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Precise Rehabilitation Strategies for Functional Impairment in Children with Cerebral Palsy

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Abstract: This paper explores the effect of precise rehabilitation strategies under the international classification of functioning, disability and health for children and youth (ICF-CY) on the motor function of children with cerebral palsy. Under the framework of ICF-CY, the observation team is designed and evaluated from physical functions, activities and participation, environmental factors, and develops individualized rehabilitation strategies that are tailored to individual characteristics. The control group was assessed by traditional methods and treatment plans and measures were formulated and guided. The course of treatment was 12 months. The scores of GMFM-88, Peabody Motor Development Scale-2concluding fine motor quotient (PDMS-FM), WeeFIM and the ability of daily living (ADL) scale (Barthel index, BI) score were compared before and after treatment. The research shows that precise rehabilitation strategy mode for children with cerebral palsy under the ICF-CY framework can effectively improve the motor function and the ability of daily living (ADL) in children with cerebral palsy. Rehabilitation evaluation and treatment mode of children with cerebral palsy under ICF-CY framework can effectively improve the gross motor function of children with cerebral palsy. Individualized evaluation and analysis and guidance of comprehensive rehabilitation treatment have certain advantages. The overall treatment effect is better than that of traditional rehabilitation evaluation.

Keywords: ICF-CY; cerebral palsy; precise rehabilitation strategy

1 Introduction

Cerebral palsy (CP) is the most common cause of physical disability in children, which is caused by an immature brain, congenital developmental defects, or acquired conditions such as prematurity, low birth weight, asphyxia, hypoxic-ischemic encephalopathy, nuclear jaundice, trauma, infection, and other non-progressive brain injuries [1]. The prevalence in children aged 0 to 6 years is as high as 1.8‰ to 4‰. The main brain pathological changes in cerebral palsy are brain white matter injury, abnormal brain development, intracranial hemorrhage, and brain damage caused by brain hypoxia. In recent years, there has been a lot of research in this field [2]. The core disorder of cerebral palsy is motor impairment, often accompanied by sensory, perceptual, cognitive, communication, and behavioral deficits, as well as epilepsy and secondary muscular and skeletal problems [3]. The clinical typology is divided into spastic quadriplegia, spastic diplegia, spastic hemiplegia, involuntary movement, ataxia and mixed types [4]. The disease seriously affects the physical and mental health of children, so early assessment and intervention treatment are of great significance to improve the effectiveness of rehabilitation treatment, reduce secondary disabilities and reduce the burden of children on their families and society.

At present, cerebral palsy rehabilitation treatment mainly adopts comprehensive treatment means such as movement therapy, physical factor therapy, speech therapy, sensory integration training, TCM massage and acupuncture and surgery. With the transformation of the modern medical model from the biomedical model to the biopsychosocial medical model and the continuous promotion of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) concept [5], it is an urgent problem to integrate various assessment tools at present, to evaluate and guide the treatment of a child with cerebral palsy precisely in an integrated, rational and efficient way, and to formulate a personalized and precise rehabilitation treatment strategy that meets individual characteristics [6–8]. The construction of a systematic and precise rehabilitation assessment and treatment system is the direction of cerebral palsy rehabilitation treatment, which helps to improve the rehabilitation treatment effect and advance the scientific research level of children's neurological rehabilitation. The ICF-CY provides a theoretical basis for child rehabilitation and provides methods and tools for functional diagnosis, functional intervention and functional assessment of children.

The ICF-CY theory and method are used to describe the functional and health status of children and adolescents, and the concept can be applied to systematically and precisely access children with cerebral palsy by combining it with clinical treatment [9,10], and to guide the formulation of a treatment plan that meets with individualized and precise rehabilitation and to provide systematic and comprehensive treatment interventions for all aspects of the child [11–13], especially abandoning the past principles of focusing only on movement disorders and neglecting the improvement of cognitive and self-care abilities, or the same treatment plan that ignores individualized individualized differences [14–16].

Precision rehabilitation means individualization and precision, that is, starting from the individual patient, locating the patient's injury site precisely through various testing means and methods, at the same time making a precise diagnosis and evaluation under the framework of ICF, and then precisely rehabilitating the patient's functional disorders in all aspects through effective personalized treatment to enable the patient to fully recover [17–19].

2 Treatment and Analysis Objects

In this study, 122 children with cerebral palsy in the rehabilitation department of our hospital from September 2018 to September 2020 were divided into two groups by a randomized controlled study method. In the treatment group, the ICF-CY functional checklist was used to provide a comprehensive and systematic assessment of physical function and structure, activity and participation, and environmental factors, and to formulate individualized countermeasures and precise rehabilitation treatment methods based on the main problems of the assessment; the control group was given conventional assessment treatment. The differences in the treatment effects of cognitive and fine motor functions and self-care ability of the children in the two groups were compared and are reported as follows [20].

A total of 122 children with cerebral palsy treated in the rehabilitation department of our hospital from September 2018 to September 2020 were selected, and these study subjects met the diagnostic and typing criteria for cerebral palsy developed at the 2014 National Pediatric Cerebral Palsy Rehabilitation Academic Conference [4]. The parents of the children gave informed consent to the study and signed an informed consent form [21].

Inclusion criteria:

- Age 3–6 years (50.875 ± 10.082 months).
- Some cognitive ability to cooperate with rehabilitation training.
- The parents of the child actively cooperated with the treatment.

Exclusion criteria:

- Children with bleeding tendency (such as acute stage of cerebral hemorrhage, coagulation mechanism disorders, etc.).
- Children with severe heart, liver, lung and kidney failure.
- Children with unstable vital signs and fever.
- Children with a history of epilepsy or abnormal behavior and other diseases.

Grouping: A total of 122 children with cerebral palsy were included and divided into treatment (n = 61) and control groups (n = 61) according to the odd and even numbers of the order of treatment visits. There were two children who dropped out during the study, one in group I who was unable to continue treatment due to recurrent respiratory infections and another in group II who was dropped out due to surgical procedures performed during the treatment period. In this paper, we compared the general data of age, gender, type of cerebral palsy, and gross motor function classification of the two groups of children in the experiment. In the general data, the clinical grading was referred to the Chinese version of Gross Motor Function Classification System (GMFCS) for cerebral palsy, including grades I to V [22].

As shown in Table 1, the differences in gender, age, gross motor function classification system (GMFCS), and cerebral palsy typing between the two groups of children were not statistically significant ($P > 0.05$) and were comparable. This study was approved by the Ethics Committee of the Children's Hospital of Nanjing Medical University (approval number: 20190727-1).

Table 1: Comparison of general information of children in two groups

Group	Num	Age	Gender	GMFCS levels	Classification of cerebral palsy			
		($\bar{x} \pm s$,Months)	(Male/Female)	(I/II/III/IV/V)	Spastic	Dyskinetic	Ataxic	Mixed type
Treatment	600	52.083 ± 10.381	39/21	8/18/17/12/5	25	15	9	11
Control	60	49.667 ± 9.709	36/24	9/20/22/7/2	20	19	12	9
x^2/t		1.226	0.320	0.602	1.400			
P		0.270	0.572	0.439	0.239			

3 Accurate Assessment of ICF-CY Function Check

During one rehabilitation cycle for both groups, the treatment group investigated and assessed three major components of body structure and function, activity and participation, and the environment in children with cerebral palsy using the ICF-CY functional checklist.

Body structure included 3 areas: neurological structures (s1), articulatory and speech structures (s3), and motor-related structures (s7); body functions included 4 areas: mental functions (b1), sensory functions and pain (b2), vocal and speech functions (b3), and neuromusculoskeletal and motor-related functions (b7); activities and participation involved learning and applying knowledge (d1), general tasks and demands (d2), communication (d3), activities (d4), self-care (d5), family life (d6), interpersonal and intrapersonal interactions (d7), major life domains (d8), and participation in the social life of the community (d9); and environmental factors mainly related to products and technologies (e1), support and interconnectedness (e3), attitudes (e4), services, institutions, and policies (e5). In addition, the environment for children with cerebral palsy includes two basic models of rehabilitation: the family environment (home rehabilitation) and the social environment (hospital institutional rehabilitation and home institutional out-of-home activity areas). Of these, children in the rehabilitation outpatient clinics of hospital institutions receive subsidized treatment from the Disability Association.

In this paper, each detail item was quantified with reference to the ICF-CY qualifying values and classified as (0, 1, 2, 3, 4), where 0 is basically normal, 1 is mildly impaired, 2 is moderately impaired, 3 is severely impaired, and 4 is completely impaired. For level 0 no intervention, level 1 observation and moderate intervention, and ≥2 focused intervention [23–25]. Long-term and near-term rehabilitation goals were determined based on the results of the systematic assessment, and guidance was provided to develop rehabilitation treatment strategies that fit individual characteristics.

Gross and fine motor training is conducted 5 times a week, 30 min/item/time, mainly to regulate muscle tension, improve muscle strength, establish normal gross and fine motor, correct abnormal patterns, etc.; speech training is conducted 3 times a week, 30 min/time, mainly to correct sound training, breathing training and organ training, etc.; cognitive training is conducted 30 min/time, twice a week, including attention training, memory training, comprehension training, etc. Cognitive training was conducted twice a week for 30 min, including attention training, memory training, comprehension training, etc., to improve attention, memory, reasoning and thinking, basic object concepts, simple mathematical concepts, basic reading and writing skills. For children older than 3 years old, we can provide color matching training to encourage them to classify objects in a simple way, instruct them to establish visual memories of objects they have touched, and strengthen their ability to retell and describe through language function training; for 4–6 years old, preschool education is the main focus (d815). Sensory integration is conducted twice a week for half an hour each time, mainly training hand-eye coordination and motor coordination, increasing concentration attention and adaptation through vestibular stimulation. There are also physical factor therapy and other aspects of comprehensive arrangement of treatment. Sensory integration is conducted twice a week for half an hour each time, mainly training hand-eye coordination and motor coordination, increasing concentration attention and adaptation through vestibular stimulation. There are also comprehensive treatment arrangements in various aspects such as physical factor therapy. ADL functional training is carried out by the nurse specialist of the rehabilitation department for children with cerebral palsy, including toileting themselves in daily life (d510), caring for various parts of the body (d520), toileting (d530), dressing (d540), eating (d550), drinking (d560), etc. Differences in self-care levels exist among children with cerebral palsy at different levels of motor function. Children with cerebral palsy have a lack of self-care skills, mainly in the areas of grooming (d510), toileting (d530), dressing (d540), and eating (d550 and d560) [26]. All training was operated by the same team of therapists.

Environmental factors mainly include the family environment where the child grows up, the social environment, the humanistic environment, and the application of assistive devices. If the child's family members have positive attitudes, the family fully supports the child, social subsidies are completed, and the disability association subsidies are in place, the child can receive more convenient and frequent intensive rehabilitation treatment. The child's positive cooperation with treatment improves the child's compliance with treatment. Family regression therapy is conducted seven times a week. The therapist can make a detailed family rehabilitation treatment plan to teach the parents basic rehabilitation skills, including the role and mechanism of each treatment method, movement essentials, commands, precautions and applications in daily life, etc. The therapist in charge will demonstrate all the movements to the parents, and then give the family rehabilitation instruction sheet to the parents to take home and conduct rehabilitation training for the child according to the plan every day. The parents are given the home rehabilitation instruction sheet to take home, and daily rehabilitation training is conducted according to the plan, and daily home therapy records and daily homework are completed. Parents can provide one-on-one counseling to their children without the constraints of time and space, which improves the effectiveness of family rehabilitation, strengthens the treatment effect and consolidates it. Parents allow their children to participate more actively in family and social activities, and also provide family education in the home, where early education is mainly verbal and simple cognitive education. In the context of medical-educational advocacy, we implemented a model of co-treatment for children in the treatment group by an inter-professional medical rehabilitation team with special education teachers and family caregivers, and regular music therapy for the children by the special education faculty. Moreover, we add regular weekly community group activities led by community workers to the social environment and promote regular weekly parent-child time out for parents, which can improve the relatively isolated environment of the affected children.

For children with cerebral palsy, personal products and technologies for indoor and outdoor mobility and transportation (e120) can assist children with cerebral palsy to a certain extent and expand their mobility, such as orthotics that can help maintain range of motion. Assistive devices such as mobility aids can compensate and improve the activities of children with cerebral palsy, create a barrier-free facility environment for them to adapt to rehabilitation, education and daily life requirements as much as possible, and are a basic guarantee for children with cerebral palsy to participate in social life and maintain a better quality of life. Fig. 1 shows the core concept of ICF-CY.

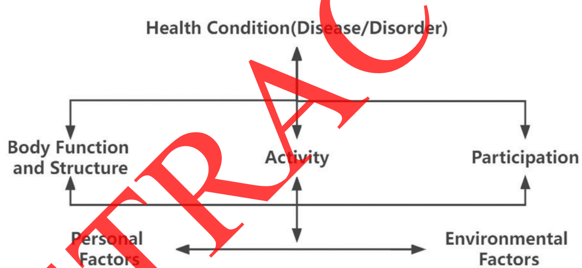

Figure 1: ICF-CY core concept

The control group was regularly evaluated with the Gesell Developmental Scale (developmental quotient) [27] to determine the long-term and near-term rehabilitation goals and implement conventional rehabilitation therapy; gross and fine motor training 5 times a week for 30 min/item/each time, mainly to regulate muscle tension, improve muscle strength, establish and improve gross and fine motor patterns, etc.; Speech training was given 3 times a week for half an hour each time, mainly in terms of sound correction training, breathing training, etc. and physical factor therapy; cognitive training, 3 times a week for half an hour each time, included regular attention training, comprehension training, etc. Daily living skills (e.g., feeding, washing, toileting, dressing) were also given. All trainings were operated by the same team of therapists.

4 Precision Rehabilitation Under ICF-CY Framework

In this study, a treatment cycle was set for 12 months, and the degree of improvement in treatment effects was compared with the improvement in the score of the Gross Motor Function Measure-88 (GMFM-88), the Peabody developmental motor scale-fine motor (PDMS-FM) score of the Peabody Developmental Motor Scales (PDMS-2), the score of the Functional Independence Measure for children (weeFlM), and the score of the Activity of Daily Living (ADL) Scale (Barthel Index, BI) at the end of one rehabilitation treatment cycle.

4.1 Gross Motor Function Measurement

The Gross Motor Function Measure Scale (GMFM) was used to assess the gross motor function status of the children. The scale has 88 items, also known as GMFM-88, and all of them distinguish 5 functional areas: A, B, C, D, and E, which are lying and turning (17 items, total 51 points), sitting (20 items, total 60 points), climbing and kneeling (14 items, total 42 points), standing (13 items, total 39 points), and walking and running and jumping (24 items, total 72 points). Each item is divided into 4 levels: 0 points (completely unable), 1 point (completion of the action <10%), 2 points (completion of the action 10%~100%), and 3 points for all completion, with a total score of 264 points. According to the movement completion score, the higher the score, the better the gross motor ability of the child.

4.2 Fine Motor Function Measurement

The PDMS-FM scale was used for the fine-motor function Measure, with 98 items of Grasping (Gr) and Visual-motor intearation (Vi), each with a score of 0–2, and a raw score of 196. The 26 items in the Gr area assessed the child's grasp, and the 72 items in the Vi area assessed the child's visual function. All children were scored on a three-level scale according to their degree of completion, and the higher the score, the better the child's grip and visuomotor function, and the better the fine-motor developmental function.

4.3 Cognitive Function and Independent Motor Function Measurement for Children

The cognitive function of the children was assessed by the Gesell Developmental Inventory of Adaptability. The higher the score, the better the cognitive developmental function of the child.

The Functional Independence Measure for Children (WeeFIM) [28] was used to assess children's independent motor function, which consists of 18 items and comprises the following 6 dimensions: self-care, sphincter control, mobility, movement, communication, and social cognition. The highest score was 126 (91 for motor function and 35 for cognitive function) and the lowest score was 18. A score of 126 was considered completely independent, 108–125 was considered basically independent, 90–107 indicated conditional independence or very mild dependence, 72–89 was considered mild dependence, 71–54 was considered moderate dependence, 36–53 was considered severe dependence, 19–35 was considered very severe dependence, and below 18 is complete dependence. The higher the score, the higher the level of functional independence.

4.4 Activities of Daily Living Measurement

The ADL scale (BI) was used to assess the children's13 self-care ability in daily living. The scale has a score of 100 and is divided into five levels, with 100 indicating independence, 61–99 representing mild dependence, 41–60 representing moderate dependence, 21–40 representing severe dependence, and less than 20 representing complete dependence. The higher the score, the higher self-care ability in daily living of the child.

5 Comparison of Precise Rehabilitation Effects

The random-effects model was used for data analysis in this study. The measurement data conformed to normal distribution and the data were expressed by ($\pm s$). The count data was tested by x^2 test. $p < 0.05$ as difference and statistically significant.

5.1 Random-Effects Model

The Random-effects model can be described by the following equation,

$$Y_{ij} = \mu + X_{ij}\beta + b_i + w_{ij}(i = 1, \cdots, n; j = 1, \cdots, r) \tag{1}$$

where Y_{ij} is the observation vector, μ is the unknown parameter vector, β denotes an unknown parameter matrix, X_{ij} denotes the fixed constant vector, b_i is the random effect vector, and w_{ij} is the random error vector. b_i and w_{ij} are independent of each other and satisfy the following conditions,

$$b_i \sim N\left(0, \sum\nolimits_b\right), \quad w_{ij} \sim N\left(0, \sum\nolimits_w\right) \tag{2}$$

where $\sum_w$ and $\sum_b$ are positive definite and non-negative definite matrices.

This model can be written in matrix form as follows,

$$Y = \mu + X\beta + U \tag{3}$$

where $U = (I_n \otimes 1)B + W$, $\otimes$ denotes the Kronecker product,

$$Y_{nr\times p} = \begin{bmatrix} Y_{11}, & \cdots, & Y_{1r} \\ Y_{21}, & \cdots, & Y_{2r} \\ \cdots & \cdots & \cdots \\ Y_{n1}, & \cdots, & Y_{nr} \end{bmatrix}, \quad X_{nr\times p} = \begin{bmatrix} X_{11}, & \cdots, & X_{1r} \\ X_{21}, & \cdots, & X_{2r} \\ \cdots & \cdots & \cdots \\ X_{n1}, & \cdots, & X_{nr} \end{bmatrix} \tag{4}$$

$$W_{nr\times p} = \begin{bmatrix} W_{11}, & \cdots, & W_{1r} \\ W_{21}, & \cdots, & W_{2r} \\ \cdots & \cdots & \cdots \\ W_{n1}, & \cdots, & W_{nr} \end{bmatrix}, \quad B_{n\times p} = \begin{bmatrix} b_1 \\ b_2 \\ \cdots \\ b_n \end{bmatrix} \tag{5}$$

In addition, $rank(X) = q$.

The general form of the linear assumption of the regression coefficient matrix β is as follows,

$$H_0: H\beta L = D \Leftrightarrow H_1: H\beta L \neq D \tag{6}$$

where H is a known matrix with a full rank of rows, L is a known matrix with full rank of columns, and D is a known matrix.

5.2 Comparison of Treatment Effectiveness in Children with Cerebral Palsy

5.2.1 GMFM Score Comparison

By comparing the GMFM scores of the two groups of children with cerebral palsy before and after treatment, it was found that the difference between the GMFM scores of the two groups of children before treatment was not statistically significant ($P > 0.05$) and was comparable. After treatment, the GMFM scores of children in both groups were higher than those before treatment, and the difference was statistically significant ($P < 0.01$), and the difference was statistically significant ($P < 0.05$) in the treatment group than in the control group.

As shown in Table 2, the score of children with cerebral palsy who received precise rehabilitation under the framework of ICF-CY was significantly better than that of children in the control group, and the gross motor ability of children with cerebral palsy who received precise rehabilitation was significantly enhanced.

Table 2: Comparison of GMFM scores ($\bar{x} \pm s$, points)

Group	n	Before	After	t	*P*
Treatment	60	56.583 ± 9.642	82.717 ± 3.242	−25.274	<0.01
Control	60	58.217 ± 6.894	71.333 ± 4.078	−14.234	<0.01
t		−1.067	16.924		
P		0.288	<0.01		

5.2.2 PDMS-FM Score Comparison

The differences between the PDMS-FM scores of the children in the two groups before treatment were not statistically significant ($P > 0.05$) and were comparable. As shown in Table 3, after treatment, the PDMS-FM scores of children in both groups were higher than those before treatment, and the difference was statistically significant ($P < 0.01$), and the difference was statistically significant ($P < 0.05$) in the treatment group than in the control group.

Table 3: Comparison of PDMS-FM scores ($\bar{x} \pm s$, points)

Group	n	Before	After	t	*P*
Treatment	60	71.650 ± 4.610	86.067 ± 3.635	−33.629	<0.01
Control	60	70.167 ± 5.732	77.800 ± 6.898	−13.833	<0.01
t		1.562	8.212		
P		0.121	<0.01		

From Table 3, it can be seen that children with cerebral palsy under the framework of ICF-CY have better grasp degree and visual motor function, and better fine motor development function.

5.2.3 Cognitive Score Comparison

The differences between the DQ scores of Gesell adaptability in the two groups of children with cerebral palsy before and after treatment were not statistically significant ($P > 0.05$) and were comparable. After treatment, the DQ of Gesell adaptation scores of children in both groups were higher than those before treatment, and the differences were statistically significant ($P < 0.01$), and the treatment group was significantly higher than the control group, and the differences were statistically significant ($P < 0.05$).

As shown in Table 4, the cognitive development function of children with cerebral palsy who received precise rehabilitation under the framework of ICF-CY was significantly better than that of the control group.

Table 4: Comparison of the DQ scores of Gesell adaptability ($\bar{x} \pm s$, points)

Group	n	Before	After	t	*P*
Treatment	60	55.850 ± 3.374	72.033 ± 2.442	−35.230	<0.01
Control	60	56.367 ± 4.472	67.033 ± 4.345	−23.795	<0.01
t		−0.714	7.770		
P		0.476	<0.01		

5.2.4 WeeFIM Score Comparison

The difference between the WeeFIM scores of the children in the two groups before treatment was not statistically significant ($P > 0.05$) and was comparable. After treatment, the WeeFIM scores of children in both groups were higher than those before treatment, and the difference was statistically significant ($P < 0.01$); and the WeeFIM scores of children in the treatment group were higher than those in the control group after treatment, and the difference was statistically significant ($P < 0.01$).

As shown in Table 5, the level of self-care, sphincter control, movement, kinesis, communication and social cognition of children with cerebral palsy who received precise rehabilitation under the framework of ICF-CY was significantly better than that of the control group.

Table 5: Comparison of WeeFIM scores ($\bar{x} \pm s$, points)

Group	n	Before	After	t	*P*
Treatment	60	51.067 ± 4.864	78.417 ± 3.950	−45.490	<0.01
Control	60	51.483 ± 5.225	68.650 ± 3.565	−32.621	<0.01
t		−0.452	14.219		
P		0.652	<0.01		

5.2.5 BI Score Comparison

The differences in BI scores between the two groups before treatment were not statistically significant ($P > 0.05$) and were comparable. After treatment, the BI scores of children in both groups were higher than those before treatment, and the difference was statistically significant ($P < 0.01$); and the BI scores of children in the treatment group were higher than those in the control group after treatment, and the difference was statistically significant ($P < 0.01$).

As shown in Table 6, the daily life self-care ability of children with cerebral palsy who received precise rehabilitation under the framework of ICF-CY was significantly better than that of the control group.

Table 6: Comparison of BI scores ($\bar{x} \pm s$, points)

Group	n	Before	After	t	*P*
Treatment	60	50.033 ± 2.629	69.450 ± 6.347	−25.739	<0.01
Control	60	50.767 ± 1.845	59.183 ± 2.541	−21.906	<0.01
t		−1.769	11.632		
P		0.080	<0.01		

5.3 Analysis of Treatment Effects

Pediatric cerebral palsy is one of the common disabling diseases of the central nervous system, and rehabilitation therapy is the most recognized treatment for cerebral palsy. With the development of the "bio-psychological-social" model of modern rehabilitation medicine, the rehabilitation treatment model for children with cerebral palsy has not only focused on the improvement of gross motor function, but also emphasized how to integrate into the family and society, how to participate in social life activities, and also recognized the importance of cognitive education for children with cerebral palsy.

The precise and systematic assessment under the ICF-CY system can accurately, effectively and comprehensively record and analyze the child's structure, function and activity participation, and also collect the influence of environmental factors on the child's development. The process of accurate rehabilitation assessment helps to develop more precise and personalized treatment plans according to the specific structural functions and activity participation levels of the children, and allows for timely adjustment of treatment plans and improvement of treatment programs based on the results of the post-stage treatment to ensure the timeliness of the children's treatment.

We analyzed the characteristics of dysfunction in children with cerebral palsy according to the theory of ICF-CY, and analyzed the rehabilitation treatment strategies for children with cerebral palsy from the perspective of individualized programs in 3 aspects: body structure and function, activity participation, and environmental factors according to the ICF-CY theoretical framework. This study incorporated a cognitive education component in addition to routine motor function improvement for children with cerebral palsy, resulting in varying degrees of improvement in learning and application of knowledge, general tasks and requirements, communication, activities, self-care, family life, interpersonal and intrapersonal relationships, major life domains, and participation in the social life of the community compared to pre-treatment. It increases the child's learning ability, self-care ability and social adjustment ability.

The interoperability of hospital rehabilitation and home rehabilitation is also emphasized. As the child's time to participate in rehabilitation treatment in the hospital is relatively limited, we actively teach parents common basic therapeutic techniques and movement-behavior management patterns, so that the child can continue to exercise and consolidate the treatment effect at home. The entire treatment process emphasizes the whole-person rehabilitation model, so that the child can integrate into society faster and better, participate in social activities, and exercise the rights of a social person after his or her functions are well improved.

As a new therapeutic theoretical framework and tool, the ICF-CY Cerebral Palsy Core Classification Set is a functional analysis and documentation tool based on the ICF-CY classification framework that is appropriate for the characteristics of cerebral palsy dysfunction. The content analysis of the evaluation tool is realized with the help of the ICF-CY concept, which allows determining the core content and the scope of the evaluation tool, which is an important method for content validity in the development of the evaluation tool [5]. In recent years, assessments regarding cerebral palsy have tended to describe functional status more using the ICF-CY approach and core classification categories [29,30]. In addition to a more refined and comprehensive functional assessment, the ICF-CY includes an assessment of activity participation levels and takes into account the impact of educational and environmental factors on the child's rehabilitation.

WeeFIM is primarily assessed for people aged 6 months to 21 years who have functional disability or developmental lag [31]. It is divided into three zones: self-care zone, mobility zone, and cognitive zone, where the self-care zone and mobility zone form the motor part and the rest is the cognitive part. This scale can better evaluate the role of children's motor function in daily life and is a professional scale for mobility, communication, and other functions of children with disabilities. It has been widely used in rehabilitation in many countries to detect the functional level of children with disabilities, develop rehabilitation plans, and assess the efficacy [32]. By combining the assessment with GMFM, we can understand the relationship between gross motor development level and life skills in children with cerebral palsy more comprehensively.

The results of this study showed that after treatment, the GMFM scores, PDMS-FM scores and Gesell adaptive DQ scores of children in both groups were higher than those before treatment, and the post-treatment scores of the treatment group were higher than those of the control group. This indicates that precise rehabilitation strategies designed to address the functional impairments of children with cerebral palsy under the ICF-CY framework can significantly improve the gross and fine motor and cognitive functions of the children.

6 Conclusion

The paper studied the precise rehabilitation strategy of children with cerebral palsy under the framework of ICF-CY. This method is simple, widely used, and can more comprehensively assess the functional level of children with disabilities than the GMFM and FMFM scales commonly used in children's rehabilitation, which only focus on reflecting the child's gross motor functional level such as sitting, crawling, standing, walking, and fine motor level. The results of this study show that the effect of precise rehabilitation strategy on cerebral palsy under the framework of ICF-CY is superior to the evaluation and treatment methods of conventional cerebral palsy, which could significantly improve the motor-cognitive function of the children, increase social participation, better reduce family dependence and prepare for social integration, and was worthy of clinical promotion.

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Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

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