



The Impact of Speech Therapy Combined with Audiovisual Integration Rehabilitation Training on the Intelligence and Language Recovery of Children with Global Developmental Delay

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Abstract: Objective: To analyze the impact of speech therapy combined with audiovisual integration rehabilitation training on the intelligence and language recovery of children with global developmental delay. Methods: A total of 60 children with global developmental delay treated in our hospital from January 2021 to December 2022 were selected as the research subjects. The children were divided into two groups according to the intervention method: the control group (n=30) and the study group (n=30). The control group received speech therapy intervention, while the study group received speech therapy combined with audiovisual integration rehabilitation training. The intelligence, language, quality of life, developmental quotient changes and family satisfaction of the children in both groups were compared before and after the intervention. Results: After the intervention, the CDCC, GDS, and PedsQL scores of the children in the study group were higher than those in the control group. The developmental quotient scores of language ability, adaptability, fine motor skills, gross motor skills, and personal social behavior were also higher in the study group than in the control group. The overall satisfaction rate of the children's families was 96.67% in the study group, which was higher than the 86.67% in the control group ($P < 0.05$). Conclusion: Speech therapy combined with audiovisual integration rehabilitation training can promote the intelligence and language recovery of children with global developmental delay, improve their quality of life, developmental quotient and family satisfaction.

Keywords: speech therapy, audiovisual integration rehabilitation training, global developmental delay, intelligence, language, developmental quotient

1. Introduction

Global developmental delay refers to a significant delay in the development of cognitive, motor, and language abilities in children aged 5 years or younger, compared to their peers. It is a common condition in the pediatric nervous system and requires timely and effective intervention. In the past, the traditional form of speech training was relatively simple and the content was rather monotonous, resulting in limited rehabilitation effects for the affected children [1-3]. This study aims to analyze the application effect of speech therapy combined with audiovisual integration rehabilitation training on children with global developmental delay.

2. Baseline Data and Methods

2.1 Baseline Data

A total of 60 children with global developmental delay treated in our hospital from January 2021 to December 2022 were selected as the research subjects. The children were divided into two groups according to the intervention method: the control group (n=30) and the study group (n=30). In the control group, there were 17 male and 13 female patients, with ages ranging from 2 to 5 years old and the average age was (3.36 ± 0.12) years old. The disease course ranged from 2 months to 6 months, with an average of (4.12 ± 0.36) months. In the study group, there were 18 male and 12 female patients, with ages ranging from 2 to 5 years old, and the average age was (3.31 ± 0.15) years old. The disease course ranged from 2 months to 6 months, with an average of (4.11 ± 0.33) months. Comparing the baseline data of the children with global developmental delay in the two groups, there was no significant difference ($P > 0.05$).

Inclusion criteria: (1) meeting the diagnostic criteria for global developmental delay according to the "Expert Consensus on the Etiological Diagnosis Strategy for Children with Intellectual Disability or Global Developmental Delay" [4]; (2) children aged ≤ 5 years; (3) language development lower than the corresponding age level as measured by the Chinese Rehabilitation Research Center's language delay assessment method; (4) incomplete adaptive behavior development corresponding to the child's physiological age; (5) informed consent from the child's family, who voluntarily cooperate and

participate in the study. Exclusion criteria: (1) presence of hearing or visual impairments; (2) patients with central motor disorders caused by trauma, genetic metabolism, or severe intellectual disability; (3) patients with autism spectrum disorder or intracranial space-occupying lesions; (4) patients with secondary epilepsy who are continuously taking medication to control their condition; (5) incomplete medical records.

2.2 Methods

The control group received speech therapy intervention, which included providing a quiet and safe training environment and adjusting the speech therapy intervention time according to the child's diagnostic and treatment status. The intervention was carried out during the time when the child had high interest and concentrated attention. The specific intervention methods involved using audiovisual and game formats to exercise the child's abilities in picture viewing and reading, gradually transitioning to gesture training and articulation structure training. The intervention was conducted for 30 minutes per session, once a day, with continuous training for 3 months.

The study group received speech therapy combined with audiovisual integration rehabilitation training. The speech therapy intervention was the same as that in the control group. In addition, audiovisual integration rehabilitation training was conducted, which involved using stereo equalizers, players, discs, and headphones. With the assistance of the child's family members, the child was guided to sit quietly for 30 minutes, and then wear headphones to listen to modulated music for 30 minutes per session, twice a day, with an interval of more than 3 hours between the two sessions. Each 10-day period constituted one course of treatment, with a 10-day break between courses, and continuous training for 3 months.

2.3 Evaluation Indicators

The changes in intelligence, language, quality of life, developmental quotient and family satisfaction were compared between the two groups before and after the intervention.

(1) Intelligence indicator: The child's intelligence level was assessed using the Infant Intelligence Development Scale (CDCC), with scores directly proportional to the child's intelligence level.

(2) Language indicator: The child's language function was assessed using the Gesell Developmental Scale (GDS), with GDS scores directly proportional to the child's language function.

(3) Quality of life indicator: The child's quality of life was assessed using the Pediatric Quality of Life Universal Core Assessment Scale (PedsQL), with scores directly proportional to the child's quality of life.

(4) Developmental quotient: The child's developmental quotient was assessed using the Pediatric Neuropsychological Development Scale, which included language ability, adaptability, fine motor skills, gross motor skills, and personal social behavior. The scores of each item were directly proportional to the developmental quotient.

(5) Family satisfaction: The satisfaction level of the child's family was assessed using a satisfaction survey questionnaire, divided into satisfied, generally satisfied, and dissatisfied categories. The sum of the number of satisfied and generally satisfied cases was considered as the total number of satisfied cases.

2.4 Data Processing

The result data was processed using SPSS 21.0 software. Count and measurement data were represented by n (%) and ($\bar{x} \pm S$), respectively. Data comparisons were performed using the χ^2 test and t-test. A p-value of <0.05 indicated a statistically significant difference.

3. Results

3.1 Comparison of changes in intelligence, language, and quality of life between the two groups before and after intervention

After the intervention, the CDCC, GDS, and PedsQL scores of both groups increased compared to before the intervention. The comparison between the two groups showed that the CDCC, GDS, and PedsQL scores of the study group were higher than those of the control group, with $P < 0.05$. The details are shown in Table 1 below.

Table 1. Compared the changes in intelligence, language and quality of life before and after the intervention ($\bar{x} \pm S$, Score)

group	time	CDCC	PedsQL
Control group (n=30)	Before the intervention	68.36±3.25	60.36±6.11
	After the intervention	84.39±3.54	72.13±5.46
Study group (n=30)	Before the intervention	68.41±3.55	60.27±5.96
	After the intervention	91.39±3.12*	80.12±4.87*

Note: After the intervention, as compared to the control group, * $p < 0.05$.

3.2 Comparison of developmental quotient changes between the two groups before and after intervention

After the intervention, the scores of the developmental quotient items, such as language ability, adaptability, fine motor skills, gross motor skills, and personal social behavior, increased in both groups compared to before the intervention. The comparison between the two groups showed that the scores of each item in the study group were higher than those in the control group, with $P < 0.05$. The details are shown in Table 2 below.

Table 2. Comparison of developmental quotient changes between the two groups before and after intervention ($\bar{x} \pm S$, Score)

Group	Time	Language ability	Adaptability	Fine motor skills	Gross motor skills	Personal social behavior
Control group (n=30)	Before intervention	71.36±3.65	50.12±3.36	70.12±3.65	72.13±4.12	51.36±6.25
	after intervention	76.87±3.41	57.32±3.12	76.13±3.24	76.39±3.65	63.25±5.37
Study group (n=30)	Before intervention	71.36±3.58	50.11±3.41	70.14±3.69	72.17±4.06	51.24±6.17
	after intervention	84.69±3.12*	64.39±3.25*	82.13±3.27*	82.36±3.96*	74.39±3.65*

Note: After the intervention, as compared to the control group, * $p < 0.05$.

3.3 Comparison of family satisfaction between the two groups

The total satisfaction rate of the family members of the children in the study group was 96.67%, which was higher than the 86.67% in the control group, with $P < 0.05$. The details are shown in Table 3 below.

Table 3. Comparison of family satisfaction between the two groups [n(%)]

Group	Satisfaction	General satisfaction	Not satisfaction	Total number of satisfactory cases
Control group (n=30)	11 (36.67)	15 (50.00)	4 (13.33)	26 (86.67)
Study group (n=30)	12 (40.00)	17 (56.67)	1 (3.33)	29 (96.67)*

Note: Compared to the control group, * $p < 0.05$.

4. Discussion

Global developmental delay refers to a situation where two or more key developmental indicators, such as fine/gross motor skills, cognitive ability, social adaptability, living ability, language ability, and communication ability, have not reached the appropriate level for the child's age[5-7]. Speech therapy is often adopted for children with global developmental delay but its effectiveness is limited. Therefore, it is considered to combine auditory-visual integration rehabilitation training with speech therapy to improve the recovery effect of children[8-9].

The results of this study show that after intervention, the CDCC, GDS, PedsQL and developmental quotient scores of the children in the study group were higher than those in the control group and the overall satisfaction rate of the family members was higher than that in the control group, with $P < 0.05$. This indicates that the combination of speech therapy and auditory-visual integration rehabilitation training leads to better recovery outcomes for children. The reason for this is that speech therapy is the primary intervention for developmental delay in children, aiming to improve their cognitive and language abilities through scientific and regular speech guidance. However, individual differences in children result in limited language improvement effects of speech therapy[10-12]. On the other hand, auditory-visual integration rehabilitation training is a type of training that can effectively improve children's attention, enhance their memory of daily life information, strengthen their communication awareness, and reduce their aggressive and impulsive behaviors. The study by Sha Guanghui and Feng Hui, "The Rehabilitation Effect of Speech Therapy Combined with Auditory-Visual Integration Rehabilitation Training on Children with Global Developmental Delay"[13], showed that the experimental group of children who received speech therapy and auditory-visual integration rehabilitation training had higher Gesell developmental scale scores, better CITSEA/CBCL scale scores, and higher tongue, lower jaw, and lip function scores 6 months after intervention compared to the control group who received conventional rehabilitation training and guidance, with $P < 0.05$. This conclusion is similar to the findings of this study and has reference value.

In summary, speech therapy combined with auditory-visual integration rehabilitation training has a significant effect on promoting the recovery of intelligence and language in children with global developmental delay and can improve their quality of life, developmental quotient, and family satisfaction, demonstrating positive clinical value.

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