



Palacky University

Doctoral Dissertation

Title: Family Intervention in Speech Communication
Competencies for Hearing Families of Children
with Hearing Impairment

Faculty: Faculty of Education

Major: Special Education

Name: Li Lin

Supervisor: Milon Potměšil

2023

Declaration of Originality

LI Lin (student ID number:80100560) declare that this dissertation entitled “Family Intervention in Speech Communication Competencies for Hearing Families of Children with Hearing Impairment” submitted as partial requirement for PhD. study program in special education is my original work and that all sources in any form (e.g., ideas, figures, texts, tables, etc.) that I have used or quoted have been properly acknowledged and cited in the text as well as in the list of references.

Signature: LI Lin

Date:07.05.202

CONTENT

Declaration of Originality	I
Acknowledgement	V
ABSTRACT	1
1. Introduction	3
1.1 Research Reason	3
1.1.1 Special Education has Been Severely Affected under the Covid-19 Epidemic, Especially the Students with Hearing Impairment	3
1.1.2 There are Problems in the Education for the Students with Hearing Impairment, and Their Parents are not Included in the System Training Scope in Children with Hearing Impairment	4
1.1.3 Speech and Communication are Important and Possible for Children with Hearing Impairment	5
1.2 Significance of Research	6
1.2.1 Theoretical Significance	6
1.2.2 Practical Significance	6
2. Theoretical Basis of Research	7
2.1 Ecological Systems Theory	7
2.2 Family Systems Theory	7
2.3 HSL (Hearing-Speech-Language) Theory	8
3. Literature Review	10
3.1 The Development of Children with Hearing Impairment	10
3.1.1 The Auditory Development of Children with Hearing Impairment	10
3.1.2 The Speech Communication Competencies Development of Children with Hearing Impairment	12
3.2 The Education Approach of Speech Communication for Children with Hearing Impairment	14
3.3 The Family Intervention of Children with Hearing Impairment	15
3.4 The Research Progress of Family Intervention of Speech Communication Competencies of Children with Hearing Impairment	16
3.4.1 Research Method and Object of the Related Researches	20
3.4.2 The Families Needs in Family Intervention of Speech Communication Competencies	20
3.4.3 The Support of Family Intervention of Speech Communication Competencies	21
3.4.4 The Content and Result of Family Intervention of Speech Communication Competencies	22
3.5 Summary of the Literature Review	22
4. Definition of Core Terms	24
4.1 Children with Hearing Impairment	24
4.2 Family Intervention	25
4.3 Speech Communication Competencies	26
4.4 Hearing Family	26

4.5 Family Education Abilities	27
5. Research Design	28
5.1 Research Purpose	28
5.1.1 Research Questions	28
5.1.2 Research Hypotheses	28
5.2 Research Participants	29
5.3 Research Data Collection	31
5.3.1 Reliability and Validity Testing of Quantitative Research Tools	32
5.4 Research Process	36
5.4 Data Analysis	39
5.4.1 Tools of Data Analysis	39
5.4.2 Approaches of Data Analysis	39
6. Research Result	40
6.1 The Current Situation of Family Education in Hearing Families of Children with Hearing Impairment	40
6.1.1 Caregivers' Basic Information in Hearing Families of Children With Hearing Impairment	40
6.1.2 Family Education Implementation Status in Hearing Families of Children With Hearing Impairment	42
6.1.3 Family Education Expectations In Hearing Families of Children With Hearing Impairment	46
6.2 The Effect of Family Intervention for the Hearing Families of Children with Hearing Impairment	46
6.2.1 The Effect of Family Intervention for the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families	47
6.2.2 The Effects of Family Intervention for the Family Education Abilities of Caregivers in Hearing Families	52
6.3 The Factors that Affect the Effect of Family Intervention in Hearing Families	58
6.3.1 Logistic Regression of Factors that Affect the Effect of Family Intervention of the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families	58
6.3.2 Logistic Regression of Factors that Affect the Effect of Family Intervention of the Family Education Abilities of Caregivers in Hearing Families	61
6.3.3 Factors that Affect the Effect of Family Intervention of The Speech Communication Competencies of Children with Hearing Impairment in Hearing Families Based on Grounded Theory	64
6.4 Problems and Further Expectations of Family Intervention Based on Grounded Theory	70
6.4.1 Research Design and Coding Process of Problems and Further Expectations of Family Intervention Based on Grounded Theory	71
6.4.2 Analyzing Problems and Further Expectations of Family Intervention Based on the Three-level Coding of Problems and Further Expectations of Family Intervention	75
7. Conclusion and Suggestion	77
7.1 Research conclusion	77

7.2 Suggestions on Family Intervention Optimization for Children with Hearing Impairment in Hearing Families	80
7.2.1 Implement Family Intervention Positively, Early and Consistently	81
7.2.2 Different Levels of Support Based on Caregivers' Different Original Education Abilities	81
7.2.3 Provide More Support and Motivation to Caregivers Who Involved Passively	82
7.2.4 Optimization of Family Intervention Supporters	83
7.2.5 Model Optimization of Family Education Intervention	84
Reference	85
APENDIX	98
PowerPoint of the Professional Lecture	98
Individualized Family Education Plan Template	99
Record and Comments of One to One Family Education Return Visit	101
Pretest Questionnaire of Caregivers of Children with Hearing Impairment	102
Post-test Questionnaire of Caregivers of Children with Hearing Impairment	109
Auditory Verbal Therapy Assessment Scale	113
Self-recording Chart of Caregivers' Family Education Information	118
Caregivers' Actively Request for Help Record Chart	119
Semi-structured Interview Outlines for the Caregivers of Children with Hearing Impairment	120

Acknowledgement

Life is not easy, especially the doctoral candidate's academic life. My doctoral candidate's academic life started almost at the same time as covid-19, but the covid-19 epidemic is not completely over until my doctoral studying is coming to an end. In this period, I lost many opportunities to communicate face-to-face with my supervisor, to return to People's Republic of China to reunite with my family (I even didn't get a chance to say goodbye to my favorite uncle face to face before he passed away) , and to deeply explore Europe which is a brand new world for me. These four years are important for my academic development, and it is also the four years for reshaping my philosophy. Misfortune may be a blessing in disguise. During this period with limitation, I was fortunate to meet a loving and responsible supervisor- Professor Milon, an enthusiastic and kind sister - GUO Ling, a teacher who gave me a lot of local information and companionship - Danping, Director Liu and Director Li who gave me many resources and help, and other friends who gave me happy or stimulating memories. Of course, the luckiest thing is that no matter what we have been through, my husband is still the same person— YANG Qiang, who still gives me endless encouragement, companionship, love and financial support, and my mother is still healthy and loves me. Their existence allows me to be brave enough to be myself, which seems simple but is actually very difficult. These 4 years experience have made me a better version of myself, and also taught me to love the people around me better, and cherish the opportunities and time in life.

It took almost a year for this doctoral dissertation from the research project defense to the formal completion of the full text of the dissertation. During this period, the guidance from my supervisor and the encouragement and help from my friends enabled me to persevere when I was desperate many times. The daily communication and contact with the families of children with hearing impairment also gave me a deeper understanding of the difficulty and diversity of families of children with hearing impairment. The experience of this year and the process of writing my doctoral dissertation gave me a new understanding of academic research, gave me the courage and motivation to carry out more academic research,

and gave me the confidence to realize the ambition I made many years ago - to make children with special needs and their families a little bit better with my efforts, even if only a little bit.

ABSTRACT

For the purposes of exploring the effectiveness, influencing factors and optimization strategies of the family intervention that incorporates the caregivers of children with hearing impairment into the auditory speech therapy education system in family education effectively, this research included 25 children with hearing impairment and their caregivers as experiment group, 46 children with hearing impairment and their caregivers as control group, and carried out family intervention which lasted 3 months to the caregivers in experiment group to carry out family education for their children with hearing impairment better in the hearing families. The basic information of family education and family intervention were collected by Pretest Questionnaire of Caregivers of Children with Hearing Impairment and semi-structured interview outline. The changes of speech communication competencies of children with hearing impairment and caregivers' family education abilities were tested by Auditory Verbal Therapy Assessment Scale and questionnaires of caregivers of children with hearing impairment. Then analyzed the data by paired sample test, analysis of variance, binary logistic regression and grounded theory.

Research found that the family education for the children with hearing impairment have a phenomena of fathers absence, 66.2% of family education is carried out by mother independently. The education background of the caregivers is not optimistic, more than 60% of caregivers are only finish the primary education or secondary education. Most of caregivers actually only spend less than 30 minutes on family education for their children with hearing impairment, and only 40.85% of caregivers are satisfied their family education effects before the family intervention. After the family intervention, their satisfaction degree of family education effects increased 24%.

After the family intervention, the speech communication competencies of children with hearing impairment and caregivers' family education abilities have significant difference in groups and between groups ($P < 0.05$). After the family intervention, all-sides of speech communication competencies of children with hearing impairment improved significantly, especially the hearing field. All-sides of caregivers' family education abilities improved

significantly too and significant better than control group.

With the results from logistic regression, the family education abilities difference of caregivers can affect the speech communication competencies difference of children with hearing impairment significantly. Furthermore, the speech communication competencies difference of children with hearing impairment also can affect the family education abilities difference of caregivers significantly. Besides, caregivers' original family education skills and knowledge can also affect the results of family intervention, while the role of family education supporter plays an important role in promotion of the family education program, and the participation characteristics of family education executors also affect the results of family education. The problems of family intervention show on the children with hearing impairment and caregivers' education participating difficulties and insufficient development of abilities. Their expectation focus on the family intervention supporters, continuity of family intervention participation, family intervention duration and content and model of further family intervention. The caregivers expectation and willingness of participation are affected by the characters of family education supporter, children's graduation and academic work, and the caregivers time arrangement.

The family intervention can promote the quality of family education of children with hearing families in hearing impairment effectively, but it is affected by several factors. In order to optimize the family education, family intervention should be implemented positively, early and consistently. With caregivers' different original education abilities, different levels' support should be given to the caregivers. As for the caregivers who involved passively, should be provided more support and motivation. Besides, the family intervention supporters and model of family intervention can be optimize too.

Key words: Family education, Support, Education for the preschooler with hearing impairment, Children with hearing impairment

1. Introduction

1.1 Research Reason

1.1.1 Special Education has Been Severely Affected under the Covid-19 Epidemic, Especially the Students with Hearing Impairment

With the outbreak of Covid-19 in late 2019, it has lasted more than two years. According to an analysis of The United Nations Children's Fund (UNICEF), 1.8 billion minors in about 132 countries around the world suffered varying degree of movement restrictions under the epidemic (UNICEF, 2020, May 12). Nearly 1.6 billion students have been forced to interrupt their studies or change their learning patterns in the process of containing the spread of Covid-19 (Lv, Wang, 2020). Confronting the epidemic, the Ministry of Education of the People's Republic of children with hearing impairment has required the schools switch to online teaching for children with hearing impairment intermittently (Ministry of Education of the People's Republic of children with hearing impairment, 2020, Mar. 29). Due to teachers' lack of online teaching for children with hearing impairment experience and poor broadband Internet penetration and quality, the digital divide has widened, disadvantaged groups have been more restricted, many inequalities in the education system have exposed (Lv, Wang, 2020). In this context, 50%-65% of teachers were satisfied with their effect of online teaching for children with hearing impairment, but no teacher thought that the effects of online teaching for children with hearing impairment is better than teaching in person for children with hearing impairment, only 25%-31% of teachers were willing to continue online teaching for children with hearing impairment after the epidemic. Besides, teachers found that online teaching for children with hearing impairment is difficult to interact with students, students' participation and continuity are not enough, and parents also have a lot of anxiety (Sui,

Zhao, &Zuo, 2020; Wang, Wang, Zhang, Wang, Shen, 2020; Yang et al., 2020). As for students with hearing loss, only about 50% of them are satisfied with the effect of online teaching for children with hearing impairment, because they cannot communicate with teachers face-to-face in real time, they have difficulties in communicating and obtaining information, and nearly half of them can't master knowledge from online teaching for children with hearing impairment well. Besides, there are too many distractions during the online learning, so more than 50% of students with hearing impairment spend less than 2 hours per day on online learning during the pandemic (Gao, 2021; You, 2021; Aljedaani et al. 2021).

1.1.2 There are Problems in the Education for the Students with Hearing Impairment, and Their Parents are not Included in the System Training Scope in Children with Hearing Impairment

With the development of hearing aid technologies for individuals with hearing impairment, there are more and more students with hearing impairment to study in mainstream schools, but because of the high cost of hearing aids for the families of students with hearing impairment, less than 28.1% of children with hearing impairment have received hearing aid services in children with hearing impairment (Qu, Wang, Han, Teng, Sun, 2009; Wang, Ji, 2015). In this context, there is a certain gap between the hearing rehabilitation level of students with hearing impairment and the requirements of mainstream schools, which in turn has a negative impact on learning adaptation and teacher-student relationship, resulting in their low adaptability in many aspects during the inclusive education (Zhang, Li, Zhao, Lu, 2019). The phenomenon of students with hearing impairment returning to special schools to continue their studies is endless, and the proportion is as high as 13%-82% (Liang, 2010; Miao, 2008). However, speech and language rehabilitation for the students in schools for the deaf is selective, and the proportion of students who actually receive speech and language rehabilitation is less than 1%. Under the premise that the

shortage of speech and language therapists is as high as 200,000 in children with hearing impairment (Wu, 2021, January 12). At the same time, even the special education teachers in Beijing, where is the center of children with hearing impairment's economy and education, still have problems such as lack of professional background, academic qualifications, and vocational skills(Sun, Wang, Liu, 2012). Teachers in rehabilitation institutions are even more mixed, and there are generally problems of low occupational stability and lack of professional knowledge (Yang, Guo, Qian, 2011). In this context, even for the children with hearing impairment who get the opportunity of speech and language rehabilitation, they only have about 2 hours of speech and language rehabilitation in institutions or schools every week. Although their families have vital responsibilities for education and rehabilitation, due to the lack of systematic training, professional knowledge and skills, more than 53.6% of the parents of children with hearing impairment are dissatisfied with the effect of family speech intervention, and close to 100% of the parents of children with hearing impairment are desperate for support from professionals outside of schools and institutions. Beside, more than 90% of children with hearing impairment are from hearing families, and their parents haven't the experience of hearing loss, so the hearing families suffered more education and communication pressure (Mayberry, Eichen, 1991).

1.1.3 Speech and Communication are Important and Possible for Children with Hearing Impairment

Boothroyd found that inborn hearing impairment affects children with hearing impairment's development from 11 aspects, including perception, speech, communication and cognition ect (Boothroyd, 1982, cited in Hu, 2012). As the most important learning and communication tool, speech plays an irreplaceable role in children with hearing impairment's development (Li et al. 2016). After the 1940s, with the development and popularization of audiology and hearing aids, the stereotype that individuals with hearing impairment can not speak was gradually corrected (Hu, 2012;

Wang, Xi, Wang, 2002). A large number of studies have shown that speech intervention combined with hearing aids can effectively improve the auditory and speech ability of children with hearing impairment (Lan ect, 2015; Lei, Gan, Fang, 2006; Hilviu, 2019).

1.2 Significance of Research

1.2.1 Theoretical Significance

This research is meaningful for enriching family education and education for the children with hearing impairment. It lays a theoretical and practical foundation for schools or professional institutions to provide rehabilitation and education support services for hearing families of children with hearing impairment to carry out family education effectively with auditory verbal therapy in the future.

1.2.2 Practical Significance

This research provides a specific practice path and effect verification for rehabilitation and education support services for hearing families based on auditory verbal therapy, to promote the development of children with hearing impairment and improvement of family education quality.

2. Theoretical Basis of Research

2.1 Ecological Systems Theory

In 1977, American psychologist Urie Bronfenbrenner put forward the idea of ecological research trend after realizing that discussing individual psychological development in the natural environment and specific social and cultural background can reflect the psychological development of individuals in real and natural life better firstly (Bronfenbrenner, 1977). Then in 1979, his book "The Ecology of Human Development" fully expounded the ecological system theory. Ecological theory regards the environment as a dynamic process which constants change and development, emphasizing that development comes from the interaction between humans and the environment. The system in space includes four environmental levels: microsystem, mesosystem, exosystem and macrosystem. The individuals develop with age, and the four environmental levels around them also change with the times, so there is also a chornosystem in the time dimension (Bronfenbrenner, 1979, cited in Zhu, 2005).

In the speech-language rehabilitation process, the children with hearing impairment, parents, and the speech-language therapist form a triangular interaction that spans multiple systems of ecological systems theory. For example, it includes microsystem (parents), mesosystem (the relationship between the parents and speech-language therapist), exosystem (parents' work environment and educational programs given by the therapist), and macrosystem (the cultural background of parent and the therapist) (Lin ect, 2015).

2.2 Family Systems Theory

In the 1940s, Murray Bowen put forward the family system theory on the basis of general system theory. In 1963, the term "family systems theory" was first applied and conceptualized by Murray Bowen (Zhang, 1990). The family system theory states

that a family is a system, and each member of the family is an integral part of the system, and each member interacts with each other. The development of individuals is closely related to their families (Wu, 2017; Zhang, 1990). The family system is organized as a set of subsystems and is characterized by the flexibility to change the boundaries and rules between different systems (Klein, White, 1996, cited in Lin et al. 2015). The family system includes four aspects: family resources, family interaction, family functions, and family life cycle (Turnbull, 1984, cited in Lin et al. 2015). The family system theory emphasizes the application of the existing advantages and resources of the families in the process of family intervention, emphasizes the participation of parents and equal cooperation, professionals play the role of assistance and guidance, provide supportive contextual intervention services which are suitable for the families and parents' executive ability in the intervention program. This allows families to independently meet family intervention needs after the services of professionals are gradually withdrawn (Lin et al. 2015).

In the speech-language rehabilitation process, applying the family system theory to analyze the interaction of family subsystems and the background structure of family interaction can understand the needs of families more clearly, and provide appropriate intervention services to the families.

2.3 HSL (Hearing-Speech-Language) Theory

In 2006, Huang Zhaoming and Zhou Hongsheng proposed the HSL (Hearing-Speech-Language) theory of rehabilitation and education for children with hearing impairment. The HSL theory points out that the rehabilitation and education of children with hearing impairment consists of three parts: hearing rehabilitation, speech therapy and language education, and the three are interrelated and restricted to each other (Huang, Du, Ji, 2004). The practical model of HSL theory is $1+X+Y$. 1 is group rehabilitation and education, X is individualized rehabilitation and Y is family rehabilitation. Family rehabilitation has the role of assistance, supplement and expansion, and is also a link between centralized teaching for children with hearing

impairment and individualized rehabilitation education. The important prerequisite for family rehabilitation of children with hearing impairment is to provide guidance and training for parents. This practical model has four characters, namely, basing on the combination of medicine and education, emphasizing oral expression, paying attention to communication and highlighting the practical application of language (Huang, Zhou, 2006).

In the speech-language rehabilitation process, HSL theory has expounded the principle and emphasis of rehabilitation education for hearing-impaired children with hearing impairment.

3. Literature Review

3.1 The Development of Children with Hearing Impairment

3.1.1 The Auditory Development of Children with Hearing Impairment

Hearing is the ability to feel sounds. Auditory ability is the ability of individuals to recognize and understand sounds (Hu, 2012). Auditory ability includes hearing, listening, and the ability to deal with the information of sound (Pollack, 1970, cited in Hu, 2012). It has sound awareness, sound discrimination, sound identification and sound comprehension four stages (Erber, 1982, cited in Chen, Lu, Zhang, 2012). In the first few hours of life, the hearing level of newborns with normal hearing can be same as the adults with a cold, but they are not sensitive to low sounds (Shaffer, 2005, cited in Chen, Lu, Zhang, 2012). With the growing of infants, their hearing thresholds gradually decrease, and their auditory ability develops further, and their auditory development has reached a plateau by 25-30 months (Chen, Lu, Zhang, 2012). The development of the central auditory pathways depends on both internal gene and external stimuli, its plasticity persists into adulthood, and it can be shaped by specific stimuli (Liu, Su, Chen, 2006).

The Individuals with Disabilities Education Improvement Act of 2004 pointed out that individuals with hearing disabilities can be divided into two categories, namely deafness and hearing impairment. Deafness is a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without hearing compensation equipment (United States Congress, 2005; Guo, 2015). The children with deafness can't receive sound in all or most of its forms. Hearing impairment is an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance (exclude the children with deafness). Children with hearing impairment can generally respond to auditory stimuli,

including speech (United States Congress, 2005; Guo, 2015). Individuals with hearing impairment have different degrees of hearing loss due to different reasons, and their auditory development is different individuals with normal hearing, but many studies have shown that more than 85% of individuals with hearing impairment have residual hearing, most of individuals with hearing impairment can get development of hearing by hearing compensation and hearing reconstruction technologies (Zhang, Gao, 2008, Chen, Lu, Zhang, 2012), and it is still necessary to know the characters of auditory development of individuals with hearing impairment to help them in the early intervention.

Researches show that the cochlear implantation, application of hearing aids and appropriate intervention in both adults and children with hearing impairment can reduce hearing thresholds and promote auditory abilities (Qiu, Zhou, Zhang, Xie, 2021; Zhu, Chen, 2017; Zhou, Chen, Han, He, Wu, 2019; Xie, Zhou, Wei, 2016; Gong, Shi, Zhao, Yang, 2020; Xie, Huang, 2018). However, due to differences in hearing age and insufficient hearing compensation, there are still a gap between their auditory abilities and individuals with normal hearing (Zhang etc, 2021; Chen etc, 2019; Zhang, 2015). In addition, the hearing aid threshold and auditory ability affect the speech ability and learning ability of the individuals with hearing impairment, but their auditory development also affects by the age of hearing intervention, the length of rehabilitation time, the degree of hearing loss, intelligence, and the length of hearing compensation time and hearing compensation mode and other factors (Jia, 2021; You, Guo, Han, Meng, Chen, 2016; Zhao, Tao, Sun, Liu, 2017; Gao, Liu, 2017; Yuan ect, 2015; Li, Liang, Tan, Li, 2014; Oziębło, Obrycka, Lorens, Skarżyński, Ołdak, 2021). The sensitive period for cochlear implantation is before the age of 3.5, and the effect is greatly reduced after the age of 7. In addition, compared with unilateral hearing compensation and binaural-bimodal fitting, bilateral cochlear implantation has the best hearing rehabilitation effect, and binaural-bimodal fitting can improve the speech recognition ability of individuals with hearing impairment under noise (Gordon, Jiwani, Papsin, 2013; Jiwani, Papsin, Gordon, 2016; Cardon, Sharma, 2013; Sharma, Nash, Dorman, 2009; Sharma, Campbell, 2011;

May-Mederake, Shehata-Dieler, 2016).

In this context, individuals with hearing impairment should choose bilateral cochlear implantation or binaural-bimodal fitting for hearing intervention before the age of 3.5, and accompany appropriate hearing rehabilitation persistently, so as to obtain the optimal hearing and speech rehabilitation effect.

3.1.2 The Speech Communication Competencies Development of Children with Hearing Impairment

Speech is a kind of expression form of language, it often refers to the oral expression process of language in a narrow sense. Communication is the process of exchanging information between organisms using various communication tools and media. Speech is one of the means of communication. Speech communication competencies include the use of the knowledge of pragmatic, semantic, grammar and phonetic. Healthy children with hearing impairment already have basic speech communication competencies at the age of 3, and their speech communication competencies have matured around the age of 6 (Hu, 2012). However, due to the limited auditory channels of individuals with hearing impairment, the quantity and accuracy of information will be affected in the process of speech information obtaining, then lead to various speech impairments, lack of basic communication behaviors and strategies, and affect the smooth communication (Chen, Lu, Zhang, 2012). Difficulties in speech communication directly affect the development of individuals with hearing impairment on social, cognitive and learning abilities (Yao, 2017), so it is necessary to give support to the individuals with hearing impairment based on understanding the specific characters of speech communication competencies development of individuals with hearing impairment.

The phonological loop can be accessed by the group with hearing impairment through oral training (Chen, Jin, Chen, 2009), but in the process of speech communication, most individuals with hearing impairment lag behind the individuals

with normal hearing of the same age in terms of phonetic, semantic, pragmatic, and grammar (Fan, 2013; Xia, Guan, Xue, 2012; Li, 2020; Wang, 2020; Chen, Li, Chen, 2020; Mu, 2018; Shen, Li, 2011; He, He, 2009; Hilviu etc, 2021; Khodeir, Moussa, Shoeib, 2021; Shoeib, Kaddah, Kheir El-Din, Said, 2016; Socher etc, 2019; Sundström, Löfkvist, Lyxell, Samuelsson, 2018). The specific manifestations are delayed phonetic processing and poor phonetic accuracy (Lan etc, 2020; Zhang, Han, Wang, Li, 2018), abnormal intonation (Xiao, Zhu, 2020; Zhang, 2005; Yi, 2013), dual defects of phonological awareness and rapid naming (Xu, Hu, 2019), insufficient speech intelligibility (Zhang, Liu, 2019; Zhang, Han, Wang, 2019), insufficient speech fluency (Hui, 2017), insufficient articulation ability (Fan, 2013; Fan, 2010), low phonetic recognition rate (Lei, Fang, 2007; Xia, Guan, Xue, 2012;), low vocabulary level (Li, 2020; Mu, 2018), lag in pragmatic communication behavior (Shen, Li, 2011; He, He, 2009), incomplete elements in speech content, reversed word order (Wang, Zhang, Chen, Lu, 2018), and significantly backward Nonverbal Communication skills (Socher ect, 2019).

Against this background, hearing compensation should be given to the children with hearing impairment as soon as possible (Lei, Gan, Fang, 2006; Hilviu, 2019), to provide a rich environment of the pragmatic development for the children with hearing impairment (Guo, 2015; He, Yi, 2012), to seize the critical period of the speech communication competencies development (Zhang etc, 2010; Liu etc, 2011; Chen, Wang, 2018), and to provide speech communication interventions for them continuously. With this way, around 70% of the children with hearing impairment can get a good development of hearing and speech (Yang etc, 2015). Besides, picture book reading, Orff music and talking about the pictures are helpful for speech communication competencies development (Shi, Song, Li, Yang, 2019; Gao, 2022; Zhou, He, Qiu, Tao, Xue, 2020).

3.2 The Education Approach of Speech Communication for Children with Hearing Impairment

There are four main education approaches for the individuals with hearing impairment in history, namely sign language, oral language, total communication and bilingual and bi-cultural (Zhang, 2012; Li, 2002). Among them, there are three kinds of educational approaches involving speech communication: oral language approach, total communication approach and bilingual and bi-cultural approach.

In practice, different education approach of speech communication is usually aimed at individuals with hearing impairment in different school stage. The children with deafness are always recommended to learn sign language in early years to become bilingual with a strong sign language (Humphries etc., 2014). Oral language approach is usually used in preschool education for children with hearing impairment. In the oral language approach, compared with other therapy methods such as multiple sensory therapy and phonemic recognizing therapy, auditory verbal therapy can promote the comprehensive development of auditory speech of children with hearing impairment better (Lu, 2004; Dao, 2020; Liu, Dong, Dao, Chen, Liu, 2019; Lu, Shen, Ma, Liang, 2014; Li etc, 2016). Since the concept of auditory speech therapy was proposed in Europe in the early 19th century, it has been rapidly promoted and applied in Europe, America, Oceania and Asia (Zhang, Chen, Dong, 2013). Since 2007, Chinese mainland has developed and promoted auditory speech therapy for preschooler with hearing impairment in 100% of provinces (Dao, 2020). The auditory verbal therapy has become the most common and popular in education for the preschoolers with hearing impairment. Researches show that auditory verbal therapy can promote the development of preschool children with hearing impairment in five aspects: hearing, speech, language, cognition and communication, and children with hearing impairment a good rehabilitation effect (Mu, 2019; Chen, 2012; Zhan, Li, 2016). However, the implementation effect of auditory verbal therapy is affected by the current number of speech therapists, the living distance of children with hearing

impairment, parents' knowledge of rehabilitation, and parents' teaching for children with hearing impairment behaviors etc (Liu, Dong, Dao, Chen, Liu, 2019; Zheng, Chen, 2020; Zhang, 2017). Using remote technology to provide auditory verbal therapy and experience sharing lectures to parents of children with hearing impairment can improve the effectiveness of auditory verbal therapy better (Guo, Chen, Liang, 2020; Guo etc, 2021; Zhu, Liang, 2021).

Total communication approach and bilingual and bi-cultural approach are usually used in primary and higher school stage (Huang, Zhu, 2019; Yang, 2021; Zhu, Xue, Yu, 2019; Indah, 2018; Nyaata, 2018). Although both the bilingual approach and the total communication approach can improve the academic progress of children with hearing impairment and children with deafness (Chen, 2014; Xia, 2020; Liu, Liu, 2017; Lu, Li, 2010; Leonard, 2017), the truth is that due to the insufficient number of bilingual teachers and deaf teachers, teachers are not well prepared for different language forms. As a result, many problems are in the teachers' signing behavior, most of the teachers find it is difficult to carry out total communication (Stewart, 1992; Zhang, 2015). At the same time, students from oral programs acquired more intelligible speech and made significantly better use of their limited residual hearing than did the total communication students (Geers, Moog, 1992), and some parents choose bilingual approach because they realize the linguistic needs of their children with hearing impairment and want them to become bilingual even though their children with hearing impairment have a cochlear implant (Svartholm, 2010). Consequently, More and more countries shifted towards an auditory-oral approach (Dammeyer, Ohna, 2021).

3.3 The Family Intervention of Children with Hearing Impairment

Family education is the mutual education among family members, which has a comprehensive and long-term impact on the development of children with hearing

impairment. Family education is the basis for promoting the development of children with hearing impairment (Hu, 2012). Family intervention refers to the measures that professionals provide family members with relevant disease knowledge, provide relevant support and services, and monitor the recovery and development of patients, so as to promote the effect of family education and the development of patients (Yang, Sun, 2013; Ganerdene, 2014).

Family interventions can not only effectively promote the development of children with hearing impairment (Yuan etc, 2015; Yu, Wang, Lu, 2010; Liu, 2018; Lei, Ding, Ding, 2020; Lozano, Conesa, Luque, 2009; Ahmadi, Sani, Farnoosh, Sani, 2017; Chen, 2012), but also increase family participation, enhance parents' knowledge of rehabilitation, and strengthen the role of family effectiveness (Cao etc, 2017; Lei, Shi, An, Lu, 2019). However, in practice, the implementation of family education is constrained by the fact that families of children with hearing impairment suffer from economic backwardness, low educational level of parents, and insufficient educational ability (Jiang, 2011). The situation of family education for children with hearing impairment is not optimistic (Ding, 2007). In addition, families of children with hearing impairment, whether studying in inclusive education or special education, have extremely high social support needs, but rarely receive social support (Liu, Jiang, Tang, Liu, Chen, 2017). Even the families of children with hearing impairment who have received educational guidance services still have problems such as difficult to meet the individual needs of parents, imperfect operating mechanisms, and lack of educational resources (Wang, Wang, Sun, 2022).

3.4 The Research Progress of Family Intervention of Speech Communication Competencies of Children with Hearing Impairment

Since the development characters of children with hearing impairment, the early

auditory compensation, speech rehabilitation, auditory speech based educational approach and appropriate family education are vital for the development of children with hearing impairment. In order to promote the development of family education, family intervention which can give support to family education is important. The purpose of this review is to know the information and research progress of family intervention of speech communication competencies of children with hearing impairment. The specific aims include:

The content and result of family intervention of speech communication competencies of children with hearing impairment;

The need of family intervention of speech communication competencies in families of children with hearing impairment;

The support of family intervention of speech communication competencies of children with hearing impairment;

The research method and object of the related research.

In order to achieve these aims, a search question (SQ) was formulated using the problem - intervention - comparison - outcome (P - I - (C - not applicable) - O) components with additional synonymous and related terms: what is the family intervention (I) of speech communication competencies (O) of children with hearing impairment (P)? The specific information was showed in table 3.4.1.

Table 3.4.1 Synonymous and related terms for the P-I-O components.

Primary search terms	
P	hearing impairment
I	family intervention
C	NA
O	speech communication competencies
Primary search terms + synonyms + related terms	
P	“hearing impairment”, “hearing loss”, “hearing disability”, “hard of hearing”, deaf
I	“family intervention”, “family education”, “parent education”
C	NA

O “Speech communication”, pragmatic, semantic, grammar, phonetic,
“auditory speech”

P—problem; I—intervention; C—comparison; O—outcome; NA—not applicable.

An evidence-based search strategy was applied. The primary search terms: hearing impairment (P), family intervention (I), speech communication competencies (O) were used as an input to the development of the search strategy. To increase the search sensitivity, synonyms and related terms were added to the primary search terms. To increase the search specificity of partial results for the P - I - O, components were connected by the Boolean operator “AND” randomly. All of the search was in title/abstract without time limitation. Language was limited to Chinese and English. The search was finished in the April of 2022. The databases, namely CNKI, Wanfang Data, VIPC, PubMed, Web of Science and Poquest were applied in this search. With the search strategies, 56 articles were got from the databases. The search results were showed in Table 3.4.2.

Table 3.4.2 Search results

Databases	Search term components (randomly match)	Search results
	P-I-O	(n)
CNKI	1.“hearing impairment”AND“family intervention”AND“Speech communication”;	56
Wanfang Data	2.“hearing impairment”AND“family intervention”AND pragmatic	0
	3.“hearing impairment”AND“family intervention” AND semantic	
VIPC	4.“hearing impairment”AND“family intervention” AND grammar	0
	5.“hearing impairment”AND“family intervention” AND phonetic	
PubMed	6.“hearing impairment”AND“family intervention” AND “auditory speech”	0
	7.“hearing loss”AND“family intervention”AND“Speech communication”	
Web of Science	.	0
	.	
Proquest	88.deaf AND“parent education”AND grammar	0
	89.deaf AND“parent education”AND phonetic	
	90.deaf AND“parent education” AND “auditory speech”	

In order to answer the search questions, all of the articles have to meet the criteria. The inclusive and exclusive criteria are as follow.

Inclusive criteria: 1. The researches are relevant to the search question; 2.The participants or objects of the researches are students with hearing impairment; 3. The articles are practical research.

Exclusive criteria: 1. The participants or object of the researches are not students with hearing impairment; 2. The participants or object of the researches have other physical impairments or neurological diseases besides hearing impairment; 3.The articles are not practical research or can't meet the academic standards.

After screening the articles, 5 articles can meet the criteria. The flow diagram of the literature search and analyzing is showed in figure 3.1.

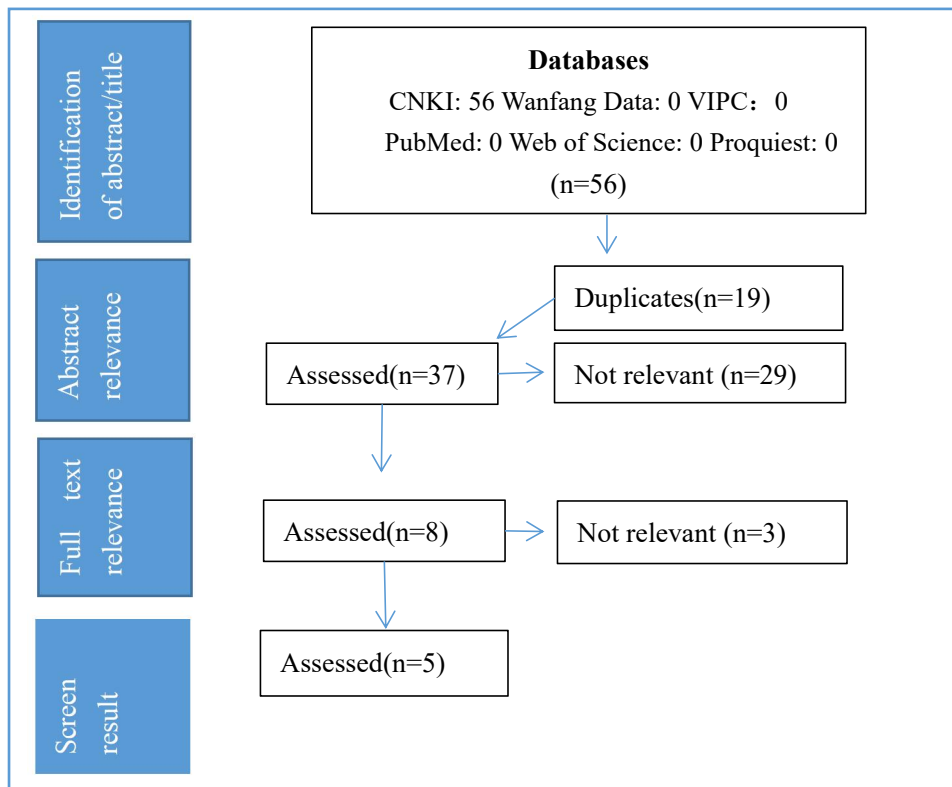


Figure 3.1 Flow diagram of the literature search and analyzing

3.4.1 Research Method and Object of the Related Researches

Table 3.4.3 Research method and object

Article numbers	Research method	Research tools	Ages of research object (years)
01	Quasi-experiment	CAP, SIR, IT-MAIS, MUSS	0.3-2.9
02	Quasi-experiment	Assessment of Auditory Language; Assessment of Language	1.2-6.0
03	Experiment	Vocabulary of Auditory Assessment; Assessment of Language; SIR	4.3-7.1
04	Case study	GDS-C; Auditory Verbal Terapy Assessment	3.9~4.0
05	Experiment	MHINT;NCIQ;PRCA-24	27-42

CAP:Categories of Auditory Performance; SIR:Speech Intelligibility Rating; IT-MAIS:Infant-Toddler Meaningful Auditory Integration Scale; MUSS:Meaningful Useful Speech Scale; GDS-C:Griffiths Development Scales Chinese Edition; MHINT:Mandarin Hearing in Noise Test; NCIQ: Nanjing Cochlear Implant Questionnaire; PRCA-24:personal report of communication apprehension

As shown in the Table 3.4.3, the articles used three different research methods to carry out their researches. The ages of research object are between 0.3-42 years old, but the adults are post-linguistic individuals with hearing impairment. The research tools payed attention to assess the auditory, speech, language, communication, learning ability, psychology and quality of life of individuals with hearing impairment, but only one article assessed the communication of individuals with hearing impairment.

3.4.2 The Families Needs in Family Intervention of Speech Communication Competencies

It is easy to find that there are no articles involved the families need of family intervention of speech communication competencies for families of individuals with hearing impairment from Table 3.4.4.

Table 3.4.4 The Families Needs in Family Intervention

Article numbers	The Families Need
01	not involved
02	not involved
03	not involved
04	not involved
05	not involved

3.4.3 The Support of Family Intervention of Speech Communication Competencies

Based on the 5 articles, the support of family intervention of speech communication competencies for families of individuals with hearing impairment can be divided into three parts. They are guidance of rehabilitation, chance of parent-children with hearing impairment activities and extended service with telephone follow-up. The specific information is showed in the Table 3.4.5.

Table 3.4.5 The Support of Family Intervention

Article numbers	The Support of Family Intervention
01	Guidance of rehabilitation content and methods from professionals 1 hour per day
02	Guidance of rehabilitation content and methods from professionals 1-2 times a week
03	Family members can imitate the rehabilitation methods of professionals in class three times a week
04	Guidance of rehabilitation and providing chance of parent-children with hearing impairment activities
05	Telephone follow-up from professionals once per week

3.4.4 The Content and Result of Family Intervention of Speech Communication Competencies

Table 3.4.6 The Content of Family Intervention

Article numbers	Content of family intervention
01	Auditory Verbal Therapy
02	Auditory Verbal Therapy
03	Auditory Verbal Therapy
04	Auditory Verbal Therapy
05	Auditory Verbal Therapy

As the Table 3.4.6, all of the articles used auditory verbal therapy to carry out family intervention for individuals with hearing impairment. The results show that family plus institution rehabilitation modes has the best advantages to promote auditory skills and speech development of infants and toddlers with hearing impairment (Yuan etc, 2015). Auditory verbal therapy can promote the hearing, speech, language, communication abilities and quality of life of individuals with hearing impairment effectively, and family plays an important role in it (Ding, Wang, Zhu, 2022; Ma etc, 2011; Guo, Deng, 2021; Qi, Dong, Li, Gao, Liu, 2015).

3.5 Summary of the Literature Review

Early auditory compensation, speech rehabilitation and auditory speech based educational approach are vital for the development of individuals with hearing impairment. Family plus institution rehabilitation modes are the best rehabilitation modes for the individuals with hearing impairment. The auditory verbal therapy has become the most common and popular in education for the preschoolers with hearing impairment, and accepted by more and more parents and teachers of children with

hearing impairment. However, the number of related researches on family intervention in the speech communication competencies of children with hearing impairment is insufficient, and the existing researches have not given family education support for children with hearing impairment on the basis of families needs. Moreover, the support given is mostly limited to the rehabilitation skills and content of auditory verbal therapy, while ignoring the systematic introduction of the developmental characteristics of children with hearing impairment, the principles of rehabilitation and family education skills. There is research provided extended services through telephone follow-up, but it did not monitor and provide further support and intervention for the problems existing in family education and rehabilitation for children with hearing impairment. In the development assessment of children with hearing impairment, most scholars only focused on the hearing, speech, and language abilities, while ignoring their communication competencies of children with hearing impairment and the development of family members' rehabilitation and education capabilities, as well as the effect factors of family intervention in promoting the development of children with hearing impairment.

In this context, future research should provide individual family education support to families of children with hearing impairment based on their needs, and popularize systematic knowledge about the development and education of children with hearing impairment. In the process of parents' application of auditory verbal therapy for family education, monitoring the deficiencies of parents' education abilities and providing corresponding follow-up support are necessary. In terms of evaluation, the hearing, speech, language, cognition and communication of children with hearing impairment, and caregivers' family education abilities will be assessed. Further analyze the factors that affect the effect of family intervention should also be included.

4. Definition of Core Terms

4.1 Children with Hearing Impairment

Some scholars have pointed out that individuals with hearing loss were caused by organic or functional lesions such as transmission, sensibility and comprehensive analysis of sounds in the auditory system (Huang, Feng, Nian, Lu, 2017). Depending on the degree of hearing loss and the availability of hearing compensation devices, individuals with hearing loss can be divided into individuals with deafness and individuals with hearing impairment (World Health Organization, 2023; United States Congress, 2005). Individuals with deafness mostly have profound hearing loss, which implies very little or no hearing, no matter with or without hearing compensation equipment. They often use sign language for communication. Individuals with hearing impairment refers to the individuals with hearing loss ranging from mild to severe. Individuals with hearing impairment usually communicate through oral language and can benefit from hearing aids, cochlear implants, and other assistive devices as well as captioning (Hallahan, Kaufman, Peggy, 2010; World Health Organization, 2023). The grades of hearing impairment are shown in Table 4.1.

Combining with the screening standards of the research objects, children with hearing impairment in this research refer to the children whose hearing loss are more than 31dB, but already have hearing compensation equipment. They can process speech and language with the help of hearing compensation equipment, and their speech vocal systems haven't organic deformation or functional destruction. In this research, the children with hearing impairment only include the children with hearing impairment who are under 7 years old and prelingual hearing loss, and they live with their family members.

Table 4.1 World Health Organization Grades of Hearing Impairment (Scientific Committee on Emerging and Newly Identified Health Risks, 2008)

Grade of impairment*	Corresponding audio-metric ISO value**	Performance	Recommendations
0-No impairment	25 dB or better (better ear)	No or very slight hearing problems. Able to hear whispers	
1-Slight impairment	26-40 dB (better ear)	Able to hear and repeat words spoken in normal voice at 1 metre.	Counselling. Hearing aids may be needed.
2-Moderate impairment	41-60 dB (better ear)	Able to hear and repeat words spoken in raised voice at 1 metre.	Hearing aids usually recommended.
3-Severe impairment	61-80 dB (better ear)	Able to hear some words when shouted into better ear.	Hearing aids needed. If no hearing aids available, lip-reading and signing should be taught.
4-Profound impairment including deafness	81 dB or greater (better ear)	Unable to hear and understand even a shouted voice.	Hearing aids may help understanding words. Additional rehabilitation needed. Lip-reading and sometimes signing essential.

*Grades 2, 3 and 4 are classified as disabling hearing impairment (for children, it starts at 31 dB)

**The audio-metric ISO values are averages of values at 500, 1000, 2000, 4000 Hz.

4.2 Family Intervention

The American *Individuals With Disabilities Education Improvement Act* of 2004 defines family intervention which refers to providing support to families of children with disabilities and strengthening their ability to respond to the developmental needs of children with disabilities (United States Congress, 2005). Some scholars also pointed that family intervention refers to a combination of related disease knowledge education for family members of patients and regular home visits by professionals for intervention training to improve cooperation with treatment and improve the quality

of life of patients (Yan, Cai, Tu, 2016).

On the basis of previous researches, combining with the needs of families of children with hearing impairment, family intervention is defined that with the basis of auditory verbal therapy, the author provides professional lecture, individualized family education plan, continuous answering of professional questions and one to one family education support by regular family return visit and giving comments (the PowerPoint of the Professional Lecture, Individualized Family Education Plan Template, Caregivers' Actively Request for Help Record Chart, and Record and Comments of Family Education Return Visit are shown in the appendix) which lasted 3 months to the caregivers to carry out family education for their children with hearing impairment in the hearing families.

4.3 Speech Communication Competencies

According to the channel of communication, communication can be divided into verbal communication and non-verbal communication. Verbal communication is the most common form of human communication (Xu, 2002). Speech is one of the means of communication, it often refers to the oral expression process of language in a narrow sense. Speech communication competencies include the use of the knowledge of pragmatic, semantic, grammar and phonetic (Hu, 2012).

The speech communication competencies are the hearing, speech, language, cognition and communication of children with hearing impairment in this research.

4.4 Hearing Family

Different family language environments have an important impact on the language development of children with hearing impairment. Families with at least one parent or an older member with hearing impairment are deaf families. Due to long-term exposure to sign language in family, children with hearing impairment in deaf families are prone to the language development trend of using sign language

after birth. Hearing families are the families that parents and other major family members have healthy hearing, but children have hearing impairment. Children with hearing impairment in hearing families are prone to become late signer or oral children with hearing impairment (Hao, Su, 2006), but more than 90% of children with hearing impairment come from hearing families (Mayberry, Eichen, 1991).

The hearing family in this study refers to the family that all of the main family members and primary caregivers have healthy hearing, but one children with hearing impairment has hearing impairment. Beside, the family provided hearing compensation to the children with hearing impairment to help the children with hearing impairment to become an oral children with hearing impairment.

4.5 Family Education Abilities

The influence of family members on children with special needs is profound (Taiwan Special Education Association, 1986), so the influence of family on their education is also very important. Family education refers to the activities that parents or caregivers consciously exert educational influence on children through their own words and deeds or family practice in accordance with social requirements for cultivating people (Li, 2017). The quality, concept and attitude of family educators are the foundation of family education ability (Jiang, 2005).

In this research, family education abilities refers to the caregivers' cognition of children's development, sensitivity of children's education needs, educational skills and educational participation performance for the children with hearing impairment.

5. Research Design

5.1 Research Purpose

The purpose of this research is going to verify effectiveness of the family intervention which is based on auditory verbal therapy in speech communication competencies of children with hearing impairment and family education abilities of caregivers, and explore the current situation of family education of children with hearing impairment in hearing families and the factors that affect the effect of family intervention. Besides, explore optimization approaches of family intervention for hearing families.

5.1.1 Research Questions

The following questions will be answered in this research.

Q1. What is the current situation of family education of children with hearing impairment in hearing families ?

Q2.Can family intervention improve the speech communication competencies of children with hearing impairment in hearing families?

Q3. Can family intervention improve the caregivers' family education abilities of children with hearing impairment in hearing families?

Q4. What are the factors that affect the effect of family intervention of children with hearing impairment in hearing families ?

Q5. What should to do to improve the effect of family intervention ?

5.1.2 Research Hypotheses

The hypothesis of this research are as follow.

H1: There is statistically significant difference between the quality of speech communication competencies of children with hearing impairment in the hearing

families who received the family intervention and in the hearing families who did not.

H1⁰: There is not statistically significant difference between the quality of speech communication competencies of children with hearing impairment in the hearing families who received the family intervention and in the hearing families who did not.

H2: There is statistically significant difference between the family education abilities of caregivers in the hearing families who received the family intervention and in the hearing families who did not.

H2⁰: There is not statistically significant difference between the family education abilities of caregivers in the hearing families who received the family intervention and in the hearing families who did not.

5.2 Research Participants

The participants include children with hearing impairment and their caregivers in this research. There are 220 children with hearing impairment took part in this research. In order to reduce confounding variables in the research, there are some inclusive and exclusive criteria for the participants. According to the inclusive and exclusive criteria, and the integrity of assessment participation, this research includes 71 children with hearing impairment who are studying and receiving rehabilitation in preschool or rehabilitation institute for the children with hearing impairment, and their caregivers as the participants. The screening process of the participants is showed in the Figure 5.1. With the screening result, 25 children with hearing impairment were included in experiment group and 46 children with hearing impairment were included in control group. The specific inclusive and exclusive criteria information of the participants is showed in Table 5.2.1.

Table 5. 2. 1 The specific inclusive and exclusive criteria information of the participants

Identity	Number	Inclusive and exclusive criteria
children with hearing impairment	71	<p>Inclusive criteria</p> <ol style="list-style-type: none"> 1. Age is under 7 years old; 2. Their pronunciation organs are normal; 3. There is no extra disabilities ; 4. The children with hearing impairment have hearing aids or implant cochlear; 5. The children with hearing impairment have normal intelligence level (All of the information will get from their admission physical examination report and family questionnaire).
		<p>Exclusive criteria</p> <ol style="list-style-type: none"> 1. The children with hearing impairment live with caregivers less than 5 days per week; 2. The children with hearing impairment who got hearing loss after 3 years old; 3. There are more than 1 person with hearing impairment in the home (All of the information will get from the admission physical examination report and family questionnaire).
caregivers of children with hearing impairment	71	<p>Inclusive criteria</p> <ol style="list-style-type: none"> 1. The caregivers haven't hearing or speech impairment (The information will get from the family questionnaire).
		<p>Exclusive criteria</p> <ol style="list-style-type: none"> 2. The caregivers stay with the children with hearing impairment less than 5 days per week (The information will get from the family questionnaire).

Until December of 2022, the physical age of experiment group is 4.79 ± 1.42 , hearing age of experiment group is 2.21 ± 1.05 . The physical age of control group is 4.76 ± 1.45 , the hearing age of control group is 2.70 ± 1.24 . The age characters of two groups are in Table 5.2.2. Besides, the physical age, hearing age, degree of hearing loss of the two groups have no statistical difference ($P > 0.05$).

Table 5.2.2 Descriptive Statistics of Participants' Age

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
physical age of experiment group	25	4.84	2.08	6.92	4.79	1.42	2.02
hearing age of experiment group	25	3.75	0.75	4.50	2.21	1.05	1.11
physical age of control group	46	5.25	1.67	6.92	4.76	1.45	2.11

hearing age of control group	46	4.17	0.83	5.00	2.70	1.24	1.53
------------------------------	----	------	------	------	------	------	------

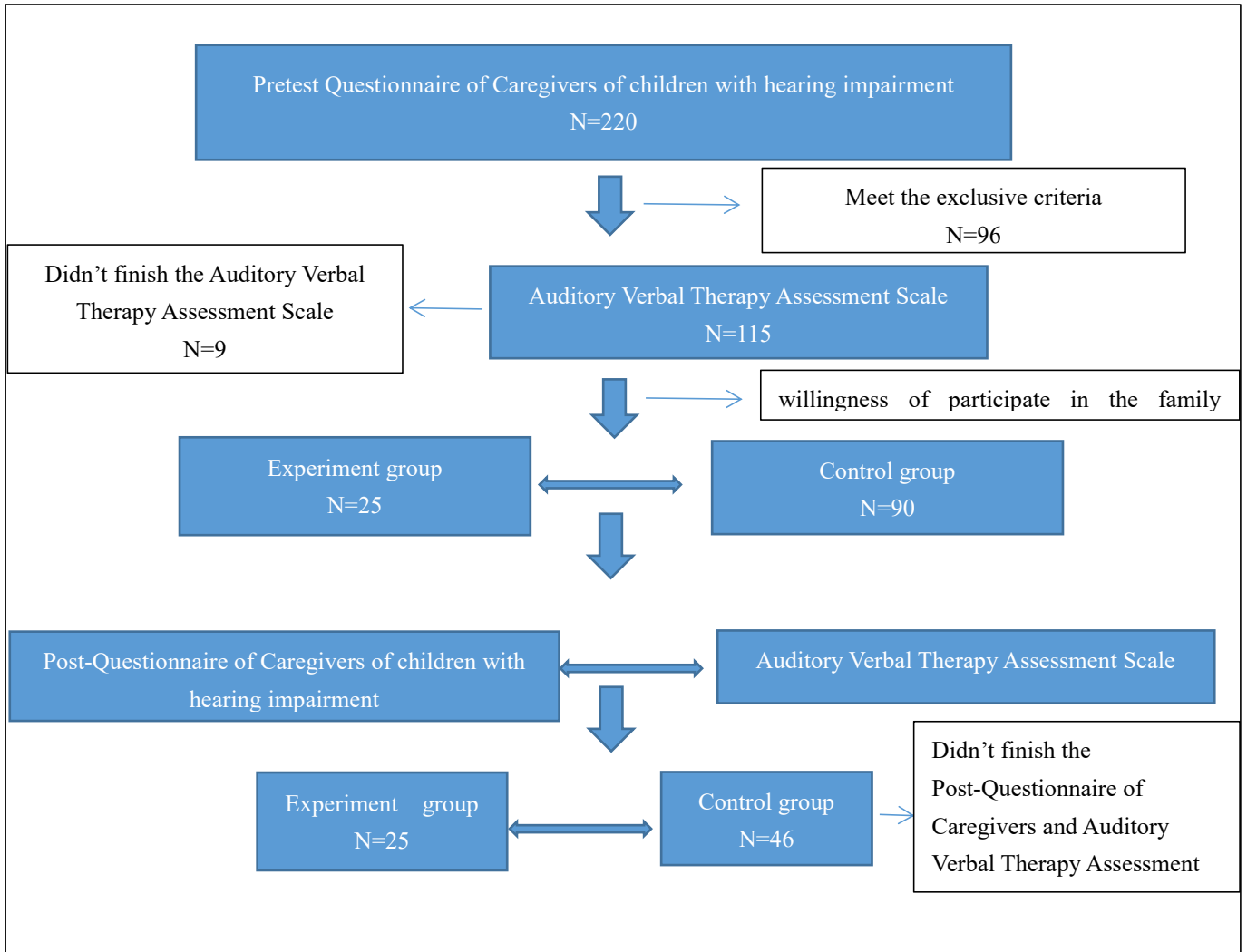


Figure 5.1 The screening process of the participants

5.3 Research Data Collection

In order to achieve the research purposes, 6 different research tools were used in this research for data collection. The specific information of the research tools are showed in Table 5.3.1.

Table 5.3.1 Information of the Research Tools

Order	Name	Completion person	Purpose of the research tools
01	Pretest Questionnaire of Caregivers of Children with Hearing Impairment	Caregivers of children with hearing impairment	Basic information of the families and children with hearing impairment The caregivers level of family education abilities
02	Post-test Questionnaire of Caregivers of Children with Hearing Impairment	Caregivers of children with hearing impairment	The caregivers level of family education abilities
03	Auditory Verbal Therapy Assessment Scale	Personal rehabilitation teacher of children with hearing impairment	Level of hearing, language, cognition, speech, communication of children with hearing impairment
04	Self-recording Chart of Caregivers' Family Education Information	Caregivers of children with hearing impairment	Participation degree and quality of family education of the caregivers of children with hearing impairment
05	Caregivers' Actively Request for Help Record Chart	Author	Content and amount of support which is actively sought and received by caregivers
06	Semi-structured Interview Outlines for the Caregivers of Children with Hearing Impairment	Author and caregivers of children with hearing impairment	Satisfaction degree with family intervention results and reasons, problems after the family intervention, further expectations of family intervention

5.3.1 Reliability and Validity Testing of Quantitative Research Tools

Among the research tools, the data from questionnaire of caregivers of children with hearing impairment and Auditory Verbal Therapy Assessment Scale will be used for quantitative analysis, so it is necessary to test their reliability and validity.

5.3.1.1 Reliability and Validity Testing of Questionnaire of Caregivers of Children with Hearing Impairment

Due to the purpose of questionnaire of caregivers of children with hearing impairment is obtaining the information about the caregivers level of family education abilities based on auditory verbal therapy. It was found that there was a lack of mature

scales after reviewing much literature, so questionnaire of caregivers of children with hearing impairment was self-edited by author. In order to ensure the reliability and content validity of the questionnaire of caregivers of children with hearing impairment, after the original questionnaire was generated, the author invited a number of experts and scholars to review it to improve the clarity of the specific items of the questionnaire and ensure the validity of the scale survey. Besides, the original questionnaire of caregivers of children with hearing impairment have 23 scale items which would be used for quantitative analysis, but after the pretest in a small group (N=30), there are 4 scale items' corrected item-total correlation coefficient are under 0.4. It can't meet the lowest standard of corrected item-total correlation coefficient, so the 4 scale items were deleted. Finally, there are 19 scale items were used for quantitative analysis in questionnaire of caregivers of children with hearing impairment (the serial number of the 19 scale items are 18-36 in Pretest Questionnaire of Caregivers of Children with Hearing Impairment, the serial number of the 19 scale items are 3-21 in Post-test Questionnaire of Caregivers of Children with Hearing Impairment).

With the Cronbach's coefficient of questionnaire of caregivers of children with hearing impairment is 0.948 and all of the corrected item-total correlation coefficient is higher than 0.4, indicating that the reliability of the questionnaire is extremely high and the comprehensive homogeneity of the questionnaire is acceptable. The specific information about the reliability test results are showed in Table 5.3.2 and Table 5.3.3.

Table 5.3.2 Reliability Statistics of Questionnaires of Caregivers of Children with Hearing Impairment

Cronbach's Alpha	N of Items
.948	19

Table 5.3.3 Item-Total Statistics of Questionnaires of Caregivers of Children with Hearing Impairment

Number of questions	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	65.39	116.665	.475	.948
Q2	65.62	111.103	.649	.945
Q3	65.70	109.274	.742	.944
Q4	65.81	110.779	.694	.945
Q5	65.85	112.169	.684	.945
Q6	66.08	111.894	.675	.945
Q7	65.96	111.268	.746	.944
Q8	66.04	111.516	.718	.944
Q9	65.73	111.970	.660	.945
Q10	65.67	112.124	.660	.945
Q11	66.23	108.946	.738	.944
Q12	65.99	109.149	.757	.943
Q13	66.04	109.453	.800	.943
Q14	65.85	111.323	.695	.945
Q15	65.85	110.652	.771	.943
Q16	65.18	114.487	.571	.947
Q17	65.58	113.466	.618	.946
Q18	65.80	111.833	.678	.945
Q19	65.61	114.679	.550	.947

As shown in Table 5.3.4, the KMO value is 0.921, $P < 0.05$. It should be extremely suitable for further exploratory factor analysis. However, in 1994, Nunnally propose that the sample-to-variable ratio should be at least 10:1, otherwise it would be difficult to obtain stable factor analysis results (Cestmoi,2020). The ratio of sample- to-variable in this research did not meet the standard of 10:1, which does not meet the sample appropriateness of exploratory factor analysis. The questionnaire based on theoretical conception is divided into 4 dimensions, namely caregivers' cognition of children's development, sensitivity of children's education needs, educational skills and educational participation performance.

Table 5.3.4 KMO and Bartlett's Test of Questionnaire of Caregivers of Children with Hearing Impairment

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.921
Bartlett's Test of Sphericity	Approx. Chi-Square	1949.327
	df	171
	Sig.	.000

5.3.1.2 Reliability and Validity Testing of Auditory Verbal Therapy Assessment Scale

There are 27 scale items in the Auditory Verbal Therapy Assessment Scale (the 27 scale items are 2-28 in the Auditory Verbal Therapy Assessment Scale). The Cronbach's coefficient of Auditory Verbal Therapy Assessment Scale is 0.962 and all of the corrected item-total correlation coefficient is higher than 0.4, indicating that the reliability of the questionnaire is extremely high and the comprehensive homogeneity of the questionnaire is acceptable. The specific information about the reliability test results are showed in Table 5.3.5 and Table 5.3.6.

Table 5.3.5 Reliability Statistics of Auditory Verbal Therapy Assessment Scale

Cronbach's Alpha	N of Items
.962	27

As shown in Table 5.3.7, the KMO value is 0.909, $P < 0.05$. It should be extremely suitable for further exploratory factor analysis, but the sample-to-variable ratio of Auditory Verbal Therapy Assessment Scale can't meet the lowest standard too. However, the Auditory Verbal Therapy Assessment Scale is developed by the team of experts in the education for the children with hearing impairment, officially published, and widely used in the teaching assessment of auditory verbal therapy in People's Republic of China. It has excellent content validity.

Table 5.3.7 KMO and Bartlett's Test of Auditory Verbal Therapy Assessment Scale

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.909
Bartlett's Test of Sphericity	Approx. Chi-Square	4149.694
	df	351
	Sig.	.000

Table 5.3.6 Item-Total Statistics of Auditory Verbal Therapy Assessment Scale

Number of questions	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	74.91	407.618	.406	.962
Q2	75.00	405.468	.465	.962
Q3	75.21	398.831	.566	.961
Q4	76.08	372.044	.861	.959
Q5	76.94	383.133	.834	.959
Q6	77.44	385.846	.813	.959
Q7	76.64	387.382	.799	.959
Q8	77.09	390.395	.732	.960
Q9	77.37	389.760	.765	.960
Q10	77.64	392.017	.703	.960
Q11	77.90	398.177	.593	.961
Q12	76.34	383.047	.843	.959
Q13	76.76	388.426	.792	.959
Q14	75.11	361.866	.684	.963
Q15	76.66	375.882	.808	.959
Q16	75.94	402.083	.551	.961
Q17	76.25	396.362	.608	.961
Q18	76.22	398.979	.584	.961
Q19	76.60	393.450	.628	.961
Q20	76.79	395.158	.653	.960
Q21	77.06	395.766	.666	.960
Q22	76.65	389.179	.767	.960
Q23	76.29	400.381	.551	.961
Q24	77.16	385.774	.821	.959
Q25	76.74	398.829	.564	.961
Q26	77.42	386.879	.820	.959
Q27	77.52	391.215	.743	.960

5.4 Research Process

As the flow diagram of the research in , there are three steps of this research. The first step is pretest, screening the participants and grouping. After completing the Pretest Questionnaire of Caregivers of Children with Hearing Impairment, checking

the admission physical examination report and finishing the Auditory Verbal Therapy Assessment Scale, the participants will be screened by the inclusive criteria and exclusive criteria. With the participants' willingness of participate in the family intervention, the children with hearing impairment and their caregivers will be divided into experiment group or control group. Then the informed consent which includes the research purpose and family intervention process and approaches will be signed with the parents of children with hearing impairment in experiment group.

The second step is carrying out family intervention for the experiment group. At the beginning, a three day's remote professional lecture which answered three questions, those are, why do children with hearing impairment need family education and rehabilitation based on auditory verbal therapy? How should the family education and rehabilitation based on auditory verbal therapy be done for the children with hearing impairment? What should be paid attention to in family education and rehabilitation of children with hearing impairment? was gave by author (who has the qualification of family education guidance of children with hearing impairment and auditory speech therapy by passing the national training and examination in People's Republic of China) by Tencent Meeting APP. Then, the individualized family education plans (IFEP is compiled from test results of Auditory Verbal Therapy Assessment Scale and Pretest Questionnaire of Caregivers of Children with Hearing Impairment) were gave to the caregivers of children with hearing impairment after the lecture. After the caregivers getting their individualized family education plans, they started their family education with auditory verbal therapy approach for three month. During the three months, the caregivers can ask unlimited professional questions about family education with auditory verbal therapy approach and get answers from the author. Besides, the author will carry out regular family return visit twice per month to watching the family education scene by Tencent Meeting APP, then giving feedback which record their content of family education, problems and suggestions for improvement of their family education to the caregivers by text form. At the same time, the control group got nothing from the author during the three month. The family intervention step is stared from 17th of September, 2022, and end on 17th of

December, 2022.

The third step is post-test and interview. After the three months' family intervention, the Post-questionnaire of Caregivers of Children with Hearing Impairment and Auditory Verbal Therapy Assessment Scale will sent to the experiment group and control group for post-test. With the post-test results, the caregivers in experiment finished the semi-structured interview to provide more information about the family intervention.

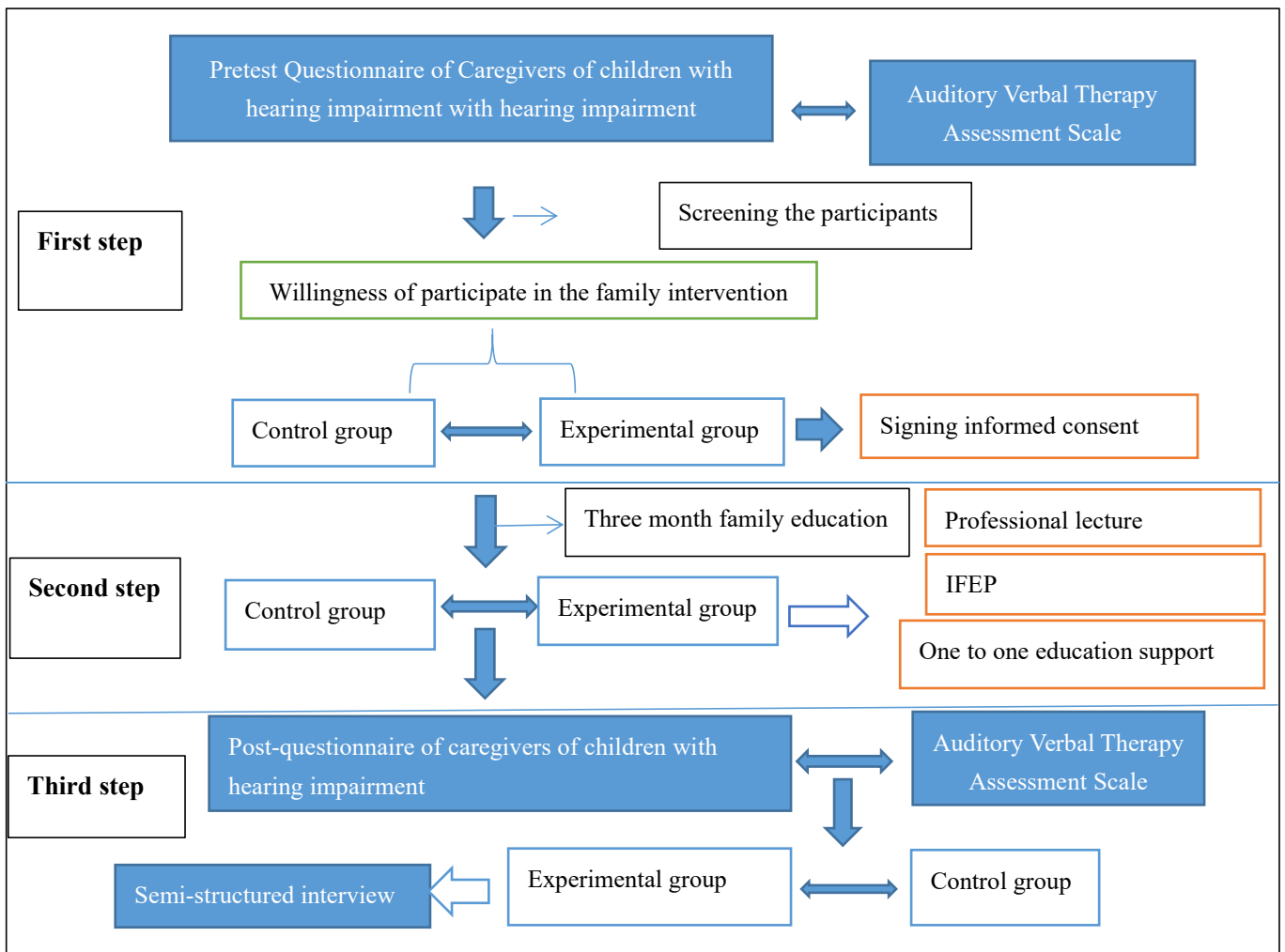


Figure 5.2 Flow diagram of the research

5.4 Data Analysis

5.4.1 Tools of Data Analysis

This research mainly used 3 tools for data analysis, namely Excel, IBM SPSS Statistics 26 and NVIVO 12. The Excel was used for data statistic and simple operation. The IBM SPSS Statistics 26 was used for complex quantitative data analysis. The NVIVO 12 was used for qualitative data entry and preliminary analysis.

5.4.2 Approaches of Data Analysis

Firstly, the current situation of family education and the caregivers' family education behaviors were described and gathered statistic by Excel.

Secondly, in order to compare the abilities difference within the group before and after the family intervention, paired samples tests were carried out by IBM SPSS Statistics 26. Comparing the abilities difference between groups before and after the family intervention, analysis of variances were operated in IBM SPSS Statistics 26. Besides, effect factors exploration of family intervention is realized through the binary logistic regression of IBM SPSS Statistics 26.

Lastly, applying the grounded theory for systematic qualitative data analysis, after the interview data was entered into NOVIVO 12, the node function of NOVIVO 12 was used for manual coding to obtain a preliminary conceptual open coding.

6. Research Result

6.1 The Current Situation of Family Education in Hearing Families of Children with Hearing Impairment

With the data from Pretest Questionnaires of Caregivers of Children with Hearing Impairment and Self-recording Chart of Caregivers' Family Education Information, the current situation of family education in hearing families of children with hearing impairment can be analyzed from caregiver's basic information, family education implementation status and family education expectations in hearing families of children with hearing impairment.

6.1.1 Caregivers' Basic Information in Hearing Families of Children With Hearing Impairment

As shown in Table 6.1, after analysis the data from Pretest Questionnaires of Caregivers of Children with Hearing Impairment, it is founded that mothers take the main responsibility of the family education for the children with hearing impairment in the hearing families. Nearly two thirds of caregivers of the children with hearing impairment in hearing families are mothers. Although research pointed out that strengthening fathers' parenting responsibilities and promoting gender balance in family education have great significance to improve the quality of family education (Xu, 2018). Among the 5 options (father, mother, parents, grandparents and others) in the questionnaire, none father takes the family education responsibility independently in the hearing families of children with hearing impairment. Only 18.3% of the hearing families are parents who share the responsibility of family education. Besides, among the 71 families, there are still 11 families where grandparents take on the role of caregivers. Although early studies have shown that inter-generational parenting easily lead to have adverse effects on children's emotional, behavioral, psychological,

academic and physical development (Du&Li, 2012; Jiang, Wang, Xia, Zhang, 2010).

Table 6.1 The Main Caregivers of the Children With Hearing Impairment in Hearing Families

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mother	47	66.2	66.2	66.2
	Parents	13	18.3	18.3	84.5
	Grandparents	11	15.5	15.5	100.0
	Total	71	100.0	100.0	

Parents' educational background is closely related to their children's educational environment (Sheng&Jiang, 2004). Moreover, parents' education level significantly affects their parenting style and children's academic achievement (Hu, Zhang, 2015; Song, Guo, 2018). However, more than 60% of caregivers in hearing families of children with hearing impairment have relatively low education degree in this research. Most of them only finished secondary school education. There are even 12.68% of caregivers who only have primary school education. During the family intervention of the experimental group, it was found that some caregivers of grandparents with primary school education had difficulties in literacy and deficiency of basic cognitive ability. Only a third of caregivers have the background of higher education. The specific information of the highest education degree of caregivers of children with hearing impairment can be found in Figure 6.1.

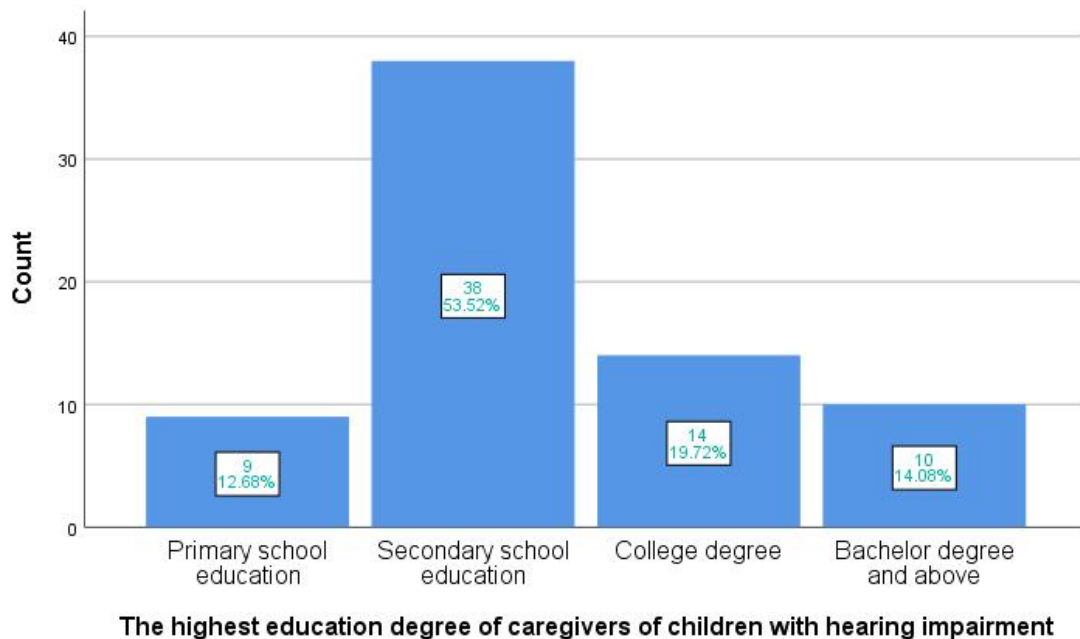


Figure 6.1 The Education Degree Information of Caregivers of Children with Hearing Impairment

6.1.2 Family Education Implementation Status in Hearing Families of Children With Hearing Impairment

Family education is the starting point of education and the foundation of children's education (Zhai, 2016). Students' educational achievement is related to the investment of parenting. Family education investment includes economic, time and energy investment (Li,&He, 2019). Research shows that family education time investment has a certain direct effect on children's academic ability. Parents directly participate in children's educational activities has great significance to the development of children's early academic ability (Li&Lu, 2013). This research analyzed the family education implementation status in hearing families of children with hearing impairment from the perspective of family education time investment and family education satisfaction degree based on the data from Pretest Questionnaire of Caregivers of children with hearing impairment with hearing impairment.

Information of caregivers' time investment of family education for children with hearing impairment can be seen from the Table 6.2. According to the results of the

questionnaire survey, most of caregivers spent 30 to 60 minutes on family education for their children with hearing impairment per day. This is lower than the family education time investment about 10 hours per week for the children with normal hearing (Zeng, 2006). Besides, 19.7% of caregivers spent 60 to 90 minutes on family education for their children with hearing impairment per day. Only a few caregivers spent more than two hours on family education for their children with hearing impairment per day, while 15.5% of caregivers spend less than 30 minutes on family education each day. However, comparing the family education time investment information from the caregivers' questionnaire and Self-recording Chart of Caregivers' Family Education Information of experiment group, it is easy to find that most of caregivers actually spend less time on their children with hearing impairment in family education practice. Even though, most of caregivers believe they spent 30 to 60 minutes on the family education for their children with hearing impairment, actually most of them only spend less than 30 minutes on the family education for their children with hearing impairment per day. Only one caregiver can insist on 60-90 minutes of family education for her children with hearing impairment per day. At the same time, none caregivers spend more than 2 hours on family education for their children with hearing impairment. The specific information of the experiment group's daily family education time investment from the main caregivers can be found in Table 6.3.

Table 6.2 Overview of Daily Family Education Time Investment from the Main Caregivers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under 30 minutes	11	15.5	15.5	15.5
	30-60 minutes	40	56.3	56.3	71.8
	60-90 minutes	14	19.7	19.7	91.5
	More than 120 minutes	6	8.5	8.5	100.0
	Total	71	100.0	100.0	

Table 6.3 Experiment Group’s Daily Family Education Time Investment from the Main Caregivers

		Frequency	Percent	Valid Percent	Cumulative Percent
Information from the caregivers’ questionnaire	Under 30 minutes	1	4.0	4.0	4.0
	30-60 minutes	18	72.0	72.0	76.0
	60-90 minutes	4	16.0	16.0	92.0
	More than 120 minutes	2	8.0	8.0	100
Information from the Self-recording Chart of Caregivers’ Family Education Information	Under 30 minutes	15	60.0	60.0	60.0
	30-60 minutes	9	36.0	36.0	96.0
	60-90 minutes	1	4.0	4.0	100
	More than 120 minutes	0	0	0	100

Although the caregivers of children with hearing impairment spend more or less time on family education, as shown in Figure 6.2, more than half of the caregivers feel that the effect of family education is neutral or worse.

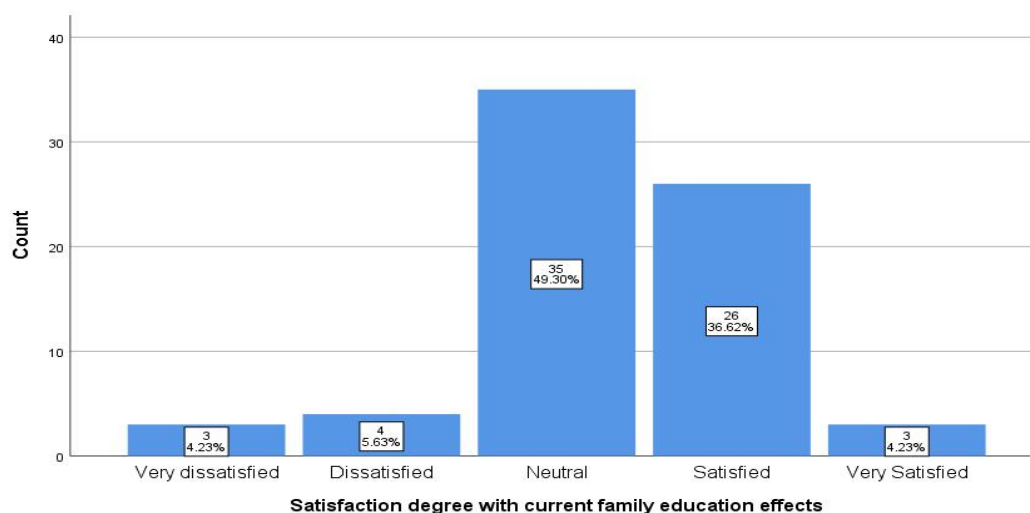


Figure 6.2 The Satisfaction Degree with Current Family Education Effects before the Intervention

Comparing the pretest and post-test of groups, it can be found that the

satisfaction degree of family education increased over time in both groups (As seen in Table 6.4). In the experiment group, 48% of caregivers are satisfied with their family education effects before family intervention, it increased to 72% after family intervention. The difference before and after the intervention of experiment group is 24%. As for the control group, 34.8% of caregivers are satisfied with their family education effects, three month later, it increased to 43.5%. The difference before and after the intervention of experiment group is 8.7%. The growth rate of family education satisfaction in the experiment group is much higher than that in the control group.

Table 6.4 Satisfaction Degree with Current Family Education Effects

Group		Frequency	Percent	Valid Percent	Cumulative Percent	
Pretest of experiment group	Valid	Dissatisfied	1	4.0	4.0	4.0
		Neutral	11	44.0	44.0	48.0
		Satisfied	11	44.0	44.0	92.0
		Very Satisfied	2	8.0	8.0	100.0
		Total	25	100.0	100.0	
Post-test of experiment group	Valid	Very dissatisfied	2	8.0	8.0	8.0
		Neutral	3	12.0	12.0	20.0
		Satisfied	14	56.0	56.0	76.0
		Very Satisfied	6	24.0	24.0	100.0
		Total	25	100.0	100.0	
Pretest of control group	Valid	Very dissatisfied	3	6.5	6.5	6.5
		Dissatisfied	3	6.5	6.5	13.0
		Neutral	24	52.2	52.2	65.2
		Satisfied	15	32.6	32.6	97.8
		Very Satisfied	1	2.2	2.2	100.0
		Total	46	100.0	100.0	
Post-test of control group	Valid	Very dissatisfied	3	6.5	6.5	6.5
		Dissatisfied	3	6.5	6.5	13.0
		Neutral	20	43.5	43.5	56.5
		Satisfied	17	37.0	37.0	93.5
		Very Satisfied	3	6.5	6.5	100.0
		Total	46	100.0	100.0	

6.1.3 Family Education Expectations In Hearing Families of Children With Hearing Impairment

Educational support mainly refers to the material, financial, service and other assistance and support provided by the state, social groups or individuals to ensure equal educational opportunities for disadvantaged groups through various means and measures (Ji, 2016). A sound family education support can effectively improve the effect of family education, and has a positive impact on parent-child relationship and family relationship (Li&Cai, 2018). As shown in the Table 6.5, with the 5 options (very dislike, dislike, neutral, like and very like), 100% of caregivers wants to get support for family education from the professionals, 73.1% of caregivers have extremely strong expectations.

Table 6.5 The hope degree that professionals will provide relevant support for family education and rehabilitation of children with hearing impairment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Like	19	13.4	26.8	26.8
	Very like	52	36.6	73.2	100.0
	Total	71	50.0	100.0	
Total		71	100.0		

6.2 The Effect of Family Intervention for the Hearing Families of Children with Hearing Impairment

With the data from questionnaires of caregivers of hearing families of children with hearing impairment and Auditory Verbal Therapy Assessment Scale, in order to get the information of the changes of children's speech communication competencies and caregivers' family education abilities before and after family intervention to know the effect of family intervention, this research carried out the before and after comparisons in experiment group by paired sample test, and comparisons between

groups by analysis of variance.

6.2.1 The Effect of Family Intervention for the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families

In order to have a clear understanding of the changes in children's speech communication competencies before and after the family intervention, this research not only compared children's speech communication competencies as a whole, but also analyzed and compared the changes from five sub-dimensions of speech communication competencies, namely hearing, speech, language, cognition and communication.

6.2.1.1 The Analysis of Assessment Results of the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families

According to the data from Auditory Verbal Therapy Assessment Scale of Children with Hearing Impairment, in order to know the change of speech communication competencies of children with hearing impairment in experiment group before and after family intervention, paired sample test was used for data analysis in this research. Since there is only 25 children with hearing impairment in the experiment group, less than 30, which belonged to a small sample. The children's speech communication competencies difference before and after the family intervention must conform to the normal distribution as the data analysis precondition.

As shown in Table 6.6, with the precondition that the children's speech communication competencies difference before and after the family intervention conforms to the normal distribution ($P > 0.05$), the paired sample test result shows that there is a significant difference in the speech communication competencies of the children with hearing impairment in experiment group before and after the family intervention (as shown in Table 6.7, $p = 0.00 < 0.05$).

Table 6.6 Tests of Normality of SCC difference before and after the family intervention

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Difference	.121	25	.200*	.943	25	.176

- a. Lilliefors Significance Correction
b. SCC=speech communication competencies

Table 6.7 Paired Samples Test of SCC of Children with Hearing Impairment

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair1	The pretest of SCC of children with hearing impairment - The post-test of SCC of children with hearing impairment	.476	.207	.041	.390	.562	11.477	24	.000

- a. SCC=speech communication competencies

Combined with the results of paired samples statistics in Table 6.8 that the mean of speech communication competencies of the children with hearing impairment in the experiment group increased from 2.85 to 3.33, it shows that family intervention has a positive effect on the development of speech communication competencies for children with hearing impairment..

Table 6.8 Paired Samples Statistics of SCC of Children with Hearing Impairment

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	The post-test of SCC of children with hearing impairment	3.3252	25	.86495	.17299
	The pretest of SCC of children with hearing impairment	2.8492	25	.85705	.17141

- a. SCC=speech communication competencies

Excluding the influence of children's natural development on the assessment results of speech communication competencies, it is necessary to compare the speech

communication competencies of children with hearing impairment between experiment group and control group. Preliminary analysis of variance found that the speech communication competencies of the children with hearing impairment have significant differences between groups (as shown in Table 6.9, $F=2.82$ $p<0.05$).

Table 6.9 ANOVA of the SCC of Children with Hearing Impairment

Dependent variable: The speech communication competencies of children with hearing impairment					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.677	3	1.559	2.820	.041
Within Groups	76.287	138	.553		
Total	80.964	141			

a. SCC=speech communication competencies

In order to know the further information of the comparison between groups, it is necessary to conduct post hoc test, but it has the preconditions that variances are homogeneous and the residuals conform to the normal distribution. Results show that the variances are homogeneous (as shown in Table 6.10, $P>0.05$) and the residuals conform to the normal distribution (as shown in Table 6.11, $P>0.05$). It meets the standard of conduct post hoc test.

Table 6.10 Test of Homogeneity of Variances of the SCC of Children with Hearing Impairment

		Levene Statistic	df1	df2	Sig.
The SCC of children with hearing impairment	Based on Mean	1.082	3	138	.359
	Based on Median	.702	3	138	.553
	Based on Median and with adjusted df	.702	3	118.076	.553
	Based on trimmed mean	1.062	3	138	.367

a. SCC=speech communication competencies

Table 6.11 Tests of Normality of Residual for the SCC of Children with Hearing Impairment

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for the SCC of children with hearing impairment	.072	142	.069	.982	142	.057

a. Lilliefors Significance Correction

b. SCC=speech communication competencies

It can be seen from Table 6.12, with the development of time, the children's speech communication competencies of the two groups has increased. However, the

speech communication competencies of the children in experiment group increased much faster than that in control group. The order of mean of children's speech communication competencies from high to low is the experiment group after the intervention, the control group after the intervention, the experiment group before the intervention, and the control group before the intervention.

Table 6.12 Description of the SCC of Children with Hearing Impairment before and after the Family Intervention

Dependent Variable: The speech communication competencies of children with hearing impairment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean			
					Lower Bound	Upper Bound	Minimum	Maximum
Pretest of experiment group	25	2.8492	.85705	.17141	2.4954	3.2030	1.41	4.63
Post-test of experiment group	25	3.3252	.86495	.17299	2.9682	3.6822	1.74	4.67
Pretest of control group	46	2.8217	.67564	.09962	2.6211	3.0224	1.30	4.07
Post-test of control group	46	2.8891	.66934	.09869	2.6904	3.0879	1.30	4.19
Total	142	2.9370	.75777	.06359	2.8113	3.0628	1.30	4.67

a. SCC=speech communication competencies

With the results of multiple comparison of the variances in Table 6.13, it shows that the speech communication competencies of children in the experiment group after family intervention has significant difference from that in the control group and in the experiment group before the intervention. Combining with the description results in Table 6.12, family intervention has a significant positive impact on the speech communication competencies development of children with hearing impairment in hearing families.

Table 6.13 Multiple Comparisons of the SCC of Children with Hearing Impairment

Dependent Variable: The speech communication competencies of children with hearing impairment

LSD

(I) Group	(J) Group	Mean	95% Confidence Interval			
		Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
pretest of experiment group	post-test of experiment group	-.47600*	.21030	.025	-.8918	-.0602
	pretest of control group	.02746	.18474	.882	-.3378	.3928
	Post-test of control group	-.03993	.18474	.829	-.4052	.3254
post-test of experiment group	pretest of experiment group	.47600*	.21030	.025	.0602	.8918
	pretest of control group	.50346*	.18474	.007	.1382	.8688
	post-test of control group	.43607*	.18474	.020	.0708	.8014
pretest of control group	pretest of experiment group	-.02746	.18474	.882	-.3928	.3378
	post-test of experiment group	-.50346*	.18474	.007	-.8688	-.1382
	post-test of control group	-.06739	.15503	.664	-.3739	.2392
post-test of control group	pretest of experiment group	.03993	.18474	.829	-.3254	.4052
	post-test of experiment group	-.43607*	.18474	.020	-.8014	-.0708
	pretest of control group	.06739	.15503	.664	-.2392	.3739

*. The mean difference is significant at the 0.05 level.

a. SCC=speech communication competencies

6.2.1.3 Multidimensional Analysis Assessment Results of the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families

The speech communication competencies of children with hearing impairment are closely related to their abilities of hearing, language, speech, cognition and communication. As shown in Table 6.14, the multidimensional paired sample test results show that hearing, language, speech, cognition and communication of children with hearing impairment in the experiment group had significant improvement after the family intervention ($p < 0.05$). At the same time, the children in the control group had only significant improvement in hearing and language ($P < 0.05$). Therefore, in comparison, family intervention can promote the development of children's speech communication competencies in all-sides better.

Table 6.14 Multidimensional Paired Samples Test of the SCC of Children with Hearing Impairment

Group		Classification				
		hearing	language	speech	cognition	communication
Experiment group	Pretest	3.42	2.15	3.30	2.91	2.50
	post-test	3.99	2.49	3.62	3.53	2.93
	P	.000*	.010*	.001*	.000*	.000*
Control group	Pretest	3.45	2.06	3.20	2.94	2.49
	post-test	3.61	2.16	3.23	3.31	2.49
	P	.000*	.002*	.058	.287	.160

- a. SCC=speech communication competencies
b. *. The mean difference is significant at the 0.05 level.

In order to learn more about the development differences of children's speech communication competencies between groups under family intervention, multidimensional analysis of variance results found that only children's hearing has significant difference between groups after family intervention (as shown in Table 6.15, $p < 0.05$), so family intervention has the most significant effect on the auditory development of children with hearing impairment.

Table 6.15 Multidimensional ANOVA of the SCC of Children with Hearing Impairment

Classification	Experiment group		Control group		F	P
	Pretest	post-test	Pretest	post-test		
hearing	3.42	3.99	3.45	3.61	3.035	.031*
language	2.15	2.49	2.06	2.16	1.271	.287
speech	3.30	3.62	3.20	3.23	.665	.575
cognition	2.91	3.53	2.94	3.31	1.138	.336
communication	2.50	2.93	2.49	2.49	2.133	.099

- a. SCC=speech communication competencies
b. *. The mean difference is significant at the 0.05 level.

6.2.2 The Effects of Family Intervention for the Family Education Abilities of Caregivers in Hearing Families

In order to have a clear understanding of the changes in caregivers' family education abilities before and after the family intervention, this research not only

compared caregivers' family education abilities as a whole, but also analyzed and compared the changes from four sub-dimensions of family education abilities--educational skills, cognition of children's development, sensitivity of children's education needs, educational participation performance

6.2.2.1 The Analysis of Assessment Results of the Family Education Abilities of Caregivers in Hearing Families

According to the data from questionnaires of caregivers of children with hearing impairment, paired samples test will be used for analyzing the changes of caregivers' family education abilities before and after the family intervention. Due to the experiment group is small sample, with the precondition that the difference between the pretest and post-test of the family education abilities of caregivers conforms to normal distribution (as shown in Table 6.16, $p>0.05$), the paired sample test result in Table 6.17 shows that there is a significant difference in the family education abilities of caregivers in experiment group before and after family intervention ($p<0.05$).

Table 6.16 Tests of Normality Of Difference between the Pretest And Post-Test of the FEA of Caregivers

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
difference	.099	25	.200*	.979	25	.859

a. Lilliefors Significance Correction

c. FEA=Family Education Abilities

Table 6.17 Paired Samples Test of the FEA of Caregivers

	Paired Differences						t	df	Sig. (2-tailed)
	95% Confidence Interval of the Difference								
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper				
Pair 1 The post-test of FEA of Caregivers - The pretest of FEA of Caregivers	.45497	.38082	.07616	.29777	.61217	5.973	24	.000	

a. FEA=Family Education Abilities

Combining the results from Table 6.17 and Table 6.18, the mean of family

education abilities of caregivers in the experiment group increased from 3.55 to 4.00, and there is a significant difference in the family education abilities of caregivers in experiment group before and after family intervention, so the family intervention can positively improve the family education abilities of caregivers.

Table 6.18 Paired Samples Statistics of the FEA of Caregivers

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	The post-test of FEA of Caregivers	4.0021	25	.57021	.11404
	The pretest of FEA of Caregivers	3.5471	25	.38053	.07611

a. FEA=Family Education Abilities

In order to exclude the influence of caregivers' natural development on the assessment results of family education abilities, analysis of variance was applied for comparison between groups. It was found that there is a significant difference between groups after comparison with the control group (as shown in Table 6.19, $p < 0.05$). With the preconditions which show in Table 6.20 and Table 6.21 that the variances are homogeneous ($P > 0.05$) and the residuals conform to the normal distribution ($P > 0.05$), the multiple comparison of the variances shows that after the family intervention, the family education abilities of caregivers in the experiment group have significant differences comparing with the control group and the experiment group before the intervention (as shown in Table 6.23, $p < 0.05$).

Table 6.19 ANOVA of the FEA of Caregivers

Dependent Variable: the family education abilities of caregivers of children with hearing impairment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.846	3	1.282	3.964	.010
Within Groups	44.631	138	.323		
Total	48.477	141			

a. FEA=Family Education Abilities

Table 6.20 Test of Homogeneity of Variances of the FEA of Caregivers

		Levene Statistic	df1	df2	Sig.
FEAof caregivers	Based on Mean	2.675	3	138	.050
	Based on Median	1.996	3	138	.117
	Based on Median and with adjusted df	1.996	3	128.499	.118
	Based on trimmed mean	2.670	3	138	.050

a. FEA=Family Education Abilities

Table 6.21 Tests of Normality of Residual for the FEA of caregivers

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for the FEA of caregivers	.064	142	.200*	.983	142	.070

a. *. This is a lower bound of the true significance.

b. Lilliefors Significance Correction

c. FEA=Family Education Abilities

Combining the results from table 6.22 and table 6.23, with the development of time, the caregivers' family education abilities of the two groups has increased. However, the caregivers' family education abilities in experiment group increased much faster than that in control group. The order of mean of caregivers' family education abilities from high to low is the experiment group after the intervention, the control group after the intervention, the control group before the intervention and the experiment group before the intervention. Family intervention has a significant positive impact on the family education abilities development of caregivers in hearing families.

Table 6.22 Description of the FEA of caregivers

Dependent Variable: the family education abilities of caregivers of children with hearing impairment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
pretest of experiment group	25	3.5471	.38053	.07611	3.3901	3.7042	2.63	4.37
post- test of experiment group	25	4.0021	.57021	.11404	3.7667	4.2375	2.21	5.00
pretest of control group	46	3.5492	.59304	.08744	3.3731	3.7253	2.53	5.00
post- test of control group	46	3.6304	.62408	.09202	3.4451	3.8158	2.42	5.00
Total	142	3.6549	.58635	.04921	3.5576	3.7522	2.21	5.00

a. FEA=Family Education Abilities

Table 6.23 Multiple Comparisons of the FEA of Caregivers

Dependent Variable: The family education abilities of caregivers of children with hearing impairment

LSD

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
					Lower Bound	Upper Bound	
pretest of experiment group	post- test of experiment group	-.45497*	.16085	.005	-.7730	-.1369	-.45497
	pretest of control group	-.00206	.14131	.988	-.2815	.2773	-.00206
	post- test of control group	-.08330	.14131	.556	-.3627	.1961	-.08330
post- test of experiment group	pretest of experiment group	.45497*	.16085	.005	.1369	.7730	.45497*
	pretest of control group	.45291*	.14131	.002	.1735	.7323	.45291*
	post- test of control group	.37167*	.14131	.010	.0923	.6511	.37167*
pretest of control group	pretest of experiment group	.00206	.14131	.988	-.2773	.2815	.00206
	post- test of experiment group	-.45291*	.14131	.002	-.7323	-.1735	-.45291
	post- test of control group	-.08124	.11858	.494	-.3157	.1532	-.08124
post- test of control group	pretest of experiment group	.08330	.14131	.556	-.1961	.3627	.08330
	post- test of experiment group	-.37167*	.14131	.010	-.6511	-.0923	-.37167
	pretest of control group	.08124	.11858	.494	-.1532	.3157	.08124

*. The mean difference is significant at the 0.05 level.

a. FEA=Family Education Abilities

6.2.2.2 Multidimensional Analysis Assessment Results of the Family Education Abilities of Caregivers of Children with Hearing Impairment in Hearing Families

The family education abilities of caregivers of children with hearing impairment is closely related to their abilities of educational skills, cognition of children's development, sensitivity of children's education needs and educational participation performance. In order to learn more about the changes in caregivers' family education abilities, multidimensional paired sample test found that after family intervention, all of the sub-dimensions of family education abilities of caregivers in experiment group have significant difference before and after the family intervention (as shown in Table 6.24, $p < 0.05$), while all of the sub-dimensions of family education abilities of caregivers in control group haven't significant difference before and after the family intervention. It shows that family intervention can promote the development of caregivers family education abilities in all-sides better. Besides, family intervention

has significant effect on the development of caregivers' educational skills, cognition of children's development, sensitivity of children's education needs and educational participation performance.

Table 6.24 Multidimensional Paired Sample Test of the FEA of Caregivers in Hearing Families

Group		Classification			
		Educational skills	Cognition of children's development	Sensitivity of children's education needs	Educational participation performance
Experiment group	Pretest	3.65	3.52	3.20	3.61
	post-test	4.05	3.91	4.00	4.06
	P	.010*	.000*	.000*	.000*
Control group	Pretest	3.62	3.41	3.29	3.72
	post-test	3.67	3.46	3.39	3.84
	P	.452	.556	.283	.132

a. FEA=Family Education Abilities

*. The mean difference is significant at the 0.05 level.

In order to get more information about the changes in the family education abilities of caregivers between groups, the multidimensional analysis of variance results found that caregivers' educational skills, cognition of children's development, sensitivity of children's education needs and educational participation performance have significant difference between the groups (as shown in Table 6.25, $p < 0.05$). Therefore, comparison of between groups, family intervention can positively promote the development of caregivers' family education abilities significantly.

Table 6.25 Multidimensional ANOVA of the FEA of Caregivers in Hearing Families

Classification	Experiment group		Control group		F	P
	Pretest	post-test	Pretest	post-test		
educational skills	3.65	4.05	3.62	3.67	3.197	.025*
cognition of children's development	3.52	3.91	3.41	3.46	3.228	.024*
sensitivity of children's education needs	3.20	4.00	3.29	3.39	6.175	.001*
educational participation performance	3.61	4.06	3.72	3.84	2.761	.045*

a. FEA=Family Education Abilities

*. The mean difference is significant at the 0.05 level.

6.3 The Factors that Affect the Effect of Family Intervention in Hearing Families

Regression has an important impact on educational results (Han, 2004). In order to find the factors that affect the effect of family intervention in hearing families, this research used binary logical regression to find the independent variables which can affect the speech communication competencies of children with hearing impairment and the family education abilities of caregivers in hearing families. Besides, using grounded theory based on the semi-structured interview data of caregivers, on the basis of understanding the results of family intervention to understand other influencing factors that affect the results of family intervention.

6.3.1 Logistic Regression of Factors that Affect the Effect of Family Intervention of the Speech Communication Competencies of Children with Hearing Impairment in Hearing Families

This research used the mean difference of speech communication competencies of children with hearing impairment before and after the intervention as the dependent variable to test the changing of speech communication competencies of children with hearing impairment. If the mean difference of speech communication competencies of children with hearing impairment before and after the intervention is greater than the mean difference of speech communication competencies of children with hearing impairment before and after the intervention in control group, it was record 1. Otherwise, it was recorded as 0. There are 7 independent variables in this logistic regression. They are hearing equipment of children, hearing loss of children, family education time, the highest education degree of caregivers of children with hearing impairment, the main caregivers of the children with hearing impairment in hearing families, hearing age and the family education abilities difference of caregivers. The

coding of the independent variables can be seen in Table 6.26.

Table 6.26 Categorical Variables Coding of Logistic Regression of Speech Communication Competencies

Independent variable	Coding of independent variable	Frequency	Parameter coding			
			(1)	(2)	(3)	(4)
Hearing equipment of children	hearing aid for one ear (1)	3	.000	.000	.000	.000
	cochlear implantation for one ear (2)	18	1.000	.000	.000	.000
	hearing aids for two ears (3)	9	.000	1.000	.000	.000
	cochlear implantation for two ears (4)	20	.000	.000	1.000	.000
	cochlear implantation matching with hearing aid (5)	21	.000	.000	.000	1.000
Hearing loss of children	hearing loss is over than 90dB (1)	55	.000	.000	.000	
	hearing loss is 81-90dB (2)	9	1.000	.000	.000	
	hearing loss is 61-80 dB (3)	6	.000	1.000	.000	
	hearing loss is 41-60 dB (4)	1	.000	.000	1.000	
Family education time	less than 30 minutes per day (1)	11	.000	.000	.000	
	30-60 minutes per day (2)	40	1.000	.000	.000	
	60-90 minutes per day (3)	14	.000	1.000	.000	
	more than 120 minutes per day (4)	6	.000	.000	1.000	
The highest education degree of caregivers of children with hearing impairment	primary school education (1)	9	.000	.000	.000	
	secondary school education (2)	38	1.000	.000	.000	
	college degree (3)	14	.000	1.000	.000	
	bachelor degree or above (4)	10	.000	.000	1.000	
The main caregivers of the children with hearing impairment in hearing families	Mother (1)	47	.000	.000		
	Parents (2)	13	1.000	.000		
	Grandparents (3)	11	.000	1.000		
Hearing age	hearing age is more than one year(1)	63	.000			
	hearing age is less than one year(2)	8	1.000			
The family education abilities difference of caregivers	Non improvement (0)	33	.000			
	Improved (1)	38	1.000			

As shown in Table 6.27, Table 6.28 and Table 6.29, the $P < 0.05$, the model of this logistic regression is effective. The $R^2 > 0.04$, it's acceptable. The overall prediction accuracy is 78.9%, it can meet the standard too. This logistic regression model met the conditions for further logistic regression analysis.

Table 6.27 Omnibus Tests of Model Coefficients of Logistic Regression of Speech Communication Competencies

		Chi-square	df	Sig.
Step 1	Step	42.797	17	.001
	Block	42.797	17	.001
	Model	42.797	17	.001

Table 6.28 Model Summary of Logistic Regression of Speech Communication Competencies

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	55.616a	.453	.604

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table 6.29 Classification Table of Logistic Regression of Speech Communication Competencies

		Predicted		Percentage Correct
		The speech communication competencies difference before and after intervention		
	Observed	Non improvement	improved	
Step 1	The speech communication competencies difference before and after intervention	29	6	82.9
		9	27	75.0
Overall Percentage				78.9

a. The cut value is .500

Combining the results from Table 6.26 and Table 6.30, it shows that in the 7 independent variables, only the family education abilities difference of caregivers can affect the speech communication competencies of children with hearing impairment significantly ($P=0.01<0.05$). With the significant improvement of the family education abilities of caregivers, it has a positive effect on the development of children's speech communication competencies ($B>0$). Even though hearing loss 61-80dB has positive effect on the development of children's speech communication competencies($P=0.044<0.05$, $B=4.125$), but the effect is unstable in hearing loss of children, so it needs to be further tested in different models or samples.

Table 6.30 Variables in the Equation of Logistic Regression of Speech Communication Competencies

Independent variables	Coding			
	(1)	(2)	(3)	(4)
The family education abilities difference	.001* (3.588)			
Hearing age	.101 (-2.312)			
The main caregivers of the CWHI in hearing families	.504 (-.752)	.831 (.275)		
Family education time	.097 (2.159)	.826 (.826)	.963 (.963)	
The highest education degree of caregivers of CWHI	.265 (1.563)	.546 (.996)	.167 (2.628)	
Hearing loss of children	.169 (-2.413)	.044* (4.125)	.999 (-46.962)	
Hearing equipment of children	.999 (-22.527)	.999 (-25.092)	.999 (-24.557)	.999 (-22.134)

a. CWHI=children with hearing impairment

b. * P<0.05

c. Variable(s) entered on step 1: Hearing loss of children, Hearing equipment of children, Hearing age, The main caregivers of the children with hearing impairment in hearing families, The highest education degree of caregivers of children with hearing impairment, Family education time, The family education abilities difference.

6.3.2 Logistic Regression of Factors that Affect the Effect of Family Intervention of the Family Education Abilities of Caregivers in Hearing Families

This research used the mean difference of family education abilities of caregivers before and after the intervention as the dependent variable to test the changing of caregivers' family education abilities . If the mean difference of family education abilities of caregivers before and after the intervention is greater than the mean difference of family education abilities of caregivers before and after the intervention in control group, it was record 1. Otherwise, it was recorded as 0. There are 7

independent variables in this logistic regression. They are the speech communication competencies difference before and after intervention, hearing loss of children, hearing equipment of children, hearing age, the main caregivers and educator of the children with hearing impairment in hearing families, the highest education degree of caregivers of children with hearing impairment, family education time. The coding of the independent variables can be seen in Table 6.32.

With the preconditions that $P < 0.05$ (as shown in Table 6.33), $R \text{ Square} > 0.4$ (as shown in Table 6.31), overall prediction accuracy=84.5%(It can be seen in Table 6.34), this logistic regression model met the conditions for further logistic regression analysis.

Table 6.31 Model Summary of Logistic Regression of Family Education Abilities

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	50.393a	.489	.653

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table 6.32 Categorical Variables Coding of Logistic Regression of family education abilities

		Frequency	Parameter coding			
			(1)	(2)	(3)	(4)
Hearing equipment of children	hearing aid for one ear (1)	3	.000	.000	.000	.000
	cochlear implantation for one ear (2)	18	1.000	.000	.000	.000
	hearing aids for two ears (3)	9	.000	1.000	.000	.000
	cochlear implantation for two ears (4)	20	.000	.000	1.000	.000
	cochlear implantation matching with hearing aid (5)	21	.000	.000	.000	1.000
family education time	less than 30 minutes per day (1)	11	.000	.000	.000	
	30-60 minutes per day (2)	40	1.000	.000	.000	
	60-90 minutes per day (3)	14	.000	1.000	.000	
	more than 120 minutes per day (4)	6	.000	.000	1.000	
The highest education degree of caregivers of children with hearing impairment	primary school education (1)	9	.000	.000	.000	
	secondary school education (2)	38	1.000	.000	.000	
	college degree (3)	14	.000	1.000	.000	
	bachelor degree or above (4)	10	.000	.000	1.000	
hearing loss of children	hearing loss is over than 90dB (1)	55	.000	.000	.000	
	hearing loss is 81-90dB (2)	9	1.000	.000	.000	
	hearing loss is 61-80 dB (3)	6	.000	1.000	.000	
	hearing loss is 41-60 dB (4)	1	.000	.000	1.000	

The main caregivers and educator of the children with hearing impairment in hearing families	Mother (1)	47	.000	.000
	Parents (2)	13	1.000	.000
	Grandparents (3)	11	.000	1.000
hearing age	hearing age is more than one year(1)	63	.000	
	hearing age is less than one year(2)	8	1.000	
The speech communication competencies difference before and after intervention	Non improvement (0)	35	.000	
	Improved(1)	36	1.000	

Table 6.33 Omnibus Tests of Model Coefficients of Logistic Regression of Family Education Abilities

		Chi-square	df	Sig.
Step 1	Step	47.681	17	.000
	Block	47.681	17	.000
	Model	47.681	17	.000

Table 6.34 Classification Table of Logistic Regression of Family Education Abilities

		Predicted the family education abilities difference of caregivers		
Observed		Non improvement	improved	Percentage Correct
Step 1	the family education abilities difference of caregivers Non improvement	28	5	84.8
	improved	6	32	84.2
Overall Percentage				84.5

a. The cut value is .500

Combining the results from Table 6.32 and Table 6.35 , it shows that in the 7 independent variables, only the speech communication competencies difference before and after intervention can stably affect the family education abilities significantly ($P=0.01<0.05$). With the significant improvement of the speech communication competencies of children, it has a positive effect on the development of caregivers' family education abilities ($B>0$). Even though family education time less than 30 minutes per day has a negative effect on the development of caregivers'

family education abilities ($P=0.017<0.05$, $B=-3.966$), but the effect is unstable in family education time, so it needs to be further tested in different models or samples.

Table 6.35 Variables in the Equation of Logistic Regression of Family Education Abilities

Independent variables	Coding			
		P	B	
	(1)	(2)	(3)	(4)
The speech communication competencies difference before and after intervention	.001* (3.745)			
Hearing age	.189 (1.585)			
The main caregivers of the CWHI in hearing families	.539 (.911)	.589 (.870)		
Family education time	.017* (-3.966)	.200 (-2.172)	.072 (-3.461)	
The highest education degree of caregivers of CWHI	.444 (1.491)	.294 (2.119)	.217 (2.758)	
Hearing loss of children	.093 (2.105)	.088 (-4.117)	.999 (26.443)	
Hearing equipment of children	.315 (2.708)	.165 (3.992)	.322 (2.627)	.857 (.415)

a. CWHI=children with hearing impairment

b. * $P<0.05$

c. Variable(s) entered on step 1: Hearing loss of children, Hearing equipment of children, Hearing age, The main caregivers of the children with hearing impairment in hearing families, The highest education degree of caregivers of children with hearing impairment, Family education time, The speech communication competencies difference before and after intervention

6.3.3 Factors that Affect the Effect of Family Intervention of The Speech Communication Competencies of Children with Hearing Impairment in Hearing Families Based on Grounded Theory

6.3.3.1 The Research Design and Coding Process of Factors that Affect the Effect of Family Intervention Based on Grounded Theory

For the purposes to understand more factors that affect the results of family intervention and understand the formation process of the results of family intervention,

this research conducted semi-structured interviews with the 25 caregivers in the experiment group after the family intervention, and applied grounded theory to analyze the interview materials. All methodologies are a way for human beings to understand the world, understanding of the world is only human's explanatory. Truth and theory are both temporary in nature. Theories are not be found, and not independent of researcher to exist in data. Any theory provides an explanatory to the world under a research, rather than the real world (Charmaz, Smith, Harre, VanLangenhove, 1995, cited in Wu, Wu, Ma, 2016). Due to the characteristics of flexibility, mobility, openness and interaction of constructivist grounded theory, this study adopts constructivist grounded theory which is proposed by Charmaz Kathy (who proposed constructivist grounded theory firstly in 1990) as the basis for interview data processing.

In the hope that understand more factors that affect the results of family intervention and understand the formation process of the results of family intervention, the semi-structured interview was carried out through WeChat video on the basis of having contacted and communicated with the caregivers in the experiment group for more than 3 months, and having a certain degree of trust, so that obtain more comprehensive and rich information. The interview materials come from the two questions in the semi-structured interview outline and temporary follow-up questions, as follows:

1. Have you gained anything from the 3 months family intervention? What are the gains? If there is no gains, why there is no gains?
2. Are you satisfied with the results of this family intervention? What are the specific points of your satisfaction? If you are dissatisfied, why?

In order to ensure the integrity of the transcription of the interview information, the entire interview process was videotaped with the consent of the interviewees. After the interview, the interview data was transcribed into a Word document timely, and entered into NVIVO12. Node function and memos were used for manual coding to obtain a preliminary conceptual open coding, 88 preliminary conceptual codes were obtained. The codes were repeated many times and were judged to be theoretically

saturated.

The coding process of grounded theory follows the three-level coding process of open coding, axial coding and selective coding. With the further analyzing and coding of the semi-structured interview, it got 69 concepts and 11 categories in the open coding. In the axial coding stage, the 11 preliminary categories were divided into 4 main categories. Besides, got the 1 core category in selective coding based on the 4 main categories. The specific coding process information is shown in Table 6.36.

Table 6.36 Three-level Coding of the Family Intervention Results and Attribution

Coding		Content
concepts	A1. In the past, the goals of the curriculum were not clear; A2. I had no direction for family education before; A3. Did not know about education	B1. Got nothing from family education B2. Older lack of knowledge and experience; B3. The original teaching methods were relatively rigid; B4. Insufficient understanding of auditory verbal therapy in the past; B5. The previous courses were messed up; B6. I didn't know how to teach before; B7. In the past, I could only review the teacher's teaching content at home
categories	A. Original family education program	B. Caregivers' Original family education skills and knowledge
concepts	C1. Teaching with purposes; C2. Teaching content is clearer; C3. The teaching content of family education is more independent	D1. The child's ability has developed; D2. child progressed; D3. The child is recovering well; D4. Child's cooperation has improved; D5. Child learns well; D6. Learning efficiency is faster; D7. The child's knowledge is consolidated and developed; D8. The child's attention has improved; D9. The child's comprehension ability has improved D10. The child's communication has improved; D11. The child developed faster D12. The child's hearing is better
open coding	categories	C. Family education programme after intervention
concepts	E1. The teacher never taught before; E2. Teachers only let us review the teaching	D. Satisfied children's abilities after intervention F1. Supervision; F2. Point out problems; F3. Free Guidance; F4. Planning for teaching content and purpose;

		content of the school at home	F5. Answer questions; F6. Inform the method of improvement; F7. Giving feedback; F8. Taught some knowledge beyond school teaching	
categories		E. Original family education support	F. The role of family intervention supporter	
concepts		G1. Family education is more conscious; G2. Study knowledge and skills independently under guiding; G3. Asking you, if there's anything I don't know	H1. Be lazy in family education; H2. Not wholeheartedly; H3. I am a little lazy; H4. Don't ask the teacher if I have questions; H5. Didn't last long enough H6. Not working as hard as other parents	
categories		G. participate actively	H. passive participation	
concepts		I1. Teaching methods are more flexible; I2. Knowing the corresponding rehabilitation principles; I3. Thinking of curriculum is clearer ; I4. Feedback makes teaching more detailed; I5. Teaching skills are developed; I6. Teaching methods are richer; I7. learned a lot; I8. Teaching ability improved ; I9. Learned more about auditory verbal therapy; I10. The language of instruction is more mature; I11. Teaching with more new educational objectives; I12. Teaching gains more; I13. Teaching with purposes; I14. Educate children better; I15. Optimizing teaching behaviour; I16. Educational content is richer; I17. Teaching words can be understand by child; I18. Teaching content is clearer; I19. Higher teaching efficiency;		
categories		I. Satisfied caregivers' abilities after intervention		
concepts		J1. Child's language - Speech development is not good enough J2. The child's development is not as good as I expected	K1. Teaching in the field of communication still does not understand; K2. Education abilities development is limited K3. Teaching ability is still insufficient K4. Some aspects are still unclear	
categories		J. Unsatisfactory children's abilities after intervention	K. Unsatisfactory caregivers' abilities after intervention	
axial coding	Family education program	Family education support	Participation characteristics of family	Results of family education Caregivers' original family education skills and knowledge;

Original family education program; Family education program after intervention;	The role of the family Education supporter; Original family education support	education executors participate positively; passive participation	Satisfied children's abilities after the intervention; Satisfied caregivers' abilities after Intervention; Unsatisfactory children's abilities after intervention; Unsatisfactory caregivers' abilities after Intervention
Selective coding	Results and attributions of family intervention		
	Family education program		
	Family education support		
	Participation characteristics of family education executors		
	Results of family education		

6.3.3.2 Analyzing Factors that Affect the Effect of Family Intervention Based on the Three-level Coding of the Family Intervention Results and Attribution

6.3.3.2.1 Results of Family Education

Before the family intervention, most of caregivers of the children with hearing impairment expressed that their education skills and knowledge are insufficient, especially for elder caregivers. Besides, their gains of family education is limited. As a consequence, the caregivers can only review the teacher's teaching content at home or carry out family education almost at random before the family intervention.

After the family intervention, there are two different education results. Most of the caregivers are satisfied with the intervention result, because the children's abilities and caregivers abilities are improved. The improvement of children's abilities are manifested in children's effect of rehabilitation, effect of learning, learning efficiency, cooperation, knowledge, comprehension ability, attention, speed of development and hearing. The improvement of caregivers' abilities are manifested in caregivers' teaching method, teaching skills, thinking of curriculum, knowledge of auditory verbal therapy, knowledge of rehabilitation principles and other knowledge, language of instruction, education objective, gains of teaching, purpose of teaching, effect of teaching, teaching behaviour, educational content and teaching efficiency. However, some of the caregivers are still unsatisfied with the intervention result, because the

caregivers and children's abilities are still unsatisfactory. With regards to children's abilities, the development of some fields are still insufficient, or the children's development does not reach the caregivers expectation. As for the caregivers, some of them do not satisfied their knowledge of teaching or extent of education abilities development.

6.3.3.2.2 Factors that Affect the Effect of Family Intervention

With the information from Table 6.36, it is easy to find that before the family intervention, the original family education support is deficient. Most of caregivers did not have approach to get support for family education, so that they can only review the teaching content of the school at home with the requirement of teachers in the school for preschoolers. After the intervention, family education supporter played a role in family intervention through supervision, pointing out problems, guidance, planning for teaching content and purpose, answering questions, informing the method of improvement, giving feedback and teaching knowledge beyond school teaching. With the increasing of family education support, the original family education program has changed from no educational concept, unclear curriculum goals, and no direction for family education to clearer and independent teaching purpose and content. Besides, even though all of the caregivers got support, but the difference of participation characteristics of family education executors further influences family education results. Some of passive participation caregivers are lazy in family education or not wholeheartedly in family education. They did not work as hard as other caregivers, and didn't last long enough time in family education. Even though they met some problems, they didn't ask help from teachers too. While the caregivers who participate positively carried out family education more consciously, even study knowledge and skills independently under guiding. When they met problems, they searched help from the supporter. As shown in Table 6.37, by observing and analyzing the data from the Self-recording Chart of Caregivers' Family Education Information and Caregivers' Actively Request for Help Record Chart, it

was found that caregivers' participation in family education has large individual differences, which verified the interview material and result of analyzing. The caregivers' original family education skills and knowledge also affect the progress space of children and caregivers to a certain extent.

In conclusion, caregivers' original family education skills and knowledge is the starting point of family education in the hearing families of children with hearing impairment, it directly determines the development of ability and potential of the individual after receiving education and training (Tang, 2006). With the support from family education supporter, family education program can get improvement, but the participation characteristics of family education executors further influences family education results. Researches show that parental involvement has a strong impact on children's academic performance, active parental education participation also promotes the development of children's positive behaviors, emotions, learning behaviors, and social competence (Huang, 2013; Wang, 2010) .These lead to different results of family intervention.

Table 6.37 Caregivers' Participation Information of Family Education

Items	Frequency	Percent
Ask question actively	17	68%
Never ask a question	8	32%
Actually family education time	Under 30 minutes	60%
	30-60 minutes	36%
	60-90 minutes	4%
	More than 120 minutes	0

6.4 Problems and Further Expectations of Family Intervention Based on Grounded Theory

The problems and further expectations of family intervention for the children with hearing impairment would find from the interview data analyzing based on the constructivist grounded theory.

6.4.1 Research Design and Coding Process of Problems and Further Expectations of Family Intervention Based on Grounded Theory

In order to understand the problems and further expectations of family intervention for the children with hearing impairment in hearing families, this research interviewed 25 caregivers of children with hearing impairment in experiment group with the follow questions from the Semi-structured Interview Outlines for the Caregivers of Children with Hearing Impairment:

1. In this family intervention, is there any problem that you cannot accept or cooperate with? If yes, why?
2. After family intervention, what problems do you still face in the family education?
3. For this family intervention, what aspects need to be improved? Or what additional support and help would you like to receive?
4. Who is the best person to provide family intervention? Or who can provide best family intervention? Why?
5. Do you think the duration of 3 months family intervention is appropriate? Why?
6. If the family intervention continues, will you still participate? Why?

After the interview, the interview data was transcribed into a word document timely, and entered into NVIVO12. Node function and memos were used for manual coding to obtain a preliminary concept open coding in NVIVO, 165 preliminary conceptual codes were obtained. The codes were repeated many times and were judged to be theoretically saturated. Based on the constructivist grounded theory, the author further processed the interview data and carried out three-level coding. With the further analyzing and coding of the semi-structured interview material, 96 concepts and 10 categories were got in the open coding. 3 main categories were got in axial coding. Then 1 core category was got in selective coding. The specific information of the coding is shown in Table 6.38.

Table 6.38 Three-level Coding of Problems and Further Expectations of Family Intervention

Coding		Content	
open coding	<p>concepts</p> <p>A1. Child dose not understand what is being taught</p> <p>A2. Child dose not cooperate</p> <p>A3. Child's emotional problems</p> <p>A4. Child is not interested in teaching content</p>	<p>B1. Child's speech-cognitive is not enough;</p> <p>B2. Child's attention is insufficient;</p> <p>B3. Bottleneck in child's ability development;</p> <p>B4. Child's ability is unstable;</p> <p>B5. Child's vocabulary is inadequate;</p> <p>B6. Insufficient communication skills and motivation in child;</p> <p>B7. Child with poor communication and speech skills;</p> <p>B8. Inadequate communication and language skills in child;</p>	
categories	<p>A. Children's participating difficulty in teaching</p>	<p>B. Insufficient development of children's abilities</p>	
concepts	<p>C1. Lack of teaching materials</p> <p>C2. Difficulties in time</p> <p>C3. Didn't get enough knowledge from primary education</p> <p>C4. Can't understand the lecture's power point</p>	<p>D1. Teaching language is not standard</p> <p>D2. Don't understand communication field teaching</p> <p>D3. There are some problems with the teaching method</p> <p>D4. Insufficient teaching methods and skills</p> <p>D5. The grasp of teaching objectives</p> <p>D6. Formulation of teaching content</p> <p>D7. Some educational skills are not good enough</p> <p>D8. Unable to flexibly handle emergencies in family education</p> <p>D9. Difficulty in teaching speech</p> <p>D10. Difficulty in language teaching and application</p> <p>D11. Teaching methods and goals are not clear</p>	
categories	<p>C. Difficulty in family education implementation and participation</p>	<p>D. Insufficient teaching skills and knowledge of caregivers</p>	
concepts	<p>E1. Personal rehabilitation teacher of children with hearing impairment in school;</p> <p>E2. Professionals related to auditory verbal therapy;</p> <p>E3. Professional institution</p>	<p>F1. Professionals tell differently from school teachers;</p> <p>F2. There are more opportunities to communicate with the personal rehabilitation teacher of children with hearing impairment in school;</p> <p>F3. Personal rehabilitation teacher of children with hearing impairment in school spend more time with children;</p> <p>F4. Child is more intimate to the personal rehabilitation teacher of children with hearing impairment in school;</p> <p>F5. Can often contact with the personal rehabilitation teacher of children with hearing impairment in school;</p> <p>F6. School is relatively close;</p> <p>F7. Can communicate with the personal rehabilitation teacher of children with hearing impairment in school face to face;</p> <p>F8. Professionals are serious and responsible;</p> <p>F9. Be more familiar with the personal rehabilitation teacher</p>	

		of children with hearing impairment in school;
		F10. Personal rehabilitation teacher of children with hearing impairment in school can practice teaching skills in real time;
		F11. Personal rehabilitation teacher of children with hearing impairment in school can guide in person, and the effect will be better;
		F12. The support model given by professionals is good
		F13. Professionals are more targeted
		F14. Professional guidance sparks the imagination
		Professionals are more professional
		F15. Professionals know more
		F16. The one-on-one guidance given by professional institutions is longer
		F17. Professional institutions are more targeted
categories	E. Expectations for the family intervention supporter	F. Reasons of diverse expectation of family intervention supporters
concepts	G1. 3-6 months	H1. Help to formulate teaching goals and methods
	G2. 3 months is not enough	H2. No need, enough
	G3. Longer time	H3. Prepare lessons with caregivers
	G4. Longer time would be better	H4. Enrich the content of the individualized education plan
	G5. Hope to continue	H5. Need more training
	G6. The longer the better	H6. Need more guidance
	G7. Long-term development is better	H7. Need more professional knowledge support
	G8. 3 months is suitable	H8. Need more teaching content and method guidance
	G9. About 3 months	H9. Need more teaching content and goal guidance
		H10. Need more knowledge
		H11. Materials for more expertise
		H12. The return visit can finished by recorded video
		H13. Timely guidance during return visits
		H14. Combination of family education return visit online and in person
		H15. Simplify terminology
		H16. The teacher gives teaching content and methods
		H17. Time adjusted to Saturday and Sunday
		H18. The role of caregiver in family education can be replaced by others
		H19. Extend to guidance in person
		H20. Already very good
		H21. Additional support for language and communication instruction
		H22. Increase the frequency of family education return visits
		H23. Provide more support for speech and communication

		H24. Need more support for the speech teaching	
		H25. Designated family education content	
categories	G.Expectations for the duration of family intervention	H. Expectations of further family intervention	
concepts	I1. Do not participate I2. participate I3. uncertain	J1. Ongoing guidance after graduation J2. There's still a lot to learn J3. Want to learn more J4. Graduate J5. If not at work J6. Not single child in family J7. Don't have enough time J8. Difficult to fully cooperate with holidays J9. No enough time for family education under work J10. Time is uncertain J11. Heavy academic tasks J12. Saturday and Sunday are more acceptable	
categories	I. Expectations of participating continuity	J. Reasons for different willingness to participate	
axial coding	Problem of family intervention Insufficient development of child's abilities; Child's participating difficulty in teaching; Insufficient teaching skills and knowledge of caregivers; Difficulty in family education implementation and participation	Expectations of family intervention Expectations for the family intervention supporter; Expectations of participating continuity Expectations for the duration of family intervention; Expectations of further family intervention content and model	Reasons of affecting the expectation of family intervention Reasons of diverse expectation of family intervention supporters; Reasons for different willingness to participate
Selective coding	Problems and expectations of family intervention Problems of family intervention Expectations of family intervention Reasons of affecting the expectation of family intervention		

6.4.2 Analyzing Problems and Further Expectations of Family Intervention Based on the Three-level Coding of Problems and Further Expectations of Family Intervention

6.4.2.1 Problems Of Family Intervention

With the results of three-level coding, it is easy to find that the difficulties of family intervention are mainly reflected in four aspects, namely children's participating difficulty in teaching, insufficient development of children's abilities, difficulty in family education implementation and participation and insufficient teaching skills and knowledge of caregivers. Firstly, because the comprehension, cooperation, the emotion stability, interest and motivation in teaching participation of the children with hearing impairment is not enough, so they have difficulties to participate in teaching. Secondly, after the intervention, children's speech, cognition, language, and communication abilities still have room for development. The attention problem, the speed and stability of abilities puzzled the caregivers too. Thirdly, due to lack of time and teaching material, moreover, some caregivers' basic knowledge and comprehension can't support them to understand the professional knowledge well, so that some caregivers have difficulty in family education implementation and participation. Lastly, some caregivers' teaching skills and knowledge are insufficient, specifically manifested in their teaching language, knowledge of education, teaching methods, teaching objectives, teaching content, educational skills, flexibility of education.

6.4.2.2 Further Expectations of Family Intervention

As shown in Table 6.38, with the duration of family intervention, most of caregivers believe that 3 months are not enough for family intervention. 3 to 6 months are more suitable, or the longer the better. In the further family intervention, there are four different kinds of expectations of the further family intervention. Firstly, most of

caregivers want to get more training and guidance about the teaching goals, methods and content, and professional knowledge of rehabilitation fields such as language ,speech and communication from the family intervention supporters. Moreover, some of them need the material and approaches for caregivers' self-improvement too. Secondly, some caregivers need more practice support such as the chance to prepare a lesson with supporter together rather than theoretical guidance. They also want to get guidance during their teaching practice timely. Thirdly, simplifying and concretizing of professional knowledge, and providing more support for the caregivers with outstanding difficulties are also needed by the caregivers. Lastly, some caregivers proposed the need to increase the frequency of family return visits and adjust the time and pattern of family education return visit, for example, combination of family education return visit online and in person or finishing the family education return visit by recorded video, so that the time arrangement can be more flexible for the caregivers.

With expectations for the family intervention supporter, there are three different views about it. The most popular supporter is the personal rehabilitation teacher of children with hearing impairment in school, because teachers have the characteristics of being closer relationship with children, closer in space, easier to contact, easier to communicate, and more familiar. In addition, teachers can also give more timely, and face-to-face support. The reasons for caregivers to choose professionals with auditory therapy as supporters are that they are serious and responsible attitude of professionals and broader professional knowledge, and more targeted and effective support. As for the professional institutions, they are chosen for that they can give longer one-to one guidance and targeted support.

As shown in Table 6.39, 84% of caregivers said they would continue to participate in the family intervention, because they still want and need to learn more from the family intervention. Some of them even want to get continuous support after graduation from preschool. 8% of the caregiver don't want to continue to participate in the family intervention, because their children are graduating from the preschool, moreover, most of them have other children, so that their time is not enough. 8% of

caregivers is not sure about the further participation, because their children's academic tasks are heavy and they need more flexible time arrangement of family intervention.

Table 6.39 Willingness to Continue Participating in Family Intervention

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unwilling	2	8.0	8.0	8.0
	Not sure	2	8.0	8.0	16.0
	Willing	21	84.0	84.0	100
	Total	25	100.0	100.0	

In conclusion, the problems of family intervention reflected in the difficulties of teaching participation of caregivers and children and their insufficient ability development, but the results based on the pretest and post-test results show that the abilities of children and caregivers have improved significantly, so the insufficient ability development should be the gap between expectations and actual development or the expectation of more development. With this bases, caregivers need more theoretical guidance and training. They also need more practice guidance from supporter. As for the caregivers with outstanding difficulties, it is necessary to provide more simplifying and concentrating support. More flexible time and support pattern arrangement of the family intervention are still needed. With understanding the willingness of participating in family intervention timely, and making flexible adjustments according to their willingness are also important.

7. Conclusion and Suggestion

7.1 Research conclusion

With the development of hearing compensation equipment and audiometry technology, and the widely application of infants' early screening, hearing compensation has become the first choice for parents of children with hearing impairment to enable the children with hearing impairment to obtain speech

communication competencies (Dao, 2020). Auditory verbal therapy is a rehabilitation model for children with hearing impairment which emphasizes the application of auditory ability and family-centered. It is widely used in the early intervention of children with hearing impairment, and has achieved remarkable results (Wan, 2011; Zhan, Li, 2016; Chen, Huang, Liu, 2018). However, in the practice of auditory verbal therapy, the role of family is always being exclude from the education which limited the effect of rehabilitation and education results of children with hearing impairment. Therefore, how to effectively incorporate parents of children with hearing impairment into the auditory verbal therapy education system and allow the rehabilitation and learning of children with hearing impairment to effectively extend from the school or institution to the family are particularly important.

Based on the survey of 71 children with hearing impairment who are receiving rehabilitation and education in preschool or institution and their caregivers, this research carried out family intervention according to the individual differences of children with hearing impairment and the needs of their caregiver, to explore the effectiveness of this family intervention model on improving the speech communication competencies of children with hearing impairment and the family education abilities of caregivers, and explore the influencing factors that affect the effect of family intervention.

The present situation of family education is not optimistic. Research find that the main caregivers who carry out family education for children with hearing impairment are mothers, more than two third of hearing families are mother taking the responsibilities of family education independently, but there is none father taking the responsibilities of family education independently. There is a phenomenon of father's absence in the hearing families. This has also been verified from other studies (Ma, Gao, Wang, Wang, 2019; Yu, 2016; Lu, Zeng, 2004; Zhao, 2010). The education background of the caregivers of children with hearing impairment is not optimistic, more than 60% of the caregivers only finished primary school or secondary school, some of them even have the difficulties with literacy and basic cognition. Most of caregivers believe that they spent 30 to 60 minute on the daily family education for

their children with hearing impairment, but actually 60% of the caregivers only spend under 30 minutes on the family education per day. With these background, only 40.85% of the caregivers are satisfied with the family education effects. The caregivers' expectation of support from the professional is extremely high, 100% of the caregivers hope to get support for family education from professionals.

Research shows that the family intervention which includes professional lecture, individual family education plan, answering of professional questions and one to one family support which is realize by regular family education visit can improve the development children's speech communication competencies and caregivers' family education abilities significantly. The improvement of the children's speech communication competencies and caregivers' family education abilities in experiment group have significant difference both in the groups and between groups after the family intervention. Family intervention can improve the positive development of children's speech communication competencies and caregivers' family education abilities. In the speech communication competencies of children with hearing impairment, the promotion effect on hearing is the most significant. Comparing with the control group, family intervention can promote the children's all-sides development of speech communication competencies better. As for the caregivers' family education abilities, family intervention can promote the positively development of all-sides development better and significantly.

With the results from the logistic regression and grounded theory, it is easy to find that the children's speech communication competencies can affect the caregivers' family education abilities stably and significantly, caregivers' family education abilities can affect the children's speech communication competencies too. The positively development of children's speech communication competencies and the caregivers' family education abilities have a positive promotion effect on each other. Besides, caregivers original family education skills and knowledge can affect the effect of family intervention, because the caregivers original family education skills and knowledge determined the development of ability and potential. With the role of family education supporter, family education program can get improvement, but the

participation characteristics of family education executors further influenced the effect of family intervention.

After the family intervention for the hearing families, the caregivers' satisfaction degree of family education in experiment group which received family intervention increased 24%. It increased more than the caregivers' satisfaction degree in control group. After the intervention, some children and caregivers meet the problems that have difficulties of participating in education, and abilities' development is lower than expected. The caregivers' expectation of family intervention shows on four aspect. With the supporters of family intervention, they should be professional, accessible, familiar with the children with hearing impairment and have a close relationship with the caregivers. 84% of caregivers would like to continue to participate in the family intervention, but their willingness of participation is affect by the children's graduation and quantity of academic. Caregivers' time arrangement is also an important factor. As for the duration of family intervention, most of caregivers believe that 3 to 6 month or longer will be better. The caregivers still need more theoretical guidance and training, practice guidance from supporter, more simplifying and concentrating support and more flexible time and support pattern arrangement.

Due to this research only has 71 children with hearing impairment and their caregivers as the participants, the sample is related small, so it is necessary to carry out the family intervention in bigger samples. Besides, this research is for the authors dissertation, so it was limited the duration of family intervention. In order to further test the effectiveness of the family intervention, it is needed to carry out longer.

7.2 Suggestions on Family Intervention Optimization for Children with Hearing Impairment in Hearing Families

The suggestions on family intervention optimization for children with hearing impairment in hearing families would be proposed based on the test results of groups and grounded theory analysis results. There are 5 suggestions on family intervention optimization for children with hearing impairment in hearing families.

7.2.1 Implement Family Intervention Positively, Early and Consistently

Based on the effectiveness of family intervention in promoting the development of children's speech communication competencies and caregivers' family education abilities in hearing families, family intervention should be carried out actively. The golden period for the development of children's central auditory system is within 3 and a half years old (Sharma, Dorman, Spahr, 2002), the critical period for children's language development is before the age of 10-12 (Lenneberg, 1967, cited in Kuang, 2010). Children with hearing impairment missing the best intervention period will affect the intervention effect (Li, Chen, Tao, Wu, 2010). The Screening Guidelines of Newborns' Diseases which is promulgated by the National Health Commission of People's Republic of China in 2010 pointed out that newborns with hearing impairment should be intervened before they are 6 months and given rehabilitation guidance to the families (National Health Commission of People's Republic of China, 2010). Besides, some caregivers reject to continue to participate in the family intervention, because their children are graduating from the preschool for the children with hearing impairment. With these reasons, implement family intervention early is necessary. Auditory compensation age and rehabilitation time are the key factors affecting the rehabilitation effect of children with hearing impairment. The auditory ability of children with hearing impairment increases with the increase of intervention time (Chen et al. 2009; Ma, Dong, Liu, Hu, Ma, 2016). Moreover, most of caregivers have the willingness to continue participating in family intervention after three months family intervention, so continuous family intervention for more than 3 months is also necessary.

7.2.2 Different Levels of Support Based on Caregivers' Different Original Education Abilities

As an important place for children, family is closely related to the development

of children. Research found that the higher the level of parents participation and support, the better the quality of children's learning (Yue, Ren, 2021; Fan, 2019). A sound family education support can effectively improve the effect of family education, and have a positive impact on parent-child relationship and family relationship (Xu, Zhou, 2016; Zhu, 2016). In family education, parents need more knowledge and skills in raising, the continuous improvement of the quality of parents will greatly improve the level and ability of parents to educate their children children (Xu, Zhou, 2016; Li, 2008). Improving the parenting abilities of parents of children with disabilities, eliminating their role adaptation difficulties and low competence, can also effectively reduce their parental stress level, thereby improving their overall quality of life (Guan, Yan, Deng, 2015). Family educators' educational background and income affect their educational involvement level and quality (Qiu, Wang, 2010; Zhang, Zheng, 2019; Huang, Huo, 2014). The older family education practitioners have higher educational support needs (Guo, Fang, 2016). In this research, caregivers with lower education levels and older age also showed more difficulties in participating in family education and needed higher levels of support. Therefore, different levels of support should be given to caregivers with different original educational abilities and characteristics.

7.2.3 Provide More Support and Motivation to Caregivers Who Involved Passively

Due to some of the caregivers involved passively in this research, but the positive involvement of parents can positively affect children's academic achievement, behavior performance, mental health, social interaction, concentration, etc. (Yang, 2003; Xie, 2020). Parents' time investment is the main factor affecting children's academic development (Li, He, 2019). There is also a significant positive correlation between parents participation and satisfaction (Xu, Zhou, 2016). Research shows that parents involvement in education is strongly influenced by teachers' understanding of the parents role, and by the available opportunities from schools and teachers (Xie,

2020). Parents' awareness of the importance of family education participation, government guidance and clarifying parents' educational responsibilities by legislation will also affect their enthusiasm for participating in education (Ma, Gao, Wang, Wang, 2019; Duan, 2011). Based on these studies, there are 3 recommendations for increasing caregiver education involvement positivity. From the national level, the country needs to legislate to clarify the role and importance of caregivers in family education and the responsibility and obligation of caregivers to participate in children's education, and designate corresponding departments to carry out supervision and support. Secondly, schools and teachers correctly understand the positive role of caregivers' participation in family education on children, give positive encouragement and affirmation to parents' participation, and provide sufficient space and opportunities for practice. From the caregivers themselves, give parenting education so that they can clarify their own importance and scope of responsibility, and have the ability to carry out family education. Besides, encourage fathers involve in the family education for the children with hearing impairment to share the responsibility and duty with mothers. In this way, caregivers can be better guided to invest more time and energy, and actively involve in family education, so as to promote the development of children with hearing impairment and their education abilities.

7.2.4 Optimization of Family Intervention Supporters

Research shows that in the process of family education support, it is easy for the supporter and the person who get support to communicate poorly, which reduces the support effect and the quality of family education results (HL,2006). Therefore the choice and capacity of family intervention supporters is very important. With the different requirements of the supporters of family education, the optimization of family intervention supporters can start from the following 4 points. Firstly, in order to carry out targeted support and effective communication, family intervention supporters must be familiar with children and caregivers, and have a relatively close

relationship with them. Secondly, in order to provide professional and efficient support for the children with hearing impairment in hearing families, family intervention supporters must have strong professional ability and rich professional knowledge. Thirdly, family education supporters must provide adequate space and opportunity to communicate with caregivers to understand their needs and struggles. Lastly, family intervention supporters need to provide sufficient strength support and appropriate support content according to the different needs of caregivers.

7.2.5 Model Optimization of Family Education Intervention

This family intervention provided four parts to the caregivers of children with hearing impairment, namely professional lectures, individualized family education plan, long-term question answering and regular family education return visit. With the different education background and comprehension of caregivers, the content of lecture and the answers of professional questions should be simplified and specific, so that the practicality of professional knowledge becomes stronger. Information on the development and progress of family education should be obtained regularly, so as to adjust and supplement the content of the individualized family education plan. As for family education return visits, time and space constraints should be minimized. For caregivers whose time is deficient, the real-time family return visit can be replaced by submitting family education videos. For caregivers with different space needs, the combination of online guidance and guidance in person can be carried out to meet the needs of space.

Reference

- [1] Ahmadi, H., Sani, H. M., Farnoosh, G., & Sani, M. R. M. (2017). Comparative study of speech and language development in children with hearing impairment with normal hearing and cochlear implant in Iran. *Indian Journal of Otology*, 135-140.
- [2] Aljedaani, W., Aljedaani, M., AlOmar, E. A., Mkaouer, M. W., Ludi, S., & Khalaf, Y. B. (2021). I Cannot See You—The Perspectives of Deaf Students to Online Learning during COVID-19 Pandemic: Saudi Arabia Case Study. *Education Sciences*, 712.
- [3] Boothroyd, A. (1982). *Hearing impairments in young children with hearing impairment*. Prentice-Hall.
- [4] Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, 32, 513-531.
- [5] Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Harvard University Press.
- [6] Cao Li, Yang Fanyun, Song Lei, Zhong Di, Chen Xiaoting & Wang Hong.(2017). The Development of Auditory and Speech Abilities under the Family-centered Rehabilitation Model for Younger Hearing—impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 209- 212.
- [7] Cardon,G., & Sharma, A. (2013). Central auditory maturation and behavioral outcome in children with hearing impairment with auditory neuropathy spectrum disorder who use cochlear implants. *International journal of audiology*, 52(9), 577-586.
- [8] Cestmoi. (28.04.2020). *Implementation of Exploratory Factor Analysis (EFA) in SPSS and Mplus*. Retrieved from: <https://zhuanlan.zhihu.com/p/136798795>.
- [9] Charmaz, K. In J.A. Smith, R. Harre & L.VanLangenhove. (1995). Rethinking methods in psychology. London:Sage, 27-49.
- [10] Chen Jing. (2012). A Case Study of Auditory Verbal Therapy Rehabilitation Training for Young Hearing-impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 446-448.
- [11] Chen Jing, Han Xi, He Saijin, Wu Rongxiu, Ding Muying & Liu Qiaoyun. (2019). A Comparative Study on Auditory Ability of Hearing-impaired children with hearing impairment with Different Hearing Compensation Methods and Healthy children with hearing impairment Aged 1-3 Years. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 305-308.
- [12] Chen Junlan, Lu Xiaoyue, Zhang Li. (2012). *Theory and Practice of Auditory Verbal teaching for children with hearing impairment*. Bei Jing Press.
- [13] Chen Keping, Jin Zhicheng & Chen Qi. (2009). Working Memory Mechanism in Deaf Population. *Advances in Psychological Science*, 1191-1196.
- [14] Chen Lilan & Wang Yan. (2018). The Development of the Semantic Processing by Hearing-Impaired children with hearing impairment Between Grade 3 and Grade 6. *Chinese Journal of Special Education*, 35-40.
- [15] Chen Peihua, Huang Wanqi & Liu Tingwei. (2018). A Survey of Satisfaction with Distonce Auditory - Verbal Therapy Intervention for Mandarin-Speaking Children with Hearing Loss. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 121-124.
- [16] Chen Shudan, Li Chunyu & Chen Suiqing. (2020). Pre-school Deaf children with hearing

impairment's Processing and Understanding of Metaphor. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 50-53.

[17] Chen Xiao. (2012). *A Case Study on the Influence of Parent-children with hearing impairment Reading on Deaf children with hearing impairment's Reading Routine and Language Ability (Master's thesis)*. Chongqing Normal University.

[18] Chen Xiaodan. (2014). The Use of Total Communication Method to Improve the Effectiveness of Deaf School Physics Classroom teaching for children with hearing impairment. *Journal of Educational Development*, 85-88.

[19] Chen Xueqing, Liu Sha, Kong Ying, Liu Bo, Mo Lingyan, Liu Haihong, WANG Shuo WU Yanjun QI Beier Li Jing. (2009). The characteristics and development of auditory skill for infants with different age after cochlear implantation. *Journal of Clinical Otolaryngology Head and Neck Surgery*, 148-150.

[20] Dao Weijie. (2020). Present Situation and Prospect of Popularization and Application of Auditory-Verbal Therapy in children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 325-327.

[21] Dammeyer, J., & Ohna, S. E. S. (2021). Changes in educational planning for deaf and hard of hearing children with hearing impairment in Scandinavia over the last three decades. *Scandinavian Journal of Disability Research*, 114-123.

[22] Ding Hongbing.(2007). Report on the Investigation of the Family—based Education for Hearing Impaired children with hearing impairment in Hebei Province. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 54-56.

[23] Ding Xiaofang, Wang Xiaofeng & Zhu Min. (2022). The Effects of Auditory Verbal Therapy on Individualized Speech Rehabilitation Training of Hearing-Impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 136-139.

[24] Duan Feiyan. (2011). Parenting education in the family from the perspective of preschool education. *Modern Educational Science* (04), 51-52.

[25] Duan Feiyan & Li Jing. (2012). A Review of Inter-generational Education Research at home and abroad in the past ten years. *Shanghai Journal of Education Research*, 13-16.

[26] Erber, N. P. (1982). *Auditory training*. Alex Graham Bell Assn for Deaf.

[27] Fan Jialu. (2013). A Comparison of the Continuous Phone-Repeating Ability between the Hearing-Impaired children with hearing impairment and Normal Ones Aged from 3 to 5. *Journal of Audiology and Speech Pathology*, 394-397.

[28] Fan Jialu.(2010). On the Correlation Between Hearing-Impaired children with hearing impairment's Articulation Ability and Continuous Phone-Repeating Ability. *Chinese Journal of Special Education*, 58-62.

[29] Fan Jingbo. (2019). Research on the Influence of Family Academic Support on Adolescents' Academic Achievement. *Xuehai* (02), 66-71.

[30] Ganerdene Lkhamsuren. (2014). *Language-based family early intervention for children with hearing impairment with intellectual disabilities (Master's thesis)*. Central children with hearing impairment Normal University.

[31] Gao Peng & Liu Xiongwei. (2017). The Effect of Auditory Compensation Time on the Rehabilitation of Hearing-Impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 213-215.

[32] Gao Xiaojun. (2022). *Research on the Learning Quality of web-based Education in*

Universities in China .East China Normal University.

- [33] Gao Zhaoqin, Han Zhiguo, An Xiurong, Mizhikamili Yusufu, Chai Guangli & Ablikmu Yiming.(2022). The Effect of Orff Music Intervention Combined with Picture Book Training on Hearing-impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 130-132.
- [34] Gao Yuxiang. (2021). A Comparative Study on Online Learning between Deaf and Hearing Senior High School Students during the Epidemic Period. *Journal of Beijing Union University*, 86-92.
- [35] Geers, A. E., & Moog, J. S. (1992). Speech perception and production skills of students with impaired hearing from oral and total communication education settings. *Journal of Speech, Language, and Hearing Research*, 1384-1393.
- [36] Gong Jing, Shi Mingxu, Zhao Min & Yang Hua. (2020). The Effect of Language Training Combined with Game Training on Hearing-Impaired children with hearing impairment's Auditory and Speech Ability. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 446-448, 481.
- [37] Gordon, K. A., Jiwani, S., & Papsin, B. (2013). Benefits and Detriments of Unilateral Cochlear Implant use on Bilateral Auditory Development in children with hearing impairment who are Deaf. *Frontiers in Psychology*, 719.
- [38] Guan Wenjun, Yan Tingrui & Deng Meng. (2015). The Characteristics of Parenting Stress of Parents of Children with Disabilities and Their Effects on Their Quality of Life: The Mediating Role of Social Support. *Psychological Development and Education*, 411-419.
- [39] Guo Meiman. (2015). Special Education Laws In the United States. *The Development of Special Education*, 45-56.
- [40] Guo Wenbin & Fang Junming. (2016). Survey on parenting education needs of parents of school-age autistic children. *Journal of Northwest Normal University (Social Science Edition)* (03), 101-105.
- [41] Guo Ying & Deng Meng. (2021). A Case Study on the Transfer Mode of Rehabilitation Education for children with hearing impairment with Hearing Impairment under Integrated Education Background. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 371-374.
- [42] Guo Yuqi.(2015). Misunderstandings and Countermeasures of Language Rehabilitation for Hearing Impaired children with hearing impairment. *Journal of Suihua University*, 63-66.
- [43] Guo Yuran, Shen Min, Huang Hongyan, Long Jiang, Liu Minghe, Zheng Shihan, Chen Xiangyu, Liang Wei. (2021). A Case Study Report in the Practice of Tele-Rehabilitation from Auditory-Verbal Therapy. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 58-60.
- [44] Han Rensheng. (2004). Return and Cause Theory in Education. *Theory and Practice of Education*, 4-7.
- [45] Hao Jian & Su Yanjie. (2006). Theory of Mind Development of Deaf children with hearing impairment from Normal-hearing and Deaf Families. *Chinese Journal of Special Education*, 45-51.
- [46] Harahan Daniel P. , Kaufman James M. , Peggy C. (2010). *Introduction to Special Education*. Renmin University of children with hearing impairment Press.
- [47] He Huizhong & He Lizhong. (2009). Comparison of pragmatic communication behavior

between hearing-impaired and hearing children with hearing impairment aged 4-6. *Journal of East children with hearing impairment Normal University (Educational Science Edition)*, 63-71.

[48] He Lizhong & Yi Lixin.(2012). A Comparative Study on the Pragmatic Communication Behavior of Chinese Severely Hearing Impaired children with hearing impairment and Their Listening Mothers. *Theory and Practice of Education*, 43-45.

[49] Hilviu, D., Parola, A., Vivaldo, S., Di Lisi, D., Consolino, P., & Bosco, F. M. (2021). children with hearing impairment with hearing impairment and early cochlear implant: A pragmatic assessment. *Heliyon*, e07428.

[50] Huang Jingjing & Liu Yanhong. (2006). An Investigation Report on Social Support to The Families with Children of Special Needs. *Chinese Journal of Special Education*, 3-9.

[51] Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., & Rathmann, C. (2014). Ensuring language acquisition for deaf children: What linguists can do. *Language*, e31-e52.

[52] Hu Xiangyang. (2012). *Comprehensive Rehabilitation of children with hearing impairment with Hearing Impairment*. Bei Jing Science and Technology Publishing.

[53] Hu Xiaoe & Zhang Weixin. (2015). Research on the Relationship between Adolescent Values and Their Parents' Education, Parenting Style, and Job Nature. *Vocational & Technical Education Forum*, 25-32.

[54] Huang Caiqing. (2013). The Overview of the Study on the Relationship between Parental Involvement and Child's Development. *Advances in Psychology*, 4-11.

[55] Huang Shuang & Huo Liyan. (2014). The Main Factors Affecting Children's Approaches to Learning: Research Progress and Implications. *Comparative Education Review*, 40-45.

[56] Huang Yun, Feng Jin, Nian Na, Lu Shufang. (2017). The effects of cognitive intervention on anxiety in patients with dysaudia. *Journal of International Psychchildren with hearing impairment*, 1138-1141.

[57] Huang Zhaoming, Du Xiaoxin, & Ji Peiyu. (2004). Research on the Model of Combining Medicine and Education for the Deaf children with hearing impairment's Rehabilitation. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 42-44.

[58] Huang Zhaoming, & Zhou Hongsheng. (2006). *Principles and methods of rehabilitation education for deaf children with hearing impairment: HSL theory and the construction and practice of 1+X+Y model*. East children with hearing impairment Normal University Press.

[59] Huang Zhonghe & Zhu Nan.(2019). On the Speech Act Interactions between Teachers and Students in Chinese Language and Literature Classrooms of Schools for Hearing-Impaired Students-Based on the Flanders Interactive Analysis System (FIAS). *Chinese Journal of Special Education*, 48-55.

[60] Hui Fenfen, Wan Qin, Gao Xiaohui, He Xiaoqin, Kim Ha-kyung & Wu Jing. (2017). Characteristics and influencing factors of speech fluency in preschool hearing-impaired children with hearing impairment after hearing aid. *Journal of Audiology and Speech Pathology*, 410-414.

[61] Indah, R. N. (2018). The Communication Methods in English Classroom for Indonesian Deaf Students. *Theory and Practice in Language Studies*, 8(1), 9-16.

[62] Ji Caijun. (2016). A Supporting Study of the “Left-behind” Children Education Based on Empirical Investigation: Take One Middle East X Area of Jiangsu Province as an Example. *Global Education*, 34-47.

[63] Jia Hui. (2021). *A Comparative Study on the Effect of Auditory and Speech Rehabilitation in*

Children with Hearing Impairment under Different Models of CI. Lanzhou University.

- [64] Jiang Xiaomei, Wang Zhongxiang, Xia Xinghai & Zhang Yanhong. (2010). Survey on Parenting and Nutritional Status of Inter-generational Children in Rural Areas. *Maternal and Child Health Care of China*, 1241-1242.
- [65] Jiang Xiaoying. (2005). A Case Study on Family Education of a Mainstreamed Deaf Children. *Chinese Journal of Special Education*, 4-8.
- [66] Jiwani, S., Papsin, B. C., & Gordon, K. A. (2016). Early unilateral cochlear implantation promotes mature cortical asymmetries in adolescents who are deaf. *Human brain mapping*, 37(1), 135-152.
- [67] Khodeir, M. S., Moussa, D. F. E. S., & Shoeib, R. M. (2021). The effect of age at time of cochlear implantation on the pragmatic development of the prelingual hearing impaired children with hearing impairment. *The Egyptian Journal of Otolaryngology*, 37(1), 1-9.
- [68] Klein, D. M., & White, J. M. (1996). *Family theories: An introduction*. Sage Publications, Inc.
- [69] Lan Li, Li Fei, Liu Yuqing, Ye Qing, Yang Kejie, Wang Min, Tao Fangqing, Han Wei, Zhang Yuan, Wang Youqin. (2015). Comparison of Auditory and Speech rehabilitation Effects of Hearing Impaired children with hearing impairment under Different Auditory Compensation Methods. *Journal of Audiology and Speech Pathology*, 186-190.
- [70] Lan Zebo, Liang Xiaowei, Wang Zhengguang, Jiang Kun, Meng Zhu & Yan Guoli. (2020). An Eye Movement Study on Phonetic Processing in Sentence Reading of Hearing-impaired College Students. *Journal of Psychological Science*, 997-1003.
- [71] Lei Jianghua & Fang Junming. (2007). Research on the effect of oral language teaching for children with hearing impairment on the development of lip-reading speech recognition skills for hearing impaired students. *Educational Research and Experiment*, 70-72.
- [72] Lei Jianghua, Gan Linlin & Fang Junming. (2006). The Effect of Hearing Aid on Lipreading Phonetic Identification of Hearing Impaired children with hearing impairment. *Journal of Psychological Science*, 1442-1443+1463.
- [73] Lei Lihong, Ding Xiaoli & Ding Yongli. (2020). Analysis of Influencing Factors of Speech Rehabilitation in children with hearing impairment after Cochlear Implantation and Application Value of Family Education Rehabilitation Model. *Chinese General Practice Nursing*, 4237-4240.
- [74] Lei Shilin, Shi Maoxue, An Qinjuan & Lu Yan. (2019). Exploration of a New Model of Hearing and Speech Rehabilitation for Young Hearing Impaired children with hearing impairment under the Fusion of IFSP and IEP. *Comparative Research of Cultural Innovation*, 134-136.
- [75] Lenneberg, E. H. (1967). The biological foundations of language. *Hospital Practice*, 59-67.
- [76] Leonard Tochukwu Ugwuanyi, Josephine children with hearing impairmentoma Ubah, Mabel Uzo Eze, Obatta Mercy Ijeoma, Mkpoikanke Sunday Otu, Adaka, Philomina Ifeoma Ezeugwu (2017). Using Total Communication Technique in teaching for children with hearing impairment Students with Hearing Impairment in Inclusive Classrooms in Enugu State-Nigeria: Teachers' Perspectives and Difficulties. *Australian Journal of Basic and Applied Sciences*, 11(5), 100-107.
- [77] Li Huan, Yang Aijia, Li Dengyu, Xia Yixuan, Ouyang Mengting & Yin Yulian. (2016). An Evidence-Based Research into the Methods of Hearing-Impaired children with hearing impairment's Speech-Language Rehabilitation. *Chinese Journal of Special Education*, 36-43.
- [78] Li Jiali & He Ruizhu. (2019). Family Education Time Investment, Economic Investment and

Youth Development: Social Capital, Cultural Capital and Shadow Education Interpretation. *Youth Studies*, 97-105.

[79] Li Mingying.(2020). *Serial Experimental Study on the Ability of Fast Mapping in children with hearing impairment with Hearing Impairment (Master's thesis)*. East children with hearing impairment Normal University.

[80] Li Qiang. (2002). The Evolution of Korean Sign Language and Education for the Deaf. *Modern Special Education*, 46-48.

[81] Li Yanbin. (2017). Follow the Rules, Adapt Measures to Local Conditions, and Build a Home-school Education. *Mental Health Education in Primary and Secondary School*, 64-65.

[82] Li Yanfang & Lu Ying. (2013). The Effect of Investment in Family Education on Preschoolers' Early Academic Skills:the Intermediary Role of Early Approaches to Learning. *Chinese Journal of Special Education*, 63-70.

[83] Li Yun, Chen Xiangping, Tao Zheng & Wu Hao. (2010). Outcome Study of the Early Intervention of Infants and Young Children with Hearing Loss Greater than Moderate Degree. *Journal of Audiology and Speech Pathology*, 176-179.

[84] Li Yong & Cai Yingqi. (2018). On Family Education Supporting in China. *Studies in Preschool Education*, 61-63.

[85] Li Yuming, Liang Yong, Tan Shaozhen & Li Xiang. (2014). Dynamic Influencing Factors of Hearing-ability in Prelingual Deafness Hearing Impaired children with hearing impairment after Rehabilitation Training. *Chinese Journal of Ophthalmology and Otorhinolaryngology*, 239-243.

[86] Liang Xu. (2010). *Study on the Refluxed Problem of Hearing-impaired children with hearing impairment Studying in Regular Class (Doctoral dissertation)*, Northeast Normal University.

[87] Lin Guiru, Hong Youzhen, Chen Peihua, Ma Yingjuan, Lin Shujuan, Chen Lijing, Qiu Fengyi (2015). *Family-Centered Early Rehabilitation of children with hearing impairment with Hearing Impairment-Auditory Verbal Therapy Practice*. Psychological Publishing.

[88] Liu Juan. (2018). Investigation of Mental Health of Hearing Impairment children with hearing impairment and Countermeasures. *Journal of modern special education*, 59-65.

[89] Li Jun. (2008). Parent Education Training Research: From Family Education to Parent Education. *Adult Education*, 10-13.

[90] Liu Lili, Dong Bei, Dao Weijie, Chen Bin & Liu Yiling. (2019). Investigation and Analysis of Auditory-Verbal Therapists and Their Professional Development. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 374-378.

[91] Liu Min, Su Zhenzhong, & Chen Xihui. (2006). Development and plasticity of the auditory central nervous system. *Chinese Journal of Otolaryngology*, 72-75.

[92] Liu Qiaoyun, Zhao Hang, Chen Li, Huang Zhaoming, Zhang Mengchao, Sun Xibin & Zhang Fang. (2011). Acquisition Process of Phoneme Contrast for children with hearing impairment Aged 3 to 5. *Journal of Audiology and Speech Pathology*, 116 -119.

[93] Liu Yongping, Jiang Arui, Tang Ziwei, Liu Qiuxia & Chen Feng. (2017). Comparative Analysis on the Typical Cases of the Social Supports for the School-age Hearing-impaired children with hearing impairment's Family Education. *The Science Education Article Cultures*, 147-149+175.

[94] Lozano, E. A., Conesa, M. D. G., & Luque, F. C. (2009). Family intervention in children with hearing impairment with language disabilities: a review. *Electronic Journal of Research in Educational Psychology*, 7(1), 1419-1448.

- [95] Lu Cailing & Li Qiang. (2010). Research and Exploration of Bilingual teaching for children with hearing impairment for Hearing Impaired Persons. *Journal of Henan Institute of Education*, 60-62.
- [96] Lu Qing, Zeng Bin. (2004). On The Thought Of The Phenomenon Of " Father' s Absence" . *Journal of Xihua University (Philosophy and Social Science Edition)* (06), 78-80.
- [97] Lu Xiaoyue.(2004). *Research on auditory and speech training methods after cochlear implantation (Master's thesis)*. Jilin University.
- [98] Lv Jiexin & Wang Hongcheng. (2020). Education Equity and Quality under COVID-19. *Journal of Comparative Education*, 15-30.
- [99] Nyaata, M. K. (2018). *Total communication teaching for children with hearing impairment approach and its influence on transition of class three learners with hearing impairment in special schools in Kisii County, kenya*. Kenyatta University.
- [100] Ma Shuang, Gao Ran, Wang Yiqing & Wang Xiaohua. (2019). The status quo of father participation in rural areas and its relationship with child development. *Studies in Preschool Education*, 51-61.
- [101] Ma Xiaonan, Feng Miao, Wang Chunying, Zhou Bin, Tao Yanqing & Yang Dongyu. (2011). The Effect of Family Rehabilitation Training in children with hearing impairment after Cochlear Implantation. *Chinese Journal of Modern Nursing*, 1776-1779.
- [102] Mayberry, R. I., & Eichen, E. B. (1991). The long-lasting advantage of learning sign language in children with hearing impairment: Another look at the critical period for language acquisition. *Journal of memory and language*, 486-512.
- [103] May-Mederake, B., & Shehata-Dieler, W. (2016). A case study assessing the auditory and speech development of four children with hearing impairment implanted with cochlear implants by the chronological age of 12 months. *Case reports in otolaryngology*, 2013.
- [104] Ma Zhongliang, Dong Yaodong, Liu Dongliang, Hu Yue & Ma Xiulan. (2016). Comparison of Rehabilitation Effects of Prelingually Deaf Children with Cochlear Implantation in Preschool Children of Different Ages. *Journal of Audiology and Speech Pathology*, 269-272 .
- [105] Miao Yihong. (2008). Return to Deafness: Unavailable Issue in Deaf Education. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 48-49.
- [106] Ministry of Education of the People's Republic of children with hearing impairment. (29. 03. 2020). *Ministry of Education of the People's Republic of children with hearing impairment: National Smart Education Platform Effectively Supports "Double Reduction" and "Classes Suspended but Learning Continues"*. Retrieved from <https://t.yynet.cn/baijia/32517907.html>.
- [107] Mu Chanchan.(2019). *A case study of Auditory Verbal Therapy in Promoting Language Rehabilitation of Preschool Hearing-impaired children with hearing impairment (Master's thesis)*. Central children with hearing impairment Normal University.
- [108] Mu Yimeng.(2018). *A Study on Vocabulary Level of Hearing Impaired children with hearing impairment Aged 4-5 (Master's Thesis)*. Nanjing Normal University.
- [109] National Health Commission of People's Republic of China. (2010). The Screening Guidelines of Newborns' Diseases. *Chinese Journal of Child Health Care*, 574-575.
- [110] Oziębło, D., Obrycka, A., Lorens, A., Skarżyński, H., & Ołdak, M. (2020). Cochlear implantation outcome in children with hearing impairment with DFNB1 locus pathogenic variants. *Journal of clinical medicine*, 9(1), 228.
- [111] Pollack, I. (1970). Depth of Sequential Auditory Information Processing: II. *The Journal of*

the Acoustical Society of America, 48(4B), 906-912.

[112] Qi Beier, Dong Ruijuan, Li Xiaofang, Gao Wenbin & Liu Bo. (2015). The Effect of Rehabilitation of Improving Physical and Mental Health on Different Rehabilitation Programs for Post-linguistic Cochlear Implanters. *Journal of Clinical Otorhinolaryngology Head and Neck Surgery*, 304-309 .

[113] Qiu Sumei, Zou Yudi, Zhang Yingwen & Xie Wei. (2021). Analysis of the Rehabilitation Effect of Cochlear Implantation in 50 Hearing-impaired children with hearing impairment. *Journal of Audiology and Speech Pathology*, 211-213.

[114] Qiu Xiaoju & Wang Lixin. (2010). Parental Involvement in the Early Intervention of Children with Autism and the Factors That Affect Parental Involvement. *Chinese Journal of Special Education*, 37-41.

[115] Qu Chengyi, Wang Yanping, Han Rui, Teng Baiyu, & Sun Xibin. (2009). An Economic Analysis of the Cost of Hearing Aid Fitting and Rehabilitation Services for Hearing Impaired children with hearing impairment in children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 16-21.

[116] Scientific Committee on Emerging and Newly Identified Health Risks. (23. 09. 2008). *Potential health risks of exposure to noise from personal music players and mobile phones including a music playing function*. Retrieved from https://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_018.pdf

[117] Shaffer. D. R. (2005). *Psicologia do desenvolvimento. Infância e adolescência*. Tradução de Sandra Regina Pemberton Cancissu. São Paulo, *Pioneira Thomson Learning*.

[118] Sharma, A., & Campbell, J. (2011). A sensitive period for cochlear implantation in deaf children with hearing impairment. *The Journal of Maternal-Fetal & Neonatal Medicine*, 24(sup1), 151-153.

[119] Sharma, A., Dorman, M. F., & Spahr, A. J. (2002). A sensitive period for the development of the central auditory system in children with cochlear implants: implications for age of implantation. *Ear and hearing*, 532-539.

[120] Sharma, A., Nash, A. A., & Dorman, M. (2009). Cortical development, plasticity and re-organization in children with hearing impairment with cochlear implants. *Journal of communication disorders*, 42(4), 272-279.

[121] Shen Min & Li Su. (2011). A Comparative Study of Ability to Raise Questions Initiatively in Narratives of Typical children with hearing impairment and Hearing-impaired children with hearing impairment at Age 3. *Journal of Audiology and Speech Pathology*, 501-505.

[122] Sheng Zhihua, Jiang Yan. (2004). A Study on Parents' Educational Level and Children's Educational Environment. *Maternal and Child Health Care of China*, 66-68.

[123] Shoeib, R. M., Kaddah, F. E. Z. A., Kheir El-Din, S. T., & Said, N. M. (2016). Study of pragmatic language ability in children with hearing impairment with hearing loss. *The Egyptian Journal of Otolaryngology*, 32(3), 210-218.

[124] Socher, M., Lyxell, B., Ellis, R., Gärskog, M., Hedström, I., & Wass, M. (2019). Pragmatic language skills: A comparison of children with hearing impairment with cochlear implants and children with hearing impairment without hearing loss. *Frontiers in psychology*, 10, 2243.

[125] Stewart, D. A. (1992). Initiating reform in total communication programs. *The journal of special education*, 26(1), 68-84.

[126] Song Shuang & Guo Yu. (2018). The Influence of Family Background Factors on the

Academic Achievement of Junior High School Students in Mathematics. *Journal of Mathematics Education*, 52-57+102.

[127] Sui Chunling, Zhao Xin & Zuo Juanjuan. (2021). Special Education Teachers' Online teaching for children with hearing impairment Quiz During the Epidemic. *Journal of Tangshan Normal University*, 150-155.

[128] Sun Ying, Wang Yan & Niu Yonghong. (2012). Research into the Current Situation of Special Education Teachers in Beijing. *Chinese Journal of Special Education*, 50-55.

[129] Sundström, S., Löfkvist, U., Lyxell, B., & Samuelsson, C. (2018). Phonological and grammatical production in children with hearing impairment with developmental language disorder and children with hearing impairment with hearing impairment. *children with hearing impairment Language teaching for children with hearing impairment and Therapy*, 34(3), 289-302.

[130] Svartholm, K. (2010). Bilingual education for deaf children with hearing impairment in Sweden. *International journal of bilingual education and bilingualism*, 13(2), 159-174.

[131] Taiwan Special Education Association. (1986). *Diagnosis and Counseling of Special Children*. Psychological Press.

[132] Tang Yaling. (2006). On the Fairness of the Starting Point of Education. *Journal of Chengdu College of Education*, 16-18.

[133] Turnbull, A., Summers, J. A., & Brotherson, M. J. (1984). *Working with families with disabled members: A family system approach*. Lawrence: University of Kansas, Kansas University Affiliated Facility.

[134] UNICEF. (12, 05, 2020). *UNICEF Appeals for \$1.6 Billion to Meet Growing Needs of children with hearing impairment Impacted by COVID-19 Pandemic*. Retrieved from <https://www.unicef.org/press-releases/unicef-appeals-16-billion-meet-growing-needs-children-with-hearing-impairment-impacted-covid-19-pandemic>.

[135] United States Congress. (17, 02, 2005). *Individuals with Disabilities Education Act (IDEA)*. Retrieved from https://insource.org/files/pages/0087-idea_faq.pdf.

[136] Wan Yi. (2011). The key to auditory verbal therapy lies in the deep participation of parents. *Journal of Audiology and Speech Pathology*, 258-259.

[137] Wang Dongdong, Wang Huaibo, Zhang Wei, Wang Hairong & Shen Xiaoping. (2020). Research on Online teaching for children with hearing impairment in the Period of “Suspending Classes without Stopping Learning” . *Modern Educational Technology*, 12- 18.

[138] Wang Hongtian, Xi Xin, Wang Rongguang.(2002). Review of the development of hearing aids. *International Journal of Otolaryngology-Head and Neck Surgery*,379-385.

[139] Wang Qiuju, & Ji Fei. (2015). Trends in Presbycusis in children with hearing impairment. *Journal of Clinical Medicine in Practice*, 481-483.

[140] Wu Ting. (12, 01, 2021). Liang Wei, *Deputy Director of children with hearing impairment Hearing and Speech Rehabilitation Research Center: There is a Huge Shortage of Speech and Language Therapists, and the Accelerated Rehabilitation Industry Talent Training Plan is Imminent*. Retrieved from <https://baijiahao.baidu.com/s?id=1688663563259599429&wfr=spider&for=pc>.

[141] Wang Jingqiang, Wang Xinbao & Sun Beibei. (2022). Exploration of the Family Education Guidance Service Model for Preschool Hearing Impaired children with hearing impairment. *Journal of modern special education*, 65-67.

- [142] Wang Xiangyu. (2010). *Family participation and its relationship with preschool children's learning behavior and social ability*, Shanghai Normal University.
- [143] Wang Xinran. (2020). *The Relationship Between Cognitive Flexibility, Phonological Awareness and Reading Comprehension and Its Promotion on Deaf children with hearing impairment (Master's thesis)*. Hebei University.
- [144] World Health Organization. (27. 02. 2023). *Deafness and hearing loss*. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>
- [145] Wu Yuwei. (2017). On the Influence of the Original Family on Individual Development: From the Family System Theory. *Journal of Quanzhou Normal University*, 88-92.
- [146] Xia Jingyu, Guan Yanping & Xue Yongqiang. (2012). Comparison of Phonetic Articulation between Hearing-impaired and Normal children with hearing impairment in 4.5~5.5 Years Old Groups. *Chinese Journal of Rehabilitation Theory and Practice*, 707-709.
- [147] Xia Yixuan. (2020). The Use of Comprehensive Communication Method to Improve the Effectiveness of Mathematics teaching for children with hearing impairment in Deaf Schools. *Chinese and Foreign Communication*, 70.
- [148] Xiao Yongtao & Zhu Jiaqian. (2020). Comparison of the Vocalization Characteristics of Second Tones Between 3-5-year-old Hearing-impaired children with hearing impairment and Hearing children with hearing impairment. *Journal of Audiology and Speech Pathology*, 207-209.
- [149] Xie Ailei. (2020). Current Situation of Father Participation and Its Relationship with Preschool Children's Development in the Rural Areas. *Global Education Perspectives* (03), 42-56.
- [150] Xie Jiangbin & Huang Haiyan. (2018). A Case-Based Study on the Auditory Recognition Ability of the Zhuang Nationality children with hearing impairment with Hearing Impairment. *Survey of Education*, 10-12.
- [151] Xie Xiaoni, Zhou Xueyan & Wei Xingmei. (2016). Analysis of Auditory Rehabilitation in Adult Impaired Patients Cochlear Implant Cases. *World Latest Medical Information*, 15-16, 19.
- [152] Xu Luying & Zhou Nianli. (2016). On the Present Status and Needs for Parent Education of Preschool Children. *Studies in Early Childhood Education*, 57-66.
- [153] Xu Qi. (2018). The Impacts of Migrating Parents on Academic Performance of the Rural Left-behind Children. *Youth Studies*, 39-51+92.
- [154] Xu Qinfang & Hu Xinyi. (2019). A Study on Chinese Reading Competence of Hearing Impaired children with hearing impairment: The Role of Phonological Processing and Oral Vocabulary. *Chinese Journal of Special Education*, 35-43.
- [155] Xu Xiaomei. (2002). Progress in Non-verbal Communication Research. *Zhejiang Social Sciences*, 166-171.
- [156] Yan Wenjuan, Cai Chunlian, Tu Xiantao. (2016). A Systematic Review of the Impact of Family Intervention on the Quality of life of COPD Patients. *Contemporary Nurses*, 22-25.
- [157] Yao Qinmin. (2017). Sign Bilingualism and Co-enrolment in Deaf Education (SLCO) : An Education Approach that Benefits both Deaf and Hearing children with hearing impairment. *Journal of Beijing Union University*, 29-35.
- [158] Yang Guangxue, Guo Dehua & Qian Xuqiang. (2011). On the Investigation into and the Analysis of the Occupational Status of Teachers from Autism Rehabilitation Agencies. *Chinese Journal of Special Education*, 66-71.
- [159] Yang Guowei. (2021). Analysis of Language teaching for children with hearing impairment for Hearing-impaired Students in Special Schools. *Scientific Consult*, 89-90.

- [160] Yang Jinyong, Pei Wenyun, Liu Shengfeng, Zhang Dongshu, Zhang Xiang, Jiang Hui, Jiang Lijie & Yu Ruili. (2020). Online teaching for children with hearing impairment Practice and Experience During the Epidemic. *children with hearing impairment Educational Technology*, 29-41.
- [161] Yang Tianping. (2003). Encouraging and Guiding Parents to Participate——Research and Practice of Educational Management Reform in American Primary and Secondary Schools. *Foreign Primary and Secondary Education*, 11-14.
- [162] Yang Ying & Sun Xibin. (2013). Chinese Journal of Rehabilitation Theory and Practice. *Chinese Journal of Rehabilitation Theory and Practice*, 620-622.
- [163] Yang Ying, Wang Liyan, Sun Xibin, Song Lei, Cao Li, Wang Jian, Ding Chunlan, Liu Yang, Wang Rui, Wang Yongming, Shen Yi, Xu Shenglin, Zhu Ligu. (2015). Follow up study on auditory development of congenital hearing-impaired infants and toddlers. *National Medical Journal of children with hearing impairment*, 3027-3031.
- [164] Yi Ling.(2013). *Research on intonation characteristics and abnormal intonation intervention of hearing-impaired children with hearing impairment (Master's thesis)*. East children with hearing impairment Normal University.
- [165] You Lina. (2021).Practice and Reflection on Online teaching for children with hearing impairment for Deaf Students in Adult Colleges under the Epidemic. *Journal of Suihua University*, 55-59.
- [166] You Yanyan, Guo Qianqian, Han Junning, Meng Chao & Chen Xueqing. (2016).The Relationship Between Auditory and Speech Abilities in Hearing Impaired children with hearing impairment after Hearing Intervention. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 251-254.
- [167] Yu Jing, Wang Aiguo & Lu Yiguang. (2010). Investigation and Research on the Mental Health of Hearing Impaired College Students. *Journal of Changchun University*, 33-36.
- [168] Yu Qinfang. (2016). Investigation on the Current Situation of Primary School Students' Fathers Participating in Family Education. *Journal Of Shanghai Educational Research*, 53-56.
- [169] Yuan Hao, Zhang Hua, Liang Wei, Wang Liyan, Sun Xuegang, children with hearing impairment Meifen, Guo Fugui & Yang Xiaohui. (2015). A Study of External Factors Affecting the Auditory Ability of Infants with Cochlear Implantation. *Clinical Journal of Clinical Otorhinolaryngology Head and Neck Surgery*, 1671-1676.
- [170] Yue Yaping & Ren Yaru. (2021). The Influence of Family Support on the Learning Quality of 5~6 Years Old Children. *Studies in Preschool Education*, 5-16.
- [171] Zeng Yanbo. (2006). A Survey on the Current Situation of Family Education of Secondary and Primary School Students. *Journal of China Youth College for Political Sciences*, 36-43.
- [172] Zhai Bo. (2016). Establishing the Family Education Value of the New Period. *Educational Research*, 92-98.
- [173] Zhan Yizhi & Li Xiaoyun. (2016). The Effects of Auditory-Verbal Therapy in Improving Language Ability of Pre-school children with hearing impairment with Hearing Loss. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 217-219.
- [174] Zhang Fang, Liu Qiaoyun, Fan Jialu, Wan Lili, Huang Zhaoming & Sun Xibin. (2010). A Study on the Intelligibility of Switchchildren with hearing impairment of Continuous Speech in 3 to 5 Years Old children with hearing impairment. *Journal of Audiology and Speech Pathology*, 430-432.

- [175] Zhang Jichun, Li Jia, Zhao Guojun & Lu Huiting. (2019). The Relationship of Hearing Rehabilitation and School Adjustment among Students with Hearing Impairment Learning in Regular Class. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 53-57.
- [176] Zhang Kexu & Zheng Donghui. (2019). Investigation and Research on Parents' Participation in Homework Behavior and Effects — — Based on 1402 Data from Province Z. *Shanghai Education Research*, 80-87+59.
- [177] Zhang Lijun.(2005). Experimental Iksearch on the Development of Chinese Phonological Awarenesss of Hearing Impaired Students. *Chinese Journal of Special Education*, 20-25.
- [178] Zhang Lei, Han Xiuhua & Wang Meimei. (2019).Features of Connected Speech Intelligibility of Hearing-Impaired children with hearing impairment Aged 4~6. *Journal of Audiology and Speech Pathology*, 148-151.
- [179] Zhang Lei, Han Xiuhua, Wang Meimei & Li Mingying. (2018). Phonetic Variation Error Characteristics and Affecting Factors in the Continuous Speech of Preschool Hearing-impaired children with hearing impairment. *Journal of Audiology and Speech Pathology*, 505-509.
- [180] Zhang Li, Chen Junlan, Dong Bei. (2013). The History and Current Status of Auditory — verbal Therapy. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 425-427.
- [181] Zhang Niaoying. (2015). *The Current Situation and Optimization of "Bilingual" teaching for children with hearing impairment for Hearing-impaired Students in Special Schools. (Master's thesis)*. Hunan University of Science and Technology.
- [182] Zhang Ningsheng. (2012). On the Communication Modes and Deaf School Education teaching for children with hearing impairment. *Journal of Guizhou University of Engineering Science*, 54-60.
- [183] Zhang Mian, & Gao Yang. (2008). Hearing Levels of Deaf children with hearing impairment in Deafmute Schools. *Chinese Archidren with hearing impairmentves of Otolaryngology-Head and Neck Surgery*, 671-673.
- [184] Zhang Qian. (2015). *The Study on Auditory Comprehension of Hearing-impaired children with hearing impairment (Master's thesis)*. Liaoning Normal University.
- [185] Zhang Xiaoyu. (2017). The ability of parents to deeply participate in the rehabilitation teaching for children with hearing impairment of hearing-impaired children with hearing impairment and their promotion strategies. *Xinkecheng*, 238-239.
- [186] Zhang Yang, Chen Bin, Dong Bei, Shen Min, Zhang Fang & Wang Liyan. (2021). A Longitudinal Study of the Auditory Ability Development of CI children with hearing impairment Aged 1-6 Years Old. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 223 -226.
- [187] Zhang Yunshu & Liu Qiaoyun.(2019). An Analysis about the Mandarin Initials Intelligibility of the Students with Hearing Aids in Shanghai. *Journal of Schooling Studies*, 82-89.
- [188] Zhang Zhixue. (1990). The Development and Current Situation of Family System Theory. *Psychological Exploration*, 31-34+20.
- [189] Zhao Hang, Tao Renxia, Sun Xibin & Liu Qiaoyun. (2017). The Development and Tracking Study of Auditory Ability in Binaural-Bimodal Fitting children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 359-361.
- [190] Zhao Lianwei. (2010). *Investigation and Countermeasures of the Absence of Fathers in Family Education*. East China Normal University.
- [191] Zheng Wenfang & Chen Junlan. (2020). Analysis of Language teaching for children with hearing impairment Activities in Remote Auditory-Verbal teaching for children with hearing

impairment for Young Hearing-Impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 332-335.

[192] Zhou Airan, Chen Jing, Han Xi, He Sajin & Wu Rongxiu.(2019). Analysis of the Auditory Ability Development of 0-3 Years Old children with hearing impairment with Cochlear Implantation. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 397-400.

[193] Zhou Airan, He Saijin, Qiu Hongxiao, Tao Renxia & Xue Wei.(2020). Case Analysis of the Influence of Reading Pictures Intervention on the Development of Language Ability of Hearing-Impaired children with hearing impairment. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 211-214.

[194] Zhu Lin, Xue Kun & Yu Wenxin.(2019). Research on Classroom teaching for children with hearing impairment Language of Hearing Impaired College Students from the Perspective of Information Communication. *Journal of Beijing Union University*, 75-79.

[195] Zhu Lingyan. (2016). The Relationship between Parents' Absence during Personal Growth Period and Social Communication Action in the Adulthood. *Studies in Early Childhood Education*, 29-37.

[196] Zhu Xueke & Liang Wei.(2021). Standardization Construction Strategy and Trial Effect of Remote AVT teaching for children with hearing impairment Management. *Chinese Scientific Journal of Hearing and Speech Rehabilitation*, 452-454+457.

APENDIX

PowerPoint of the Professional Lecture

Due to the PowerPoint is more than 150 pages, so the PowerPoint is presented with a web link.

Web link: <https://pan.baidu.com/s/1UAHMeqcEYLMGJH8BNi0aaA?pwd=1111>

Pin: 1111

Individualized Family Education Plan Template

1. Information of Child and Family

Name of child		Birth date of child		Main caregiver and educator in family	
----------------------	--	----------------------------	--	--	--

2. Team Members of Family Intervention

Name	Phone number	Role in the team
LI Lin	183XXXXXXXXXX	Supporter of family education
		Implementer of family education

3. Individualized Family Intervention Service Model and Duration

Family Intervention Service Model: remote (Wechat+Tencent Meeting)

Duration: 2022.09.17-2022.12.17

4. Statement of Family

As the caregiver/guardian of XXX, I hereby declare that I participated in and had knowledge of making the Individualized Family Education Plan of child. This material accurately reflects the family's concerns about the child's development. Therefore, I allow children to participate in this family intervention and I will cooperate with family education activities positively.

Signature:

Date:

5. Content of Individualized Family Education Plan

Content of family education		Objectives and description of family education
Hearing	Development level of child	
	Family education objectives	
	Family education approaches	
	Family education skills	
Cognition	Development level of child	
	Family education objectives	-
	Family education approaches	
	Family education skills	
Language	Development level of child	
	Family education objectives	
	Family education approaches	
	Family education skills	
Speech	Development level of child	
	Family education objectives	
	Family education approaches	
	Family education skills	
Communication	Development level of child	
	Family education objectives	
	Family education approaches	
	Family education skills	

Record and Comments of One to One Family Education Return Visit

Name of child		Family education implementer		Field of education	
date		Recorder	LI Lin		

Hearing

Content and process of teaching:

Comments

Advantages:

Disadvantage:

Cognition

Content and process of teaching:

comments

Advantages:

Disadvantage:

Language

Content and process of teaching:

comments

Advantages:

Disadvantage:

Speech

Content and process of teaching:

comments

Advantages:

Disadvantage:

Communication

Content and process of teaching:

comments

Advantages:

Disadvantage:

Pretest Questionnaire of Caregivers of Children with Hearing Impairment

Dear children's parents, I am —— Li Lin, a PhD candidate whose major is special education in Palacky University of Czech Republic. I am doing a research about family education support for the children with hearing impairment in hearing families. I hope you can help me to finish this questionnaire. This questionnaire needs to be completed by the main caregiver and educator of the children with hearing impairment in families. The purpose of this questionnaire is to obtain the basic information of children and their family education, and to provide corresponding programs for the subsequent family education support. All the information obtained from this questionnaire is only used for the research, and the relevant information will be kept confidential. I hope you can provide true and effective information. Sincere thanks!

1. Child's name

2. Date of birth

3. Hearing loss degree of child's ears (without hearing compensation equipment)

A. First level of hearing impairment (hearing loss more than 90 dB)

B. Second level of hearing impairment (hearing loss 81~90 dB)

C. Third level of hearing impairment (hearing loss 61~80 dB)

D. Fourth level of hearing impairment (hearing loss 41~60 dB)

4. Time of hearing loss of child

A. Within 3 months of birth

B. From 3 to 12 months after birth

C. From 1 to 3 years old after birth

D. After the age of 3

5. Whether the child wore or implanted the hearing compensation equipment

A. Yes

B. No (please skip to question 8)

6. Child's compensation equipment

A. Hearing aid for one ear

B. Cochlear implantation for one ear

C. Hearing aid for two ears

D. Cochlear implantation for two ears

E. Cochlear implantation matching with a hearing aid

7. Child's hearing compensation equipment start applied from

8. Whether child has other disorders (excluding language-speech impairment) besides hearing impairment

A. Yes

B. No (please jump to question # 10)

9. In addition to hearing impairment, child has a hospital diagnosis of

10. Whether there is other people with hearing impairment in the family living with the child for a long time

A. Yes

B. No (please jump to question 12)

11. The relationship between the people with hearing impairment and the child

12. The main caregiver and educator of child in family

A.Father

B.Mother

C. Parents

D. Grandparents

E.Others

13.The highest education degree of the main caregiver and educator of child in family

A.Primary school

B.Secondary school

C. College education

D. Bachelor degree or above

14 How many days per week does the child spend with the main caregiver and educator of child in family?

A.1 Day and below

B.1-3 Days

C.3-5 Days

D.5-7 Days

15. The average daily time of purposeful family education for the child which is getting from the main caregiver and educator of child in family

A. Under 30 minutes

B. For about 30 – 60 minutes

C. For 60 – 90 minutes

D. Over 120 minutes

16. Satisfaction degree with the current family education effect

A. Very dissatisfied

B.dissatisfied

C.Natural

D.satisfied

E. Very satisfied

17. Do you want to get relevant support from professionals for family education and rehabilitation
of children

A. Very undesired

B. Undesired

C.Natural

D.Desired

E. Very desire

Questions	Answers				
	Very dis-understand	Dis-understand	Neutral	Understand	Understand very well
18. About the application and maintenance of hearing compensation equipment					
19. About the application principle and skills of Ling's					
20. About the child's development stage of auditory memory					
21. About the child's development stage of auditory description					
22. About the child's development stage of language understanding and expression					
23. About the child's development stage of speech and strategies of dealing with their abnormal pronunciation					
24. About the education contents and methods of child's cognitive development					
25. About the education goals and skills of child's communication ability					

Questions	Answers				
	Very inconsistent	Inconsistent	Neutral	Consistent	Very consistent
26. I can often take the action to interact with child and carry out education through interesting activities such as games.					
27. With the teachers' guidance, I can often cooperate with the teacher to complete child's education and extension in school and after school.					
28. I can learn child's education and rehabilitation skills from the teacher quickly, and don't need further guidance from the teacher.					
29. I can always quickly and sensitively find the development and needs of child, and communicate with teacher timely.					
30. I have a very clear understanding of the development characteristics and educational needs of child with hearing impairment.					
31. I often carry out picture books reading or other reading activities with child.					
32. I often collect study materials actively, and provide rich study materials and environment for the child.					
33. I believe that child can achieve					

positive development through auditory speech rehabilitation and education.					
34. I am always providing rich education materials and environments of language development positively for the child.					
35. I clearly understand the changes in child's auditory speech development, and adjust teaching strategies and goals.					
36. I have very high expectations and confidence in child's auditory speech development, and carry out family education activities persistently.					

Post-test Questionnaire of Caregivers of Children with Hearing Impairment

Dear children's parents, I am —— Li Lin, a PhD candidate whose major is special education in Palacky University of Czech Republic. I am doing a research about family education support for the children with hearing impairment in hearing families. I hope you can help me to finish this questionnaire. This questionnaire needs to be completed by the main caregiver and educator of the children with hearing impairment in families. The purpose of this questionnaire is to obtain the basic information of children and their family education, and to provide corresponding programs for the subsequent family education support. All the information obtained from this questionnaire is only used for the research, and the relevant information will be kept confidential. I hope you can provide true and effective information. Sincere thanks!

1. Child's name

2. Satisfaction degree with the current family education effect

A. Very dissatisfied

B.dissatisfied

C.Natural

D.satisfied

E. Very satisfied

Questions	Answers				
	Very dis-understand	Dis-understand	Neutral	Understand	Understand very well
3.About the application and maintenance of hearing compensation equipment					
4.About the application principle and skills of Ling's					
5.About the child's development stage of auditory memory					
6.About the child's development stage of auditory description					
7.About the child's development stage of language understanding and expression					
8.About the child's development stage of speech and strategies of dealing with their abnormal pronunciation					
9.About the education contents and methods of child's cognitive development					
10.About the education goals and skills of child's communication ability					

Questions	Answers				
	Very inconsistent	Inconsistent	Neutral	Consistent	Very consistent
11. I can often take the action to interact with child and carry out education through interesting activities such as games.					
12. With the teachers' guidance, I can often cooperate with the teacher to complete child's education and extension in school and after school.					
13. I can learn child's education and rehabilitation skills from the teacher quickly, and don't need further guidance from the teacher.					
14. I can always quickly and sensitively find the development and needs of child, and communicate with teacher timely.					
15. I have a very clear understanding of the development characteristics and educational needs of child with hearing impairment.					
16. I often carry out picture books reading or other reading activities with child.					
17. I often collect study materials actively, and provide rich study materials and environment for the child.					
18. I believe that child can achieve positive development through auditory					

speech rehabilitation and education.					
19.I am always providing rich education materials and environments of language development positively for the child.					
20.I clearly understand the changes in child's auditory speech development, and adjust teaching strategies and goals.					
21.I have very high expectations and confidence in child's auditory speech development, and carry out family education activities persistently.					

Auditory Verbal Therapy Assessment Scale

Dear teachers, I am —— Li Lin, a PhD candidate whose major is special education in Palacky University of Czech Republic. I am doing a research about family education support for the children with hearing impairment in hearing families. I hope you can help me to finish this questionnaire. This questionnaire needs to be completed by the personal rehabilitation teacher of children with hearing impairment. The purpose of this questionnaire is to obtain the basic information of children's speech communication competencies in five filed, and to provide corresponding programs for the subsequent family education support. All the information obtained from this questionnaire is only used for the research, and the relevant information will be kept confidential. I hope you can provide true and effective information. Sincere thanks!

1. Name of child

Questions	Answers				
	No response	Perceivable	Recognizable	Occasionally understand	Often understand
2. Child's response to teachers' speech					
3. Child's response to their name and title of families					
4. Children's response to the Ling's					

5. What is the child's development stage of auditory memory?

1. First stage of auditory memory development or worse
2. Second stage of auditory memory development
3. Third stage of auditory memory development
4. Fourth stage of auditory memory development
5. Fifth stage of auditory memory development
6. Listen to the long sentences to answer multiple questions
7. Listen to a passage or story to answer multiple questions

6. With the visual prompts, child's development stage of auditory description is

1. First stage of auditory description development or worse
2. Second stage of auditory description development
3. Third stage of auditory description development
4. Fourth stage of auditory description development

7. Without the visual prompts, child's development stage of auditory description is

1. First stage of auditory description development or worse
2. Second stage of auditory description development
3. Third stage of auditory description development
4. Fourth stage of auditory description development

Questions	Answers				
	Very few of simple words	Few simple words	General quantity simple words and advanced words	Many advanced words	Much more advanced words
8. The quantity level of noun understanding					
9. The quantity level of verb understanding					
10. The quantity level of adjective understanding					
11. The quantity level of quantifier understanding					
12. The quantity level of other words' understanding(a dverb, pronoun, preposition)					

13. Maximum length of speaking imitation

1. Non oral

2. 1-3 words
3. 4-6 words
4. 6-9 words.
5. More than 10 words

14. Maximum length of active expression

1. Non oral
2. 1-3 words
3. 4-6 words
4. 6-9 words.
5. More than 10 words

15. Stage of expressive language development of child

1. Crib speech
2. Overlapped words
3. Imitation of single word
4. Express single words actively
5. Simple sentence
6. Complex sentence

16. Ability of questions

1. Can't understand any question
2. Can understand a few questions, but can't answer
3. Can understand some question, and answer with simple words
4. Can understand most of questions and answer them
5. Can express questions

Questions	Answers				
	Very poor	Poor	Neutral	Good	Very good
17. Child's ability of classification and pairing					
18. Child's ability of color					
19. Child's ability of shape					
20. Child's ability of quantifier					
21. Child's ability of sequence					
22. Child's ability of thinking					
23. Child's ability of express needs by oral					
24. Child's ability of waiting for the rotation					
25. Child's ability of asking question positively					
26. Child's ability of interaction positively					
27. Child's ability of keeping a same topic					
28. Child's ability of starting a topic					

Self-recording Chart of Caregivers' Family Education Information

Name of child	Interventionist																				Date of family education (Week)						
	Content of family education																				Duration Of family education	note					
	Hearing					cognition					language					speech							communica tion				
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4			0	1	2	3	4
Monday																											
Tuesday																											
Wednesday																											
Thursday																											
Friday																											
Saturday																											
Sunday																											

Note: The content only needs to tick (√) to mark the intervention field (0 means that did nothing; 1 indicates did some work, but not reached any teaching goal; 2 indicates that did some work, but not reached 1 whole teaching goal; 3 indicates that did some work, reached 1 teaching goal; 4 indicates that did some work, achieve more than one teaching goals). Family education date fill in the start and end dates of the week, and take photo to submit to me by Wechat before 8:00 pm of Sunday. Thanks!

Semi-structured Interview Outlines for the Caregivers of Children with Hearing Impairment

Dear children's parents, we are carrying out a semi-structured interview. The purposes of this interview are knowing your ideas of this family intervention and the problems and expectations of the further family intervention to optimize the family intervention and provide better support for the hearing families of children with hearing families. In order to ensure the integrity of the interview information, the entire interview will be videotaped for subsequent data collation. All related material will only be used for research purpose and will be kept confidential. Thanks!

1. Have you gained anything from the 3 months family intervention? What are the gains? If there is no gains, why there is no gains?
2. Are you satisfied with the results of this family intervention? What are the specific points of your satisfaction? If you are dissatisfied, why?
3. In this family intervention, is there any problem that you cannot accept or cooperate with? If yes, why?
4. After family intervention, what problems do you still face in the family education?
5. For this family intervention, what aspects need to be improved? Or what additional support and help would you like to receive?
6. Who is the best person to provide family intervention? Or who can provide best family intervention? Why?
7. Do you think the duration of 3 months family intervention is appropriate? Why?
8. If the family intervention continues, will you still participate? Why?