The International Conference on Interdisciplinary Humanities and Communication Studies
DOI: 10.54254/2753-7048/6/20220499

Analyze Social Behavior in Autistic Children by Using Theory of Mind

Zijing Zong

Ulink College of Suzhou Industrial Park, Suzhou, Jiangsu, China
zijing.zong@sz-alevel.com

Abstract: A complicated heterogeneous disorder, autism spectrum disorder (ASD) impacts verbal and nonverbal communication, social relationships, as well as social and cognitive activities. The study of the theory of mind (ToM) entails the observation, comprehension, and interpretation of mental states and the behaviors they produce. ToM and ASD are closely related. The ToM exam is frequently failed by kids with ASD. Currently, scientists have discovered a link between ToM, social-emotional development, and cognitive development in kids with ASD. ToM was successful in predicting with precision the limitations of autistic patients' social skills, creative abilities, and communication. However, the causes of autism are still largely unknown because of the disorder's complicated behavior and polygenic disorders. The purpose of this paper is to investigate how ToM affects the social, emotional, and cognitive growth of children with ASD. The study uses Empathizing-systemizing (E-S) theory to explain the non-social and social traits of autistic children and describes how ASD children make moral decisions from the perspective of cognitive and social development.

Keywords: autism spectrum disorder, theory of mind, Empathizing-systemizing (E-S) theory, cognitive development, moral decision

1. Introduction

Autism spectrum disorder (ASD) is a complex, neurobiologically diverse condition marked by deficiencies in perception, information processing, social interaction, verbal and nonverbal communication, and social and cognitive behaviors. The cognitive ability to infer other people's mental states is known as the theory of mind (ToM) [1]. ToM and social cognitive skill deficiencies are related to autism symptoms related to perception, social stimuli, or processing, and attention deficit disorder.

ToM and its predecessors start to appear in neurotypical people as early as 14 months old, and they develop along predictable paths throughout childhood [2]. ToM's ability plays a crucial role in everyone's life since it makes it easier to comprehend the whole spectrum of mental conditions that lead to conduct as well as to reflect our own and other people's psychological makeup. Given that many kids exhibit anomalous behavior from an early age and perform poorly on formal ToM tests, ToM has long been associated with ASD. It has been suggested that ToM development in people with autism may be inadequate or even delayed [1].

This paper's main objective is to investigate the ToM developmental deficits in ASD children using eye tests and false belief tests, to explain social communication problems using the theory of

DOI: 10.54254/2753-7048/6/20220499

mental blindness, and to explain non-social traits from two dimensions using the theory of empathy systematization, such as restricted interests and repetitive behaviors.

2. Method

The author searches the keywords "autism," "theory of mind," "empathy," "moral decision-making," and pertinent Chinese synonyms, in the database of https://x.sci-hub.org.cn/scholar and Wanfang.

3. Theoretical Background

3.1. Theory of Mind

ToM is a basic social cognitive ability, broadly defined as the ability to attribute mental states such as beliefs, desires, opinions, and intentions to others and recognize these as mental states independent of one's own [1]. ToM involves understanding other people's beliefs, feelings and thoughts, and its development affects all aspects of a child's life. In neurologically normal individuals, ToM tends to follow a predictable developmental trajectory throughout childhood and gradually develops.

ToM increasingly develops as kids get older. At 14 months, a typically developing infant exhibits shared attention, which occurs when he pays attention to an object while seeing his mother's reaction to the same object; At age 2, he engages in symbolic play, comprehending others' pretenses, and copying others' behavior. By age 3, when he has a fundamental comprehension of emotions, perceptions, desires, and intentions, he can pass the first stage of the eye test. These are the first indications of ToM's growth. The concept of incorrect beliefs begins to progressively take shape in youngsters around the age of four, which is a crucial developmental stage. The cerebral processes for processing behavior and belief content gradually advance with language and executive skill gain. Understanding that false beliefs are associated with some real performance at age 4 and suggest evolutionary cognitive development. Between the ages of 5 and 8, reasoning about deception and lies emerges, and children try new theories and modify old theories through experience. At age 9, children performed well on the faux pas task because they realized that something needed to be said or that it would affect someone else's mood [1-3].

ToM is a requirement for communication and interaction, and social contact necessitates learning a language and comprehending what the speaker is attempting to convey. Higher cognitive functions, certain brain connections, and reasoning processes are all involved in ToM's development. Although the brain is equipped with the necessary processes, the infant ToM is not fully developed, and the social environment coordinates and initiates the movement. The evolution of the ToM depends on a number of processes, including the social brain's capacity to perceive sounds, faces, and body movements of others [1].

3.1.1. “Mind Reading through Eyes" Test

According to earlier research, an ASD child's ToM and their capacity to comprehend emotions are related. A face perception test called the "eye-based Mental State Prediction" demonstrates that people with autism have trouble reading people's minds [4]. The test examined how well kids with ASD could recognize the emotions (joy, sadness, surprise) hidden behind images of various facial expressions. Participants in the test were shown 25 images of various actors’ and actresses' facial regions, and they were asked to select the two words that best captured the thoughts and feelings of the subject in each image. Participants had to match samples of eye region expressions in particular mental states rapidly and unconsciously to decide which word the eyes were closest to. The test,

DOI: 10.54254/2753-7048/6/20220499

which asks participants to picture feelings in another person's head, allows for attributions to a relevant mental state but not for inferences regarding that mental state. According to the findings, autistic kids had trouble with the experimental task but did well on the control task.

Basic emotions (such as happiness and sadness) can be recognized and expressed by children with ASD, but they struggle to comprehend and communicate cognitive emotions (embarrassment, surprise) [5]. Understanding erroneous ideas in youngsters are correlated with cognitive emotions. The performance on the eye test was negatively related to the performance on the autism spectrum quotient (AQ), and there was no significant link between IQ and the eye test. This implies that general (non-social) intelligence and IQ are related.

3.1.2. False Beliefs Test

Children spontaneously assign erroneous beliefs to others before passing the explicit false belief test, according to the most recent ToM studies. Our understanding of typical development and the emergence of the ToM in autistic patients has been altered by these recent discoveries. Between the ages of 2 and 3, children passed a spontaneous false belief test [6]. The second order belief, or knowing why a third party holds a particular belief, is included in the false belief test in addition to the first-order belief, or comprehending the other party's psychological condition. The false belief test includes not only the first order belief, that is, the understanding of the other party's psychological state, but also the second order belief, that is, the understanding of the third party's holding a certain belief. At the age of 6, children with typical development gradually develop secondary false beliefs, resulting in a more mature ToM.

Children with autism frequently lack the executive function necessary to govern memory, which necessitates planning, flexibility, or restraint. These deficiencies were substantially related to false belief test performance in both normally developing and autistic children. Children with better planning and control were more likely to pass the false belief test, supporting the idea that passing the false belief test requires a person to maintain a false representation of events in working memory while predicting a person's propensity to act based on what they know to be true [7].

According to studies, thinking necessitates the suspension of accurate beliefs in error situations, and mental functioning requires the cooperation of higher-order cognitive skills that are frequently restricted to autistic children, like working memory, attention, flexibility, and inhibitory control. Children with autism performed worse on the false belief test and did worse at grasping false beliefs, indicating some complexity in ToM's development. It is important to note that the delay in ToM's development is linked to the development of verbal mental ability and linguistic ability [1].

Children have limited capacity to assign incorrect beliefs because of their developing linguistic and cognitive abilities. The most recent ToM innovation, the Spontaneous False Belief Test, measures participants' propensity to spontaneously assign their own belief states to those of others.

3.2. Mind-blindness Theory

When people read the thoughts or thoughts of another person, people not only comprehend their behavior and feelings but also have the capacity to forecast their mental states. For example, when people observe another person's expression or movement in response to an object of interest, they know that person wants that item [3].

Mind-blindness Theory refers to the ToM developmental delay in autistic children, which has a significant impact on how well they understand and interpret the behavior of others [1]. According to the hypothesis of mental blindness, kids with ASD have trouble putting themselves in other people's situations and imagining their experiences. As a result, they find other people's conduct to

DOI: 10.54254/2753-7048/6/20220499

be perplexing, unexpected, and sometimes even terrifying. Their struggles in mastering the skill of mind reading serve as evidence in this regard [3].

Baron Cohen's false belief test and Baron Cohen et al. "mind reading through eyes" test revealed that ASD youngsters have trouble understanding the thoughts of others. Due to their inability to comprehend the emotions and feelings of others, Baron Cohen theorizes that people with ASD suffer from an empathy deficit as a result of a fault in their ToM. This is known as the mindblindness hypothesis [8]. According to the psychological blindness hypothesis, many studies think that ASD persons' theories of mind should be modified in order to increase their capacity for empathy.

Children with ASD have trouble following other people's eyes in the first year of life, they are unable to share attention, and they lack social interests like disliking other people's facial expressions. They become less adept as they become older at identifying and comprehending the complex emotions that result from mental processes, which affects their capacity to socialize and regulate their behavior. They lack first- and second-order false beliefs, deceit, and deception perceptions, but they struggle to sustain these deficits when playing a game that uses symbols to help players grasp the viewpoints of others. Due to their diminished capacity to understand the thoughts, feelings, and actions of the characters in the story, they also had trouble perceiving thoughts, other people's eyes, understanding faux pas tests, and understanding and interpreting narrative texts [3].

Language issues and other social and communication challenges associated with ASD can be explained by the mental blindness theory. Because abnormalities are present throughout the entire life cycle when utilizing age and psychologically age-appropriate assessments, the degree of heart blindness is common across all people with ASD. Autism is currently predicted and diagnosed in infancy using tests related to common attention and pretend play [3].

However, this approach is unable to explain non-social characteristics (narrow interests, need for similarity and attention to detail). True empathy needs more than just the ability to read another person's mind; it also calls for an emotional reaction to that person's mental state. Many autistic people are unsure of how to react to someone else's emotional state. This may not be exclusive to autism because many clinical illnesses exhibit several types of psychiatric disorders, such as borderline personality disorder. The hypothesis of mental blindness ignores areas of strength and concentrates on the challenges faced by individuals with ASD. The E-S theory is a novel explanation for social and communication challenges in autism that makes use of delayed transference and impairments, while also making use of areas of advantage by reference to systematized advanced skills [3].

3.3. Empathizing-systemizing (E-S) Theory

According to the notion of Empathizing-systemizing (E-S) theory, which is an extension of the theory of mental blindness, individuals with ASD show lower levels of cognitive empathy (commonly known as "mind reading") than the general population [9]. This idea highlights that while ASD individuals' social dysfunction is caused by a loss in their capacity for empathy, their capacity for systemization is unaffected and may even be greater than that of typical people [8].

Systematizing and empathizing allow for the population's individual variances [3]. The capacity to comprehend and exert emotional and cognitive control is empathizing. Identification of other people's emotions and sentiments, as well as the ability to forecast and respond to them appropriately by assuming that they are in a certain psychological state, is what motivates people; the ability to analyze, build, and infer the control of rule-based systems and predict the driving force of "the behavior of non-intelligent deterministic systems" is referred to as systematizing. It is the driving force to identify the emotions and feelings of others and to make appropriate predictions

DOI: 10.54254/2753-7048/6/20220499

and responses to them by inferring the psychological state of others [9]. When people systematize, they attempt to ascertain the control system's rules and make predictions about the system's future behavior [3]. Since humans are not subject to rules, empathy is a better indicator of how they will behave [1].

According to the E-S theory, empathy is accomplished through the empathy quotient (EQ), which includes anticipating how someone will feel, interpreting what someone else is saying to mean, and assessing what they are thinking based on what they are saying. Systematization is measured by the systematization quotient (SQ), which includes researching mathematical models and principles, being curious about the parts of electronic gadgets, and understanding how machines work [10].

Individuals with ASD or the general population only have lower-than-average social communication performance when it comes to empathy. While systematic disparities in empathy between children with ASD and generally developing children are connected with autistic symptoms, other observational research has indicated that empathy is not associated with autistic traits [8]. Instead of a general lack of empathy, it has been proposed that autism is linked to an inability to comprehend and predict mental states. When faced with the social world, people with autism may exhibit predicted system behavior rather than typical human conduct [2].

Over time, the E-S theory has produced convincing theoretical and empirical data that explains how cognitive styles and autism are related. Comparing a person's scores on systematization (S) and empathy (E) reveals their cognitive style or type of brain. People with S brains systemize more than they empathize, while those with E brains empathize more than they systemize. People who score equally in E and S are categorized as type B. (i.e., balanced). The extreme S-shape signifies above-average systematization but difficulties with empathy; extreme E types represent above-average empathy but difficulty with systematization. These brain types have distinct neuronal structures and functional characteristics. Psychologically speaking, more women have E-type brains and more men have S-type brains [3, 9].

The E-S hypothesis, a two-factor theory, is useful in describing the distinctive traits of the autism spectrum. A distinction between problems with empathy and the systematic pursuit of integrity or even greatness by many groups can only be made in the autistic spectrum. A rigorous systematization was used to educate empathy in the new interventions, which emerged gradually along with the theory [3]. E-S theory, which takes into account skills like improved memory, strong visuospatial ability, various mental levels, central cohesiveness, and executive functions, also explains cognitive impairment in kids with ASD. ToM and executive skills are also essential conditions for the development of some functions and other functions [1].

Both the social and non-social aspects of ASD can be explained by the E-S theory. A straightforward explanation for social and communication challenges is below-average empathy, while average to above-average systematization offers a comprehensive explanation for specific interests, recurring patterns of behavior, resistance to change, and the need for identity [3]. Limited empathy helps to explain communication and social deficits, whereas highly developed systematization explains repetitive behaviors, specialized interests, obsessive attention to detail, and resistance to systematization encouraging prediction and understanding of an inanimate universe governed by rules, rather than fostering empathy for the perception and interpretation of the social world [1].

3.4. The Connection Between ToM and Moral Judgment

Social decision-making, which is the process of making decisions based on moral judgments, is a category that includes moral decision-making. Evaluating moral principles and social construction standards needs moral judgment. Significant alterations in the growth process are the hallmark of

DOI: 10.54254/2753-7048/6/20220499

moral decision-making behavior. ToM and executive function are two cognitive abilities that encourage sharing [2].

ASD is mostly seen as a condition of social dysfunction. Children with ASD struggle mightily with emotional cognition and social interaction. ToM is associated with social competency, which is vital for moral reasoning as well as for human social interaction and communication [2]. ToM is therefore a fundamental requirement for humans to successfully adapt to complex social systems [10].

The development of moral decision-making and the alteration of sharing behavior with age are described as youngsters start to assimilate social standards into their cognition. Children with typical development began to demonstrate expectations for fairness at the age of 15 months; at 3 years old, they expressed a desire to distribute resources equally among third-party resource allocation tasks; at 6 years old, they started to assess whether the recipient was deserving of the resources in terms of value and welfare; and at the age of 7 to 8 years old, they corrected the inequality in their judgment and distribution, demonstrating that fair distribution is preferable to equal distribution under the circumstances [2].

3.4.1. Cognitive Development

According to psychologists, moral thinking in children develops in stages and is founded on cognitive development. The set of mental operations required to categorize and interpret perception is referred to as cognition. Perception, memory, attention, learning, language development, motor skills, and visuospatial skills are examples of basic cognitive abilities. The first two years of a child's existence are when they establish their ability to describe their environment and learn the fundamentals. The interaction of cognitive and emotional abilities is necessary for the steady growth of cognitive abilities. As a higher psychological process, metacognition describes the person's understanding of how their cognitive abilities function as well as their awareness, evaluation, and management. According to research, the development of metacognitive abilities is essential for the growth of executive function, social competence, and children's ToM [1].

Emotional and cognitive brain pathways interact when making moral decisions. Empathy encompasses self-control, emotional empathy, and cognitive empathy. ToM and emotional cognition are the two fundamental elements of emotional empathy, which is often referred to as emotional sharing or arousal. Numerous studies have shown that ASD children have trouble absorbing and interpreting social cues since their social cognitive ability has not yet developed [11]. Cognitive empathy overlaps with ToM, which refers to the ability to infer the psychological state of others to improve emotional awareness and understanding. Emotions, driving forces, and emotions can all be managed through self-regulation. Self-control and cognitive empathy mature with age. By properly adjusting the intermediary function of effective empathy and cognitive empathy, empathic attention is achieved. Some people believe that the interaction of cognitive and emotional empathy will increase prosocial behavior and raise concerns about empathy [2].

ToM must incorporate the sharing of emotions with knowledge of other people's mental states and the results of actions in moral contexts. This might encourage empathic attention in neurotypical kids, which is crucial for moral judgment. Cognitive empathy is hampered, but emotional empathy is unaffected. Children with ASD may struggle to make moral decisions because of cognitive empathy deficiencies. ToM deficiency especially hinders the successful fusion of empathy arousal and emotion sharing (affective empathy) with social knowledge in moral circumstances. As a result, while making moral judgments, children with ASD may lack the desire necessary for empathic action [2].

DOI: 10.54254/2753-7048/6/20220499

3.4.2. Social Development

Children with ASD often struggle socially because of their unusual moral understanding. Due to the ToM flaw, ASD children frequently assign blame based on the outcomes of the conduct rather than the actor's intentions. Children typically start thinking about social norms and making moral judgments about equality before the age of 6. When children think about fairness, they detest harm to individuals more than harm to things like property and material possessions [12]. The participants' capacity for rational thought and sense of moral obligation determine how much they make morally righteous decisions. Equal allocators gradually improve their capacity to incorporate social information into moral judgments. This could result in a rigid approach to moral judgment on the part of these kids, preventing them from viewing fairness as a real-world application of moral principles. The preference for equality and reliance on norms in some children with ASD indicate that these individuals' social skills are underdeveloped and gradually develop with age [2].

Because ASD children's theoretical understanding of right and wrong and their assessments of the behavior of others may not be indicative of the moral decisions they will ultimately make, moral knowledge and moral decision-making are distinct. According to certain studies on moral judgment, ASD judges others' behavior for a variety of reasons. They also tend to make more general condemnations, as "because it is right," and rarely use abstract moral principles to support their claims [12].

According to E-S theory, ASD children who decide to distribute resources evenly might be methodical rather than compassionate. This enables children with ASD to perceive every social situation as a "system" that is set in stone. With this strategy, they might apply norms to events that they view as reasonable and predictable. Given that systematization's prediction power in the social sphere is inferior to empathy, this ASD methodology may result in improper moral decision-making. As a result, some kids with ASD may turn to systematizing and applying particular norms that they have either formed themselves or learned in order to fit in with their social context. Therefore, people do not believe that ASD lacks morality; rather, they believe that ToM's flaws make it challenging to apply moral concepts to social information [2].

4. Analyze Children’s Behavior with Theory of Mind

4.1. Symptoms of Autism

Three fundamental traits are typically present in children with ASD: difficulty with social development (social barriers), exceptionally strong communication development (language barriers), limited interests, and repetitive conduct (imagination barriers) [3, 5]. The primary signs include social barriers include things like difficulty interacting with others daily and having a secure attachment to one's parents. Language barriers include things like limited language skills and a lack of substantive communication. Finally, there is the issue of imagination disorder, which makes it challenging to use one's imagination to simulate the beliefs and desires of others in order to speculate about other people's behaviors and assign causes. While some ASD individuals do not exhibit deficiencies in the aforementioned three areas, they do show clear signs of dysfunction in a few of these areas, deviating from normal autism in some ways.

As a result, the term "spectrum" was used to describe how the degree of the relevant sickness was organized, from low to high. They meet the criteria for ASD as long as at least one of a triad's symptoms is present, and the severity of their symptoms can be assessed in relation to where they fall on the spectrum [5].

Understanding other people's mental states and the ability to maintain focus are related. People can only infer and understand another person's mental state by paying attention to and integrating

DOI: 10.54254/2753-7048/6/20220499

their facial, body, and speech cues. Children with ASD have significantly poorer attention spans and cognitive sensitivities than children without ASD. According to ToM, children with ASD struggle with picking, holding, and switching their attention between items. They also exhibit ritualistic stereotyped behavior, constantly paying attention to familiar objects while showing little interest in and attention to novel objects. Children with ASD may have attention issues that make it difficult for them to integrate cues about their mental states, which is not good for the growth of the ToM [5].

4.2. Defects' Causes

It was suggested that ASD is caused by improper family interaction patterns after the first report of a whole set of symptoms in ASD children, i.e., attributing ASD to ingested environmental variables. However, it was later found that genetic factors may potentially play a significant role in the emergence of ASD. Some researchers have also suggested that psychological elements may play a significant role in the development of autism. They have researched psychological characteristics such as linguistic ability, attention, emotional understanding, and motivation level in ASD children. Currently, there is agreement that autism is caused by a combination of genetics, the environment, and mental health, even though the attribution of ASD is still up for debate.

Research on the deficiencies in ToM in children with ASD focuses on congenital and acquired issues. Currently, innate module theory and anti-innate module theory are the reasons for the ToM issues in children with ASD [5].

4.2.1. Innate and Anti-Innate Modularity Theory

According to the notion of innate modules, the social flaws of the inherent domain cause flaws in the ToM. According to the inherent module theory, the human brain has a modular structure that is responsible for detecting one's own and other people's mental states. This innate module is automatically processed. According to Baron Cohen, this unique modular structure is a component of the social brain in humans and is intimately tied to how people develop socially. This unique module structure does not represent information like photos, but rather psychological states like desire and belief. Autistic children struggle to infer the characters' erroneous ideas in images, although they excel at inferring other facts, according to certain studies [5]. In addition, fMRI research has revealed that brain regions like the right orbitofrontal cortex, left medial frontal cortex, and amygdala may be closely related to the development of ToM ability in humans. These regions of the brain have been implicated in the development of ToM ability in animals, including humans. Amygdala dysfunction, which is linked to impaired emotional capacity in autistic children, plays a critical role in producing both happy and negative emotions as well as in the operation of higher cognitive skills like memory, concentration, and decision-making, which are the source of emotions [1].

To understand the reasons for the deficiencies in ASD children's idea of mind, several researchers have challenged the intrinsic module theory and attempted to investigate the connection between cognitive capacity and the development of children's theories of mind. Therefore, the anti-innate module theory was put up in the belief that the impairment of executive function may be responsible for the problems in ASD children's ToM. The confluence of the ToM flaws and executive dysfunction in ASD children can be adequately explained by the notion of executive dysfunction [5]. Children's centers for ASD now have a poor ability to integrate information; this is because their cognitive style is one of local processing, which also explains why their ToM is flawed. The domain specificity concept in innate modularity theory was refuted by Jarrold et al., who also showed that executive dysfunction and poor central information integration capacity may

DOI: 10.54254/2753-7048/6/20220499

contribute to the ToM problems in children with ASD. Additionally, it has been shown in numerous research that children with ASD have trouble understanding tasks and incorrect beliefs, which may be connected to the absence of mental state communication in the familial context [5].

Although the innate modularity theory is contested by the theories of executive dysfunction, central information integration, and acquired environmental impediment, it cannot be entirely disproved. The reasons of ToM deficits in children with ASD are still a matter of debate [5].

4.2.2. Theory of Mind Perspective

ASD Children's fundamental communication and social reciprocity deficits will affect how they engage with others in a variety of social contexts on a daily basis. The hurdles in ToM illustrate how severe social and communication barriers are. The ToM hypothesis, however, is unable to account for these damaged regions or the positive traits of autistic individuals, such as their superior visual attention abilities. Children struggle with information processing, according to recent research. They frequently do not employ the same neurocognitive system as other children when determining mental status [7].

Family, comprising family members, family communication, family activities, and parenting style, is crucial to a child's ToM development [13]. According to family system theory, children who have less self-differentiation are more likely to be emotional, find it challenging to maintain appropriate distance in social situations, be influenced by others, and make irrational decisions.

The number of family members affects children's prospects for social interaction, according to research. A child's cognitive growth will be more mature the more communication there is concerning mental states. Children and siblings' ability to work together, as well as the creation of rules and objectives in family games, all encourage the development of ToM. Parenting style has a significant impact on how people experience metacognitive emotion. When it comes to influencing their children's emotional cognition and expression, parents who use an emotional parenting approach typically fare better than parents who are dismissive [13].

4.2.3. Neurotransmitter Perspective

The medial prefrontal cortex, temporo-parietal junction, anterior cingulate gyrus, insula, and amygdala are significant regions of the "social brain" that are specifically activated during mind-reading tasks in typical brains but are underactive in autistic brains, according to functional neuronal imaging studies [3]. The pathogenesis of autism is influenced by immunological, genetic, epigenetic, environmental, and immune variables, which create the central nervous system's neuroanatomy and neurochemistry relatively early [14].

An increasing body of research emphasizes autism's biological roots. In fact, in the first few months of life, social behavior alterations or other modest autistic symptoms might be seen. This implies that neurotransmitters and neuropeptides play key roles in healthy brain development and contribute to the regulation of memory, behavior, and motor activity. They influence synaptogenesis, apoptosis, synaptic pruning, differentiation, and migration of neuronal cells. Thus, the altered brain development processes that are associated with autism can result from a neurotransmitter system malfunction.

A key contributing element to autism is neurotransmission dysregulation. The central nervous system is developing quite early in neuroanatomy and neurochemistry, which is very helpful. Autism can be caused by genetic anomalies, brain structural abnormalities, and neurochemical dysfunction of several neurotransmitters and neuropeptides. ASD etiology is heavily influenced by changes in neurotransmission [14].

DOI: 10.54254/2753-7048/6/20220499

5. Suggestion: Intervention Method

Based on the hypothesis of psychological blindness, many researchers believe that the ToM of ASD individuals should be intervened, so as to improve the empathy ability of ASD individuals. ToM intervention can not only help ASD individuals to improve their understanding of relevant concepts of ToM, but also improve their social skills and behavioral deficits, and increase their empathic response to social interaction with strangers [8].

Children with autism should get tailored, multidimensional intervention and education that targets a variety of developmental areas, tries to increase their functional independence and quality of life, and provide essential family support. Even though there is currently no widely approved treatment for autism, early detection and therapy can improve a person's brain's structure, function, and behavior as well as postpone or halt the onset of significant symptoms [1].

5.1. Music Therapy

Depending on the brain type, different musical tastes are expressed by children with ASD. According to E-S theory, Type E people with higher degrees of empathy are able to sense, identify, and react to a broad range and depth of emotions and consequently come into contact with them frequently. Empathetic individuals are better able to identify emotions and concentrate on the musical elements that are more about the content than the sounds. They will therefore favor music that has an emotional, intense, contemplative, romantic, and delicate quality. Type S people are more likely to focus on logic than emotion while seeing and responding to systems and patterns. They might be drawn to music that features intricate arrangements of timbres and musical instruments. However, systemizes may like energizing, stimulating music, such as rock or heavy metal, as they also have lower empathy levels and are less able to perceive and respond to emotions [9]. As a result, the cognitive style of children with ASD should be taken into consideration while choosing appropriate music styles for music therapy.

Children with autism benefit from music therapy in terms of behavior, social interaction, emotion, and linguistic function. First of all, music has the power to open children's closed emotional doors. To accommodate autistic children's non-verbal self-expression, the unique perception of musical experience can disregard verbal representation. If he doesn't do harm and is allowed to use the instrument any way he pleases, music offers a secure setting for kids to develop a bond with the instrument. Second, kids who progressively grow to love music will interact with those who work in the music industry. A mediating system for building a link between therapists and children is the use of musical instruments. Children with autism exhibit higher imitation skills and focus during informal musical instrument instruction [15].

5.2. Sand Play Therapy

Storytelling is utilized in sand play therapy, a type of non-verbal therapy, to enhance communication abilities and the use of meaningful words. Sand play, an analyst at by producers put the scenario for producers of subconscious thoughts, and finally, an analyst at combined with sand tour act for psychological counseling and treatment of the visitors. Maker in a quiet environment, the use of sand, sand, and all kinds of the miniature small model is closely related to life scenes to show put out by his own inner world [16].

The underlying premise of sand play therapy is that people are born with the capacity for self-healing, which can only be awakened in a setting that promotes acceptance, security, and freedom. The act of putting toys in the sandbox can reflect the children's underlying wants and feelings, which are difficult for them to articulate verbally. The children can gradually experience the joy of communicating with others in a setting of being loved, actively concerned, and accepted,

awaken their self-energy under attention and protection, and gradually leave the autistic world, the analyst enters their world in this way, listens to their voices, and releases their negative emotions [17].

Children can more easily and comfortably express their feelings and reveal their inner world when playing in the sand and the sea. Children with autism can modify their energy distribution, awaken their potential, and mobilize their sense of touch by playing in the sand. Children with autism experience relaxation, acceptance, and satisfaction while in the water, and it also stimulates their imagination. Therapists should always treat children with genuine respect and care, accept their realistic performance, and express their sentiments to them. Children with ASD can play out their flaws and be controlled to eventually improve themselves by providing a secure and trustworthy environment [17]. The social interaction of autistic children is of low quality and scope due to their social dysfunction, which prevents them from communicating like other kids. Sand play can be utilized to intervene in this issue and then effectively boost the child's self-esteem and social conduct skills [16].

6. Conclusion

This paper analyzed the behavior of children with ToM autism from the perspectives of social cognition and emotion, and provided two methods that can be used music therapy and sand play therapy. Additionally, it is advised that parents of children with ASD carry out diagnostic intervention following early discovery, which is crucial for the training of ASD. To create a comprehensive system of intervention, people should also focus on family intervention, enhance their professional knowledge and skills, and work with rehabilitation facilities and educational institutions. Don't overlook the children's exceptional qualities, maximize their potential, aid in their social integration, and eradicate autism at the same time.

However, this study has some limitations. This study merely employs the research technique of a literature review. In the future, people can conduct case studies, use questionnaires, interviews, or statistical analysis of pertinent data to better understand the role and impact of autistic children's ToM development on social-emotional cognition and to summarize more effective intervention methods.

References

[1] *Bamicha Victoria, Athanasios Drigas. ToM&ASD: (2022). The interconnection of Theory of Mind with the social-emotional, cognitive development of children with Autism Spectrum Disorder. The use of ICTs as an alternative form of intervention in ASD. Technium Social Sciences Journal. 42-70.*

[2] *Jessica Ellen Ringshaw, atie Hamilton, Susan Malcolm-Smith. (2021). Theory of Mind and Moral Decision-Making in the Context of Autism Spectrum Disorder,*

[3] *Simon Baron-Cohen. (2009). Autism: The Empathizing–Systemizing (E-S) Theory. THE YEAR IN COGNITIVE NEUROSCIENCE. 68-80.*

[4] *Simon Baron-Cohen, Sally Wheelwright, Jacqueline Hill, Yogini Raste, and Ian Plumb. (2001). The ‘‘Reading the Mind in the Eyes’’ Test Revised Version: A Study with Normal Adults, and Adults with Asperger Syndrome or High-functioning Autism. Cambridge University Press, Child Psychol. Psychiat. Vol. 42, No. 2, pp. 241–251.*

[5] *Huang Weijie, Huang Qiongduan, Song Sihua (2022). Genesis analysis and intervention path of children with autism spectrum disorder. Psychological Progress, 12(4), 1492-1499.*

[6] *Atsushi Senjun, Birkbeck. (2011). Spontaneous Theory of Mind and Its Absence in Autism Spectrum Disorders.\Research Article Find in PubMed, UK*

[7] *Helen Tager-Flusberg, (2007). Evaluating the Theory-of-Mind Hypothesis of Autism. Association for Psychological Science. CURRENT DIRECTIONS IN PSYCHOLOGICAL SCIENCE,311-315*

[8] *Huo Chao, Li Zuoshan, Meng Jing. (2021). Empathy intervention in individuals with autism spectrum disorders: foster strengths or complement weaknesses. Advances in the Psychological Science, Vol. 29, No. 5, 849–863*

[9] *Ning Pan, Bonnie Auyeung, Xin Wang, Li-Zi Lin, Hai-Lin Li, Xiao-Ling Zhan, Cheng-Kai Jin, Jin Jing, Xiu-Hong Li. (2022). Empathizing, systemizing, empathizing-systemizing difference and their association with autistic traits*

DOI: 10.54254/2753-7048/6/20220499

in children with autism spectrum disorder, with and without intellectual disability. International Society for Autism Research and Wiley Periodicals LLC. Autism Research, 2022:1–10. wileyonlinelibrary.com/journal/aur.

[10] DAVID M. GREENBERG, PETER J. RENTFROW, SIMON BARON-COHEN.(2015) Can Music Increase Empathy? Interpreting Musical Experience Through The Empathizing– Systemizing (E-S) Theory: Implications For Autism. Empirical Musicology Review, Vol. 10, No. 1,

[11] Tai-Shan Li, Susan Shur-Fen Gau Tai-Li Chou. (2022). Exploring social emotion processing in autism: evaluating the reading the mind in the eyes test using network analysis. BMC Psychiatry, 22:161

[12] Mathieu Garon, Baudouin Forgeot d'Arc, Marie M. Lavallée, Evelyn V. Estay and Miriam H. (2018). Beauchamp. Visual Encoding of Social Cues Contributes to Moral Reasoning in Autism Spectrum Disorder: An Eye-Tracking Study. Frontiers in Human Neuroscience | www.frontiersin.org| Volume 12 | Article 409.

[13] Sang Biao, Liu Junsheng. (2022). Child Development Psychology (second edition) Beijing: Higher Education Press, 2.

[14] Rosa Marotta , Maria C. Risoleo, Giovanni Messina, Lucia Parisi, Marco Carotenuto, Luigi Vetri and Michele Roccella. (2020). The Neurochemistry of Autism. Brain Sci. 10, 163;

[15] Liu Zhenhuan, Zhang Lihong, Yin Xiantao, Li Zhilin, Feng Shuqin.(2011). Clinical study of music therapy for children with autism. The Journal of TCM Pediatrics J.PEDIATRICS OF TCM,Vol.7 No.6 11：17-19.

[16] Li Ao. (2022). Review of the status of sand game. Frontiers of the social sciences, 11(6): 2321-2325.

[17] Li Nan. (2012). The application of sandbox games in the treatment of children with autism. Journal of Suihua University Volume 32, Issue 3,June：35-41.