Application of Modern Information Technology in Remote Rehabilitation Training System

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Abstract. With the increasing attention and importance placed on children's health, more and more people hope for a more scientific and effective method to prevent and treat common diseases in children. Child rehabilitation has also become an important direction in medical development. However, traditional rehabilitation training models have various problems such as regional limitations, uneven resource allocation, and low patient participation, resulting in unsatisfactory rehabilitation effects. This paper aims to explore the application of modern information technology in the remote rehabilitation training system, analyze the role and advantages of various technologies in rehabilitation training, and how to integrate these technological convergence into the remote rehabilitation training system, so as to achieve "intelligence" in the true sense, and provide reference for improving the quality of life of patients and promoting the sustainable development of medical cause. A randomized scientific control was designed to evaluate the application effect of modern information technology in children's remote rehabilitation training system. Group A was set to receive remote rehabilitation training based on modern information technology, and Group B was set to receive traditional rehabilitation training. The experimental results showed that the average score of children's daily living ability in Group A was about 34.6 points, while that in Group B was about 31.2 points. It has been proven that modern information technology has great feasibility in the practical application of remote rehabilitation training systems for children. It can not only improve the efficiency of rehabilitation training, but also greatly improve the physical and mental health level of patients. Modern information technology, characterized by high digitization, networking, and multimedia, has rapidly popularized in various industries and fields. Utilizing these advanced technologies to build rehabilitation systems suitable for various populations is an imperative trend and a promising topic.

Keywords: Modern Information Technology, Remote Rehabitation Training, Children's Health, Training System

1. Introduction

With the rapid development of technology, remote rehabilitation training has gradually become a hot topic in the field of modern healthcare. Rehabilitation training

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is a process of systematic training and treatment to help patients recover or improve their physical function and improve their quality of life, especially for patients living in remote areas or with limited mobility. This service has important practical significance. In addition, with the increasing population of chronic diseases and disabilities worldwide, remote rehabilitation training has important value in improving patients' quality of life and reducing the social medical burden.

Remote rehabilitation training systems can provide convenient and efficient rehabilitation services for patients, especially for patients living in remote areas or with limited mobility. This service has important practical significance. J Bai proposed a home rehabilitation training and evaluation system for stroke patients based on workplace measurement. This system can easily guide patients to undergo home rehabilitation training and evaluation without the need for doctor supervision, making it a simple and convenient rehabilitation training and evaluation method [1]. MN Maximova analyzed the experience of remote implementation of the comprehensive rehabilitation system for the disabled in the rehabilitation center of the Tatarstan, and put forward conclusions and suggestions on the rehabilitation skills training of disabled family members and the remote provision of additional services through information and communication technology to effectively and reasonably provide social services [2]. AFSJ Syed introduced how physical therapy rehabilitation can promote the functional ability of the disabled through range of motion exercises, use physical therapy rehabilitation based on natural user interface, provide personalized motion rendering and monitoring systems for patients, and provide mobile decision support systems for therapists [3]. Y Bouteraa proposed a low-cost open-source robot solution for remote rehabilitation, which ensured that devices can be remotely controlled using only simple gestures. Experimental studies on a group of patients in a clinical environment have shown the efficiency and reliability of the developed robot solution [4]. With the increasing population of chronic diseases and disabilities worldwide, remote rehabilitation training has important value in improving patients' quality of life and reducing the social medical burden.

The development of sensor technology, wearable devices, artificial intelligence, and machine learning has brought new opportunities and challenges to remote rehabilitation training. W Zhang proposed a motion intention modeling method based on joint posture, speed, and force/torque information, as well as a rehabilitation training control strategy based on fuzzy compensation. Based on the fuzzy compensation algorithm, a patient master-slave cooperative control strategy is proposed with the input parameter of the patient's intentional movement time. Simulation results show that the rehabilitation robot's slave arm can follow the movement of the main arm according to the patient's motion intention, effectively avoiding misoperation and secondary damage to the affected limb [5]. P. Xie proposed a virtual rehabilitation system based on electroencephalography to meet the key requirements of virtual rehabilitation system in terms of individual adaptability, security and active participation. A system with virtual scenes and feedback control strategies was constructed, and the effectiveness of the system was evaluated through virtual rehabilitation experiments [6]. X Tang proposed a 3D human pose estimation method based on OpenPose-Kinect and innovatively implemented it in rehabilitation training, demonstrating a method that combines OpenPose-based joint localization with depth information obtained from Kinect to locate joints. Then, the Holt dual

exponential smoothing program is used to smooth and predict the obtained joint trajectory [7]. The application of modern information technology in remote rehabilitation training provides more possibilities for rehabilitation training.

Remote rehabilitation training for children is an emerging means of rehabilitation, but currently there is still a lack of a relatively complete technical system to support the rapid development of this field [8]. The remote rehabilitation training system for children established using modern information technology and methods can integrate psychological intervention, health education, and auxiliary treatment, providing patients with comprehensive services, alleviating their pain, enhancing their confidence and self-esteem, and enabling them to quickly overcome disease difficulties [9]. Compared with general rehabilitation training, this system can not only achieve the entire process from basic to clinical and then to back-end development, but also adjust or stop some functional operations at any time according to the needs of the condition, improve the efficacy while ensuring safety and effectiveness, and provide targeted guidance for children of different ages.

2. Role of Modern Information Technology in Remote Rehabilitation Training for Children

With the improvement of technological development and changes in population structure, people are paying more attention to health issues. Using information technology to provide more convenient conditions for children has become a necessity of the times [10]. Children's rehabilitation training is a special educational activity for individual children. It mainly helps children of different ages to acquire skills and abilities suitable for social life through physical rehabilitation, including sports training, intelligence training, sensory processing training and abnormal behavior correction training [11-12]. This article aims to use the theory of children's rehabilitation training as the foundation, and combine with the current situation that parents generally value family education while neglecting early rehabilitation training for children. It explores how to apply modern information technology to children's rehabilitation training and analyzes its application effects, in order to better promote the comprehensive, coordinated and sustainable development of individuals' physical and mental health.

Firstly, modern information technology makes remote rehabilitation training more convenient, allowing children to receive rehabilitation training at home or elsewhere, eliminating the need for frequent visits to medical institutions, reducing transportation and time costs, and not worrying about delaying treatment opportunities due to missed visits. This provides greater convenience and flexibility for children and families, bringing a new service experience [13].

Secondly, personalized rehabilitation plans have become a new possibility. By evaluating and monitoring children's rehabilitation progress, the system can develop targeted training plans based on their special needs and rehabilitation goals, and adjust training content and intensity based on real-time data to meet the personalized needs of children, helping them achieve the best rehabilitation effect in the shortest possible time.

Once again, modern information technology can record and analyze children's

rehabilitation training data, including movement data, progress records, etc. Through data analysis, medical professionals can provide real-time guidance and feedback to help children correct incorrect postures, ensuring the effectiveness and safety of rehabilitation training [14].

Finally, by providing communication channels between children and healthcare professionals, other rehabilitation patients, and parents, information exchange, experience sharing, and mutual support can be promoted, enhancing children's rehabilitation motivation and enthusiasm. At the same time, it can also help children and parents understand rehabilitation knowledge, master rehabilitation skills, and self-manage and maintain rehabilitation in daily life, reducing the occurrence and development opportunities of diseases [15].

3. Construction and Functions of a Remote Rehabilitation Training System for Children

This article is based on computer and network technology, digitizing and integrating the traditional rehabilitation training process, and utilizing information technology to complete data collection, analysis, processing, and feedback. It constructs a children's remote rehabilitation training that integrates motor function evaluation and intervention. It can provide patients with comprehensive and accurate information, guide children's rehabilitation treatment to achieve good results, and help parents timely grasp the physical development status of children at different stages [16]. The specific framework and page display of the system are shown in Figure 1.

Fig.1 Children's remote rehabilitation training system

The system mainly consists of six modules, namely individual evaluation, remote training, training plan, training time recording, training effectiveness, and communication and support. Each module is functionally independent and

complementary, forming a complete closed-loop structure, and achieving comprehensive evaluation of children's abilities and qualities. In this system, the individual evaluation module makes objective judgments on various physical fitness indicators and future development status of children based on their actual situation, and the formulation of training plans is an important prerequisite for ensuring the quality of rehabilitation training. The remote training module provides real-time online teaching through computers or mobile phones, and provides functions such as remote monitoring, guidance, and feedback to ensure that children receive appropriate guidance and support during the training process. It is the core of the entire system. In short, through the collaborative work of these modules, children can receive personalized rehabilitation training in a remote environment and receive professional guidance and support to promote the improvement of rehabilitation effectiveness. Finally, the application of digital information technology could have a revolutionary impact on the entire rehabilitation healthcare system, making communication between doctors and patients more convenient, while also helping to improve patient satisfaction and quality of life, reduce family economic pressure, and enhance their autonomy and social adaptability [17-18].

4. Evaluation of the Effect of Modern Information Technology on Children's Rehabilitation Training

4.1 Experimental Design

In a randomized scientific control, participants were randomly divided into group A and group B, and group A was set to receive remote rehabilitation training based on modern information technology, using remote access, personalized rehabilitation plan, remote monitoring and guidance and other technologies. Group B received traditional rehabilitation training, such as daily exercise, face-to-face rehabilitation treatment, and guidance. A rehabilitation period of 6 months was set, and relevant data was collected from the patient's motor function, mental health, and daily living ability before and after rehabilitation training. Appropriate statistical methods were used to analyze the collected data and compare the differences between the two groups.

4.2 Participants

Taking children of different ages, genders, and rehabilitation needs from a rehabilitation center as the experimental subjects, these children are basically distributed between the ages of 1 to 9, with a similar gender ratio, and they all have varying degrees of psychological, intellectual, developmental delays, and other problems. 30 participants were randomly selected as participants in the randomized scientific control, and they were divided into two groups, A and B, 15 in each group.

4.3 Data Evaluation

4.3.1. Movement Function

Two groups of children were required to perform movements such as balance, jumping, and running, and their coordination, strength, and flexibility were evaluated

using software tools. The scoring criteria were 1-10 points, and the results are shown in Figure 2.

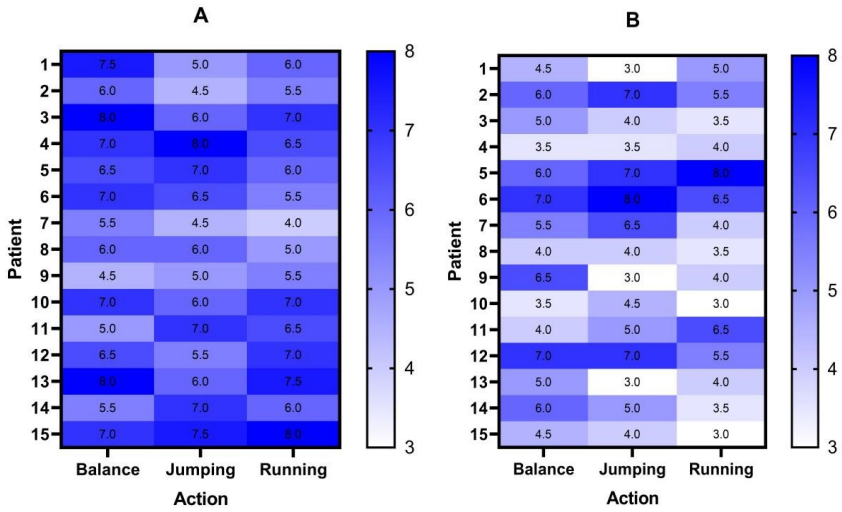

Fig.2 Comparison of motor function between two groups of children

Figure 2A Motor function scores of children in Group A
Figure 2B Motor function scores of children in Group B

The abscissa of Figures 2A and 2B represent three motion related movements, while the ordinate represents 15 pediatric patients. The color mapping range set for both heat maps is 3-8 points. The lower the score, the closer the color is to white. The higher the score, the darker the blue. It can be clearly seen that 2B has relatively more light colors, which means that the proportion of patients with lower scores is higher. However, in 2A, the blue range is larger and the overall score is higher. Therefore, children's rehabilitation training assisted by modern information technology can effectively improve motor function and make them healthier Happy growth.

4.3.2. Psychological Health

This article invites rehabilitation professionals to observe the emotional performance, social interaction, and other behaviors of two groups of patients, and evaluate the psychological health status of children after rehabilitation training by counting the number of occurrences of these behaviors within the specified time. The emotional performance can be divided into angry or happy, as shown in Figure 3.

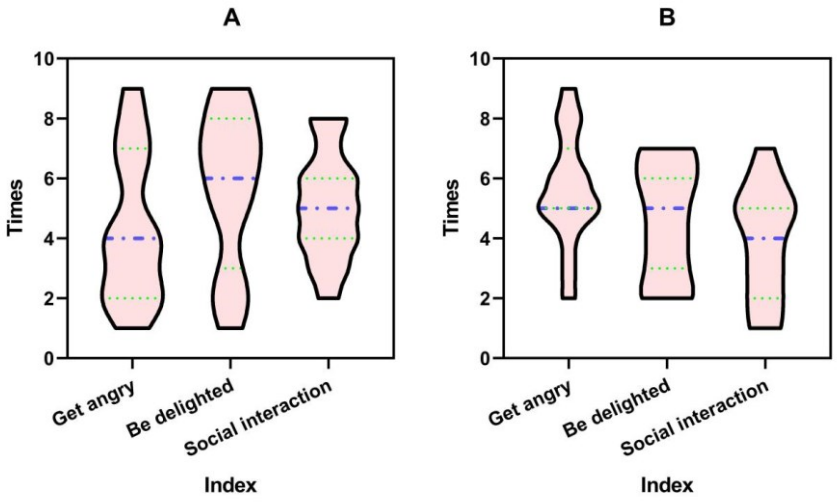

Fig.3 Comparison of mental health between two groups of children

Figure 3A Psychological health status of children in Group A
Figure 3B Psychological health status of children in Group B

The horizontal axis of Figures 3A and 3B represent the three evaluation indicators of mental health, while the vertical axis represents the number of occurrences of each indicator. It can be seen that the number of times patients in Group A and Group B are angry is between 1-9, with a small difference. However, Group A has a larger data span in the indicator of happiness, with a maximum of 9 times and a minimum of only 1 time. However, the data distribution in Group B is relatively concentrated, between 2-7 times. From the perspective of emotional performance, both groups of patients have reached a good level of psychological state. From the perspective of the number of social interactions, Group A patients generally have 2-8 interactions, with an average of around 5.07, while Group B has 1-7 interactions, with an average of around 3.93 per patient. This indicates that Group A patients can engage in better interpersonal communication and maintain a good mental state after rehabilitation training.

4.3.3. Daily Living Ability

According to the Children's Daily Living Ability Assessment Form, the quantitative scores of two groups of patients in eight aspects after rehabilitation training, including diet, dressing, washing, and going to the bathroom, were calculated. The score for each behavior was 1-5 points, with 1 point indicating that it cannot be completed and 5 points indicating that it can be completed independently. The maximum total score was 40 points. The scoring results are shown in Figure 4.

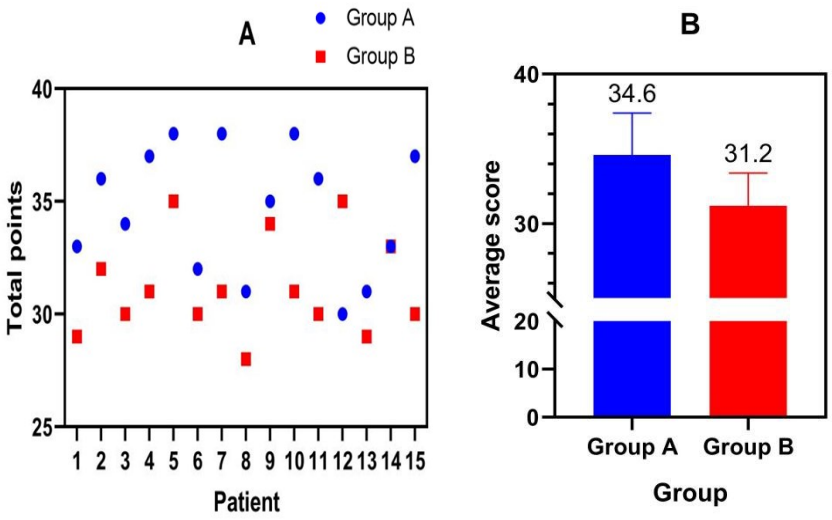

Fig.4 Comparison of daily living abilities between two groups of children

Figure 4 A Total daily living ability scores of two groups of children
Figure 4 B Average score of daily living ability between two groups of children

Figure 4A shows the total score of daily living ability for all patients, with the horizontal axis representing the patient and the vertical axis representing the total score. Figure 4B shows the average score for each group, with the horizontal axis representing the group and the vertical axis representing the mean. The total score in Figure 4A is the highest at 38 points, with three patients reaching this level and all of them belonging to Group A. The minimum total score is 28 points, with only one patient in Group B receiving this score. After statistics, it can be concluded that the average score of Group A is about 34.6 points, while Group B is about 31.2 points. It can be seen that Group A has a good rehabilitation effect and can meet the basic quality of life requirements of most people who need functional exercise and self-care.

5. Conclusions

Children are the future and hope of society, and child rehabilitation has profound significance for the entire family and even the entire nation. Applying modern information technology to children's remote rehabilitation training can not only effectively improve their learning ability and personality development, but also help them establish healthy self-confidence, improve and enhance their physical condition, and promote physical and mental health growth. This article starts with the problems in the field of rehabilitation training, and uses modern information technology to construct a remote rehabilitation training system for children, achieving information exchange and sharing, as well as intelligent management. At the same time, it also

provides reference and reference for future information construction in related industries.

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ATTACHMENT:

Assessment Form for Children's Daily Living Ability

	Can not complete 1	Auxiliary is also difficult to accomplish 2	Complete with assistance 3	It takes a long time to complete 4	Can complete independently 5
Wash hands and face					
Brush one's teeth					
Have a meal					
Peel the fruit					
Put on and take off clothes					
Go to the toilet					
Use electrical appliances					
Express one's willingness					
Total points					