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Review

Perspective taking of children with special needs: A systematic review

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Abstract: Perspective taking ability is an important influencing factor on the development of children's social skills, but the perspective taking ability of children with special needs may be characterized differently due to their physical and mental developmental deficiencies. By combing and analyzing the relevant literature on perspective taking in children with special needs, this paper finds that existing studies have focused on four aspects: the overall level of perspective taking in children with special needs, the influencing factors of differences in the level of perspective taking, the assessment and measurement of perspective taking, and the intervention for the development of perspective taking ability. This paper reviews the four aspects of these studies and makes recommendations for future research and educational interventions on perspective taking in children with special needs. Further research is needed to focus on qualitative research methods to complement existing research findings and to develop effective intervention strategies for children with different special needs.

Keywords: children with special needs; social perspective taking; visual perspective taking; affective perspective taking

1. Introduction

Children's social development is an important influence on their adaptation to society and completion of socialization. It is widely recognized that the development of social cognitive ability is an important element of social development (Yu and Xin, 2013). As the core of children's social cognitive development, perspective taking ability has an irreplaceable value in their socialization process. Perspective taking originated from "role-taking" proposed by psychologist Mead. In the 1980s, the concept of "role-taking" was gradually replaced by "perspective taking," a term commonly used in psychology to refer to the ability to perceive the emotional and psychological states of others (Shatz et al., 1983).

Perspective taking consists of three different components: cognitive, affective, and visual, which can be specifically categorized into cognitive perspective taking, affective perspective taking and visual perspective taking (Cigala et al., 2014). Cognitive perspective taking is a judgment of another person's thoughts or knowledge about an event or situation, while affective perspective taking is an inference about another person's emotional state or emotional reflection in a situation, and these two types of viewpoint choice can be categorized as social perspective taking (Landry and Lyons-Ruth, 1980). Visual perspective taking, also known as spatial perspective taking, refers to judgments about the reflections (or visual experiences) of others who are in a spatial location different from one's own about the spatial properties or spatial relationships of a thing or things (Zuo and Hu, 2021). It can be categorized into first-level visual perspective taking, in which an individual is able to judge whether the other person can see the object he or she is looking at, but does not need to point out

what the object is, and second-level visual perspective taking, in which an object is visible to both parties, and the individual knows what the object looks like from the other person's point of view (Flavell et al., 1981). On the one hand, only when children possess these three perspective taking abilities can they move away from self-centeredness and gradually develop an understanding of self, interpersonal relationships, moral rules, social norms, etc.; on the other hand, the development of children's ability to coordinate different viewpoints also marks the construction of cognitive social relations, such as self-construction, self-management, planning ability, and social adaptation (Liu et al., 2021; Zhang and Lin, 1999).

It has been shown that for children, a higher level of perspective taking has a positive impact on their sharing behavior, peer interaction and other pro-social behaviors such as altruism, and at the same time, it can significantly reduce anti-social behaviors such as aggression (Deng et al., 2023; Han, 2019; Li et al., 2015). The functional characteristics of perspective taking objectively determine its importance in child development and education, and have a profound impact on children's cognitive society. Perspective taking ability is the main condition for children to establish good peer relationship, adapt to the society and finally realize socialization. However, many studies have pointed out that children with visual impairment, autism, and hearing impairment lag typically developed children in the development of perspective taking ability, and there is a significant difference with typically developing children (Chen et al., 2023; Hao and Su, 2015; Li, 2012; Wang and Li, 2021). Under the direct influence of lower cognitive comprehension, emotional anxiety and stereotyped behaviors brought about by physical and mental disorders, most children with special needs are prone to be self-centered, take self-imagined things as the real phenomena, and are unable to understand other people's thoughts, let alone thinking from other people's perspectives, which greatly affects the process of children with special needs in developing their social interaction skills, participating in integrated education, and realizing their social integration (Fang and Lei, 2018; Gao and Zhang, 2005; Lei, 2015; Wang and Li, 2021).

In view of this, the purpose of this study is to screen and sort out domestic and international studies on perspective taking of children with special needs, to systematically review the overall level of perspective taking of children with special needs and the factors affecting it, and to summarize the strategies and results of the intervention studies, with a view to providing reference for researchers to conduct studies on perspective taking of children with special needs and for educational practitioners to addressing social interaction issues of children with special needs.

2. Methods

This study conducted a foreign literature search in EBSCO and Web of Science databases in the form of subject headings to locate children with special needs in terms of "people with disabilities" or "persons with disabilities" or "children with disabilities/special needs/difficulties/developmental delays". disabilities" or "children with disabilities/special needs/difficulties/developmental delays". The search also encompassed various forms of perspective taking by using terms such as "social perspective taking" or "cognitive perspective taking" or "affective perspective taking"

or "empathic perspective taking" or "visual perspective taking" or "spatial perspective taking". Selecting the theme, we found that the foreign language literature in the related field started in the 1990s, but most of the literature is concentrated after 2000, so the time node of foreign language literature is set as "1990–2023". In this study, we conducted a domestic literature search on the China Knowledge Network (CNN), using "special children" or "children with disabilities" and other joint "perspective taking" as the subject terms. It was found that the Chinese literature in the related fields started in 2005, but the volume of literature was mostly concentrated after 2010, so the time node of Chinese literature search was set as "2005–2018".

After that, the retrieved literature was screened at three levels, and a total of 31 pieces of literature were finally selected, including 23 pieces of English literature and 8 pieces of Chinese literature. In terms of the amount of literature, the total amount of research is small, and there is a big difference between the amount of research in Chinese and in English (**Figure 1**).

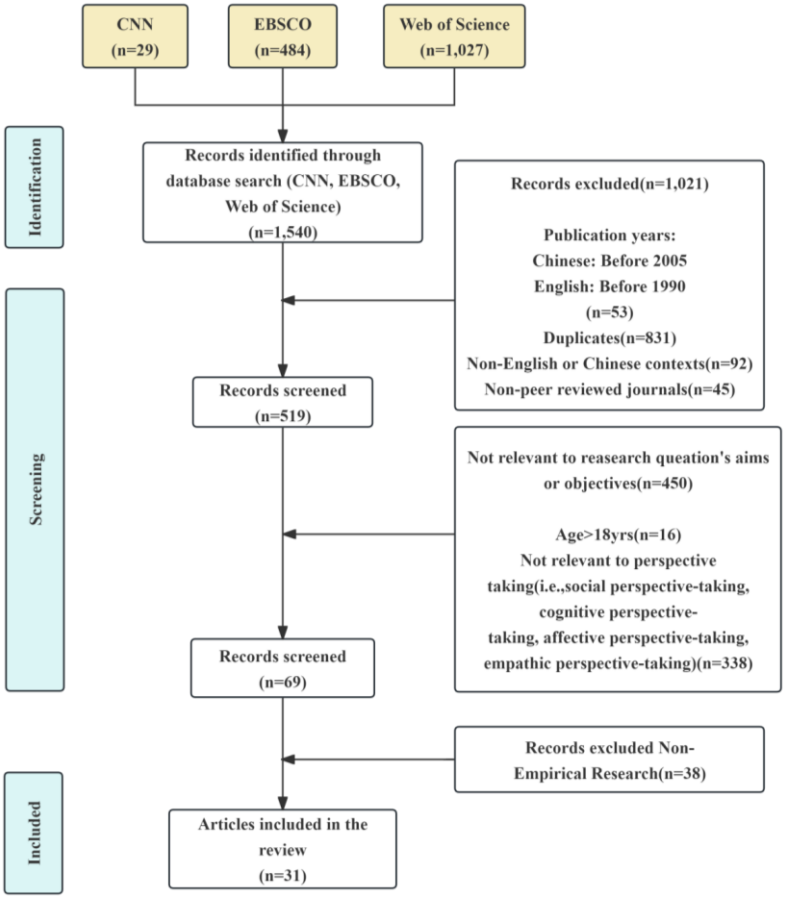

Figure 1. Literature screening process.

3. Results

In this study, the retrieved domestic and international related literature was categorized according to the content and focus of the studies based on the content of the selected literature, which mainly included four aspects, namely, the overall level of perspective taking of children with special needs, factors influencing the differences in the level of perspective taking, assessment and measurement, and intervention

countermeasures (**Figure 2**). The studies covered a wide range of children with autism, intellectual disabilities, hearing impairments, visual impairments, and other special educational needs, with more than half (18) of the studies focusing on children with autism. Most of the studies set up experimental and control groups to analyze the level of special children's perspective taking against the level of general children's perspective taking, so the research subjects also included general children.

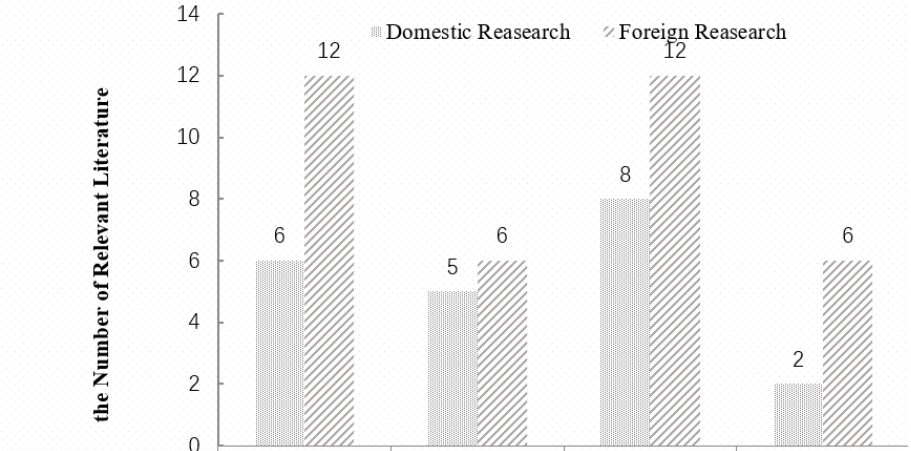

Figure 2. National and international research on perspective taking for children with special needs.

Note: there are articles that fall into more than one field category at the same time.

3.1. Overall level of perspective taking for exceptional children

3.1.1. Characteristics of perspective taking for children with special needs

Most of the existing studies have used test tasks, story assessment and other methods to study the overall characteristics of perspective taking of various types of children with special needs in different regions and age groups, and concluded that children with special needs are generally impaired in perspective taking ability and lagging in their development. However, there are also differences in the conclusions of the studies on different perspective taking categories.

For visual perspective taking, Russo et al. (2018) used a simplified version of Piaget's Three Hills Experiment, the Cube test, and found that children with autism performed poorly on a spatial perspective taking task. Farrenkopf and Davidson (1992) compared the spatial perspective taking abilities of blind children aged 3–8 years and found that there was no significant difference in spatial perspective taking abilities between 3–4-year-olds and 5–6-year-olds, i.e., the spatial perspective taking abilities of the blind children did not appear to have developed or improved over a six-year period. Brambring (2005) used an observational method to conduct developmental assessments of a girl with congenital blindness at 12, 15, 18, 24, 30, 36, 42, and 48 months of age, primarily based on videotaped assessments of her visual perspective taking abilities. It was found that the blind child could spontaneously

demonstrate correct first-stage spatial perspective taking at the age of three, and that development in spatial perspective taking was not necessarily delayed until the age of six.

For emotional perspective taking, Jahromi et al. (2021) used a puppet play task to measure emotional perspective taking ability and found that children with autism showed lower emotional knowledge in a non-stereotyped emotional perspective taking task, and were less likely to experience the emotions of a story character with emotions different from their own. Foreign researchers Ziv et al. (2013) used a story test and found that the vast majority of 5–7-year-old Israeli children with hearing loss had no difficulty in completing an emotional perspective taking task.

Most studies have examined the developmental level of special children's cognitive perspective taking as a component of social perspective taking as a whole. For example, Zhong et al. (2005) used Chinese fables and picture stories as stimulus materials, and used individual tests to examine the social perspective taking ability and its development of 122 hearing-impaired students in grades 3 to 6 of elementary school and grades 1 and 3 of junior high school, and found that the social perspective taking ability of the hearing-impaired students, although showing an upward trend as a whole, was developing slowly, and the overall level of the low level, especially the backwardness of social cognitive ability, and the low level of cognitive perspective taking ability.

3.1.2. Differences in the level of perspective taking between exceptional and regular children

Research on visuospatial selection has shown that children with special needs are generally significantly weaker in this area than typically developing children. For example, Shield et al. (2016) found that typically developing children were significantly better at visual perspective taking than children with autism. Pearson et al. (2016) used a secondary visual perspective taking task to compare the visual perspective taking of children with autism with that of children without autism in more detail, and the results showed that children without autism used an embodied self-centric transformation (EET) to select visual viewpoints, imagining themselves standing in the position of a doll and looking through the eyes of the doll, and utilized primarily the ability to body representation. In contrast, children with autism more often use mental rotation (MR) strategy to complete perspective taking tasks, mainly utilizing spatial skills, demonstrating the possibility of vicarious processing in children with autism. Based on this study, Cardillo et al. (2020) continued to investigate the differences in visual perspective taking between the two groups of children, and found that children with autism had significantly more errors in visual perspective taking in the range of 0–60° of stimulus angular parallax than normal children. Hao et al. (2015) showed that the visual perspective taking ability of deaf children was significantly different from that of hearing children. Hilviu et al. (2021) used the Color Game to measure children's visual perspective taking ability, and found that hearing-impaired children with early cochlear implantation scored significantly differently from the general children in this game, indicating that hearing-impaired children have lower visual perspective taking ability. All these studies support the idea that children with special needs are significantly weaker than regular children in visuospatial selection.

There have also been studies comparing the visual perspective taking abilities of children with different types of disability. Miletić (1995) simplified Piaget's Three Hills Experiment by using three-dimensional geometric shapes as stimuli and plastic dolls as observers, and asking the children to verbally answer the question, "Which side of the doll does the doll see?". The results showed that the spatial selection ability of typically developing children, children with low vision, and blind children decreased in that order.

Children with autism were significantly weaker than the general population in terms of affective perspective taking. In contrast, more studies have supported that children with hearing impairment do not differ significantly from typically developing children in emotional perspective taking; Ziv et al. (2013) explored the emotional perspective taking abilities of typically developing children and children with hearing impairment, and found that children with hearing impairment between the ages of 5–7 years old did not differ significantly from hearing children in their ability to select emotional perspectives. Wang et al. (2018) used the wordless picture book One Frog Too Many as a narrative material and found that deaf children's affective perspective taking abilities differed significantly from those of hearing children in the early stages of childhood development; however, as they grew older, deaf children were able to develop affective perspective taking abilities comparable to those of hearing children.

In terms of cognitive perspective taking, studies on cognitive perspective taking in children with autism have shown inconsistent findings. For example, a study by Chen et al. (2023) also concluded that children with autism scored lower than average children in cognitive perspective taking, while Scheeren et al. (2015) found that children with autism did not show problems with social perspective taking using the Social Story Test. Research on cognitive perspective taking in children with attention deficit hyperactivity disorder (ADHD) has found that children with ADHD have significantly longer reaction times than the general population when they need to overcome their self-centeredness for additional cognitive processing under a cognitive perspective taking task (Gao et al., 2021). Other studies have combined affective perspective taking with cognitive perspective taking at the level of social-cognitive perspective taking. For children with ADHD, studies have also measured children's social perspective taking abilities through The Interpersonal Negotiation Strategies (INS) interview and found that children with ADHD had poorer overall social perspective taking abilities compared to the general population of the same age group, which at least in part contributed to their difficulties in the social domain (Marton et al., 2009). For the visually impaired children, Li (2012) selected the Cognitive Perspective Taking Test (CPT) story by Zhang (1998) based on the Cognitive Perspective Taking Test (CPT) story of Chandler and Greens-pan and the Emotional Perspective Taking Test (EPT) story of Urberg and Do-cherty and Landry and Lyonds-Ruth, which was adapted to be used as a tool for measuring the social perspective taking ability of visually impaired children, and the results showed that The results showed that the social perspective taking ability of visually impaired children differed significantly from that of children in the general population.

3.1.3. Differences in perspective taking among children with different disabilities

In addition, studies have focused on differences in perspective taking between children with different types of disability. Studies comparing the perspective taking levels of children with autism and children with intellectual disabilities are the most common and have focused on differences in visual perspective taking abilities, with relatively consistent findings. Reed (2002) found that children with intellectual disabilities performed better than children with autism in coordinating multiple viewpoints in visual perspective taking. Russo et al. (2018) compared the visual perspective taking abilities of children with autism to those of children with intellectual disabilities using a cube test and found that children with autism had significantly lower visual perspective taking abilities than children with intellectual disabilities.

In summary, children with special needs generally have some problems with perspective taking, particularly visual perspective taking, and are generally lower than the level of perspective taking in the general population. Only a few studies have shown that children with hearing impairments in the early age range have comparable affective perspective taking abilities to the general population. There are fewer comparative studies involving children with different disabilities, and the current research has yielded consistent results on the differences in visual perspective taking between children with autism and children with intellectual disabilities.

3.2. Influencing factors of the level of perspective taking among children with exceptionalities

3.2.1. Influences on visual perspective taking in exceptional children

It has been found that visual (spatial) perspective taking of children with special needs are primarily influenced by individual executive function (EF), language, age, and fine motor ability.

Executive functioning is a higher cognitive function involved in problem solving and is closely related to children's emotional control, self-management, and many other abilities. Executive function subcomponents include working memory, inhibitory control, and cognitive flexibility (Han and Xu, 2020). Meanwhile, executive function is susceptible to a variety of factors, such as sensory experience, neural activity, and education (De Greeff et al., 2018; Xie et al., 2021; Zhang, 2021). Children with special needs have an impact on their executive functioning to some extent due to physical or psychological deficits. Reed (2002) explored the relationship between working memory and visual perspective taking and found that children with autism performed worse than non-autistic children as the need for working memory in the task increased. Cardillo et al. (2020) found that visuospatial working memory was an important predictor of visual perspective taking, and that children with autism and children with intellectual disabilities had weaker simultaneous and sequential working memory predicting lower levels of visual perspective taking.

Language ability has also been shown to have a significant effect on visual perspective taking in children with special needs, and a study by Shield et al. (2016) showed that language ability was significantly correlated with visual perspective taking in native sign-language hearing-impaired children diagnosed with autism.

Cardillo et al. (2020) also found that fine-motor ability was a significant predictor

of visual perspective taking in children with autism, and that better fine-motor ability predicted better spatial transposition in children with autism. Peterson et al. (2000) used a false-beliefs task to measure visual perspective taking in 23 visually-impaired children aged 5 years, 7 months, to 12 years, 10 months, and found that increasing age significantly predicted improved visual perspective taking in the visually-impaired children, which reminds us of the relationship between fine-motor ability and age and visual perspective taking.

In addition, it has been shown that body schema, the ability to organize and coordinate the body to act, is an important influence on visual perspective taking. Children with autism are unable to use elements of other people's bodies as a source of information for constructing their own body schema, thus giving it social and communicative value. That is, children with autism are unable to use other people's bodily experience as a model for constructing their own socially and communicatively meaningful body schema, which may be related to deficiencies in their theory of mind (ToM) that make it difficult to judge the spatial relations of others to an object that is different from one's own position (Russo et al., 2018).

Findings regarding the relationship between gender and visual perspective taking ability in children with special needs are inconsistent with findings in studies of children in general. Currently, some studies have shown that preschool boys have better spatial perspective taking ability than girls in general children (Zhang and Wang, 2008). And a study by Li (2012) showed that visually impaired females were better than visually impaired males in spatial perspective taking ability. However, the number of related studies is small and further research is needed to confirm this.

3.2.2. Factors influencing the social perspective taking of children with special needs

As mentioned earlier, both affective and cognitive perspective taking belong to social perspective taking. Therefore, some studies have explored the influences of affective and cognitive choices of children with special needs separately, while others have combined the two to explore the influences of social perspective taking.

Research on the influencing factors of emotional perspective taking in children with special needs mainly focuses on factors such as individual age and gender. For example, Li (2012) used the story test method and found that there were significant age differences in the emotional perspective taking ability of visually impaired elementary school students. Wang and Sun (2015) tested 80 children with intellectual disabilities on an emotional comprehension task through a one-on-one experimental testing method, and found that there were age differences in the emotional perspective taking task, and the emotional perspective taking ability of middle school children was significantly higher than that of elementary school children. Not only the age of the individual, but the influence of gender on emotional perspective taking is also supported by research, with several studies concluding that girls are more capable of emotional perspective taking than boys, and are more likely to experience the feelings of others in helping situations (Feshbach and Hoffman, 1978; Li and Jiang, 2002). Specifically, it was found that children with autism's emotional perspective taking ability was negatively correlated with executive functioning (Chen et al., 2023). This contrasts with the results for executive functioning in spatial perspective taking in

children with autism. Moreover, there is support for a significant positive effect of executive functioning on social perspective taking ability in children with ADHD (Gao et al., 2021). More research is needed to further explore the relationship between emotional perspective taking ability and executive functioning in children with autism.

Research on cognitive perspective taking in children with special needs has examined the effects of age and socialization. A study on the cognitive perspective taking of visually impaired elementary school students showed that the cognitive perspective taking ability of visually impaired students varied significantly by age (Li, 2012). Chen et al. (2023) found that the cognitive perspective taking ability of autistic children was related to their social cognition and social communication in social responses, and the affective perspective taking ability was related to their social cognition, social communication, and social motivation.

Studies that combine the emotional and cognitive perspective taking of children with special needs into social perspective taking have identified social and linguistic competence as the main influences on the social perspective taking of children with special needs. For example, Zhong et al. (2005) found that the social perspective taking ability of children with hearing impairment was related to the social experiences they received. The study concluded that children with hearing impairments' cognitive ability to recognize personality traits was significantly and positively correlated with their social perspective taking ability. Perception of personality traits requires children to evaluate the personality traits of story characters. The correctness of these evaluations is closely related to their level of social and moral development, and the social experiences that children with hearing impairments receive are an important factor in their level of social and moral development. Consequently, the socialization of children with hearing impairments is also an important factor in their ability of social perspective taking. Language is a major medium for the development of children's perspective taking abilities, and several studies have found associations between social perspective taking abilities and language abilities in children with special needs. For example, cognitive and emotional perspective taking in children with autism is positively correlated with their verbal comprehension; social perspective taking in children with hearing impairment can be used as a test indicator (Chen et al., 2023; Zhong et al., 2005). Retelling requires children to have a certain level of understanding of the storyline and characters, as well as to memorize and recall the whole process of the story in a logical manner. Thus, it requires children's language and thinking ability to reach a certain level. Language skills develop to a certain level, and their ability of social perspective taking develops to a certain extent.

In addition, some studies have found that the social perspective taking ability of hearing-impaired children is significantly affected by parental literacy, which scholars believe that this is related to the fact that parents with higher literacy invest more in the education of hearing-impaired children (Zhong et al., 2005). However, for visually impaired children, parental literacy was not significantly related to their social perspective taking ability (Li, 2012). Moreover, in the study of hearing-impaired children, no significant role of gender in social perspective taking was found. Zhong et al. (2005) also agreed that the gender difference in the social perspective taking ability of hearing-impaired children is not significant. However, some foreign studies have shown that gender affects the social perspective taking ability of children with

ADHD, and the perspective taking level of girls is higher than that of boys (Marton et al., 2009). The same influencing factors have different effects on the social perspective taking ability of children with different types of disorders. In addition, the more severe the disability of executive functioning, working memory, and organizational indicators, the longer the response time of children with ADHD to others' perspective taking in the dilemma stage (Chen et al., 2023).

In summary, the level of perspective taking ability in children with special needs is mainly influenced by age, socialization, executive function, language level, and parental literacy. Specifically, the visual perspective taking of children with special needs is mainly affected by individual language level, executive function, fine motor ability and age, and the effect of gender is opposite to the results in typically developing children, showing a significant male dominance, but due to the small number of studies, further validation is needed. Studies conducted separately on affective and cognitive perspective taking showed that affective perspective taking in exceptional children, on the other hand, was mainly influenced by age and gender, and unlike the studies on the other categories of perspective taking, executive functioning was found to have a significant negative correlation with affective perspective taking. The number of studies on cognitive perspective taking is relatively small, reporting mainly the effects of age and socialization. There are also studies that merge affective and cognitive perspective taking to explore the influences of social perspective taking as a whole. Related research suggests that an individual's socialization, language level, and body schema may influence the social perspective taking abilities of children with exceptionalities, but conflicting findings regarding the roles of parental literacy, executive functioning, and gender need to be further explored in subsequent research.

3.3. Assessment of perspective taking for exceptional children

Researchers have made many different attempts to assess and measure children's perspective taking ability, and a series of classic studies have emerged. Most of the measurements of special children's perspective taking are based on the measurements of typically developing children with targeted adaptations.

3.3.1. Assessment of visual perspective taking

Research has mostly used false-belief tasks to measure visual perspective taking in children with special needs. For example, Baron-Cohen's Sally-Anne task tests whether children know the current location of an object and accurately recall previous locations; Chandler's hide-and-seek task requires children to answer questions about where the participant should look for the hidden object; and Perner's M&Ms task requires the provision of containers with labels that do not correspond to the contents, and under the precondition that children know the contents, children are asked to answer questions about their knowledge of the container from the participant's perspective, etc. (Dhadwal et al., 2021; Tsunemi et al., 2014). Some studies have also examined children's visual perspective taking abilities using a visual perspective taking task adapted from Huttenlocher and Presson and a viewpoint-perspective shift task in which stimuli are presented through the E-prime program (Gao et al., 2021; Hao and Su, 2015). With the development of digital construction, the integration of information technology with the assessment of children's abilities has also become

closer, e.g., Korhonen et al. (2016) adapted a computer game with a positive user experience for use in a school setting for children with autism who have high support needs and minimal language skills, to assess whether children with special needs have underlying visual perspective taking skill problems.

3.3.2. Assessment of social perspective taking

Some assessments of cognitive perspective taking in social perspective taking use false belief tasks, such as Perner and Wimmer's Level 2 False Beliefs Test, which asks for judgments about one story character's beliefs about another, and examines recursive thinking about the mental activities of others. Zhang and Lin (1998) adapted the "Attack Story" and "Grief Story" from Chandler and Greenspan's "Outsider Cartoon Stories".

For the emotional perspective taking in social perspective taking, most of the domestic and foreign studies have used story measures, among which some domestic studies have used adapted foreign perspective taking test tasks, and some researchers have combined with the traditional culture to measure the perspective taking ability of hearing-impaired children by independently compiling stories, for example, using the Chinese Fable Picture Stories as the stimulus material (Chen et al., 2023; Wang and Sun, 2015; Wang et al., 2018; Yang et al., 2014; Zhong et al., 2005). The four standardized short stories from Zhang and Lin (1998) are the most widely used measures of social perspective taking in China at present. In addition to the two stories mentioned above to test cognitive perspective taking, the measures of affective perspective taking are based on the stories of Urberg and Docherty and Landry and Lyonds-Ruth, respectively, and were standardized and passed the reliability and validity tests. In addition, studies have also used the Emotional Knowledge Puppet Task to assess children's affective perspective taking (Ziv et al., 2013; Jahromi et al., 2021). Carey and Cassels (2013) explored both the Reading the Mind in the Eyes (ET) task and its open-ended form Generative Eyes Task (GET) as measures of affective perspective taking. The task requires participants to choose the correct words to describe the thoughts or feelings of others based on a still photograph of the eye region of the face. It was found that the ET task measured two standard deviations below the mean and was most accurate for the severely impaired population, whereas the GET task was most accurate at the mean level of perspective taking. Based on these analyses, it was concluded that the ET task is appropriate for assessing broadly defined perspective taking abilities and for identifying and differentiating between children with autism and normally developing children; the GET task is more appropriate for measuring and identifying subtle deficits in emotional perspective taking in typically developing or otherwise less severely deficient clinical populations.

Like the current state of research on influencing factors, some of the studies on the assessment of perspective taking have combined affective perspective taking and cognitive perspective taking into social perspective taking. In addition to the false belief task mentioned above, most assessments of social perspective taking are based on an adaptation of Piaget's Three Hills Experiment, such as the cube task and the spinning plate task (Peterson et al., 2000; Reed, 2002; Shield et al., 2016; Tsunemi et al., 2014). Some studies have used story measures, with Denham's Social Perspectives Adoption Test story being the most widely used (Ghanouni et al., 2021; Scheeren et

al., 2015). Structured interviews have also been used to measure the social perspective taking abilities of children with ADHD. The Interpersonal Negotiation Strategies Interview (INS) is also commonly used. The INS focuses on measurement through five steps of functional problem solving: problem definition, identification of emotions, alternative strategies, selection of the best strategy, and assessment of outcomes. Children's answers to the dilemma questions are scored according to their answers, with 0 being impulsive and not considering perspectives, 1 being considering only one person's perspective, 2 being expressing both perspectives separately, and 3 being coordinating both perspectives expressed to each other, with lower scores representing a lower level of social perspective taking (Marton et al., 2009).

From the existing studies, there are abundant assessment and measurement tools for special children's perspective taking level. However, since most of these instruments were not developed specifically for children with special needs, researchers need to make some modifications when using these instruments. Moreover, the process of revising the instruments for different categories of children with special needs has different degrees of limitations, which makes it difficult to establish norms for large samples.

3.4. Interventions for perspective taking skills in children with exceptionalities

Interventions for children's perspective taking skills began in the 1970s. Scholars have proposed a variety of methods, including role-playing, structured and dramatic play interventions, cooperative and interactive group interventions, new social skills training programs, and false belief comprehension training. In general, however, there are differences in intervention methods for different perspective taking abilities. For example, interventions for affective perspective taking skills are mainly in the form of dialogues, and discussions after story reading; interventions for cognitive perspective taking skills are mainly in the form of a large number of tasks that allow children to differentiate between their own perspectives and the perspectives of the characters in the story by means of interpersonal, spatial, and temporal indications, which can be roughly divided into two types: first, a theory-of-psychology intervention, which promotes children's understanding of the thoughts of others, and the intervention is a position-change task, whose intervention is a position-change task; the other approach relies on relational frame theory (RFT), i.e., interpersonal, spatial, and temporal relational stimulation (Mori and Cigala, 2016).

Most of the intervention studies on perspective taking ability of children with special needs continue the intervention methods of typically developing children, showing diverse characteristics, but mainly focusing on the field of autism. For example, Tsunemi et al. (2014) found that reinforcing autistic children's narrative experiences by reading storybooks and creating narrative situations improved their social perspective taking. Dhadwal et al. (2021) used a multiple baseline cross-subjects design to intervene on perspective taking in three autistic children, and found that multiple exemplar training, prompting, and reinforcement was effective in improving the correct responses to an erroneous beliefs task in autistic children. Ghanouni et al. (2021) developed an interactive action game program focusing on perspective taking

for children and adolescents with high-functioning autism to solve their affective perspective taking problems. Another study used video demonstration to maintain and generalize spatial perspective taking skills in children with autism after an intervention (Tsukamoto et al., 2023). Yang et al. (2014) used visual materials such as expression photographs, contextual pictures and video animations as the main body, and a discussion-based teaching format with a question-and-answer structure containing correct feedback to provide a comprehensive intervention on expression recognition and naming, emotion perspective taking and emotion attribution in emotion comprehension for children with autism, and the results proved that the intervention was effective on the emotion perspective taking ability of children with autism. In addition, after Barnes-Holmes proposed a direct evidence-based relational response assessment and training program based on the RFT—Barnes-Holmes Protocols (BHP), more and more studies have been conducted using the BHP program to train different populations in perspective taking. For example, Gilroy et al. (2015) adapted the BHP protocol from children's stories and found that the BHP protocol based on naturalistic situations could effectively improve the perspective taking level of autistic children aged 8–13 years old, and that the children were able to respond correctly in direct evidence relationships with other adults after reaching the training standard. Liu et al. (2021) found that the use of the BHP protocol can effectively enhance the perspective taking ability of children with autism, and has better maintenance and generalization effects.

Apart from interventions for children with autism, there have been fewer studies of interventions for other types of children with special needs in terms of perspective taking ability. One study used video demonstration to intervene in the spatial perspective taking skills of children with intellectual disabilities, and achieved significant improvement as well as good maintenance and generalization effects (Tsukamoto et al., 2023). Milligan et al. (2015) used a mixed-methods approach to design a social competence group program to improve the social competence of children with learning disabilities who face mental health challenges, and found that the children's basic social competence, including perspective taking skills, improved significantly after the intervention.

The above studies have shown that children with special needs can effectively improve their perspective taking skills through role-playing, cognitive training, cooperative activities, and other forms. However, most studied rely on quantitative test scores to assess perspective taking ability without collecting feedback from children or teachers about the intervention experience, which should be considerate in the further studies. The intervention study assessed the effectiveness of the intervention measures in the short term but did not track the performance of participants one year or more after the intervention. The long-term effectiveness of intervention should be addressed in the further studies. Besides, little research has been conducted on the perspective taking abilities of children with special needs other than autism, and this may be an interesting direction for future research.

4. Further direction

4.1. Educational implications of existing research for promoting

perspective taking skills in children with special needs

4.1.1. Perspective taking training through games

Play is an important channel for children's socialization and development, and it is also one of the effective measures for training children's perspective taking ability. It has been shown that role-playing and simulation games help to improve the perspective taking ability of children with special needs. Role-playing or situational role simulation games require children to consider problems from the perspective of the role they play, and to experience the events, experiences and feelings of others in their lives by playing or simulating the roles of others in different situations. By creating opportunities for children to play the roles of characters in life or literature, such as parents, teachers, and the main character of novels, they can learn and experience the behaviors and feelings of the characters, and practice thinking from others' perspectives, which in turn guides children to transfer the experience gained in the game to their lives, so that they can better put themselves in the position of others to think about issues in real life and in the educational environment, and deduce their views or feelings, thus promoting their socialization.

4.1.2. Creating the right conditions to increase social interaction among peers

The development of perspective taking skills requires children to gradually de-center themselves and to process and reason about representations with the help of prior knowledge and experience; and interaction with peers facilitates de-centering. First, interaction with peers provides children with opportunities to learn about the perspectives of others. Second, children need to learn to understand others' perspectives to maintain good relationships with peers, especially when interactions are poor, and they need to learn to reconcile their own perspectives with those of their peers. Finally, children gradually learn to control and discipline themselves to achieve de-centering when conflicts arise in peer interactions. Cooperative group activities are an important form of intervention in perspective taking research, and it is clear that the role of peers is important for the enhancement of perspective taking skills. For children with special needs, peer interaction provides an opportunity and atmosphere for them to participate in interpersonal interactions on an equal basis, which can help them accumulate experience in contact with others and gain knowledge of understanding others. Therefore, it is necessary to create a good peer interaction situation for children with special needs, so that they can develop their perspective taking ability in the opportunity of peer interaction.

4.1.3. Enhancing the cultural capital of families and strengthening the quality of family education

Family cultural capital refers to the tangible and intangible assets related to culture and cultural activities within the family, which is the sum of social resources accumulated by family members through social activities, and affects children's access to learning opportunities and resources, as well as their learning processes and learning outcomes (Yang et al., 2022). It has been shown that institutionalized family cultural capital, i.e., parental literacy, affects the development of perspective taking abilities in exceptional children due to differences in family educational inputs. Family educational inputs include both monetary resources, such as educational expenditures

and material inputs, and non-monetary resources, such as educational perceptions and contributions of parenting time and energy (Jin et al., 2023). Among them, the input of non-monetary resources is of great significance to children's early socialization ability, including the ability to choose opinions (Zhang and Zhao, 2022). Based on this, parents should firstly set up a scientific education concept and understand the rule and importance of the development of children with special needs in the ability of perspective taking; secondly, parents should adopt a democratic parenting style, create a good environment for children to interact, and pay attention to communicating with children to understand their psychological needs; thirdly, parents should guide children to think from others' perspectives when interacting with their peers, learn to control their own behaviors and emotions, express their emotions reasonably, etc., to create a good environment for the development of children's ability of perspective taking through the improvement of family education quality.

4.1.4. Early development of children's spatial visualization skills through the use of multidimensional graphics

According to the above literature, the deficits in visual perspective taking in children with special needs are more prominent than those in other perspective taking abilities and require urgent attention from educational practitioners. Among them, mental rotation, as a kind of spatial visualization ability, has an important impact on the understanding of perspective representation in the process of visual perspective taking, and stimulus angle parallax is related to the response time and correctness of children's visual perspective taking (Cardillo et al., 2020; Xu et al., 2014). While the preschool stage is a critical period for children's mental rotation development, educators can improve children's spatial visualization ability through mental rotation games such as two-dimensional and three-dimensional shapes and image rotation, as well as video games such as Tetris. For example, when playing jigsaw puzzles, children need to imagine in their minds how each piece should be moved to put together a complete image; when playing Rubik's Cube, children need to imagine in their minds how the Rubik's Cube should be rotated to rotate the same color side. As children's ability to mentally rotate abstract materials gradually improve, so does their ability to spatial perspectives taking, meaning the process of viewing objects from another person's perspective will become smoother.

4.1.5. Implement gender-specific, differentiated perspective taking competency interventions

Research has shown that boys and girls have different strengths in certain perspective taking tasks. For example, boys specialize in spatial perspective taking and girls in emotional perspective taking. In the dimension of cognition of others and relationship cognition, due to the characteristics of their own psychological development and the different requirements of society on gender roles, girls' social sensitivity is usually higher than that of boys; and in activities such as mental rotation from two-dimensional to three-dimensional space and determining target objects, boys show greater advantages (Zhang and Wang, 2008). Based on this, interventions should be focused on different types of perspective taking abilities of children with special needs according to gender, so as to enhance the effectiveness of interventions.

4.1.6. Application of new technologies in the intervention on the perspective

taking of children with special needs

In the educational intervention for children with special needs, traditional teaching methods are still being used without attempting new technologies, such as Virtual Reality (VR). Explore the use of VR technology to improve the perspective taking abilities of children with special needs by creating simulated social scenarios that allow children to practice social skills in a safe environment. VR technology supports experiential learning, which is crucial for children with special needs who often struggle with abstract concepts and benefit more from concrete experiences. In these virtual environments (VEs), children can engage in diverse experiences that are embedded in real-world contexts, which helps them learn from mistakes without the fear of failure or embarrassment. Moreover, VR can offer experiences that might be impossible in the real world, such as allowing a wheelchair user to experience standing up, thus broadening their perspective and understanding.

4.2. Prospects for research on perspective taking in children with special needs

4.2.1. Expanding the research subjects and content of perspective taking

Most of the current research on perspective taking in children with special needs focuses on children with autism, with a few studies involving children with other disabilities such as hearing impairments, intellectual disabilities, visual impairments, and ADHD, which are more limited in scope. Most of the research on children with disabilities other than autism has focused on children's ability of social perspective taking, and the content of the research is also limited. Children with hearing disabilities and visual disabilities perceive the world differently from autistic children due to their sensory deficits, and the level of perspective taking, especially emotional and spatial perspective taking, is also different. Therefore, future research should be more comprehensive in selecting research subjects and enriching the content of the study.

4.2.2. Development of a measurement tool for the level of perspective taking among special groups of children

Most of the commonly used research tools for measuring perspective taking skills of children with special needs are adapted from stories and tasks applicable to the perspective taking skills of typically developing children, but for children with special needs, such as visually impaired children, the results of the studies differ due to the limitations of the measurement tools, and there is an urgent need to improve the scientific validity and accuracy of the results of the measurements of the perspective taking skills of children with special needs. In addition, most of the measurement tools used in the existing studies only focus on one type of perspective taking ability, which is not conducive to judging the overall social skills and socialization level of children. Therefore, future research should vigorously develop measurement tools for children with special needs or children with different disabilities, integrate different perspective taking abilities in terms of content and paradigm, strengthen the reliability and validity analyses of the measurement tools, and explore localized measurement tools for perspective taking abilities of children with special needs in China.

4.2.3. Enrichment of research on intervention responses to the perspective

taking of children with different types of disability

According to the above literature, the current intervention responses for perspective taking ability of children with special needs mainly include story reading, cooperative activities, role-playing, and other interventions like those for typically developing children. Some studies have shown that children with special needs have social, motor, body schema, and executive functions that affect the development of their perspective taking skills. In the future, we can integrate the cognitive and motor aspects of intervention with social skills and executive functioning to help children with special needs to improve their perspective taking.

In addition, the current intervention research mainly focuses on autistic children, and there is little intervention research on children with other disabilities, such as visual impairment and hearing impairment, compared with autistic children. Although there are some similarities in the perspective taking characteristics of different categories of children with special needs, there are differences within the group, and intervention research needs to focus on multiple research subjects and adopt differentiated intervention strategies. For example, the intervention strategy of emotional perspective taking with visual materials is not applicable to students with total blindness, and it is necessary to switch to different intervention methods, such as visual teaching, situational experience, and other intervention strategies. In addition, intervention strategies should consider the age, personality traits, interests, cognitive characteristics, environment and other factors of children with special needs, so as to develop systematic, generalizable and flexible intervention strategies for children with different types of disabilities in perspective taking.

4.2.4. Focus on qualitative research methods to complement existing research findings

Quantitative research provides objective data to reflect the level and characteristics of children with special needs, and most of the existing studies have adopted this research paradigm. Although quantitative research can objectively reflect the common characteristics and developmental trends of a group, it is difficult to reflect individual differences; and individual differences among children with special needs are very obvious, including not only the differences in their physical and mental development, but also the differences in the ecological environment in which they live, such as the differences in the social knowledge, motor skills, and cognitive level of different categories of children with special needs, which affect their ability of perspective taking, and make peer relationships and teacher-student relationships show different characteristics, which in turn affect the children's school life, and the children's ability of perspective taking. For example, differences in social knowledge, motor skills, and cognitive levels of children with special needs in different categories affect their ability to choose their perspectives, and make peer relationships and teacher-student relationships show different characteristics, which in turn affect children's experiences of school life. In view of this, future research should strengthen the design of qualitative research, explore the role and mechanism of the influencing factors of perspective taking ability derived from quantitative research, and enhance the effectiveness of educational intervention strategies, so as to supplement the data of quantitative research, further enrich the research results, and help solve the problem

of perspective taking of children with special needs in practice and improve their social interaction level.

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