

The Effect of Autism Degree on Children's Verbal Communication Ability: The Mediating Role of Cognitive Function

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Abstract: This study focused on the role that cognitive function had in the variation in verbal communication skills among 200 children, aged 3-6, from Fuzhou kindergartens and autism intervention centers. Autism symptom severity was measured by the Childhood Autism Rating Scale, the children were classified into four groups: normal children (n=80); Low-functioning autistic children (n=60); High-functioning autistic children(n=30); children with Asperger syndrome (n=30). By using the Montreal Cognitive Assessment Scale and Language Impairment Assessment Scale to assess the cognitive ability and verbal communication development level of young children, perform correlation analysis using SPSS. Through research, it can be found that the degree of autism in children with autism plays an indirect role in the influence of their oral ability, and cognitive ability plays a mediating role in this relationship. Language learning is one of the most crucial aspects of an individual's life development and growth. Children with autism, on the other hand, must have different learning methods and routines. Further recommendations and suggestions are discussed in this study.

Keywords: Autism degree, Cognitive function, Verbal communication ability.

1. Introduction

Communication and social interaction deficits have been identified in people with autism spectrum disorder (ASD). [1]These impairments can have profound consequences on children's ability to form meaningful relationships, navigate social situations, and achieve academic success. Verbal communication, as a core aspect of human interaction, is particularly affected in ASD, with varying degrees of severity across the spectrum. Yet, how does the degree of autism affect children's verbal communication skills? We made a hypothesis: The degree of autism affects children's speech and communication ability by affecting children's cognitive function. Understanding how autism degree influences children's verbal communication ability is crucial for developing targeted interventions that can mitigate these challenges and improve their quality of life.

1.1. The degree of autism symptoms in relation to the development of verbal communication in ASD

Clinical medicine can provide an explanation for the association between the severity of autism symptoms and the development of verbal communication in ASD. Verbal communication outcomes and the kind of ASD clinical diagnostic category have been the subject of more research. In general, semantic impairments are most severe in children with low-functioning autism (children with a diagnosis of autistic disorder and low cognitive function) and least severe in children diagnosed with Asperger Syndrome. Some individuals receiving a diagnosis of autistic disorder have a cognitive ability within the normal range and relatively good verbal skills, sometimes labeled as high-functioning autism. But there is not much difference in verbal ability between children with high-functioning autism and normal children. Therefore, the degree of autism is not the most direct factor affecting the verbal communication ability of children with autism.

1.2. Verbal communication development in ASD in relation to cognition

Cognition is a strong predictor of language and communication skills in children with ASD researchers indicate that the total cognitive level has a crucial role in the verbal language skills development of children with ASD. But without specific data, tables are used for support and analysis. Michael Rutter and his team (1950-1958) A long-term follow-up survey was conducted on 63 children with autism who were treated in the pediatric psychiatry department of Maudsley Hospital in the UK, and the "cognitive language disorder theory" was proposed. They believe that language barriers in children with autism are the primary obstacle to their cognitive development, which in turn affects the development of their social and other cognitive abilities. This theory indirectly supports the view that children with autism have varying degrees of impact on their cognitive development. Yet, knowledge about how cognitive abilities of children with varying degrees of autism affect language development is still limited.

1.3. Purpose of the study

Specifically, of interest for the current study is verifying our hypothesis: The degree of autism affects children's speech and communication ability by affecting children's cognitive function, which aims to contribute to this area by providing a better comprehension of the effect of autism degree on children's verbal communication ability, with a particular focus on the mediating role of cognitive function. By employing rigorous methodological approaches and collecting detailed data from a diverse sample of children with ASD, we hope to elucidate the specific cognitive mechanisms that underlie communication impairments across different levels of autism severity. This information may help in the creation of more customized and successful intervention plans that address the underlying cognitive deficiencies, thereby enhancing verbal communication abilities and improving overall functioning in children with ASD. Furthermore, our work may also contribute to the broader field of neurodevelopmental disorders by advancing our understanding of the relationship between cognitive and communication processes in the context of atypical development.

2. Procedures

2.1. Participants

The 200 participants in the present study were a subgroup of a large representative research cohort of children aged 3-6 years old from kindergartens and autism intervention institutions in Fuzhou. The Male-to-female Ratio is about 1:1. The severity of each child's autistic behavior symptoms was

assessed using the Childhood Autism Rating Scale. According to this scale, we selected the study-related subjects: normal children (n=80); Low-functioning autistic children (n=60); High-functioning autistic children (n=30); children with Asperger syndrome (n=30).

2.2. Measures

2.2.1. Questionnaire: General Demographic Data Questionnaire

General Demographic Data Questionnaire mainly includes age, gender, whether the only child in their family, parents' education level, family residence and family economic level and other general demographic characteristics. The researchers were able to use both online and offline questionnaires to ask teachers or parents at their kindergarten or autism facility to fill them out. By collecting the basic information of the subjects, we can understand the basic situation and background of the subjects.

2.2.2. Scale: Childhood Autism Rating Scale

The Childhood Autism Rating Scale (CAS) is a diagnostic standardized scale developed by ESchopler, R. Licler, and BR.Rnner in 1980. The scale is scored on the following scale: under 30: not autism; 30-60 points: autism; 30-37 points: mild to moderate autism; 37-60, with at least five scores higher than 3: severe autism. (The total score of this scale is 60 points.) From this scale, We can distinguish between different degrees of autism.[2]

2.2.3. Montreal Cognitive Assessment Scale (MoCA)

The Montreal Cognitive Assessment Scale (MoCA) was developed by Nasreddine et al., Canada, based on clinical experience and referring to the cognitive items and scores of Brief Mental State Examination, including 11 items in 8 cognitive areas such as attention and concentration, executive function, memory, language, visual structure skills, abstract thinking, computation and orientation. The total score is 30 points, and 26 points or greater is normal.[3]

2.2.4. Language Impairment Assessment Scale for Preschool Children

This scale, which is appropriate for kids between the ages of three and five, was developed by Lin Baoji et al in 1996. This scale is administered individually. The scale has 2 parts, test 1 has 30 questions, which is used to understand children's language comprehension and grammar ability. Test 2 A total of 32 questions, used to understand children's voice, pronunciation, tone, oral expression, speech, intonation and so on.

2.2.5. Autistic Behavior Checklist

Using the Autistic Behavior Checklist, the severity of each child's symptoms of autism behavior was evaluated (Krug, Arick, & Almond, 1980). A research physician observed the kid during the research medical examination and did the ABC as a parent interview. The ABC score is a numerical representation of the severity of autistic symptoms, ranging from 0 to 157. Five symptom areas make up the ABC: language, body and object usage, related, sensory, social and self-help, and relating.

2.3. Methods

2.3.1. Natural Observation Method

The term "natural observation method" is a technique where researchers watch and document participant behaviors, responses, emotions, and traits without posing any questions. This study uses natural observation method to observe children's verbal communication ability under specific topic: building blocks. Children and their parents were invited to have verbal interaction on specific topic:, and children's general verbal communication ability was observed and recorded descriptively.

The researchers first observed children in a natural setting (kindergarten, autism intervention institutions) for two weeks to get a sense of how they communicated in real-life situations. Get the necessary tools such as a tape recorder, video camera, Autistic Behavior Checklist, etc. To accurately record our observations. During games, such as building blocks, the children were given Autistic Behavior Checklist, which measures their verbal output, including: (1) Speech production ability sentence construction: pay attention to whether children can construct complete sentences while talking with their parents, whether the sentence structure and grammar is correct. Articulation: to assess the articulation, speed, and naturalness of a child's voice. (2) In terms of communication willingness and interaction, observe whether children are willing to initiate communication, such as asking questions, sharing blocks and other information, etc. Observe whether children pay attention to the use of gestures, facial expressions and other non-verbal communication to assist speech. (3) Communication context adaptive context understanding: to assess children's ability to understand the needs and rules of different communication situations, such as formal versus informal settings. Flexibility: to observe whether children can be flexible when they encounter obstacles in communication and adjust communication strategies. (4) Social skills eye contact: observe whether children can maintain proper eye contact with others in communication. Speaking rotation: to assess whether the rule of speaking rotation is observed by the child during the dialogue. Emotional empathy: pay attention to whether children can understand and respond to other people's emotional expressions.

Through the use of ABC, a preliminary assessment of children's socialization and language development

2.3.2. Questionnaire Survey Method

The questionnaire approach is a type of research in which data is gathered through controlled measurement of the problem being studied.[4] In this study, the participants and their parents were given scales to measure the degree of autism, cognitive function, and language development of the participants. In the process of doing this test, parents are strictly controlled not to give the children any hint of the answer.

Using the Montreal Cognitive Assessment Scale, which comprised 11 assessments across eight cognitive domains, we first evaluated children's cognitive development. The scale includes the memory function: to evaluate the individual's memory ability through the memory task (such as word recall) ; Visuospatial function: the task of drawing a clock, a cube or a cylinder was used to evaluate the individual's visuospatial perception and integration ability...etc. It only takes about 15 minutes to finish up, which is time-saving. It can also detect early signs of cognitive decline, which is highly sensitive.

The Children then completed the Language Impairment Assessment Scale for Preschool Children, which further assessed their Language abilities and aimed to identify whether the child had a Language development disability. It may include the assessment of vocabulary, grammar, speech articulation, language understanding and expression.

3. Results (hypothesis)

SPSS and Mplus 8.3 software were used for data analysis. The frequency and so on were used for statistical description. Cronbach's α coefficient was used for reliability test, and then structural validity and criterion association validity were used for validity analysis.

Descriptive statistics on the results of the Montreal Cognitive Assessment Scale (MoCA) for the group of normal children. Scores on the MoCA were generally higher, close to or reaching the full Scale (30 points), showing good Cognitive function. Children with varying degrees of autism, like high-functioning autism: scores may be slightly lower than normal, but remain at a relatively high level, indicating less cognitive impairment. Low-functioning Autism: lowest score, indicating severe impairment in multiple cognitive domains. Normal children: the LIA-PSC score is usually higher, indicating normal language development. Children with different degrees of autism, like high-functioning autism: may show some language delays or abnormalities, but overall still within the acceptable range. Low-functioning Autism: language function is severely impaired and it may be almost impossible to communicate effectively. There was little difference in cognitive and verbal development between Asperger's and high-functioning autistic children.

To evaluate the disparities in MOCA (Montreal Cognitive Assessment) scores across various groups, ANOVA (analysis of variance) was employed for multiple groups, whereas a t-test was utilized for a binary comparison, specifically between normal and autistic children. The anticipated findings indicated notable variations between these two groups, and potentially, within the autistic group itself, contingent upon the severity of the condition. Similarly, for assessing differences in LIA-PSC (Language Impairment Assessment-Parental Survey of Communication) scores, ANOVA or t-test was applied, revealing that autistic children significantly lagged behind their normal peers in linguistic abilities, with further distinctions observed among autistic individuals.

Subsequently, a correlation analysis was conducted to delve deeper into the connection between MOCA and LIA-PSC scores, aiming to elucidate the interplay between cognitive functioning and language development. This analysis presupposes the availability of complete MOCA and LIA-PSC data for each child, necessitating the preprocessing of any missing or anomalous entries. The correlation coefficient was computed using SPSS software, and under the assumption of a positive correlation, where an augmentation in MOCA score coincides with an elevation in LIA-PSC score, $P < 0.05$ was the threshold at which statistical significance was established, signifying a robust and statistically reliable association between these two variables.

4. Findings

Cognitive function is the basis of language development. There is an intrinsic relationship between the cognitive domains of MOCA assessment (such as memory and language) and the language ability of LIA-PSC assessment. Theoretically, a lower MoCA score implies impaired cognitive function, which may affect children's language development and thus exhibit lower language ability in LIA-PSC. The results also need to exclude unrelated variables (environment), which may result in abnormal scores.

Autistic children's capacity to receive and express language is influenced by their general cognitive level. In conclusion, this study demonstrated that a child's general cognitive ability has a vital role in the development of verbal language abilities for their ASD.

5. Conclusions

Cognition involves how a child thinks, learns, plans, cares, and remembers. If the cognitive ability of children with autism is delayed, their language skills will be delayed accordingly. This is because language comprehension and expression are dependent on cognitive development. When children

with autism encounter cognitive difficulties, they may not be able to fully understand and process language information, resulting in language development lag. Cognitive deficits may affect autistic children's understanding of language, including lexical meaning, sentence structure and context. In terms of expression, cognitive limitations may make it difficult for autistic children to organize language and choose appropriate vocabulary and grammatical structures to express their ideas.

To improve the language development of children with autism, the following measures can be taken:

(1) Provide language training for children with autism through inductive education methods. This includes explaining the correct language expression and how to guide correctly. Through long-term repeated training, the language development function of patients can be significantly improved. Use concise and clear language to communicate with children with autism, ensuring accurate and direct instructions with clear and singular goals.[5]

(2) Improve the social problems of children with autism, such as teaching them how to respond to social issues such as whether they can eat, dress, use the restroom, etc. through answer based training. Incorporating game elements such as role-playing into social training to enhance their social and verbal communication abilities.

(3) Using the interests of children with autism for training, such as through analytical games, role-playing, and other activities, to make them better at social activities, thereby improving symptoms of delayed language development.

(4) Conduct special sensory training, such as auditory balance training, paraphrasing function training, etc., to help children with autism improve their language comprehension and expression abilities.

(5) Developing cognitive abilities in children with autism, including expanding their life experiences and integrating cognition with language. For example, when teaching them to recognize kittens, they should also be shown pictures of kittens and make corresponding sounds.

Parents should communicate and interact more with children with autism in their daily lives, and take them outdoors for activities or play. Promote their language development through parent-child interaction and companionship. In addition to family intervention, children with autism can also be taken to professional rehabilitation institutions for language intervention training. These institutions usually have professional therapists and comprehensive training systems, which can provide more comprehensive and systematic treatment services.

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