



On the Psychological Characteristics of Hearing Impaired Children and the Design of Rehabilitation Training Products from the Perspective of Metacognitive Theory

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Abstract. In recent years, the total number of disabled children in China has been rising, and the number of newly added hearing-impaired children has been climbing up every year. The deaf children are in the language sensitive period of early discovery, early treatment and early rehabilitation at the age of 0–6. This paper starts with the research of metacognitive theory, explores the psychological characteristics and rehabilitation needs of hearing-impaired children, and analyzes the development of metacognition of hearing-impaired children and its impact on cognitive ability and psychological rehabilitation, Establish a new rehabilitation platform under the remote visual interaction mode, carry out scientific teaching plans according to the training conditions of hearing-impaired children, reduce the tension and negative emotions of hearing-impaired children. It has full practical significance for the design of rehabilitation training products.

Keywords: Metacognition · Hearing impaired children · Psychological feature · Rehabilitation product design

1 Introduction

Based on the investigation and Research on hearing-impaired groups, China is the country with the largest group of hearing-impaired people in the world, accounting for about 1.67% of the total population, and the number is as high as 27.8 million, which means that China has a huge demand for hearing-impaired rehabilitation. With the promulgation and development of the three child policy on July 20, 2021, the number of newborns will gradually increase in the future. The research on the etiology of hearing impairment shows that the proportion of deafness related to genetic genes in the world is as high as 60% [1]. In 2018, the total number of hearing disabled children aged 0–14 in China exceeded 4.6 million, including 800000 preschool children; More than 30000 children with hearing disabilities will be added every year, and 60000–80000 children with delayed deafness will be found every year, most of them are severe or extremely severe sensorineural deafness. The age of 0–6 is the golden period for the development

of children's speech ability and reading ability. It is a sensitive period for children to exercise their communication ability through oral language. It is also a critical period for hearing-impaired children to successfully cross the "ten deaf and nine dumb" period.

2 Metacognitive Theory and Metacognitive Development of Hearing Impaired Children

In the field of psychology, metacognition is a popular research direction in recent decades. Its advocate, Flavell, believes that metacognition is the knowledge about personal cognitive processes and the ability to regulate these processes, as well as the knowledge and control over thinking and learning activities. Although many researchers have expressed different views, it is generally accepted that the metacognition is a concept about cognitive ability. It expresses the self-reflection, self-control and self-regulation of cognitive process when people are aware of their cognitive ability. To a certain extent, it also shows the consciousness and initiative of the cognitive process. In the 1980s, European psychologists used the method of introspection to study people's psychology, and believed that people's psychological function can not only be realized, but also be conveyed by language; After the 1930s, psychologists began to explore the operating mechanism of metacognition, taking metacognition as the core of intelligence and combining it with factors such as learning motivation; In the mid-1990s, the development of metacognitive theory, on the one hand, is reflected in the continuous widening of its connotation, and at the same time, the research on its processing mechanism is also deepening. Chinese researchers have studied metacognitive theory from the perspective of information reception, processing and self-regulation. It is generally believed that human growth and maturity are accompanied by the development of self-regulation ability in psychology [2].

Hearing impairment is defined according to the national standard for classification and classification of disabled persons (gb/t26341-2010), which refers to permanent hearing impairment in both ears to varying degrees due to various reasons, and the inability to hear or understand the ambient sound and speech sound, thus affecting their daily life and social participation. The data showed that the main causes of hearing impairment from 0 to 6 years old were 34.70% unknown causes, 19.40% heredity and 6.72% maternal viral infection during pregnancy; The main causes of hearing impairment from 7 to 14 years old were 28.69% unknown causes, 18.38% heredity and 17.18% otitis media. For hearing-impaired children, hearing impairment affects their language, thinking and concentration. These factors are related to the cultivation and acquisition of metacognition, resulting in the development of executive function of hearing-impaired children after receiving information. However, people with hearing impairment have keen visual and other perceptual functions [3]. Steveler and other scholars have found that adults with severe hearing impairment can identify target stimuli faster than adults with normal hearing. In the book executive function development of deaf children: a comparison between deaf children and policy children, Yiyuan Li and other researchers studied that the executive function of hearing-impaired children developed rapidly at the age of 6 and reached its peak at the age of 7. From this, they came to the conclusion that only after the age of 6 can they have the inhibition ability and representation transformation ability

necessary to complete card sorting characters; Dr. Suhong Yu, in the cognitive research on adding and subtracting word problems of deaf students, studied that the difficulty of hearing-impaired children in solving adding and subtracting word problems is not an inherent defect. After a period of comprehensive training in understanding, problem model construction, metacognition and other aspects, the actual level and cognitive ability of hearing-impaired children in solving adding and subtracting word problems can be improved.

It can be seen that the research of metacognitive theory provides a clear entry point for the rehabilitation of hearing-impaired children. Hearing impaired children can form effective cognitive learning strategies through independent training, and can fully grasp the rules of information conversion, achieve better development in metacognitive ability, and then promote the improvement of learning ability. Therefore, the language function of hearing-impaired children directly affects their executive ability. The rehabilitation training of hearing-impaired children should start with improving their language ability, persevere and find appropriate rehabilitation methods.

3 Psychological Characteristics and Rehabilitation Training Methods of Hearing Impaired Children

3.1 Psychology and Cognition of Hearing Impaired Children

Hearing impairment will affect children's cognition, personality, emotion and concentration. Many literature research results show that the detection rate of mental health problems of hearing impaired children is generally higher than that of ordinary children, and their psychological patience, resilience, emotional control, cognitive and interpersonal abilities are generally lower than that of ordinary children [4]. The psychological and cognitive characteristics of hearing-impaired children are shown in the following aspects: firstly, in the face of traumatic events, hearing-impaired children generally have low adaptability, low pressure resistance, and are prone to anxiety, withdrawal, depression or behavioral problems. The barriers caused by hearing impairment mainly include language and communication barriers. In interpersonal communication, they often show incorrect self cognition, fail to clearly confirm the role of individuals in society, and sometimes fail to know the real emotions and emotions of others, resulting in misjudgment of information; At the same time, it is easy to form psychological problems such as dependence under the long-term protection of family members, and it is difficult to accept the opinions of others. Secondly, in terms of family, many hearing-impaired children do not have much contact with the outside world and lack social experience under the protection of their families for a long time. A survey report shows that the family upbringing methods of hearing-impaired children are divided into 47.3% indulgent, 18.7% autocratic and 8.9% indulgent. Only 25.1% of the family upbringing methods are democratic. Parents usually have two extreme attitudes towards their children, one is the mentality of compensation, the other is the mentality of despair. In addition, the economic status of the family also directly determines the living and rehabilitation level of hearing-impaired children. At the same time, the harmony of the family environment will directly affect the children and their mental health. Thirdly, in school, the peer

relationship established by hearing-impaired children in school and the communication relationship with teachers are important factors affecting their mental health. In particular, hearing-impaired children who have entered normal schools to study in regular classes, if the peer relationship is tense and the quality of friendship is low, it will lead to their emotional tension and unable to express themselves correctly and effectively. Therefore, whether the school can create a harmonious and safe barrier free environment is very important. Finally, at the social level, hearing-impaired children face challenges such as interpersonal relationships, study and life, and even employment in adulthood. At this stage, the society still focuses on material provision for special children. Even if barrier free facilities are provided, such facilities still give less attention to the psychological level. We should help hearing-impaired children with language rehabilitation, but also develop their cognitive, People skills, and social skills.

3.2 Rehabilitation Methods Based on Psychological Factors

Childhood is a critical period for the rapid development of all aspects of individuals. The quality of growth and development in this period directly affects the healthy life in the future. It has been the original intention of special education experts and teachers to ensure the brain development, cognitive ability and language development of hearing-impaired children for a long time [5]. In various rehabilitation training, psychological counseling and rehabilitation services are often provided for mental health. Sand table games, painting, music, dancing, drama, role play, dolls and other teaching aids and forms are used to stimulate children's recovery enthusiasm, show real emotions, and exercise their cognitive comprehension and verbal expression ability with the story plots that children love. The mental health problems of hearing-impaired children are more complex than those of normal children. In particular, family members need to participate in it, and help them out of cognitive misunderstanding, form a sense of responsibility, learn to stand on their own and establish correct values through professional means. Montessori, a famous Italian child educator, was the first to introduce this concept into the field of rehabilitation for special children. She specially designed play aids for children with mental retardation to train their sensory activities, small muscles and self-care ability to help them operate and practice and arouse their interest in learning. At the same time, another famous Belgian educator also advocated using toys to train special children so that they could better adapt to life. Different rehabilitation methods have different adaptability to children with different types of disorders. Therefore, hearing-impaired children should be more suitable to use the rehabilitation mode with more gestures or visual stimuli.

4 Product Design of Rehabilitation Training for Hearing Impaired Children

At present, the rehabilitation training methods for hearing-impaired children in China are still relatively simple, mainly including oral training method, "combination of medicine and education", inclusive education, computer-assisted auditory and speech assessment

and rehabilitation system, etc. The evaluation of rehabilitation effect is based on the evaluation of hearing and language ability. The psychological and social evaluation is mainly based on the subjective judgment of rehabilitation teachers. There is a lack of objective evaluation tools and indicators, which relatively weakens the rehabilitation intervention for the psychological and social adaptation of hearing-impaired children. The idea of modern rehabilitation medicine puts forward that we should reduce the psychological and social discomfort caused by hearing loss through systematic and comprehensive rehabilitation intervention from the perspective of “biology society psychology” model, so as to improve their quality of life.

At the same time, family rehabilitation is an important module for the rehabilitation of hearing-impaired children. Family rehabilitation means that hearing-impaired children can give full play to their parents’ leading role in the family, and use medical means to make hearing-impaired children obtain effective hearing compensation under the guidance of rehabilitation doctors, so as to promote their all-round development of morality, intelligence, physique, art and labor [6]. Family rehabilitation can be divided into family auditory rehabilitation training and family language rehabilitation training. The late rehabilitation of hearing-impaired children with cochlear implants is a long process. In addition to school time, most of their time is spent at home. Parents play the role of good teachers and helpful friends. With the bond of kinship, parents will be more devoted. At the same time, this “one-to-one” or “one to several” model is more conducive to the language development of hearing-impaired children. The traditional rehabilitation treatment mode also has an online and offline interaction mode. The offline classroom can be understood as that hearing-impaired children follow their parents to the hospital at the specified time for on-site rehabilitation treatment; Online class can be understood as the electronic data recorded by doctors according to children’s rehabilitation and the latest research results in this field obtained with the development of the times. The online and offline forms form two independent domain plates, but they cannot form a real interactive effect. There are many problems in the traditional rehabilitation treatment mode, for example, the traditional rehabilitation treatment method is single; Due to the limited location and time of rehabilitation affected by the epidemic, the psychological impact of each medical visit on hearing-impaired children, and the uneven proportion of doctors and patients in the field of hearing-impaired in China, there are also cases where hearing-impaired children may be delayed or not receive rehabilitation training due to geographical restrictions.

The new rehabilitation products in the remote visual interactive mode can solve the limitations brought by time and place. With the Internet, hearing-impaired children can train 24 h at any time, and get the scientific adjustment of the training plan in time according to the training situation. It will also greatly reduce the tension and resistance of hearing-impaired children caused by the unfamiliar environment, and greatly enhance the interaction between doctors and children, children and children. It breaks the relatively isolated state between doctors and children after offline rehabilitation training, and makes children receive more. Personalized rehabilitation training. The use of visual online courses for rehabilitation training can bring more extensive domain information to the parents of children, download relevant information at any time for learning, and timely communicate with one-to-one rehabilitation doctors or other children’s families, so as to

bring more rich, intuitive and personalized rehabilitation training platform for hearing-impaired children.

5 Conclusion

Through the research on speech rehabilitation training for hearing-impaired children, it is hoped that it can help hearing-impaired children who carry out rehabilitation training in the traditional form, actively seize the golden period of preschool speech ability development, participate in targeted training and learning, and enable hearing-impaired children to recover in a more convenient, comfortable, interesting and personalized training mode through the home school learning mode. So as to promote the healthy development of their physical and mental health, let the hearing-impaired children reach the normal level of children of the same age in all aspects, so that they can enter ordinary schools. The rehabilitation platform for hearing-impaired children continues to develop in the process of continuous improvement and iteration. The society of hearing-impaired children in China is becoming more and more mature in the continuous updating of science and technology, cares for the mental health of hearing-impaired children, and makes practical contributions to the starting point of education.

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