

Family Intervention for Children with Autism Spectrum Disorder Following Malignancy: A Narrative Review

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	Abstract
Article history: Received: 25 Sep 2025 Accepted: 8 Nov 2025 Available online: 13 Nov 2025	Background: This review explores how such interventions can enhance the quality of life for children undergoing cancer treatment and support their social integration. Materials and Methods: This review draws on a wide range of studies and clinical trials concerning family interventions for children with ASD undergoing cancer radiotherapy. The research materials include both domestic and international literature on various family-centered approaches, such as psychoeducational programs, behavioral interventions, and parent training. Results: The review identifies several key family interventions that are effective in improving the treatment process for children with ASD undergoing cancer radiotherapy. These include structured parent training, psychoeducational support, and behavioral interventions tailored to the unique needs of children with ASD. Family interventions were found to enhance the children's ability to cope with the stresses of cancer treatment, improve their emotional regulation, and promote better social integration. Furthermore, active family participation in the treatment process led to improved adherence to medical protocols and greater emotional well-being during radiotherapy. Conclusion: Family intervention plays a critical role in improving the outcomes for children with autism spectrum disorder undergoing cancer radiotherapy. By actively engaging families, providing appropriate support, and integrating psychoeducational and behavioral strategies, children with ASD can experience better treatment outcomes, enhanced social integration, and improved quality of life. Future research should continue to focus on refining family-based interventions and exploring innovative approaches to support children with ASD in challenging medical situations such as cancer treatment.
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1. Overview of Autism Spectrum Disorders

1.1 Definition and diagnosis

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder characterized by persistent social interaction and communication impairments, as well as restrictive interest and repetitive behavior patterns. As defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), ASD covers a range of different symptom

presentations, ranging from mild to severe, and is therefore referred to as a "spectrum" disorder. This means that the specific presentation of each patient may vary, but all fit the core characteristics of this broad category [1, 2].

(1) Social interaction disorders: ① Non-verbal communication difficulties: such as lack of eye contact, poor or inappropriate facial expressions. ② The ability to understand other people's emotions is limited: it is difficult to identify other people's emotional States and

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make appropriate responses accordingly. ③ Friendship-building challenges: Lack of empathy with the interests of peers, preferring to play alone or interact with only a few people[2].

(2) Communication barriers: ① Language development retardation: Some children may speak late or even not speak at all. ② Abnormal use of language: Even if they are able to speak, they may show problems such as limited vocabulary and frequent grammatical errors. ③ Preference for non-verbal communication: Some children are more accustomed to expressing themselves through gestures, pictures or other visual AIDS.

(3) Restrictive interest and repetitive behavior patterns: ① Focus on specific things: extremely obsessed with a certain theme or activity, such as train models, numbers, etc. ② Adhere to the fixed routine: There are strict requirements for daily habits, once they are disrupted, they will feel uneasy. ③ Stereotyped actions: Repeatedly perform some seemingly meaningless actions, such as shaking the body, beating objects, etc[3, 4].

The diagnosis of an ASD is usually based on multiple evaluations, including but not limited to behavioral observations, detailed reports from parents or teachers, and the use of standardized testing tools. The doctor will also rule out other conditions that may cause similar symptoms, ensuring that the final diagnosis is accurate. In addition, with the deepening of research and technological progress, there are also some detection methods based on biomarkers under development, which may provide more help for early detection in the future[5, 6]. However, at present, it is still the most reliable way to consider the above factors comprehensively.

1.2 Epidemiology

According to the World Health Organization (WHO), the prevalence of ASD is about 1.0% worldwide, which means that about 1 out of every 100 people has ASD[5]. According to the latest Centers for Disease Control and Prevention (CDC) data, the prevalence of ASD in the United States is about 2.8%[6]. It is important to note that the epidemiological characteristics of ASD show clear gender differences. Globally, male children have a significantly higher probability of being diagnosed with ASD than female children, a ratio was 3.8:1[6]. This significant gender imbalance has attracted the attention of researchers, who have tried to explore the biological mechanisms behind it[6, 7]. At present, it is believed that the difference of sex hormone levels may be one of the reasons for this phenomenon, but the specific biological pathway has not yet been fully clarified.

In addition to gender differences, the rate of ASD diagnosis has risen significantly over the past few

decades. This trend is partly attributable to increased public awareness and increased awareness of ASD among medical professionals[7]. As society's concerns about mental health problems increase, more and more families are willing to take the initiative to seek help in order to identify and treat their children's developmental problems as early as possible. At the same time, advances in diagnostic tools and technology have allowed physicians to more accurately identify minor ASD symptoms, thereby increasing the number of reported cases[8].

However, there is still controversy regarding changes in the actual incidence of ASD. On the one hand, it is believed that the relaxation of diagnostic criteria and the improvement of public awareness have led to higher diagnosis rates. On the other hand, some studies have pointed out that some environmental factors may be related to the increased risk of ASD. For example, some studies have found that people who live in urban areas or are exposed to certain chemicals may have higher rates of ASD[8, 9]. However, the results of these studies are inconsistent and often lack sufficient evidence to support a causal relationship. Therefore, scientists are calling for more high-quality studies to better understand the etiology of ASD and its distribution in different populations.

1.3 Influencing factors

The exact cause of ASD is not fully understood; however, research suggests that genetic, environmental, and biological factors may work together to contribute to the development of autism spectrum disorders.

Genetic factors play an important role in the development of ASD. Certain genetic variants have been found to be associated with an increased risk of ASD. These genetic variants may affect the development and function of the brain, leading to the symptoms of ASD. In addition, family history is an important risk factor, and if a member of a family already has ASD, the risk of other family members will increase accordingly[10, 11].

In addition to genetic factors, exposure to certain environmental toxins during pregnancy has been linked to an increased risk of ASD. For example, maternal exposure to certain chemicals or drugs during pregnancy, such as pesticides, heavy metals, antibiotics, etc., may adversely affect the brain development of the fetus, thereby increasing the risk of ASD[11]. In addition, preterm birth or low birth weight is also considered to be a risk factor for ASD. Brain development in premature and low birth weight infants may be somewhat limited, increasing the likelihood of ASD[12].

1.4 Impact on child development

Children with ASD have varying degrees of impairment in social, language, cognitive, and emotional

development. These disorders not only affect children's daily life and learning ability, but also may lead to emotional and behavioral problems, which in turn affect their social adaptability and quality of life [12, 13]. This is manifested in:

(1) Social interaction barriers: Establishing and maintaining relationships is a natural thing for most children, but it is full of challenges for children with ASD. They often lack interest in making eye contact with others, are reluctant to participate in group activities, and are particularly difficult to share interests, feelings and understand other people's views. These factors work together to make it difficult for children with ASD to integrate into the peer group, thus increasing the risk of isolation [12].

(2) Language and communication disorders: Many children with ASD have difficulties in language comprehension and expression. This may be manifested by late speech, limited vocabulary, simple sentence structure, or complete inability to speak. Even if some children are fluent in language, they may have difficulty understanding the meaning of non-verbal information such as body language or facial expressions. In addition, some ASD patients tend to repeat certain words or phrases, a phenomenon known as "echoic speech" [13, 14].

(3) Insufficient cognitive flexibility: Although not all individuals with ASD suffer from mental retardation, many do face deficits in executive function. For example, when faced with new situations, they may show excessive adherence to established rules and reluctance to try new approaches, or difficulty in quickly adjusting strategies to adapt to changes when task requirements change. This mindset limits their creativity and ability to solve problems [13].

(4) Emotional regulation problems: Because the brain processes sensory input in an unusual way, many children with ASD are extremely sensitive to stimuli such as sound and light in the environment. A slight noise may make them feel extremely uncomfortable or even panic. At the same time, they are more likely to experience negative emotional states such as anxiety and depression. If not properly managed and supported, these problems will further exacerbate their psychological distress and social maladjustment [14, 15].

1.5 Autism spectrum disorder and cancer radiotherapy

Children with ASD undergoing cancer radiotherapy face unique challenges due to the sensory sensitivities, communication difficulties, and behavioral traits associated with ASD. The hospital environment, routine changes, and medical procedures can cause significant distress, making it harder for these children to tolerate treatment. The need for precise positioning and the

physical discomfort from radiotherapy can further exacerbate anxiety and behavioral problems in children with ASD, complicating the treatment process [16, 17].

ASD children often struggle to express their emotions, making it difficult for healthcare providers to assess their comfort levels. Meltdowns or aggression may occur, particularly when routines are disrupted or during periods of discomfort. The physical side effects of radiotherapy, such as fatigue and nausea, may also be harder for children with ASD to manage.

Family intervention is crucial in addressing these challenges. Parents can help by maintaining routines, providing sensory accommodations, and using soothing techniques to reduce anxiety. Effective communication between healthcare providers and families ensures that the child's emotional and physical needs are met throughout the treatment process.

In conclusion, tailored family interventions are essential for improving the treatment experience for children with ASD undergoing cancer radiotherapy, helping them manage anxiety, adhere to treatment protocols, and maintain their overall well-being [15, 16].

2. The necessity and importance of family intervention

2.1 Theoretical basis of family intervention

Family intervention plays a vital role in the treatment of children with autism spectrum disorder (ASD), and its theoretical basis mainly comes from behaviorism theory, systems theory and ecological theory [16]. These theories not only provide scientific guidance for family intervention, but also ensure the effectiveness and pertinence of intervention measures.

(1) Behaviorist theory

Behaviorist theory holds that all behaviors are acquired through learning and can be controlled or modified by changing the environment. Positive reinforcement is one of the most effective strategies for children with autism spectrum disorders. Positive reinforcement refers to giving a reward when a child performs a desired behavior in order to encourage the behavior to be repeated in the future. For example, if an autistic child is rewarded with praise or small gifts after completing a task, he is more likely to try to complete a similar task again. In addition, other techniques in behavioral therapy, such as negative reinforcement and extinction, are often used to reduce the frequency of bad behavior [15, 16].

(2) System theory

Systems theory emphasizes the interactive relationship between individuals and their

surroundings, especially the influence of interaction patterns among family members on personal development. According to this view, the family is seen as a whole unit in which each member plays a specific role and influences each other. Therefore, when intervening in children with ASD, we should not only pay attention to the improvement of their symptoms, but also take into account the operation of the whole family system. By adjusting the way of family communication, strengthening parents' educational skills and promoting the establishment of good relationships between brothers and sisters, we can help create a more conducive family atmosphere for children's growth[16, 17].

(3) Ecological theory

Ecological theory further expands the view of system theory, which is not only limited to the analysis of family internal factors at the micro level, but also focuses on the broader social and cultural background. According to this theory, human behavior is influenced by multi-level environmental factors, including but not limited to physical environment, social structure and cultural customs. For ASD patients, in addition to direct family support, the attitude of school teachers, peer acceptance and even the availability of community resources may have an important impact on their rehabilitation process. Therefore, when formulating individualized intervention plans, we must fully consider the role of these external conditions and make full use of all favorable resources to create the best living environment for patients[17, 18].

2.2 Influence of family environment on children with ASD

Family is the main place of socialization in early childhood, which has a profound impact on the behavior and development of children with ASD. Family members' attitudes, educational methods and interaction patterns directly affect children's social skills and emotional regulation ability[19]. A supportive and positive home environment promotes social inclusion and personal growth for children with ASD.

(1) Attitude and support of family members:

Positive attitude: Parents' acceptance of the fact that their child has ASD directly affects the atmosphere of the whole family. If parents can face challenges with an open mind and seek professional help to better understand and support their children, it will help to foster a more inclusive and harmonious family environment.

Continuous emotional support: It is important to give unconditional love and care to children with ASD. This kind of emotional security can help alleviate their

anxiety and enhance their self-confidence, so that they can face the external environment more bravely[19, 20].

(2) The choice of educational methods

Individualized instructional strategies: Given the diversity of individuals with ASD, a customized approach to education is critical. By observing and understanding children's interests and learning styles, parents can design activities that are more suitable for them and stimulate their desire for exploration and creativity[21].

Reinforcing positive behavior: Using incentives to encourage good performance is one of the effective ways to cultivate good habits. When children show appropriate social skills or complete a task, timely praise or small gifts as incentives can effectively improve their motivation[21, 22].

(3) The importance of interaction mode

Promote two-way communication: Building a good parent-child relationship requires the joint efforts of both parties. Parents should learn to listen to their children's thoughts and feelings, and teach them how to express their needs. Such a communication process is not only conducive to enhancing mutual understanding, but also to exercising children's oral expression ability[22].

Involvement in daily activities: Involving children with ASD in family decision-making or other group activities can make them feel valued and accepted. In addition, by completing tasks together, we can also strengthen the sense of teamwork and enhance the ability to solve problems[17, 18].

2.3 Advantages and limitations of family intervention

Family interventions are widely admired for their convenience, economy, and sustainability. It is allowed to occur naturally in daily life, is easily integrated into the child's daily life, and is relatively inexpensive. However, family intervention also has limitations, such as parents may lack professional knowledge and skills to cope with the special needs of children, or encounter difficulties in the implementation process.

2.2.1 Advantages of family intervention

(1) Convenience: Family intervention can be carried out anytime and anywhere in daily life, without specific time and place. This flexibility makes it easier to integrate the intervention into the child's daily life, thus increasing the frequency and duration of the intervention.

(2) Economy: Compared with professional medical institutions or special education centers, the cost of family intervention is relatively low. Parents can use the existing resources and environment to implement the

intervention plan, which reduces the additional cost expenditure.

(3) Individualization: The situation of each child with autism spectrum disorder (ASD) is unique, and family intervention can be tailored to the specific situation of the child, closer to the actual needs of the child. Parents, as the people who know their children best, can better adjust intervention strategies to adapt to the changes and development of their children.

(4) Continuity: Family is one of the main environments for children to grow up, and long-term stable support can be achieved through family intervention. Over time, parents can gradually acquire more professional knowledge and skills to provide continuous help and support for their children.

(5) Emotional support: The intimate relationship between family members can provide a safe and warm emotional support network for children. In the face of challenges, encouragement and support from family members are essential to improve children's self-confidence and social adaptability [23, 24].

2.2.2 Limitations of family intervention

(1) Lack of professional knowledge: Although parents have a deep understanding of their children, they may lack professional theoretical knowledge about ASD and effective intervention methods. This may lead to ineffective or even counterproductive interventions.

(2) Skills training needs: The implementation of effective family intervention requires certain skills and methods, which often require professional training. If parents have not received the appropriate training, they may feel unable to start or implement it improperly [18, 25].

(3) Time and energy investment: Family intervention requires parents to invest a lot of time and energy to learn relevant knowledge, prepare materials and actually participate in activities. This is a challenge for families with busy work or multiple children.

(4) Emotional stress: Long-term care for children with ASD may bring great psychological stress to parents. Parents are likely to feel frustrated when they see their children's progress is slow, and they have to deal with cognitive biases about ASD, which can have an impact on their mental health [24, 25].

(5) Resource Access Difficulty: Although there are many free or low-cost instructional resources available on the Internet, they are of varying quality and are not necessarily suitable for children of all ages. In addition, it is not easy to find the right expert guidance, especially in remote areas [25].

3. Methods and effect evaluation of family intervention

3.1 Early Intervention Denver Model Intervention

The core concept of early intervention Denver model intervention is timely and effective intervention based on the critical period of children's development. Children's brains are highly plastic in the early stages of development, and interventions in this period can have a positive impact on the neural connections and development of the brain. The Denver Model intervention captures this critical period by providing a rich and meaningful learning experience to help children with autism spectrum disorders break through the limitations of their own development and achieve the greatest potential for development [26, 27]. The intervention model covers a number of important areas, among which the development of social skills is the most important. In terms of social interaction, interveners will use various strategies and methods to guide children to pay attention to other people's facial expressions, body language and verbal information, and learn to understand other people's intentions and emotions. For example, through role-playing games, children can simulate different social scenes, such as greeting friends and sharing toys, and gradually master social rules and skills in practice. At the same time, it will also focus on cultivating children's sense of cooperation and team spirit, organizing group activities, so that they can learn to cooperate, help each other and share in the interaction with their peers [16, 26].

The improvement of language ability is also one of the important goals of early intervention in the Denver model. For many children with autism spectrum disorders, language development often lags behind their peers. To solve this problem, the intervention staff will adopt a variety of language training methods. Starting from simple pronunciation exercises, children are gradually guided to master the correct pronunciation and intonation; then through vocabulary development, sentence construction and other activities, their language expression ability is enriched; then dialogue training is carried out to help children learn to communicate and respond appropriately in different situations. In addition, stories and children's songs will be used to stimulate children's interest and love in language [18, 27].

In addition to the social and language domains, the Early Intervention Denver Model intervention focuses on cognitive development and emotional management. In terms of cognition, through various cognitive games and tasks, children's attention, memory and thinking ability are exercised [20, 23]. For example, jigsaw puzzles can improve children's spatial cognition and hand-eye coordination; classification games can develop

their logical thinking and inductive ability. In the aspect of emotional management, children are taught to recognize different emotions, learn to express their emotions in an appropriate way, and how to deal with negative emotions. When children have emotional problems, the interveners will guide them to relieve their emotions by breathing deeply and relaxing their muscles, so as to help them gradually build up the ability of emotional regulation. A large amount of research evidence shows that early intervention of Denver model has a significant effect on the rehabilitation of children with autism spectrum disorders. After systematic intervention training, many children have improved significantly in social interaction, language expression, cognitive ability and so on. They can better communicate and communicate with others, show more positive emotions and behaviors, and lay a solid foundation for future integration into society[27, 28].

3.2 Floor time intervention

3.2.1 Implementation method of floor time intervention

(1) Create a safe and comfortable environment

Creating a warm, familiar and secure environment for children is the primary task of floor time intervention. The intervention place should be chosen in the familiar home of the children or in the specific treatment room, which is simple and comfortable to avoid too many interference factors. At the same time, the intervener should maintain a gentle and patient attitude so that the children can feel respected and accepted [27, 28].

(2) Developing individualized interactive activities

Each child with ASD has his or her own unique interests and development level, so the floor time intervention needs to be individualized according to the individual differences of the child. Through observation and evaluation, the interventionist can understand the children's interests and areas of strength, and then design the corresponding interactive activities. For example, for children who like jigsaw puzzles, they can complete jigsaw puzzles with them and guide them to communicate and cooperate in the course of the game[28].

(3) Pay attention to emotional communication and response

Emotional communication is the core link of floor time intervention. The interveners should always pay attention to the emotional changes of the children and give positive response and support in time. When children show positive emotions, such as smiling, active

participation, etc., the intervener should give affirmation and encouragement; when children have negative emotions, such as crying, temper, etc., the intervener should be patient to comfort and help them regulate their emotions. Through this kind of emotional interaction, children's emotional cognition and expression ability can be enhanced[28, 29].

3.2.2 Effect of floor time intervention on children with autism spectrum disorder

(1) Improvement of social skills

Several studies have shown that floor time intervention can significantly improve the social skills of children with ASD. Through frequent interaction and cooperative games with interveners, children gradually learn to understand other people's expressions, language and intentions, improve their ability to look, listen and respond, and enhance their willingness and skills to communicate with others. For example, in an experimental study of children with ASD, after a period of floor time intervention, their scores on social interaction tests improved significantly, and the frequency and quality of interaction with peers increased[21, 27].

(2) Promotion of language development

Language development is one of the important challenges faced by children with ASD, and floor time intervention provides rich language learning opportunities for children. In the process of interaction, the intervener will use simple and clear language to communicate with the children, guide them to imitate pronunciation and express their thoughts and feelings. At the same time, through story telling, singing children's songs and other activities, enrich children's vocabulary and language expression. The study found that children with ASD who received the floor time intervention made significant gains in language comprehension and expression, increased vocabulary, and improved sentence length and complexity[22, 25].

(3) Improvement of cognitive ability

The floor time intervention can also promote the cognitive development of children with ASD. In all kinds of games, children need to observe, think and solve problems, which helps to exercise their attention, memory, thinking ability and creativity. For example, in the game of building blocks, children need to classify and combine according to different shapes and colors, which cultivates their spatial cognition and logical thinking ability. Relevant studies have confirmed that after floor time intervention, the performance of children with ASD in cognitive tests is significantly better than that of children without intervention[24, 26].

3.3 Applied Behavior Analysis (ABA)

Applied Behavior Analysis (ABA) is a therapy supported by scientific evidence, which is widely used in the treatment of children with autism spectrum disorder (ASD). The core idea of ABA is to encourage positive behavior change through positive reinforcement, while reducing or eliminating bad behavior. This approach emphasizes systematic, individualized, and data-driven intervention strategies aimed at improving children's social skills, communication skills, and daily living skills[27, 28]. Its basic principles include: (1) Positive reinforcement: increasing the frequency of a particular behavior by giving a reward. For example, when children complete a task or show good behavior, they can be rewarded with their favorite snacks, toys or verbal praise. (2) Negative reinforcement: increasing the frequency of a particular behavior by removing an unpleasant stimulus. For example, if children finish their homework within the time limit, they can reduce their housework time. (3) Punishment: to reduce the frequency of bad behavior by introducing unpleasant consequences. In ABA, however, punishment is often not the preferred method, relying more on positive and negative reinforcement[28]. (4) Extinction: Reduce the frequency of certain behaviors by ignoring them. For example, parents can choose not to pay too much attention to some self-injury behaviors, so as to gradually reduce the occurrence of such behaviors. (5) Generalization: Ensure that newly learned skills can be applied in different environments, at different times and in front of different people. This needs to be achieved through repeated practice in different situations. (6) Shaping: The process of gradually guiding children to approach the target behavior. For example, if the goal is for the child to learn to dress independently, you can start with simple steps, such as putting on a sleeve, and then gradually increase the difficulty until the whole process is fully mastered[29].

Studies have shown that ABA has a significant effect on improving the core symptoms of children with ASD. It can not only promote language development, social interaction ability and academic achievement, but also enhance children's self-confidence and independence. However, it is important to note that the effects of ABA vary from person to person and require long-term adherence to see significant changes. Therefore, before choosing to use ABA, it is recommended to consult a professional medical team and formulate an appropriate treatment plan according to the specific situation of the child.

3.4 Natural Developmental Behavior Intervention (NDBI)

Naturally Developmental Behavioral Intervention (NDBI) is a family intervention approach for children

with ASD that emphasizes training in a natural setting, where children learn new skills in a familiar and comfortable environment. The core idea of this method is to use natural situations in daily life to promote the development of children's social skills, communication skills and adaptability. In NDBI, parents play a crucial role. They need to help their children develop social skills by observing and imitating the way normal children interact with each other. This means that parents need to be active participants in their children's learning and development, not just spectators or guides[17, 18]. Specifically, NDBI's approach includes the following aspects:

(1) Observation and imitation: Parents need to carefully observe the interaction between normal children, including their language, expression, body language, etc., and then try to integrate these elements into the interaction with their children. For example, when children want to express a certain need, parents can guide them to use appropriate language and gestures to express it.

(2) Create opportunities: Parents need to create opportunities in their daily lives for their children to interact with others. This can be done by organizing family gatherings, attending community events, or inviting friends to your home. In these activities, parents can encourage their children to take the initiative to communicate with others and share their thoughts and feelings.

(3) Reinforce positive behavior: When children show positive social behavior, parents should give timely praise and reward to enhance their self-confidence and motivation. At the same time, parents also need to take appropriate measures to correct and guide some inappropriate behaviors.

(4) Continuous monitoring and adjustment: NDBI is a continuous process, and parents need to constantly observe and evaluate their children's progress and make adjustments as needed. This may include changing training strategies, increasing or decreasing the frequency of certain activities, etc[29, 30].

3.5 Structured teaching method

Structured pedagogy is an intervention strategy widely used in the education of children with autism spectrum disorder (ASD) to support children's learning and social skill development by creating a highly organized and predictable learning environment. This approach is particularly useful for children with ASD who are sensitive to daily changes or have difficulty adjusting to a new environment because it reduces uncertainty and increases a sense of stability and security[21, 23, 24].

3.5.1 Clear goal setting

Before implementing structured teaching, clear, specific and achievable goals need to be formulated according to each child's specific situation. These goals can be short-term, such as learning to dress yourself, or long-term, such as improving your ability to communicate with others. It is important to make sure that these goals are understandable and interesting to children, so that they can be motivated to participate. At the same time, parents and teachers should review these goals regularly and adjust them according to their children's progress[31].

3.5.2 Step decomposition

For many children with ASD, they may feel overwhelmed or frustrated when faced with complex tasks. So it's very helpful to break down big tasks into a series of small, manageable steps. For example, if you want to teach your child how to brush his teeth, you can start with knowing the toothbrush, and then learn to squeeze toothpaste, moisten the surface of the teeth, and move the toothbrush up and down and left and right. Give positive feedback after each step until the whole process becomes natural and smooth. This can not only reduce the difficulty, but also enable children to experience the joy of success, thereby enhancing self-confidence[23, 24].

3.5.3 Visual Aids

Using diagrams, pictures, or other forms of visual materials can help children with ASD understand and remember information better. For example, use a time chart to show the schedule of activities in a day, or make simple icon cards to show the names of different objects and their uses. In addition, a color-coding system can be used to distinguish between different types of tasks or areas, making the environment more intuitive and understandable[31-33].

3.5.4 Consistency and repeatability

Maintaining consistency in daily life is essential to building a sense of security. This means trying to follow a set schedule for eating, sleeping, etc., and being consistent in enforcing the rules. Although occasional changes are inevitable, the reasons should be explained as far in advance as possible to reduce the child's uneasiness. At the same time, it is necessary to practice the same skill repeatedly until it is mastered, because frequent repetition helps to consolidate memory and promote the formation of neural connections.

3.5.5 Positive reinforcement

It is very important to give praise or other forms of reward in time when children show good behavior or complete a task. This positive incentive can not only

encourage them to continue their efforts, but also enhance the relationship between parents and children. It is worth noting that the form of reward should be diversified and attractive to meet the needs of different individuals[33].

3.6 Discussion on the Comprehensive Model of Family Intervention

Family intervention plays a crucial role in the treatment of children with autism spectrum disorder (ASD). With the deepening of research and the accumulation of practical experience, more and more evidence shows that a single intervention method is often difficult to meet the needs of all families[34]. Therefore, constructing a comprehensive family intervention model has become one of the focuses of current research. This comprehensive model aims to provide more comprehensive support and services for children with ASD and their families by integrating multiple effective intervention strategies.

3.6.1 Combination of Behavior Therapy and Parental Training

Behavior therapy is an effective means of direct intervention for common behavioral problems of ASD children, such as stereotyped movements, social disorders and so on. It focuses on positive reinforcement to promote the formation of positive behavior and reduce the occurrence of bad behavior. Parent training, on the other hand, emphasizes improving parents' ability to manage their children's behavior and how to apply these skills in daily life. Combining the two can not only accelerate the progress of children, but also enhance communication and understanding among family members, thus creating a family environment more conducive to the growth of children[34, 35].

3.6.2 Importance of personalized design

Each child with ASD is a unique individual, and their symptoms and development levels are very different. Similarly, the cultural background, economic status and other factors of each family will also affect the choice and implementation of intervention programs. Therefore, these factors must be fully taken into account in the formulation of comprehensive intervention plans to ensure that the methods used are both scientific and targeted. This may include, but is not limited to, measures such as adjusting the intensity of training and choosing activities that are appropriate for a particular age group or stage of development[33, 35].

3.6.3 Interdisciplinary teamwork

In order to achieve the best results, it is necessary to establish a multidisciplinary team of professionals. This team should include psychologists, special education

teachers, speech therapists and other experts in various fields. Together, they can assess the child's specific situation and provide guidance and support as needed. At the same time, parents are encouraged to participate in the whole process, so that they can become important partners rather than bystanders in their children's recovery journey[35, 36].

3.6.4 Continuous monitoring and feedback mechanism

Any successful intervention program needs to be based on regular follow-up observations. By setting clear goals and regularly reviewing our progress, we can help us adjust our strategies in time to meet new challenges that may arise. In addition, it is important to establish effective two-way communication channels so that participants can share their feelings and suggestions to further optimize the intervention process[36].

3.7 ASD and Cancer Radiotherapy: Considerations and Challenges

Children with Autism Spectrum Disorder (ASD) who undergo cancer radiotherapy face unique challenges that necessitate special attention in both medical and psychological care. ASD is characterized by difficulties in social interaction, communication, sensory processing, and repetitive behaviors, which can complicate the experience of undergoing medical treatments like radiotherapy. The combination of ASD symptoms with the stresses of cancer treatment can make the therapeutic process particularly challenging [35, 36].

3.7.1 Challenges for Children with ASD Undergoing Radiotherapy

Sensory Sensitivity:

Children with ASD are often highly sensitive to sensory stimuli. The noise from radiotherapy machines, the brightness of medical lights, or the touch of medical staff can lead to increased anxiety or distress. Such stimuli can be overwhelming for these children, making it difficult for them to remain still or cooperate during the procedure.

Routine Disruption:

Children with ASD often thrive on routine and predictability. Radiotherapy typically requires frequent hospital visits and can disrupt their daily schedules. This disruption may increase their anxiety levels, as they are not accustomed to the unpredictable nature of medical appointments and hospital settings.

Communication Difficulties:

Many children with ASD have limited verbal communication skills and may not be able to express discomfort or fear during treatment. This makes it challenging for healthcare providers to gauge how the child is feeling and adjust treatment plans accordingly. Non-verbal cues such as facial expressions or body language may be the only indicators of distress, which can be difficult to interpret.

Emotional and Behavioral Reactions:

Due to the challenges in regulating emotions, children with ASD may have stronger emotional reactions to the stress of cancer treatment. This can result in behavior such as meltdowns, refusal to cooperate, or withdrawal, which complicates the administration of treatment and the overall caregiving process.

3.6.2 Role of Family Intervention in Managing Challenges:

Family intervention plays a vital role in supporting children with ASD undergoing cancer radiotherapy. Parents and caregivers are essential in creating a more predictable and comforting environment for these children. Some strategies for effective family intervention include:

Creating a Familiar and Comforting Environment: Parents can help children feel more at ease by incorporating familiar objects or routines during treatment. Bringing personal items like toys, blankets, or music that the child enjoys can make the hospital environment feel more familiar and less intimidating.

Providing Emotional Support:

Parents can be trained to recognize signs of distress and use calming techniques, such as deep breathing exercises, to help manage anxiety. By offering consistent emotional support, parents can help children feel more secure and better able to tolerate the challenges of treatment.

Preparing the Child for Treatment:

Giving the child advance notice of what to expect during radiotherapy sessions, using visual aids or social stories, can help reduce anxiety. Teaching the child in a calm and structured manner about the procedure, in terms they can understand, allows them to mentally prepare for the experience.

Maintaining Routine and Predictability:

Keeping other aspects of the child's life as consistent as possible, such as meal times or sleep schedules, can provide a sense of stability amid the medical treatment. This is particularly important for children with ASD, who rely heavily on routine for emotional security.

Collaboration with Medical Professionals:

It is crucial for families to maintain open communication with the medical team to ensure that the child's ASD-specific needs are met. Healthcare providers can work with parents to adjust treatment plans as needed, ensuring that the child's comfort and emotional well-being are prioritized during radiotherapy.

4. Existing problems and challenges**4.1 Insufficient knowledge and skills of parents**

Parents are the first teachers of children, and they play a vital role in the early intervention of children with ASD. However, many parents may lack basic knowledge about ASD, do not understand how to effectively communicate and interact with their children, or do not know how to use specific behavior management strategies[37]. This lack of knowledge and skills can lead to feelings of helplessness and frustration among parents, which can affect their ability to provide effective interventions. Therefore, providing parents with professional training and support services to help them learn how to implement effective interventions at home is the key to improving the success rate of family interventions[37, 38].

4.2 Constraints on resources and support

The implementation of family intervention requires certain resources and support, including professional ASD services, trained professionals, and financial assistance. In some areas, however, these resources may be very limited, making it difficult for families to obtain the necessary help. Moreover, even with available resources, the financial burden can be a significant challenge, especially for families of children with ASD who require long-term and intensive interventions. Therefore, the government and relevant agencies need to provide more support and services to help families overcome these obstacles[39, 40].

4.3 Consideration of cultural and social factors

Cultural and social factors have an important impact on the implementation and effectiveness of family intervention. Different cultural backgrounds and social values may influence family members' perceptions of ASD and expectations for intervention[40]. For example, some cultures may focus more on collectivism and face-saving concepts, which may affect family members' attitudes toward open discussion and seeking help. In addition, the degree of social cognition and support for ASD will also affect the family's intervention decisions and the social integration of children. Therefore, understanding and respecting the needs of families in different cultural contexts, as well as improving social

awareness and support for ASD, are important factors to improve the effectiveness of family intervention[40, 41].

4.4 Sustainability of long-term interventions

Family intervention requires long-term commitment and sustained effort. However, over time, parents may feel tired and frustrated, especially in the face of slow improvement or relapse in their child's behavior. This situation may cause parents to lose motivation or even give up intervention[42, 43]. Therefore, how to maintain the motivation and sustainability of family intervention is an urgent problem to be solved. This may need to be achieved by providing ongoing parent support, encouraging communication and sharing of experiences between parents, and finding innovative ways to increase the enjoyment and attractiveness of the intervention[44, 45].

5. Future research directions and suggestions**5.1 Strengthen interdisciplinary cooperative research**

In order to better understand and implement effective family intervention strategies, future research should strengthen interdisciplinary collaboration in the fields of psychology, education, medicine, and sociology. By integrating expertise and research in different fields, more comprehensive support and services can be provided to children with ASD[45].

5.2 Development of Individualized Family Intervention Program

Given the large individual differences in children with ASD undergoing radiotherapy, future research should aim to develop more individualized family intervention programs. This includes consideration of the child's age, gender, severity of symptoms, and the specific circumstances of the family to ensure the appropriateness and effectiveness of interventions[44, 46].

5.3 Increase parental involvement and satisfaction

The active participation of parents is the key to the success of family intervention. Therefore, future research should explore how to improve parent engagement and satisfaction, for example, by providing more educational resources, training and support services, and establishing parent support groups[40, 47].

5.4 Support and promotion at the policy level

Government and non-governmental organizations should formulate relevant policies to support family intervention for children with ASD undergoing radiotherapy. This includes providing financial support, training professionals and establishing service networks. At the same time, the publicity and education of the public should be strengthened to improve the social awareness and support for ASD[47, 48].

6. Conclusion

This article highlights the importance of family intervention for children with ASD undergoing cancer radiotherapy. Family support plays a crucial role in addressing the unique challenges these children face during treatment. To improve intervention outcomes, interdisciplinary collaboration, personalized strategies,

and increased parental involvement are key. Future research should focus on enhancing these interventions to better support the overall development and well-being of children with ASD undergoing cancer treatment.

Data Availability

The data supporting the findings of this review are available from the corresponding author upon request.

Conflict of Interest

The authors declare no conflict of interest.

Informed Consent

There is no informed consent issue involved in this review.

Clinical trial number

not applicable.

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