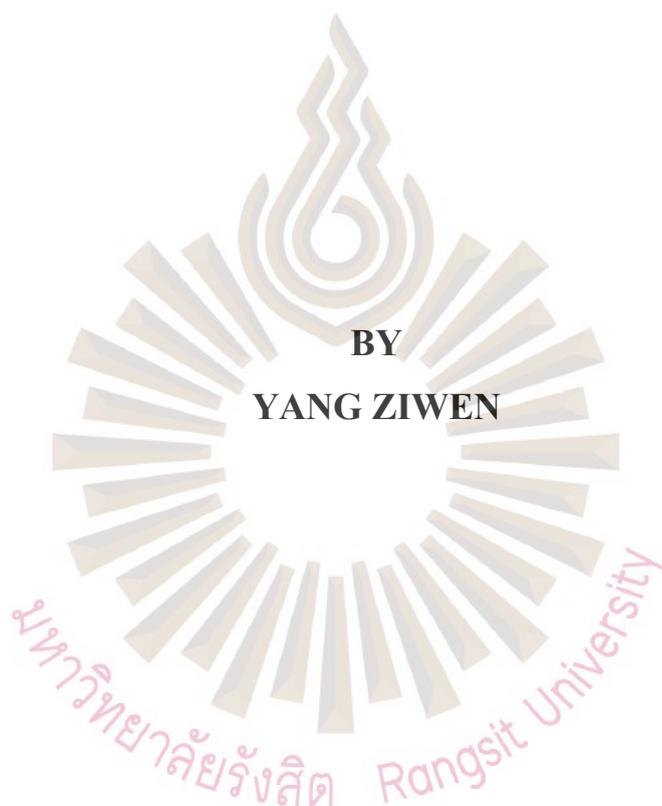




**BOOK DESIGN FOR CHILDREN WITH DEVELOPMENTAL  
DISABILITIES**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR  
THE DEGREE OF MASTER OF FINE ARTS IN DESIGN  
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**BOOK DESIGN FOR CHILDREN WITH DEVELOPMENTAL  
DISABILITIES**

by

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was submitted in partial fulfillment of the requirements  
for the degree of Master of Fine Arts in Design

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### **Abstract**

The number of children with autism has been increasing year by year, and more and more people are paying attention to the physical and mental health of these children. This study summarized and analyzed the cognitive characteristics and daily behaviors of children with autism through methods such as reviewing relevant literature, conducting in-depth school research on children with autism, and interviewing professional doctors. It was found that they were more sensitive in visual and tactile aspects, but their logical thinking and emotional discrimination ability were weak. Based on the findings, the author designed a book that could help autistic children strengthen their cognition to a certain extent, addressing the congenital defects of autistic children by analyzing successful cases of relevant interactive book models.

(Total 43 pages)

Keywords: Book Design, Interaction Design, Sensory Experience, Autistic Child

Student's Signature ..... Thesis Advisor's Signature .....

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# Chapter 1

## Introduction

### 1.1 Background and Significance of the Problem

The medical field has pointed out that due to the extremely complex characterization and causes of autism, no effective and complete disease solution has been proposed yet. In the 1950s, people believed that autism was caused by neglecting family education and parents' indifference towards children. Therefore, it is advocated that parents should provide more care and care for their children in terms of education and treatment. In the 1970s, research found that autism symptoms were not directly related to family education, and the root cause was congenital brain injury. Since the 1980s, research on cognitive teaching theory has found that cognitive impairment is the core factor causing interpersonal relationships and language disorders in children with autism. However, with the continuous development of scientific understanding of autism, the base of this special social group continues to grow, and the situation is not optimistic.

In recent years, with the increasing attention paid to autistic children, the incidence rate of autistic children has increased year by year (Cheng, 2022). Summarized according to the statistics of the Centers for Disease Control (CDC), The incidence rate of autism has more than quadrupled (Figure 1.1). Because there is no targeted drug for treatment at present, the symptoms can only be improved through special education (Xiong, 2022). Through targeted behavioral intervention, their important symptoms can be alleviated, and they can have the opportunity to communicate and learn like ordinary children. Books are one of the teaching aids of rehabilitation schools and an important way of family learning. Due to the slow development of most autistic children (Li, 2021), it is relatively difficult to understand some books. Therefore, in the design of picture books for children with developmental

disabilities, we should consider their particularity, and design books suitable for better development of autistic children according to their development advantages and behavioral characteristics.

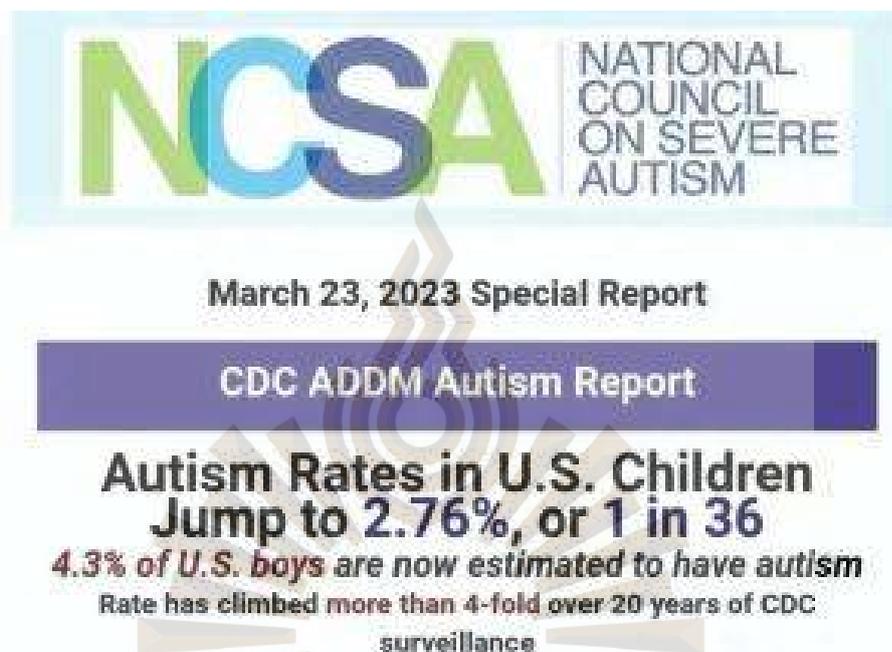


Figure 1.1 Prevalence statistics of autistic child

Source: CDC ADDM Autism, 2023

Ordinary books lack a certain level of specificity for such children and cannot effectively improve their developmental barriers. The designer Lisa believes that people transmit and perceive information through their senses (Lisa, 2019). As the sensory development of autistic children is more sensitive than that of ordinary children, the author applies sensory experience to book design, which has improved the reading experience of autistic children in book learning to a certain extent (Figure 1.2). Due to the fact that many books are primarily focused on reading, which makes autistic children unable to concentrate, resulting in a lack of interest in book learning. The author adds interactive design to books to make them as vivid and interesting as toys, thus more interesting to read (Figure 1.3). Secondly, such children do not like to communicate with others, and do not understand the emotions and needs of others. The author added an emotional design to address this feature.

Autism may be related to a loss of touch, and most individuals with autism also have altered touch - they are usually highly sensitive to light touch and are at a loss for certain tactile sensations (Zhu, 2021) . In response to this symptom, the author combines books with tactile sensation to learn while being exposed to and recognizing different tactile sensations.

The abnormal psychological activities of children with autism can trigger their special behaviors, and they have emotional cognitive impairment and cannot control their emotions (Masgutova, 2016). They often only express their emotional state through crying, shouting, losing temper, and self injuring or aggressive behavior. A comfortable and safe rehabilitation environment can to some extent improve the abnormal psychological behavior of children with autism and regulate their negative emotions. When designing a space, it is important to respect the psychological preferences of children, including spatial colors, layout, and form, incorporating fun elements that children enjoy, and bringing them closer to children with autism.

Based on the above situation of children with autism, this study combines the existing research results with the physiological and psychological characteristics of children with autism, and then, it expounds and proposes the design of an interactive book that can effectively strengthen the logical thinking and emotional recognition ability of children with autism through sensory experiences from the perspectives of senses, thinking, and emotions.

From this point of view, in the Chinese market, books for autistic children are very scarce, and the number of autistic children is increasing year by year. The country and even the world attach great importance to this group. According to the existing problems, the characteristics of autistic children and their needs for books, this study proposes a design strategy for autistic children's books, designs a book suitable for autistic children, and provides some reference for the design and research of autistic children's picture book.



Figure 1.2 Touch book case

Source: Lan, 2019



Figure 1.3 Interactive book case

Source: Ha, 2019

## 1.2 Research Objectives

Through the research on autistic children, we can deeply understand the characteristics, current situation and existing problems of these children, and investigate the demand for these books in the current market. This paper aims to design a book suitable for autistic children, use the development advantages of autistic children, and improve the development barriers of autistic children. The objectives are as follows:

- 1.2.1 Try to use the advantages of such children to design books.
- 1.2.2 Try to make books improve some mild symptoms.
- 1.2.3 Try to make a lively and interesting book.

## 1.3 Content and method

This study focuses on individuals aged 3-6 with autism as the main research object, and conducts interdisciplinary comprehensive research based on the behavioral characteristics, behavioral psychology, and design psychology of children with autism. In terms of research methods, based on the actual research situation of rehabilitation treatment centers, analyze the behavioral characteristics and preferences of children with autism during the teaching process, combined with intervention therapy theory, summarize and summarize the book design strategies for children with autism, and design a framework based on the summary, including book content, visual design, and form design.

The research method for selecting the topic is as follows: Literature research method. Use an online literature library to read a large amount of information related to autism, and understand the cognitive, emotional, social, and sensory characteristics of children with autism. Analyze the reasons for the formation of obstacles and lay a scientific theoretical foundation for the subsequent design of books. Participatory observation method. Conduct on-site investigations on autism rehabilitation education institutions and rehabilitation schools, observe the emotional expression ability,

sensory ability, and other behavioral characteristics of children with autism, and conduct interviews with autism doctors, teachers, and parents to comprehensively understand the needs of the target group from multiple perspectives. Market research method. By collecting and sorting out books for children with autism on the market, analyzing their strengths and weaknesses, identifying areas for improvement, and proposing strategies for designing books for children with autism.



## **Chapter 2**

### **Literature Review**

#### **2.1 Overview of Children with Autism**

##### **2.1.1 Definition of children with autism**

In 1943, American child psychologist Kenner first proposed the concept of autism. In 1992, the World Health Organization defined it as a diffuse developmental disorder. In 2013, the United States adopted measures to combat autism a detailed study of symptoms has been conducted, and the "Statistical Manual for the Diagnosis of Mental Disorders" has been updated. Formal Explanation of Solitude Spectrum Disorder (ASD) the concept of. Autism manifests as social communication barriers, abnormal and stereotyped sensory behavior, and a distant and narrow interest in the heart obstacles to the development of hairdressing and education. The etiology is influenced by various factors such as genetics, environment, psychology, and cognition, and has biological characteristics basic underdevelopment disorders.

Before 1980, the incidence rate of autism was only 2/10000, which was still a rare disease. However, since the 1990s, the number of people with autism in the world has sharply increased. On April 2, 2007 world Autism Day. According to the latest statistics from the Centers for Disease Control and Prevention (CDC) in 2012, among 68 children there is a confirmed patient with autism.

Currently, the medical community has not yet reached pathological conclusions and targeted drug treatment plans. Scientific intervention methods it is an important way to improve the ability and quality of life of individuals with autism spectrum disorders. Autism education has special physiological and psychological characteristics the education and treatment for children with autism must also be

personalized based on their physical characteristics.

This article targets children with autism who are suitable for comprehensive sex education. By treating autism in hospitals or schools conduct a survey and research on the language ability, emotional perception, social behavior, and other aspects of the children.

### **2.1.2 Characteristics of children with autism**

Autism belongs to a wide range of underdevelopment disorders. The physical and mental characteristics of children with autism include attention and behavior abnormal sensitivity and apathy in the five major directions of approach, emotional perception, understanding and stigmatization, and social interaction know the reaction. Due to imbalanced cognitive development, some children with autism have visual advantages and strong perception of details. The following five perspectives analyze the differences between children with autism and ordinary children:

**Attention:** Children with autism find it difficult to maintain their attention for a long time and usually choose to focus on certain specific things. During communication, one's gaze flickers and requires constant attention. They often develop a special obsession with non-life characteristic objects, and if their attachment objects are taken away, it can trigger emotional reactions such as anxiety and irritability.

**Behavior:** Children often exhibit stereotypical, repetitive, and uncoordinated behaviors, with some children experiencing abnormal behaviors such as repetitive jumping, unconscious clapping, and walking with their toes. For non functional features (odor, texture) of objects, they will repeatedly smell the odor or touch the surface of the object. Children will persist in a repetitive and rigid lifestyle, and if their familiar environment suddenly changes, they may feel insecure.

**Emotional perception:** The child's emotions are abnormally variable, unable to accurately express their inner emotions, and difficult to understand complex

emotional expressions. They often feel uneasy and express their emotions through shouting, running, impulsive attacks, or other means. But with the correct intervention of parents or teachers, they will gradually recover their composure.

Understanding and summarizing: Lack of ability to understand and summarize normally. There are obstacles in verbal communication and communication, making it difficult to understand the abstract language meanings of metaphors and idioms, and to express one's inner thoughts normally. Some children suffer from lifelong loss of discourse ability, speech comprehension abilities, frequent rigid repetition of certain vocabulary, lack of logical connections in communication, frequent grammatical errors, and difficulty understanding abstract concepts such as personal pronouns.

Social interaction: Children with autism have obstacles in social interaction, lack communication skills and interests with others, and are unable to participate in social activities independently; They are unable to express their love for others through appropriate language and behavior, and lack the ability to imitate and understand nonverbal communication. It is often difficult to understand the normal rules of social interaction due to self entertainment and neglect.

### **2.1.3 Common problems in children with autism**

Emotional, behavioral, and social adaptation problems can have an impact on the psychological behavior of autistic children, including three common problems:

#### **2.1.3.1 Emotional issues**

Children with autism often cannot express their true feelings to others due to their own language barriers feeling, but also unable to control their emotions, which leads to their inability to receive correct venting and relief when their inner emotions encounter problems slow down can easily lead to some "extreme behavior". For example, screaming, crying loudly, self attacking, or attacking others,

this is beneficial for them my own mental health also has negative effects, which can easily lead to anxiety, irritability, etc.

**Anxiety:** Children with autism face many difficulties in their daily lives, and seemingly simple scenarios can also be beneficial for them it can cause great stress or drowsiness, and due to inability to cope, they may have varying degrees of anxiety, but not being able to express one's needs and anxieties can lead to seemingly strange behaviors, such as sudden screams, crying self attack and attacking others are actually manifestations of their self-defense.

**Loneliness:** Children with autism already lack social awareness and are accustomed to living in their own small world. If someone around me people who are not invested enough or do not provide timely feedback on their emotions can easily exacerbate their sense of loneliness, and over time, they will retreat into a smaller space.

Scientific research has shown that the frontal lobe of the head of children occupies a larger area than that of normal people. The frontal lobe is a part of the human brain that stores important cognitive functions and is the cause of various symptoms caused by underdevelopment abnormalities. The rapid development of cells in children with autism can instantly occupy brain space and damage the normal functioning of the brain. The dense frontal lobe cells are interconnected and interact with each other, gradually losing their connection to other cells in the brain, thereby interrupting information transmission.

**Melancholy:** Although children with autism have many problems accompanied by intellectual disability, they are all very sensitive. Especially as time goes on, children with autism will begin to understand their environment and personal problems, but they may not find a way to solve them the solution is that they will gradually become inferiority, helplessness, and even depression.

Fear: Children with autism often have abnormal fears, such as social fear. When they are in a strange ring changes in the environment or familiar environment, and being in the same environment as unfamiliar people, can easily lead to fear and anxiety the mood can lead to emotional loss. Even sensory stimuli such as light or sound can cause some children with autism to develop fear fear.

### 2.1.3.2 Bad behavior issues

Self stimulating behavior some children with autism may engage in actions that do not have any practical significance, such as unconsciously clapping hands, rotating objects on the table, swinging back and forth, moving fingers to their eyes, placing objects or parts of the body in their mouth, sniffing others, etc., to meet individual sensory or psychological needs through these behaviors.

Identity sexual behavior, also known as stereotypical behavior, refers to adhering to a certain behavior or habit and refusing to make changes, such as drinking only a certain brand of milk; Eat only noodles without rice, etc. Their game form awareness is also very simple and they refuse to accept changes, such as watching only a certain TV program and repeatedly tearing paper for several hours without getting bored.

Aggressive behavior some children with autism may exhibit aggressive behavior, including self aggression and harmful behavior towards others, often in a state of emotional instability.

Hyperactivity behavior the hyperactivity behavior of children with autism, including constantly rotating their bodies, shaking their heads, running in circles, and constantly climbing up and down and behaviors similar to those of children with ADHD, such as difficulty concentrating.

### 2.1.3.3 Social adaptation issues

Children with autism have poor adaptability to the environment, and this disorder becomes increasingly apparent as they grow. They lined up refuse unfamiliar environments and do not like any changes in their familiar environment. If the curtains at home have changed to a different style, this subtle difference may also create a strong sense of unease and rejection towards the familiar environment.

The brain of the child develops rapidly in the early stages. When children with autism are born, there is no abnormal brain development, but at the age of 2, the brain rapidly develops and produces a large number of frontal lobe cells. Medical experiments have observed that the brain development of children around the age of 4 is similar to that of adolescents. Some parents mistakenly believe that their children possess talent and exceptional learning abilities. In fact, this abnormality is the main cause of attention deficit and mirror system dysfunction in children with autism.

Attention system deficits in children with autism lead to various bizarre behaviors. Common symptoms include persistent repetitive behavior, stereotypical and destructive behavior, inability to identify with identity changes, dysfunctional reward cognitive system, lack of self-care ability, lack of understanding of abstract concepts, and weakened awareness of safety. The lack of a mirror system is manifested as difficulty in imitating others' behavior, a lack of physical communication and the ability to capture facial expressions, which seriously hinders the development of social communication skills.

Children's psychological development can be divided into four stages: perceptual operation stage; Pre operational thinking period; Specific calculation period; Formal operation period. Children with autism exhibit autism and silence, which is a psychological defect. The lack of psychological perception and self exploration ability is caused by abnormal development of brain nerves.

In 2003, China conducted an experiment on the psychological reasoning ability of children with autism. The results indicate that the gap in psychological inference ability between children with autism and normal children continues to widen with age. A large amount of data analysis shows that due to the lack of psychological reasoning ability in children with autism, they are unable to accept and process information from the outside world, resulting in varying degrees of social interaction, communication, and abstract innovation abilities obstacles.

## **2.2 Existing research results**

Looking globally, there is an increasing amount of research on the correlation between autism. Many companies are aware of important business opportunities and have established design teams to focus on the teaching needs of special children. Based on the latest research theory, major companies are attempting to develop and produce children with autism with the help of designers exclusive toys for children. Make the product both provide psychological comfort and attention to children, and serve as a tool for cultivating their growth important carrier.

In 2013, Jowan Baransi designed a multifunctional product for children with autism (Figure 2.1). adopt colorful and diverse combinations of basic graphics can intuitively convey product efficacy and usage characteristics to users.



Figure 2.1 Multifunctional autism toys

Source: Baransi, 2013

Plan toys has launched an expression recognition "robot" for children with autism and has obtained The 2011 G-Mark Toy Award, as shown in (Figure 2.2). The focus of this product is to guide children to observe emotional changes transforming, compensating for facial cognitive impairments, while promoting the practice of perceptual and motor skills. The robot is equipped with four geometric head components that can clearly display changes in facial expressions.



Figure 2.2 Expression robot

Source: Plan toys, 2011

Currently, the theoretical research and design practice related to books and teaching aids for children with autism in China are still in the initial stage and have broad market prospects. In the field of design, special children's products are divided into entertainment and adjustment therapy toys. Traditional teaching aids mostly come from the design concept of general teaching aids, but children with autism are different from ordinary children. The rehabilitation treatment tools sold on the market often make the intervention training process dull, tedious, and rigid. Lack of children's lack of interest in learning is very detrimental to their treatment and growth. Teachers and parents who participate in rehabilitation treatment for children with autism also report that a single training method can only have a short-term effect on their child's recovery.

As a representative of a comprehensive entertainment product designer for autism, Huang Yuan realized the gap in products for children with autism in China. For the autism community, she designed a series of rehabilitation aids, including adventure backpack combinations, emoji cards, and character recognition trains (Figure 2.3). The combination of product design and cognitive teaching aims to enhance the understanding of emotions and expressions for special children during the game process. Children with autism tend to be happy simulate learning and self-expression in an atmosphere, gradually changing the gameplay and difficulty level based on children's abilities, and prolonging the product's usage cycle. The overall visual presentation uses simple symbols to effectively convey rich knowledge, which has been unanimously recognized by children, teachers, and parents.



## **Chapter 3**

### **Research Methodology**

#### **3.1 Research on Children with Autism**

##### **3.1.1 Research content and objectives**

Research content: Based on field research and survey questionnaire methods, analyze the social integration characteristics and actual needs of children with autism. On the basis of understanding the curriculum of the autism rehabilitation training center, choose game interaction courses, mental training courses, picture book social courses, and sensory training courses to observe and analyze the real needs in the classroom.

Research purpose: To analyze the characteristics and cognitive styles of children with autism aged 3-6, deeply participate in the actual classroom of special education for children with autism, understand and verify the emotional and sensory cognitive characteristics and behavioral preferences of children with autism in teaching practice, and lay a theoretical foundation for future children's book teaching design. Provide reference for the design of books for children with autism.

##### **3.1.2 Survey location**

Representative autism rehabilitation institutions and schools were selected in Qingdao, Shandong Province, China for practical research:

Shengzhiai Rehabilitation School (Figure 3.1) is a non-profit rehabilitation institution located in Chengyang District, Qingdao City. The main purpose is to

provide professional rehabilitation training services for children with autism. In order to further understand the characteristics of children with autism and the actual needs of rehabilitation education, on-site observation methods are used as volunteers to participate in rehabilitation education classes for children with autism without exposing their identity. On the other hand, one can directly experience the current situation of rehabilitation education for children with autism.

Runhe Rehabilitation Hospital (Figure 3.2) is located in Liuting District, Qingdao City. The hospital is committed to the rehabilitation treatment of children with developmental deficiencies and provides comprehensive treatment services.



Figure 3.1 Holy Love Rehabilitation School

Source: Researcher



Figure 3.2 Runhe Rehabilitation Hospital

Source: Researcher

### 3.1.3 Investigation and analysis

As mentioned above, autistic children and ordinary children have some particularities, which are embodied in their physiological characteristics and psychological characteristics. The author consulted some papers and materials, and learned some significant characteristics of autistic children according to the articles and materials, which laid the foundation for the subsequent design of books suitable for autistic children.

Research has shown that both children with autism and ordinary children have some particularities, and autism is not a defect but a unique cognitive style (Li, 2017). Children with autism are more special than ordinary children, and more people are paying attention to this group of children.

The author reviewed materials and articles to summarize the characteristics of children with autism, categorizing them into two aspects: psychological and physiological characteristics. Psychological characteristics are further divided into four aspects: cognition, behavior, language, and perception. Physiological characteristics were investigated and summarized from an emotional perspective (Figure 3.3).

Only by fully understanding the behavioral characteristics of children with autism can we better alleviate their behavioral deficiencies.

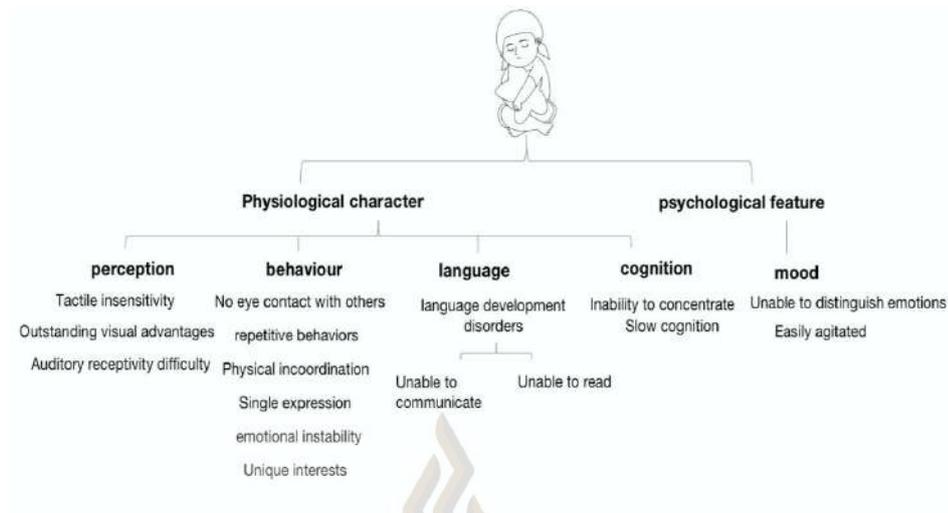


Figure 3.3 Characteristics of Children with Autism

Source: Researcher

The treatment methods for autistic children include schools, families, kindergartens, medical institutions, etc. 70% of them choose rehabilitation institutions for rehabilitation treatment. The treatment effect of rehabilitation institutions is also the best (Figure 3.4).

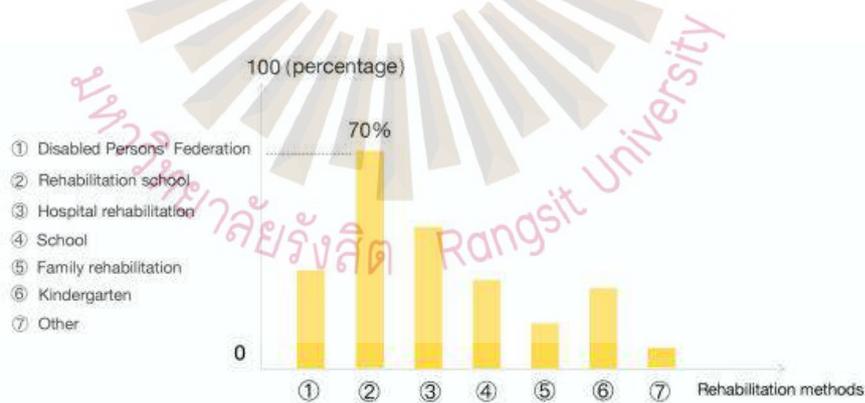


Figure 3.4 Healing methods of autistic children in China

Source: Researcher

In order to gain a deeper understanding of the group of children with autism, the author has collected and read a large number of research literature and data models related to the group of children with autism;

The author also went to the Rehabilitation Center for Children with Autism to have an in-depth conversation with Dr. You, the director of child psychological rehabilitation, to interpret and study the characteristics and treatment directions of children with autism from the perspective of a doctor, in order to determine the research direction; At the same time, in order to better understand the problems encountered by children with autism in daily rehabilitation training and the real needs of families for rehabilitation products, the author conducted a month long survey and research at the Autism Children's Rehabilitation School (Figure 3.4) (Figure 3.5). By participating in the daily learning and extracurricular expansion activities of children with autism, the author observed the behavioral and psychological characteristics of children with autism more intuitively.

During the author's participation in daily learning and extracurricular activities, while observing the state of such children, four teachers and two parents from rehabilitation schools were selected for interviews, and the following questions were raised:

- 1) Can autistic children get relief of symptoms through intervention?
- 2) How long has this school for autism been established?
- 3) What teaching aids are there in the school?
- 4) What problems will children encounter in the process of intervention?
- 5) What types of books do children prefer? What types are there now?
- 6) What are the characteristics of autistic children?
- 7) What intervention products do schools need more?

The author also participated in the intervention class for autistic children, recording which types of books are used more frequently and which books can bring good experience to children, providing ideas for future design research. Close contact with autistic children and discover their characteristics. In addition, In order to better understand the market demand, the author visited bookstores and libraries to

investigate the books related to autism and autistic children in the market.



Figure 3.5 Contact with children with autism

Source: Researcher



Figure 3.6 Communicate with teachers at a rehabilitation school  
for children with autism

Source: Researcher

### **3.2 Design Study**

After investigating the needs of these children for books and understanding the characteristics of these children. The author found that these children are particularly sensitive to color. The author further analyzed the sensory characteristics of these children. "Five sense experience" has developed rapidly in recent years, and many young designers are willing to put the five sense elements into their own field of design. The five senses are hearing, vision, touch, smell, taste.

According to previous investigations, such children are sensitive to touch and Visual discontinuity. For example, they know that roses are red, but cannot contact apples that are also red. Such children unable to recognize emotions or express them, usually expressed through shouting. In addition, their brain development has defects. The author has designed for these three aspects.

According to the survey, autistic children do not like to communicate with others. In order to alleviate this problem and make books attract the interest of such children, so as to design books more suitable for such children's reading and learning, the author made specific analysis from two dimensions, namely, the interactive research on autistic children and the case of interactive books for autistic children.

### **3.3 Model Sketching**

The first step in model production is to determine the form of the book, exploring two forms of books, the traditional book form and the card book form. The second step is to determine the chapters of the book and set up three parts for three different aspects.

### **3.4 Create a prototype**

Choosing the form of a card book has created a set of interactive card books. The book is divided into three parts, namely touch, brain, and emotion. Using the

visual cognition of children with autism to create illustrations and enhance the fun of books (Figure 3.7).

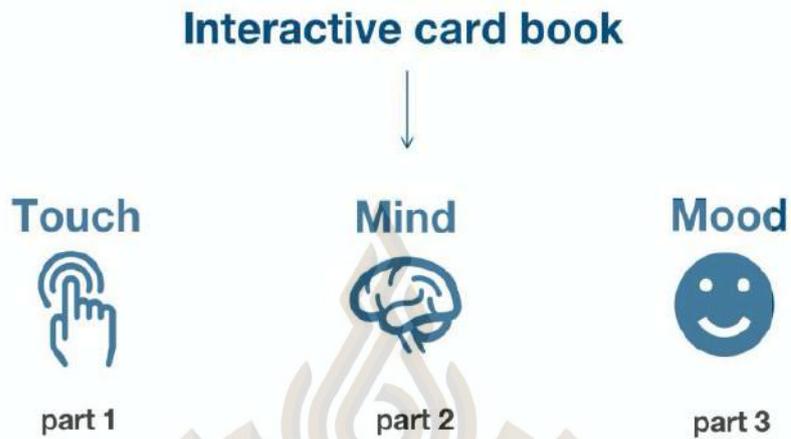


Figure 3.7 Three aspects of interactive books

Source: Researcher

## **Chapter 4**

### **Project development**

#### **4.1 Design Strategy**

##### **4.1.1 The Value of Sensory Experience in Books**

Taking the visual advantages of children with autism as a starting point can better attract and increase their reading interest. They always like to immerse themselves in their own world. If books can help them understand the beauty of the world and provide them with a certain degree of stimulation, it will improve their rehabilitation effect. The author combined the psychological and physiological characteristics of children with autism and added sensory experience theory to the picture book, summarizing the strategies for sensory experience picture books.

In recent years, research on children's books has been actively carried out, but there has been almost no research on books for children with autism. The inspiration for the application of the Five Senses theory in books comes from Buddhism, which has six elements in daily life: eyes, ears, nose, tongue, body and mind, as well as six elements of color, sound, smell, taste, touch and sensation. This is the law in the field of human and object. Therefore, the five senses experience has applications in multiple fields.

When reading books, children can gain sensory experiences through the unique functions of paper books (visual and tactile). In addition to exchanging information, high-quality books can also allow readers to experience transcendent beauty and tangible feelings, thus providing a genuine pleasure in reading. Therefore, integrating the five senses experience into picture books for children with autism will have a good guiding and regulating effect on children with autism. The five senses experience can enhance reading appeal and give readers a richer reading experience.

In the field of children's picture books, bright colors and text, unique form designs, and different materials can bring a realistic feeling. In addition to traditional visual experiences, it also provides children with interesting sensory experiences.

#### **4.1.2 Combining books and puzzles**

Children's understanding of the world is first about cultivating their interests, and then about the process of memory recognition expression writing application series process. Puzzle is one of the enlightenment aids that most parents choose and is also a necessary teaching tool for cognitive training of children with autism one of the tools.

### **4.2 Results & discussions**

#### **4.2.1 Book Content**

##### **4.2.1.1 Touch part**

In terms of physiological characteristics, the group of children with autism is mainly manifested in two aspects: visual and tactile. Intuitively speaking, the group of children with autism is very sensitive to color and has their own special color preferences, but it is difficult to connect two objects of the same color. In terms of tactile perception, the group of children with autism has characteristics such as insensitivity to touch and rejection of external things.

Research has shown that the visual and tactile effects of common objects in daily life have a greater impact on children with autism and are more helpful in strengthening their cognition (Chen, 2020). In order to fully utilize these two characteristics, the author designed from both visual and tactile perspectives, selecting six common but tactile items in daily life for design and creating models, as shown in (Figure 4.1).

The book card consists of two pieces of cardboard, one of which is hollowed out, and the middle layer is embedded with materials that provide different tactile sensations.



Figure 4.1 Six commonly used tactile models

The background color of the model is blue, and according to research, these children prefer cool tones (Yang, 2020). As shown in the figure (Figure 4.2), the front of the model combines vision and touch, while the touch part is made of materials that are as soft as the sofa. Together with the graphics on the cardboard, it forms a complete understanding of the sofa for children. On the back, other equally soft objects are listed to improve children's cognitive level and logical thinking ability.

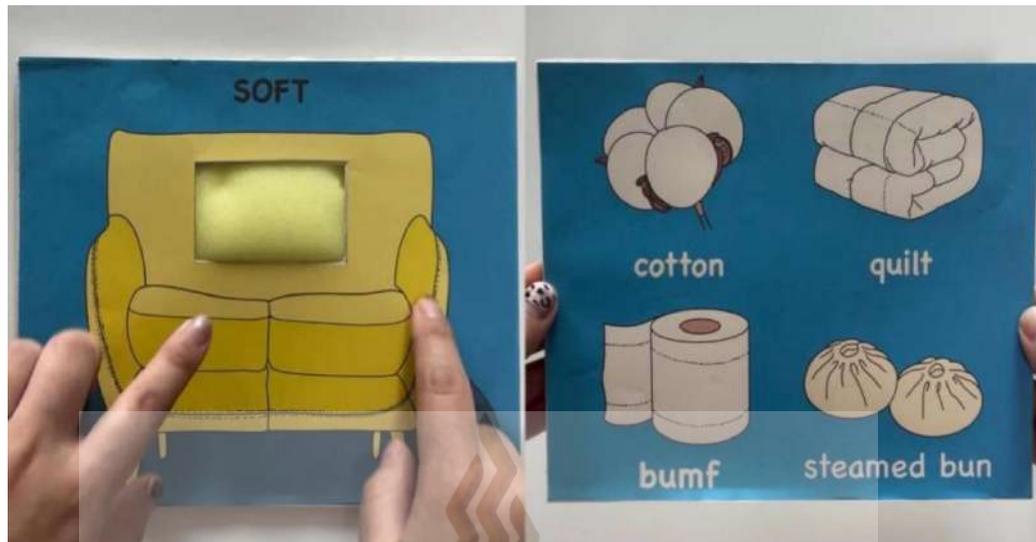


Figure 4.2 A model combining vision and touch

#### 4.2.1.2 Mind part

Puzzle games are games that can simultaneously train children's thinking and hands-on abilities (Qiang, 2014). During the puzzle process, children with developmental disabilities can improve their various qualities, especially the coherence of logical thinking, by hands-on operation and thinking about the connection between the puzzles. The combination of puzzles and books not only increases the interactivity of books, but also significantly improves their readability and fun. The content of the puzzle is mainly focused on animals, and in order to enable children with autism to think more comprehensively based on images, the image design of the puzzle tends to be flat.

As shown in the figure (Figure 4.3), animal jigsaw puzzles are created by digging out and cutting the side of the cardboard with animal images into different shapes. This design allows children to not only recognize the shapes but also complete their understanding of the shapes.



Figure 4.3 Example of a puzzle

#### 4.2.1.3 Mood part

According to a survey and research, children with autism have problems in recognizing and understanding facial expressions from others and expressing their emotions appropriately (Yan, 2022). To solve this problem, a more effective way is to provide intervention training for children with autism during the teaching process, combining books with emotional cognition, so that these children can recognize, feel, and understand emotions during the learning process, Thus achieving a certain therapeutic effect.

In the emotional module design of this book, the author drew different emotions for different children's facial expressions (Figure 4.4). By using Velcro materials to create an expression puzzle, it not only increased interactivity but also increased the fun of learning, enabling them to have a more intuitive and accurate understanding of emotions (Figure 4.5).



Figure 4.4 Facial expressions of different children



Figure 4.5 Expression puzzle made of Velcro material

#### 4.2.2 Book format

In the early stages of the design of this book, the traditional form of book buckles connecting the pages was adopted. However, after the initial design and production, it was found that the book designed in this way was too cumbersome, not convenient and direct, and the form was not novel and unique enough. After repeated

research and simulation, it was finally decided to design this book in the form of a card, in order to achieve convenience, simplicity, and practicality (Figure 4.6).



Figure 4.6 Cards in the Book

Add cover, table of contents, and introduction sections to make them more intuitive and complete. At the same time, a raised design was made on the first page of the book cards in different learning modules, and corresponding chapter contents were marked on the raised book cards, making the book more convenient and durable during use (Figure 4.7).



Figure 4.7 Sample display of card books

### 4.2.3 Content Illustration

The illustrations in the first part of the book are mainly about the recognition of common items. The overall background color is blue, combining visual and tactile senses. Items with the same tactile sensation as the items in the picture are inserted in the interlayer of the book page, some with rough and some with soft tactile sensations (Figure 4.8), allowing children with autism to have a more intuitive and specific understanding and learning process.



Figure 4.8 A sofa with a soft touch

The illustrations in the second part mainly focus on the cognition of animals, with an overall background color of green (Figure 4.9). By concatenating animal images in different shapes, children with autism can achieve dual cognition of animals and graphics, thereby improving their graphic cognition and logical thinking level.

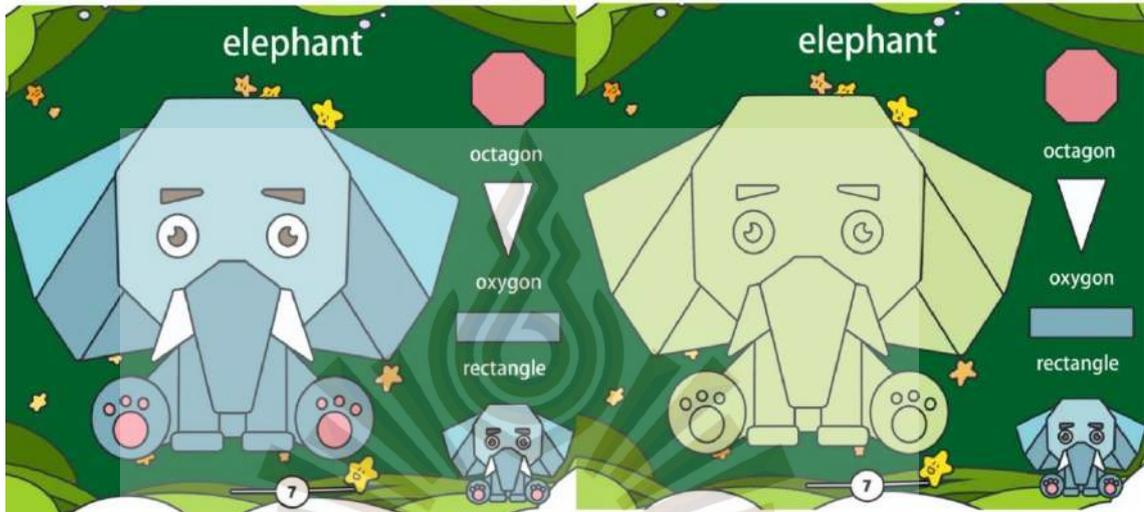


Figure 4.9 Elephants made by splicing different shapes

The illustrations in the third part mainly include emotional cognition cards, facial cognition puzzles, emotional cognition puzzles, and mirror parts, with an overall background color of light yellow (Figure 4.10). Mainly through the recognition, association, and splicing of different expressions, we aim to improve the emotional cognitive and expression abilities of children with autism.

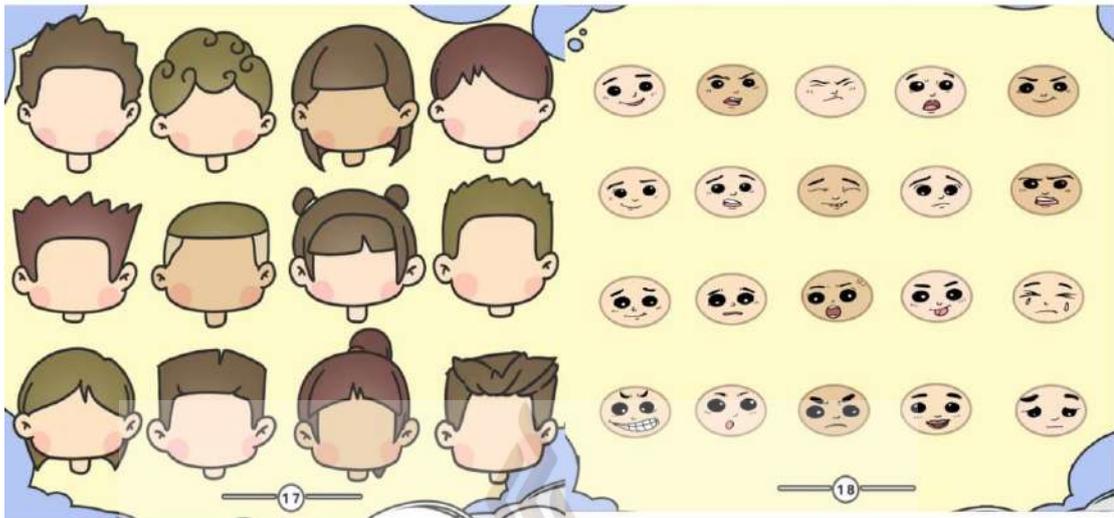


Figure 4.10 Different facial expressions of children

At the end of each section of this card book, the same pattern and different colors are used to compose the picture (Figure 4.11). Blue represents love and tolerance, green represents liveliness and vitality, yellow represents joy and peace, the child sitting on the knee in the picture represents autistic children, and the stars represent hope for life. The overall meaning of this card is that children from the stars, wishing every autistic child a happy and healthy growth, Every family with autistic children can achieve their wishes and happiness.



Figure 4.11 Children from the Stars

#### 4.2.4 Book packaging box

The external packaging of this book is a rectangular body, consisting of a wooden box and lid (Figure 4.12). This design is mainly designed to facilitate the storage and storage of cards, and better protect the book content from moisture or compression damage.



Figure 4.12 Book packaging box

#### 4.2.5 Final product prototype

This set of books is mainly designed for children with autism over the age of two (Figure 4.13). All card designs in the book are double-layer cardboard, with built-in materials used for tactile or adhesive purposes to better present the corresponding content. This book mainly focuses on the slow cognitive development, sensitivity to touch, and difficulty in distinguishing emotions of children with autism. Three targeted parts of content are designed to assist children with autism in cognitive learning, providing an efficient and feasible way for home practice and interaction for families with autism.



Figure 4.13 Final product prototype

This interactive card book mainly consists of a cover, a table of contents, an introduction, an introduction section, and a card book. The overall design is characterized by simplicity, strong interactivity, and durability, aiming to provide services within our capabilities for the treatment and learning of children with autism. The following image shows the final finished product image (Figure 4.14).



Figure 4.14 Card book finished product display

The method of using the first part of a book is to touch and feel materials during the cognitive process (Figure 4.15). Mainly through the tactile and visual effects of relevant materials, vivid and vivid expressions of soft, smooth, fluffy, undulating, rough, granular and other sensations are achieved.



Figure 4.15 Visual and tactile senses

The usage method of the second part is to use puzzles to recognize shapes and animal cognition (Figure 4.16). mainly using cute and highly recognizable animals such as elephants, giant pandas, pigs, parrots, foxes, and groundhogs, to improve the graphic cognition level, logical thinking ability, and hands-on operation ability of children with autism.



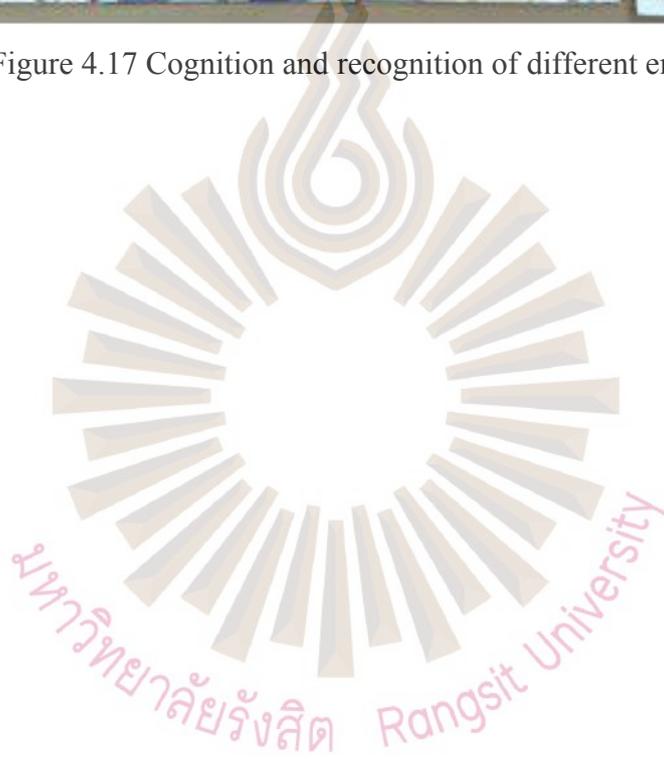
Figure 4.16 Different animal puzzles

The third part mainly focuses on the cognition and recognition of various emotions (Figure 4.17). By using materials such as Velcro in cards for interaction, children with autism can leap from recognizing emotions to understanding emotions, and improve their expressive ability in interacting with the outside world.

The author added a mirror material to one page and embedded the mirror surface in book cards, enabling children to see their facial expressions change during cognitive learning, making it more vivid and realistic to observe facial features, expressions, and emotions.



Figure 4.17 Cognition and recognition of different emotions



## **Chapter 5**

### **Conclusion and Recommendations**

#### **5.1 Conclusion**

This project starts with a focus on the physical and mental health of children, and takes autistic children as an example for research and exploration. Because these types of children are more unique than ordinary children, early intervention and treatment can lead to better treatment outcomes.

The author focuses on children with autism who are two years old and above, exploring their characteristics and designing books on three aspects, aiming to achieve a healing effect during reading and learning.

This is an interactive card book, which is divided into three aspects: touch, brain, and emotion. The card book is combined with touch, and different tactile materials are designed in the book, allowing children to touch different tactile materials while learning, so that they no longer resist different tactile sensations. Combining card books with puzzles to exercise children's brains. Combining card books with emotions allows children to recognize different emotions, enabling them to understand emotions and express them accordingly.

In addition, interactive books can cultivate children's hands-on ability, thinking ability, discrimination ability, etc. Finally, the box was designed to make the product complete. This book is the beginning of exploring the design of books for children with developmental disorders, providing reference for future design of books for children with other types of developmental disorders.

## References

- Chen, Q. X. (2020). *Research on the intervention of peer video demonstration teaching on life skills of resident students with Autism spectrum disorders* (Master's thesis, Southwest University). Retrieved from <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202201&filename=1022453566.nh>
- Li, P. (2017). *Investigation and analysis of cognitive style of autistic children and their parents* (Master's thesis, Zhejiang Normal University). Retrieved from <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201802&filename=1017247299.nh>
- Li, Y., Koldenhoven, R. M., Liu, T., & Venuti, C. E. (2021). Age-related gait development in children with autism spectrum disorder. *Gait & Posture*, (36), 260-266. doi:10.1016/J.GAITPOST.2020.12.022
- Lisa, F. B., Ralph, A., Stacy, M., & Seth, D. P. (2019). Emotional Expressions Reconsidered: Challenges to Inferring Emotion From Human Facial Movements. *Psychological Science in the Public Interest*, 20(1). <https://doi.org/10.1177/1529100619832930>
- Masgutova, S., Akhmatova, N., Sadowska, L., & Akhmatov, E. (2016). Neurosensorimotor Reflex Integration for Autism: a New Therapy Modality Paradigm. *Journal of Pediatric Neurological Disorders*, (1). <http://dx.doi.org/10.4172/2572-5203.1000107>
- Qiang, W. (2014). *Analysis of the role of puzzle games in the physical and mental development of children with intellectual disabilities Off campus education in China* (Master's thesis, Zhejiang Normal University). Retrieved from <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202201&filename=1022453566.nh>
- Xiong, S., Li, W. W., & Wang, J. (2022). Research status of rehabilitation pathway for autistic children at home and abroad Chinese. *Journal of Health Psychology*, (12), 1902-1908. doi:10.13342/j.cnki.cjhp.2022.12.028

## References (continued)

- Yan, R. (2022). *Research on product design of rehabilitation education for autistic children based on synaesthesia theory* (Master's thesis, Qingdao University). Retrieved from <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202301&filename=1022772224.nh>
- Yang, J. Y. (2020). *Application of Five Senses Comprehensive Experience in the Design of Rehabilitation Space for Children with Autism Dagan*. Retrieved from <https://kns.cnki.net/kcms/detail/detail.aspx?FileName=DAGN202007029&DbName=CJFN2020>
- Yu, L. C., Feng, Z., & Cheng, H. P. (2022). Analysis of the clinical effect of the treatment and rehabilitation of autistic children under the background of big data. In *Proceedings of 2022 International Conference on Cloud Computing, Big Data and Internet of Things(3CBIT2022)* (pp.183-188). n.p.: IEEE.
- Zhu, L., Yuan, X. Z., Li, J. G., & Ying, C.(2021). Understanding autism spectrum disorders with animal models: applications, insights, and perspectives. *Zoological Research*, (06), 800-824.



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