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Study on the Effect of Swimming on Psychological Rehabilitation of Children with Ataxic Cerebral Palsy

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Abstract: The study aims to investigate the psychological rehabilitation effects of swimming training on children with cerebral palsy with ataxia. The study uses literature review, experimental research, observation, statistical analysis, and logical analysis. The study takes a 7-year-old male child with cerebral palsy as the experimental subject and conducts a systematic study. The results show that compared with before the training, the child's self-esteem, self-confidence, and life satisfaction have improved overall after 6 months of swimming training, as measured by the Rosenberg Self-Esteem Scale, Children's Self-Confidence Scale, and Children's Life Satisfaction Scale. The child's anxiety and depression have also improved overall as measured by the Children's Depression Inventory and Children's Anxiety Scale. The child's social emotional competence and child social interaction have also improved as measured by the Children's Social-Emotional Competence Scale and Child Social-Interaction Scale. However, due to the influence of individual differences, training frequency and intensity, parental participation, facilities and resources, and research sample, the study results have certain limitations. Therefore, the universality and applicability of the research results need further verification.

1. Introduction

On October 25, 2016, the Central Committee of the Communist Party of China and The State Council issued and implemented the Outline of the Healthy China 2030 Plan, which states that it is necessary to "highlight and solve the health problems of key groups such as women and children, the elderly, the disabled and low-income people", "strengthen the integration of physical and medical care and non-medical health intervention". The government should give full play to the positive role of national scientific fitness in health promotion, chronic disease prevention and rehabilitation[1].

Children with cerebral palsy are both children and "disabled". Cerebral palsy is the most important disabling disease in pediatric field after poliomyelitis has been controlled. Its incidence has not decreased, and the world still fluctuates between 2‰ and 3‰, and it is the main object of

pediatric rehabilitation treatment [2]. Prevention and treatment of cerebral palsy caused by children with various aspects of disability, especially limb disability, improve the quality of life of children, so that they return to society, is the boundlessness of children rehabilitation related workers. At present, the research on various treatment methods for spastic cerebral palsy or mixed cerebral palsy with spastic in children accounts for an absolute majority, while the research on treatment methods for ataxic cerebral palsy (ataxic type accounts for 24.01% of the total number of cerebral palsy in children) is relatively rare. Children with ataxic cerebral palsy often show motor retarding and inability to maintain a posture. In order to maintain a standing posture when standing, they must constantly adjust, have difficulty in motor coordination, distance impairment, staggering gait, poor orientation, and lower than normal muscle tone [3]. It is necessary to explore the rehabilitation treatment of ataxic cerebral palsy under the model of physical and medical fusion.

Swimming in sports has its unique potential application value to the psychological rehabilitation of children with ataxic cerebral palsy. First of all, the rehabilitation training of children with ataxic cerebral palsy in the form of swimming can be an attempt to enrich the rehabilitation training methods of ataxic cerebral palsy, further reduce the disability rate of children, improve the quality of the population, and reduce the burden of society and families. Secondly, from the phenomenon that has been observed so far, swimming training has obvious effect on the rehabilitation of children with ataxic cerebral palsy, but there is a lack of further systematic research. Finally, compared with other rehabilitation treatment methods, swimming training has the potential value of being more interesting, less prone to injury, and able to improve the comprehensive physical fitness level.

2. Research Objectives and Methods

2.1 Research Objectives

The psychological rehabilitation effects of swimming on children with cerebral palsy with ataxia are the research objectives.

2.2 Research Methods

2.2.1 Literature Review Method

This study reviewed a large number of literature on cerebral palsy pathology, various types of cerebral palsy treatment, and swimming training for cerebral palsy, to have a certain understanding of the current situation of cerebral palsy and its treatment at home and abroad, and to lay a certain theoretical foundation for this study.

2.2.2 Experimental research method

Taking a 7-year-old male child with ataxic cerebral palsy as the experimental object, the psychological status of the child with ataxic cerebral palsy was measured and recorded within one week before teaching and training, including three aspects: psychological state, anxiety and depression, and social adaptability. Then, the child was taught and trained in breaststroke, freestyle, backstroke and butterfly (limited to the child's athletic ability, and butterfly was not mastered in the end) for a period of 6 months (two hours a day, one day off every Sunday), including the teaching and training of various necessary links such as familiarity with water, starting and turning. Within one week after the 6-month teaching and training, the psychological aspects of the child were measured, evaluated and recorded in time (including the above four aspects as before the training), and the relevant data were compared and analyzed with that before 6 months, so as to draw relevant conclusions.

2.2.3 Observation method

According to the theory of functional assessment of rehabilitation, psychology and sports training, the experimental subjects were directly observed to obtain the data of psychological rehabilitation.

2.2.4 Mathematical statistics

Excle and SPSS23.0 software were used to analyze the experimental data.

2.2.5 Logical analysis method

Using modern systems theory, information theory, logic, and other multidisciplinary theories and methods, we can summarize and analyze processed data and logical reasoning. Test results for this child indicate that his social interaction skills improved after swimming training compared to before.

3. Research results and analysis

3.1 Evaluation of mental state

Table 1: Comparison of mental state parameters before and after swimming training

Project	Before	After
Rosenberg Self-Esteem Scale	12	15
Children's Self-Confidence Scale	85	70
Children's Life Satisfaction Scale	3	4

The psychological state of the child was assessed by the following three scales. The Rosenberg Self-Esteem Scale, the Children's Self-Confidence Scale, and the Children's Life Satisfaction Scale Scale). As can be seen from Table 1, the scores of these three scales have improved to varying degrees after swimming training compared with before training.

On the Rosenberg Self-Esteem Scale, the total score should be between 10 (lowest level of self-esteem) and 40 (highest level of self-esteem). A total score between 10 and 16 indicates low self-esteem; The total score was between 17 and 33, belonging to the middle level of self-esteem; The total score is between 34 and 40, which is considered to be a high self-esteem group. The child's test results showed that after the swimming training compared with before training, although the self-esteem was still at a low level, but still improved slightly.

On the Children's Self-Confidence Scale, the total score of the test results should be between 0 (highest confidence level) and 100 (lowest confidence level). The total score is between 0 and 20, and the self-confidence level is high, indicating a lot of confidence; The total score is between 25 and 45, and the self-confidence is high, indicating that the confidence is good, but it should be improved; The total score is between 50-70, and the self-confidence is low, indicating that the degree of self-confidence is not ideal, and efforts should be made to improve it; The total score is between 80 and 100, and the self-confidence is very low, indicating that the self-confidence is very poor and must be improved. The test results of this child showed that after swimming training, compared with before training, his self-confidence improved from a very low state to a low state, and also got a small improvement.

On the Children's Life Satisfaction Scale, the total score of the test results should be between 7 (highest life satisfaction) and 1 (lowest life satisfaction). Score more than 6 points, life satisfaction is high, indicating that close to their own ideal, very satisfied with their life; Scores between 5 and 6

points, life satisfaction is high, indicating that they are basically satisfied with their lives; A score between 4 and 5 indicates low life satisfaction, indicating some satisfaction with their lives and some dissatisfaction with their lives. A score of less than 4 indicates low life satisfaction, indicating basic dissatisfaction with their lives. The child's test results showed a small improvement in life satisfaction after swimming training compared with before training, although still low.

3.2 Assessment of anxiety and depression

Table 2: Comparison of anxiety and depression mood parameters before and after swimming training

Project	Before	After
Children's Anxiety Scale	9	5
Children's Depression Inventory	11	6

The child's Anxiety and Depression were mainly assessed by the following two scales, namely, the Children's Anxiety Scale and the Children's Depression Inventory. It can be seen from Table 2 that the anxiety and depression of this child were generally improved after swimming training compared with before training.

On the Children's Anxiety Scale, the total score of the test results should be between 0 (lowest level of anxiety) and 30 (highest level of anxiety). The total score is between 0 and 10, indicating mild anxiety symptoms, and the child may have some worry occasionally, but it does not affect their daily life and emotional state; The total score is between 11 and 20, indicating moderate anxiety symptoms. Children's anxiety has caused a certain impact on daily life and learning, and some interventions may be needed to help them relieve anxiety. A total score between 21 and 30 indicates severe anxiety symptoms. Children's anxiety has seriously affected their daily life and study, and they need to seek professional help immediately and receive necessary psychological treatment or medication. The child's test results showed that his anxiety symptoms were alleviated after swimming training compared with before training.

Children's Depression Inventory, the total score of the test results should be between 0 (lowest level of depression) and 30 (highest level of depression). A total score between 0 and 10 indicates mild depressive symptoms, which may manifest as occasional low mood, decreased interest, and so on. A total score between 11 and 20 indicates moderate depressive symptoms, which may manifest as persistent sadness, self-blame, sleep disturbances, etc., affecting daily life and learning. A total score between 21 and 30 indicates severe depressive symptoms, which may manifest as severe low mood, suicidal ideation, and so on, requiring immediate professional help. The child's test results showed that his depressive symptoms were greatly relieved after swimming training compared with before training.

3.3 Assessment of social adaptability

Table 3: Comparison of social adaptability parameters before and after swimming training

Project	Before	After
Children's Social-Emotional Competence Scale	9	13
Child Social-Interaction Scale	8	12

The child's social adjustment was evaluated on two scales, the Children's Social-Emotional Competence Scale and the Child Social-Interaction Scale. It can be seen from Table 3 that after swimming training, compared with before training, the child's social-emotional ability and children's social ability were improved.

On the Children's Social-Emotional Competence Scale, the total score of the test results should

be between 0 (lowest level of social-emotional competence) and 30 (highest level of social-emotional competence). A total score between 0 and 10 indicates that the child has weak social-emotional abilities and may need to strengthen social and emotional skills. A total score between 11 and 20 indicates that a child is at an intermediate level of social-emotional competence, may excel in some areas, but still has room for improvement in others; An overall score between 21 and 30 indicates that the child has strong social-emotional abilities, is able to handle interpersonal relationships, emotion management and learning tasks well, and is confident and compassionate. The test results of this child showed that his social emotional ability was improved after swimming training compared with that before training.

For the Child Social-Interaction Scale, the total score of the test results should be between 0 (lowest level of Social competence) and 30 (highest level of social competence). A total score between 0 and 10 indicates that children have weak interpersonal skills and may need additional support and guidance from adults to develop social skills; The overall score is between 11 and 20, indicating that children have moderate social skills, but there is still room for improvement, and they can improve social skills through daily interaction and play activities. An overall score between 21 and 30 indicates that the child has strong interpersonal skills, is able to interact socially independently, and demonstrates good social skills. The test results of this child showed that his social ability was improved after swimming training compared with that before training.

4. Discussion

4.1 The rehabilitation effect of swimming on the psychological state of children with ataxia cerebral palsy

Swimming training can effectively improve the psychological state of children with ataxia cerebral palsy. Through the Rosenberg Self-Esteem Scale, the Children's Self-Confidence Scale, and the Children's Life Satisfaction Scale According to the data analysis, the child's self-esteem, self-confidence and life satisfaction were improved after swimming training compared with before training. Swimming is a kind of whole body movement, can exercise to all parts of the body muscle groups. For children with cerebral palsy, there is a need for targeted exercises to improve muscle strength and coordination due to reduced muscle control due to brain damage. Swimming is an effective way to exercise. When swimming in water, the resistance of water will make the body of children fully exercise, thereby improving muscle strength and coordination [4]. In addition, swimming can also exercise children's cardiopulmonary function, balance ability and spatial orientation ability [5]. Through the comprehensive exercise of these aspects, the physical function of children with cerebral palsy has been comprehensively improved, thus enhancing their self-esteem level and self-esteem. Swimming can not only improve the self-esteem level of children with cerebral palsy, but also promote their self-confidence. When swimming in water, children need to overcome the resistance of the water to complete various movements. This challenging environment can stimulate children's inner potential and make them more brave to face difficulties and challenges. At the same time, swimming can also cultivate children's perseverance and endurance, making them more determined to pursue their goals [6]. These factors all contribute to the improvement of confidence in children with ataxic cerebral palsy. Swimming can not only improve the self-esteem level and self-confidence of children with cerebral palsy, but also promote their life satisfaction. When swimming in the water, children can feel a sense of freedom, which can relieve their stress and anxiety. At the same time, swimming can also cultivate children's social skills and team spirit, so that they can participate in social activities more actively [7]. These factors all contribute to the life satisfaction of children with ataxic cerebral palsy.

4.2 The rehabilitation effect of swimming on anxiety and depression in children with ataxia cerebral palsy

Swimming training can effectively alleviate anxiety and depression in children with ataxia cerebral palsy. Through the determination of the Children's Depression Inventory and the Children's Anxiety Scale, the data analysis showed that the child's anxiety and depression were generally improved after swimming training compared with before training. Through swimming training, children with ataxic cerebral palsy can gradually relax their body and mind, reduce stress and tension, and thus improve their psychological state. When children with cerebral palsy are exposed to water, the buoyancy of water can reduce the gravitational pressure on their bodies, so that the bodies originally limited by muscle tension or movement disorders can relax [8]. By participating in a series of carefully designed water games, such as chasing floating toys in the water and performing simple water dances, these activities not only enhanced their physical coordination, but also stimulated their curiosity and desire to explore, making them feel an unprecedented sense of fun and achievement in play. In addition, the water floating exercise is also a very beneficial activity. With the assistance of a coach or a parent, children with ataxic cerebral palsy can safely experience the feeling of floating on the water. This weightlessness often brings a calm and peaceful state of mind, which helps them temporarily forget their daily troubles and challenges and immerses themselves in pure relaxation [9]. As their breathing synchronizes with the rhythm of the water flow, they gradually reached a state of inner peace, which had a significant effect on alleviating the negative emotions caused by long-term physical obstacles, such as anxiety and depression.

In the water, it is free to move and explore, discovering its ability and potential. This positive experience can enhance the confidence and self-esteem of children with ataxic cerebral palsy, making them more confident in facing their own life and challenges. In addition, swimming training can provide a safe and comfortable environment in which children with ataxic cerebral palsy feel relaxed and joyful. In the water, they can feel the softness and warmth of the water, which can help them relax and reduce anxiety and depression [10]. Both anxiety and depression scores decreased in children with ataxic cerebral palsy after training. This suggests that swimming training has a significant effect on alleviating psychological problems in children with ataxic cerebral palsy. In conclusion, swimming training plays an important role in alleviating anxiety and depression in children with ataxic cerebral palsy. At the same time, it can also improve the mental health of children with ataxic cerebral palsy, so that they can better cope with the stress and challenges in life. In summary, by participating in a series of interesting and challenging activities such as water games and floating in water, children with cerebral palsy can not only exercise and recover physically, but more importantly, their minds can also be nourished and comfortened in these activities, thus effectively alleviating and reducing the level of anxiety and depression and improving the overall quality of life.

4.3 The rehabilitation effect of swimming on the social adaptability of children with ataxia cerebral palsy

Swimming training can significantly improve the social adaptability of children with cerebral palsy. Through the determination of the Children's Social-Emotional Competence Scale and the Child Social-Interaction Scale, the data analysis showed that after swimming training, compared with before training, the child's social-emotional ability and children's social ability were improved.

This improvement is reflected not only in the way they interact with the outside world, but also in the construction of their inner emotional world and social skills. First of all, the soft touch and buoyancy support of water during swimming provide a relatively weightless environment for children with ataxia cerebral palsy, which not only helps them relax tight muscles and reduce body tension, but also promotes the development of body coordination. This physical comfort provides them with more opportunities to participate in social activities and enables them to interact with

people more confidently, thus enhancing their social-emotional abilities. Surrounded by water, children learn how to cooperate with others to complete tasks, such as finding submerged toys together or completing a water relay race. These experiences let them feel the strength of a team and the warmth of friendship, which further promotes their emotional maturity and social skills improvement. Secondly, swimming training also provides a platform for children with ataxic cerebral palsy to show themselves and build self-esteem. With the patient guidance of their coaches and the encouragement and support of their peers, they gradually overcame their physical limitations and learned how to move freely in the water and even complete some seemingly impossible tasks. The accumulation of these feelings of achievement gives them a new understanding of their own abilities, enhances their self-confidence, and makes them more willing to share their experiences and feelings with others, which promotes the depth and breadth of social interaction. In addition, swimming training also emphasizes the importance of communication and cooperation. In swimming lessons, children need to understand the instructions of the coach and coordinate movements with their peers. This frequent interaction not only exercises their language understanding and expression skills, but also teaches them how to play their role in the team, how to listen to others, and how to negotiate to solve problems. The learning and practice of these social skills have laid a solid foundation for their social activities in daily life. In conclusion, through swimming training, children with ataxic cerebral palsy not only improve their physical coordination, but more importantly, their social-emotional and social abilities are also comprehensively improved, which lays a more solid foundation for their future social integration and interpersonal communication.

4.4 Limitations and shortcomings of the study

Although swimming training has a significant effect on the psychological rehabilitation of children with ataxic cerebral palsy, there are still some limitations.

Individual differences: Different cerebral palsy children have differences in illness, age, personality and other aspects, resulting in different effects of swimming training. Therefore, it is essential to develop a personalized swimming training program to improve the rehabilitation effect.

Training frequency and intensity: too low training frequency and intensity are difficult to achieve the desired rehabilitation effect, while too high training frequency and intensity may lead to fatigue and resistance in children. Therefore, reasonable control of training frequency and intensity is the key to ensure the effectiveness of swimming training.

Parent involvement: Parents play an important role in the rehabilitation training of children with cerebral palsy. However, due to the limitation of time, energy and other factors, it is difficult for some parents to participate in the whole swimming training, which affects the continuity of rehabilitation effect.

Facilities and resources: Swimming training requires professional facilities and resources, including swimming pools, therapists, auxiliary equipment, etc. However, rehabilitation institutions in some areas may lack these resources, resulting in difficulties in popularizing and promoting swimming training.

Research sample: In clinical practice, since the proportion of ataxic cerebral palsy in all children with cerebral palsy is relatively low, and most of them are mixed, it is difficult to carry out experiments with large samples and collect data for horizontal comparison. However, the study is conducted in the form of a case study, which leads to certain limitations in its research results. Therefore, the generality and applicability of the results need to be further verified.

In conclusion, swimming has a significant effect on the psychological rehabilitation of children with ataxic cerebral palsy, but there are still many limitations. Future research should further explore the problems of personalized training program, reasonable control of training frequency and intensity, strengthening parents 'participation, improving facilities and resources support, so as to provide more comprehensive support for rehabilitation treatment and mental health education for

children with cerebral palsy.

4.5 Clinical Implications and Recommendations

This study demonstrates that swimming, as a safe and effective rehabilitation treatment, can significantly improve the self-esteem level, self-confidence and life satisfaction as well as motor function in children with ataxic cerebral palsy. Therefore, in clinical practice, doctors can formulate personalized swimming training programs according to the specific conditions of children and incorporate them into the comprehensive rehabilitation treatment system. At the same time, parents should also actively participate in the rehabilitation process of their children and give them enough care and support. In addition, schools and society should also strengthen their attention and support for children with ataxic cerebral palsy, and provide them with more opportunities and platforms to show their talents and values. Only in this way can we truly achieve the goal of making every life respected and loved.

5. Conclusion

The psychological state of the child was significantly improved after swimming training compared with before training. The child's anxiety and depression were significantly relieved after swimming training compared with before training. After swimming training, compared with before training, the child's social adaptability has been significantly improved. Due to some objective reasons, this study also has certain limitations and deficiencies.

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