The Impact Of Tele-Rehabilitation Nursing On The Daily Living Abilities Of Children With Cerebral Palsy

Zhao Jing[1], Liu Ying[2*], Su Junting[3], Sun Guang[4], Xie Huan[5]

[1]School of Nursing, Jiamusi University,154002, China；
[2]School of Nursing, Jiamusi University,154002, China；
[3]School of Nursing, Jiamusi University,154002, China；
[4]School of Nursing, Jiamusi University,154002, China；
[5]School of Nursing, Jiamusi University,154002, China.
Email: 80966012@qq.com,   792690239@qq.com, 315600757@qq.com, 295471182@qq.com,544044479@qq.com

Abstract: The objective of this study is to delve into the influence of tele-rehabilitation nursing on children diagnosed with cerebral palsy. To achieve this, we conducted a thorough search across multiple databases including the Cochrane Library, PubMed, ScienceDirect, CNKI, and WanFang Data, aiming to gather evidence on the efficacy of tele-rehabilitation for cerebral palsy. Subsequently, a comparative analysis was performed to assess the differences in physical structure, function, activities, and participation in daily living activities between children receiving tele-rehabilitation nursing and those undergoing home-based care. For the purpose of this investigation, a total of 30 subjects were divided into two groups: a control group that received tele-rehabilitation nursing, and an observation group that underwent traditional home-based rehabilitation. The findings of our data analysis revealed that tele-rehabilitation nursing significantly improved the daily living abilities of children with cerebral palsy, with statistical significance ($P<0.05$). Notably, children in the tele-rehabilitation group exhibited a significantly higher level of participation in daily activities compared to the home-based rehabilitation group, while no significant differences were observed in terms of physical structure, function, and activity levels.

Keywords: cerebral palsy; tele-rehabilitation nursing; daily living abilities.

Introduction

Cerebral palsy (CP) is a persistent disorder of movement and posture development, along with activity limitation, that is attributed to non-progressive brain injury occurring in fetal or infant brains. Long-term rehabilitation therapy and nursing can reduce the degree of limb deformities and improve the quality of life for children with CP. [1]While the physical and mental development of children with CP lags behind that of normal children, they are still undergoing continuous development and change. Rehabilitation training can reduce motor impairments and enhance children's self-care abilities in daily life. By combining the characteristics of children's physical and mental development, we can provide theoretical foundations for children's rehabilitation, as well as methods and tools for functional diagnosis, intervention, and evaluation. Multi-level exploration of assessment methods for CP rehabilitation nursing and accurate understanding of children's physical functions can effectively guide clinical rehabilitation nursing work.[2]

However, some parents of children with cerebral palsy have a certain degree of fear towards inpatient rehabilitation nursing. This psychology can lead some parents to forgo inpatient rehabilitation nursing and opt for home-based rehabilitation and care instead. [3] Factors such as varying family conditions and limited parental expertise can affect the effectiveness of home-based rehabilitation for children with cerebral palsy. These children with disabilities require scientific and effective long-term rehabilitation, as well as support from corresponding rehabilitation nursing techniques, to improve and enhance their functioning as much as possible.[4]

The World Health Organization has launched an initiative to implement home-based rehabilitation for children with cerebral palsy, aiming to increase their access to rehabilitation therapy and reduce the economic burden on their families. Meanwhile, as the home is the primary living environment for children, the familiar surroundings can alleviate their fear. [1] The uniqueness of rehabilitation nursing techniques for children with cerebral palsy lies in the combination of medical rehabilitation nursing and educational rehabilitation, utilizing various means to improve children's functioning and maximize their potential.[6]

Due to the limited avenues for parents to obtain rehabilitation guidance, the utilization rate of home-based rehabilitation is relatively low. Integrating rehabilitation nursing into children's daily lives can not only improve their physical impairments but also ensure the development of their complete personalities. Therefore, exploring new avenues to provide

reliable and practical rehabilitation training guidance for parents will effectively increase the utilization rate of home-based rehabilitation.[7]

Remote rehabilitation nursing refers to the utilization of internet-enabled smart devices such as computers, mobile phones, televisions, "virtual reality" technology, or social media software by patients with physical functional disabilities to receive professional rehabilitation nursing guidance from device terminals and achieve "one-on-one" rehabilitation nursing training via the internet. In recent years, the remote rehabilitation nursing model has received increasing attention in the treatment of children with cerebral palsy due to its advantages of low treatment costs and shared medical resources. According to literature reports, the remote rehabilitation nursing model can improve motor function, promote physical and mental health, and reduce economic costs for children with cerebral palsy.[8]

In the combined model of remote technology and rehabilitation therapy, nurses can remotely monitor patients' training and adjust the training plan and intensity based on patients' feedback information. At the same time, this model has addressed the issue where children with cerebral palsy, due to various reasons, are unable to obtain long-term inpatient rehabilitation nursing guidance during the normalization of the pandemic, enabling them to receive guidance from rehabilitation nurses at home and ensuring the continuity of rehabilitation training[9] .

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Literature Review
Unlike general clinical specialties, the rehabilitation nursing for children with cerebral palsy (CP) possesses strong value for remote implementation, supported by modern communication technology. The development of home nursing abroad started earlier, and the content of home nursing and health care in Europe has been integrated into the government's healthcare system. Home rehabilitation in the United States and the United Kingdom emphasizes treating the family as a whole, requiring a home healthcare model that combines hospital and family care. The application of virtual reality (VR) in children's home-based rehabilitation therapy has been explored. Relevant research results indicate that children can achieve better rehabilitation outcomes. The immersive experience, diversity, and personalized, phased, and controllable rehabilitation game training provided by VR can enhance patients' enthusiasm for rehabilitation training and avoid fatigue caused by repetition and boredom of traditional rehabilitation training[1] .

Cerebral palsy is a disease that deserves attention as it is often accompanied by intellectual disabilities, vision abnormalities, hearing loss, language barriers, epilepsy, and cognitive and behavioral disorders, in addition to delayed motor development and abnormal posture. These symptoms severely impact the daily living activities and social interaction abilities of children with CP, further affecting their quality of life and hindering their entry into mainstream society, causing a significant burden for families and society. To enable children with CP to enter mainstream society and enjoy equal treatment in school, they must not only be able to perform basic daily living activities such as eating, drinking, using the bathroom, bathing, self-managing urination, and walking, but they must also possess cognitive, comprehension, and social functions. All these aspects are referred to as the functional independence of children with CP. If children with CP possess this functional independence, they can integrate well into mainstream society, and their quality of life will improve accordingly. Therefore, how to improve the functional independence and quality of life of children with CP, enabling them to truly integrate into mainstream society, is an important topic in modern CP rehabilitation research. [3] Consequently, establishing a corresponding feedback mechanism between nursing technicians and remote nurses can greatly ensure the operability, timeliness, and accuracy of rehabilitation nursing programs. Liu Zhenhuan and others have implemented a tri-combination rehabilitation model for children, combining modern medical rehabilitation, traditional medical rehabilitation, and home-based rehabilitation nursing. After discharge, regular training for family members of patients is conducted, along with regular follow-ups and assessments. Related results show that children receiving home-based rehabilitation have better long-term stability of efficacy compared to those who do not receive such rehabilitation. Home-based rehabilitation has a significant impact on the rehabilitation of children with CP, and the influence of tele-rehabilitation nursing on specific evaluation indicators for children with CP has become an urgent issue to address.[4]

Daily living activities encompass self-care abilities, mobility, and cognitive communication skills, including eating, grooming, bathing, dressing, controlling urine, indoor and outdoor exercise, using the toilet, getting into and out of vehicles, climbing stairs, daily communication, and safety. Through a comprehensive assessment of a child's self-care abilities, consciousness, play, and memory, it can be determined which actions the child cannot complete independently and how much assistance they require. Quantitative assessment is a crucial part of determining training goals and plans.[2]

Daily living skills are the most basic requirements for achieving self-care and are also indispensable activities in social life. However, most daily activities of children with cerebral palsy require assistance from others. Children with cerebral palsy are in the process of growth and development, resulting in continuous changes in abnormal posture and movement, disease type, severity, nursing conditions, psychological qualities, environmental influences, spontaneous desire for daily activities, and self-confidence. All these factors can have an impact. Factors such as cerebral palsy classification, intelligence, and comprehensive impairments are closely related to daily living skills. These factors significantly affect children's lives and growth, preventing them from attending school, integrating into society, and reducing their quality of life. Children's rehabilitation nursing primarily targets children with developmental disabilities or other disabilities. Children should start rehabilitation nursing training as soon as possible to improve their daily living skills and strive for self-care. Rehabilitation nursing is an important means to help disabled individuals return to society, with strong national characteristics.[5]

Comprehensive assessments can determine which actions children cannot complete independently and how much assistance they need. Quantitative assessment is a crucial part of determining training goals and plans. Activities such as eating, changing clothes, and using the toilet can be challenging, requiring not only specialized training for children but also environmental modifications and the production of assistive devices when functions are difficult to change. In the nursing process, it is essential to encourage children to complete daily living activities while emphasizing the role of their parents in assisting them. Enhancing daily self-care abilities and integrating into family life as soon as possible can effectively improve children's compliance and maximize their motor, intellectual, linguistic, and social adaptation skills.[3]

Research and Methodology:
This study aims to track and observe the rehabilitation effects of remote rehabilitation nursing techniques on the daily living abilities of children with cerebral palsy, and compare them with home-based rehabilitation nursing. The goal is to identify the actual impact of remote nursing on children with cerebral palsy, determine the key factors, and explore its application value.

Study Participants:

The study evaluated the effects of remote rehabilitation nursing for children with cerebral palsy and compared them with the rehabilitation process of hospitalized children. The selected children were randomly divided into two groups: 15 cases in the intervention group and 15 cases in the control group. All 30 children underwent a child behavioral ability assessment. The intervention group received remote rehabilitation nursing, including remote rehabilitation nursing environment assessment, remote rehabilitation nursing guidance, and remote nursing feedback. Micro-videos were created through online one-on-one rehabilitation nursing guidance, WeChat consultation, live streaming, and other methods.

Research Methods

(1) Conducted an environmental assessment for remote rehabilitation nursing and made necessary environmental modifications. The space should be spacious, bright, and barrier-free, suitable for rehabilitation nursing training. The primary family rehabilitation caregivers should grasp specific nursing points and precautions, integrate the concepts and methods of rehabilitation nursing into family life and children's daily activities, and guide parents to master rehabilitation training through remote training methods.

(2) Remote Rehabilitation Nursing Guidance: Develop a plan, formulate a nursing plan based on the child's actual situation, and develop specific nursing measures, including physical structure and function guidance, daily living ability guidance, activity participation guidance plans, and parent training programs. Each section has corresponding nursing goals.

(3) Establish a corresponding feedback mechanism between nursing technicians and remote nursing staff. The control group adopted home-based rehabilitation nursing. The specific content was formulated by nursing staff based on assessment indicators and rehabilitation was carried out accordingly.

Statistical Analysis

SPSS 22.0 software was used for data analysis. Measurement data that conformed to a normal distribution were expressed as ($\bar{x} \pm s$), and the comparison between groups was performed using the two-independent sample t-test. $P < 0.05$ indicated that the difference was statistically significant.

Results
After 3 months, both the intervention group and the control group underwent re-assessment of rehabilitation nursing. The score changes in the rehabilitation nursing evaluation results were compared, and the correlation between the changes in rehabilitation nursing indicators was analyzed.

Table 1

Daily Living Abilities	Remote Rehabilitation Nursing	Home-based Rehabilitation Nursing	T-value
Physical Structure & Function	11.25±3.33	11.12±4.75	1.43
Activity	30.06±3.27	32.82±2.64	1.27
Participation	34.93±4.11	23.71±3.98	3.32*
Total Score	77.36±3.22	68.73±3.55	9.87*

*$p < 0.05$. Table 1: Comparison of Daily Living Abilities Scores after 3 Months

Analysis of the data in the table above reveals significant differences in the effects of remote rehabilitation nursing and home-based rehabilitation nursing on the daily living abilities of children with cerebral palsy. Specifically:

In terms of physical structure and function, the scores of the two groups were similar. The average score of the remote rehabilitation nursing group was 11.25±3.33, while the average score of the home-based rehabilitation nursing group was 11.12±4.75. The difference between the two groups was not significant (T-value = 1.43).

Regarding motor function, the scores of the two groups were also close. The average score of the remote rehabilitation nursing group was 30.06±3.27, while the average score of the home-based rehabilitation nursing group was 32.82±2.64. The difference between the two groups was also not significant (T-value = 1.27).

However, in terms of participation ability, the remote rehabilitation nursing group demonstrated a significant advantage. Its average score was 34.93±4.11, while the average score of the home-based rehabilitation nursing group was only 23.71±3.98. The difference between the two groups was significant (T-value = 3.32, $p < 0.05$), indicating that remote rehabilitation nursing is more effective in improving the participation ability of children with cerebral palsy.

In terms of the total score, the average score of the remote rehabilitation nursing group was 77.36±3.22, significantly higher than the 68.73±3.55 of the home-based rehabilitation nursing group (T-value = 9.87, $p < 0.05$). This result suggests that, overall, remote rehabilitation nursing is more effective in improving the daily living abilities of children with cerebral palsy compared to home-based rehabilitation nursing.

Remote rehabilitation nursing has significant advantages over home-based rehabilitation nursing in improving the participation ability and overall daily living abilities of children with cerebral palsy. This finding is of great significance for the further promotion and application of remote rehabilitation nursing techniques to improve the rehabilitation outcomes of children with cerebral palsy.

Conclusion:
In this study, the remote rehabilitation nursing model adopted by the experimental group had a positive impact on the daily living abilities of children with cerebral palsy, especially in the dimension of participation. The average score of the control group was lower than that of the experimental group. Therefore, in future remote nursing work, it can be emphasized that remote rehabilitation nursing has a significant positive impact on the participation dimension of daily living abilities for children with cerebral palsy. It is suggested that remote rehabilitation nursing can be utilized to improve the daily living activities and participation of children with cerebral palsy. However, in terms of physical structure, function, and motor function, the effects of remote rehabilitation nursing were not significant.

Remote rehabilitation nursing has a clear advantage over home-based rehabilitation nursing in terms of daily living abilities for children with cerebral palsy. Since traditional rehabilitation nursing is often conducted in treatment rooms, while patients may demonstrate improved function in the training room and can fully or partially achieve daily living activities after receiving traditional rehabilitation therapy, most patients struggle to maintain the therapeutic effects and meet their daily activity needs once they leave the treatment room. Rehabilitation should incorporate remote rehabilitation nursing techniques, which can largely compensate for this shortcoming, helping children restore some motor functions and improve their independent living abilities.

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