control group were measured again using the ABC scale. The results showed that the average ABC scale score after intervention in the experimental group was 18.50 ± 1.30, while the average ABC scale score after intervention in the control group was 22.30 ± 1.16, T=-8.55.67, P=0.00. There was a significant difference in ABC scale scores between the experimental group and the control group after intervention, Prove that sports games have a significant effect on improving the social interaction ability of children with autism.

3.2 Comparison and Analysis of CARS Scale Test Results

The CARS scale was used before and after the experiment to pre test and post test the social communication abilities of children in the experimental group and control group. The results are as follows:

Table 2. Comparative Analysis of Differences in CARS Scales between the Experimental Group and the Control Group before and after Intervention

types of	experimental group	control group	Tvalue	Pvalue
Before intervention	38.18±1.36	38.13 ± 1.32	0.15	0.84
After intervention	32.12±1.56	37.30 ± 1.49	-7.32	0.00

The CARS scale was used to pre test and post test the social communication ability of 20 children with autism in a group. Through independent sample t-test, the results showed that the pre intervention mean of the CARS scale in the experimental group was 38.18 ± 1.36, while the pre intervention mean of the CARS scale in the control group was 38.13 ± 1.32, T=0.15, P=0.84, P>0.05. This indicates that there is no significant difference in the pre intervention CARS scale scores between the experimental group and the control group, which belongs to the same level and meets the conditions for intervention. After 6 months of physical game intervention, the CARS scale was used again to measure the experimental group and the control group, and the results showed that the post intervention mean of the CARS scale in the experimental group was the

same. The mean CARS score after intervention was 32.12 ± 1.56 , while the mean CARS score after intervention in the control group was 37.30 ± 1.49 , $T=-7.32.67$, $P=0.00$. There was a significant difference in CARS scores between the experimental group and the control group, indicating that sports games have a significant effect on improving the social communication ability of children with autism.

3.3 Comparison and Analysis of ATEC Scale Test Results

Before and after the experiment, the ATEC scale was used to pre test and post test the social communication abilities of children in the experimental group and control group. The results are as follows:

Table 3. Comparative Analysis of Differences in CARS Scales between the Experimental Group and the Control Group before and after Intervention

types of	experimental group	control group	Tvalue	Pvalue
Before intervention	21.32 ± 1.32	21.30 ± 1.35	0.31	0.78
After intervention	16.52 ± 1.18	19.80 ± 1.90	-5.62	0.00

The ATEC scale was used to pre test and post test the social communication ability of 20 children with autism in the group. Through independent sample t-test, the results showed that the pre intervention mean of the ATEC scale in the experimental group was 21.32 ± 1.32 , while the pre intervention mean of the ATEC scale in the control group was 21.30 ± 1.35 , $T=0.31$, $P=0.78$, $P>0.05$. This indicates that there is no significant difference in the pre intervention ATEC scale scores between the experimental group and the control group, and they belong to the same level, Eligible for intervention. After 6 months of sports game intervention, the ATEC scale was used again to measure the experimental group and control group. The results showed that the mean ATEC scale of the experimental group after intervention was 16.52 ± 1.18 , while the mean ATEC scale of the control group after intervention was 19.80 ± 1.90 , $T=-5.62.67$, $P=0.00$. There was a significant difference in ATEC scale scores between the experimental group and the control group after intervention, Prove that sports games have a significant

effect on improving the social interaction ability of children with autism

4 Conclusion and Suggestions

4.1 Conclusion

4.1.1 Design sports games based on differences in children with autism. The selection of content, implementation of organizational plans, and application of teaching strategies provide guarantees for the effectiveness of sports game intervention programs. The sports game intervention program has enriched and developed the theory of social interaction ability intervention for children with autism.

4.1.2 Sports game intervention plan is an effective method for intervening in the social communication ability of children with autism. Researchers combine theory with practice through cooperation with autism rehabilitation schools and teachers, solve practical problems, and improve the effectiveness of intervention in the social communication ability of children with autism.

4.1.3 By comparing the social communication ability of the experimental group and the control group after 6 months, it was found that the social communication ability of 10 autistic children in the sports game intervention group improved significantly, thereby confirming that sports games are an effective intervention method for improving the social communication ability of autistic children.

4.2 Suggestions

4.2.1 Design differentiated sports games suitable for children with autism, attracting them to integrate into the process of sports games. This requires the joint efforts of relevant researchers, teachers for children with autism, and parents to design a set of sports game intervention plans that are suitable for children with autism.

4.2.2 Build a sports game library to provide sports game courses for children with different symptoms of autism, and provide theoretical and practical training on sports games for teachers and parents of children with autism.

4.2.3 Interventions for children with autism are a combination of multiple methods, and sports games are beneficial for improving their performance.

Children with autism have social communication skills, but sports games can

only be used as an auxiliary means to promote their social communication skills. Only when used in conjunction with other intervention methods can they have a greater promoting effect on their social communication skills

5. Summary

In recent years, the application of game intervention has become increasingly widespread, suitable for different special needs children, and has achieved good results in dealing with different problems. This study is based on the cognitive development characteristics of children with autism, and incorporates games into the study of integrated education for children with autism; Design targeted game plans based on the intervention effects of different games, optimize comprehensive game design, and promote the comprehensive development of social communication skills; Seize the effective period of intervention and effectively enhance the educational synergy of children with autism. Mainly targeting children with autism in Linyi City, an experimental control method was adopted to compare the results of pre - and post experimental tests between the sports game intervention group and the control group. This method changed the shortcomings of previous autism research, such as a lack of comparison in a single subject and a small sample size, and fully reflected the rigor and innovation of the experimental design. This study is based on the theoretical system of previous research, Construct a sports game intervention plan that conforms to the physical and mental development characteristics of children with autism, explore different types of sports game intervention techniques and their effects for children with autism, and hope to provide a theoretical basis for research on sports intervention for children with autism in China, further improving the theoretical system of sports game intervention for autism.

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