

The Effects of Music Therapy on Autism

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Abstract. Autism is a neurodevelopmental disorder characterized by deficits in social communication, repetitive stereotyped behaviors, and sensory abnormalities. At present, there is no radical cure, and functional improvement mainly relies on educational and behavioral interventions. Due to common problems such as language difficulties, emotional anxiety, and insufficient social motivation in patients, traditional intervention methods are often difficult to implement effectively. With its non-verbal, structured, rhythmically stable, and emotionally arousing features, music has become an important intervention approach suitable for individuals with autism. Through melody, rhythm, singing, instrumental performance, and other forms, music therapy bypasses language pressure to improve emotional regulation, social interaction, joint attention, and behavioral control. Meanwhile, it promotes brain functional integration through neuroplasticity, improving sensory integration and the willingness to express. In recent years, relevant studies have gradually shifted from early clinical observations to mechanism exploration and intervention verification, advancing continuously in effectiveness, action pathways, and intervention models, aiming to provide a safer, more acceptable, and more easily accessible non-pharmacological intervention for autism. This paper primarily examines the effects of music therapy on patients with autism, including its impacts on attention, emotion, and social interaction. The second part of the study examines the current status of music therapy in autism intervention, including case studies, existing challenges, and suggestions for improving implementation.

Keywords: Music therapy, Autism, Clinical treatment

1. Introduction

As a common neurodevelopmental disorder, autism is characterized by social communication disorders, repetitive stereotyped behaviors, and abnormal emotional regulation, which seriously affect the quality of life and social integration of children [1]. With the development of rehabilitation medicine, non-pharmacological interventions have gradually become mainstream in autism rehabilitation. Among them, music therapy has been widely used in the clinical rehabilitation of autistic children due to its safety, high compliance, and favorable intervention effects.

At present, music therapy has been proven to improve the behavioral and social abilities of autistic children effectively. However, there are still many deficiencies in clinical application, such as the lack of unified standards for intervention programs, a shortage of professionals, and imperfect

systems for evaluating curative effects, which limit the full realization of its clinical value. Combined with existing clinical case practices, music therapy has significant effects in alleviating emotional anxiety, reducing repetitive stereotyped behaviors, and improving the social interaction ability of autistic children. However, limited by the insufficient pertinence of intervention programs and the lack of long-term follow-up data, its therapeutic efficacy has not been fully established.

Based on existing clinical practice and research findings, this paper systematically reviews the current status of music therapy in the treatment of autistic children, analyzes implementation challenges, and proposes targeted improvement suggestions. It aims to provide practical guidance for the standardized application of music therapy in the rehabilitation of autistic children, to improve rehabilitation outcomes and social integration, and to promote the high-quality development of the autism rehabilitation field.

2. Music therapy

2.1. Definition and application of music therapy

Music therapy is an independent applied discipline integrating musicology, psychology, medicine, rehabilitation science, and education. With music as the medium, professional therapists carry out systematic interventions purposefully and plannedly, using various music forms such as singing, instrumental performance, rhythmic movement, music listening, and improvisation, according to individuals' physical and mental development characteristics and rehabilitation needs. Through emotional regulation, sensory stimulation, and interactive guidance in music, it improves individuals' emotional state, social communication, behavioral cognition, and physical and mental functions, thereby achieving rehabilitation correction, psychological adjustment, and physical and mental health promotion as a non-pharmacological psychological rehabilitation therapy.

However, this is only a general summary, and there is no universally recognized definition of music therapy worldwide. Music therapy should be a science that systematically studies the treatment of disease using music as a means, grounded in music's practical functions. All treatment methods and activities that systematically, purposefully, and plannedly use music as a means to promote human physical and mental health should fall within the scope of music therapy [2].

At present, music therapy is widely used in medical treatment, psychology, special education, elderly rehabilitation, and community health, among other fields. It is applied to intervene and treat different problems in psychiatry, neurological and elderly rehabilitation, and children's groups. Meanwhile, music therapy is also commonly used in clinical comprehensive medical treatment, which can relieve tension before and after surgery and provide psychological comfort for critically ill and dying patients. In addition, it has been gradually integrated into schools, communities, and workplaces. With diversified intervention forms and the advantages of being mild and highly acceptable, it has become an important means of modern adjuvant therapy and health promotion.

2.2. Music therapy and psychotherapy

Psychotherapy is a professional psychological intervention process in which professional therapists use psychological principles and standardized intervention techniques to establish a safe and trusting professional relationship, and help clients regulate emotions and understand themselves through systematic professional methods such as conversation, behavior guidance, cognitive adjustment, and emotional counseling for individuals' emotional distress and cognitive bias, to maintain mental health and promote physical and mental harmony.

Music therapy possesses analogous attributes to conventional psychotherapy: music therapists cultivate a constructive therapeutic rapport with patients to address their emotional and behavioural issues. Music therapy also has its own characteristics, and the difference from general psychotherapy is mainly reflected in therapeutic methods. The medium of general psychotherapy is language, while that of music therapy is music [3]. Both music and language are important tools for communication and receiving external information. The two therapies use different tools and methods to achieve the same goals and effects: regulating patients' emotions and promoting their physical and mental health.

3. Effects of music therapy on autistic children

Autism, also known as Autism Spectrum Disorder (ASD), is a congenital neurodevelopmental disorder. Its core manifestations include weak social communication skills, difficulty with interpersonal interactions, slow or abnormal language development, repetitive, stereotyped behaviors, fixed emotional patterns, and sensory sensitivity. Studies have shown that musical ability in autistic children is almost universal. Although they are indifferent to the outside world and even lack language skills in some cases, most autistic children show a strong interest in music, and some even have excellent musical perception and outstanding sound discrimination. Therefore, music therapy stands out among various autism interventions [4].

3.1. Effects on language

As a promising auxiliary means in language intervention for autistic children, the core mechanism of music therapy lies in activating shared neural pathways for music and language (such as Broca's area, Wernicke's area, the cerebellum, and other key brain regions). It systematically improves the language abilities of autistic children by alleviating their social anxiety and fear of expression, strengthening the rhythmic linkage between respiratory control and oral muscle coordination, and enhancing motivation for intervention participation through gamified music activities.

Music can affect the brain's language network, including areas closely related to language processing—music and language share neural processing mechanisms to a large extent. Through music training, especially rhythm and melody training, autistic patients can make progress in language comprehension and production [5].

Specifically, its intervention effects are mainly reflected in significant improvements in pronunciation clarity, standardized correction of intonation and speaking rate, a steady increase in core vocabulary, and an obvious enhancement of willingness to express language actively. Meanwhile, it can effectively promote children's auditory attention, language comprehension, and the development of interactive language skills, such as turn-taking responses and initiating conversations in social interaction. Relevant meta-analytic studies (including 18 randomized controlled trials with a total of 1,457 autistic children) have clearly confirmed that music therapy has a stable effect on improving the language communication ability of autistic children [6].

3.2. Effects on social ability

Good social skills are the foundation for individual physical and mental health and social development, as well as an essential skill for integrating into collectives and adapting to the social environment. Stable social interaction can promote interpersonal communication, emotional

exchange, and mutual understanding, help individuals establish benign interpersonal relationships, obtain emotional support and a sense of security, and alleviate negative emotions.

Studies on the social skills of autistic children have shown that these children are less likely to initiate interactions; in conversations, they continue the conversation less when it is their turn to speak, and they show less empathy and interest in people who interact with them [7]. Music therapy builds a bridge of nonverbal communication. By activating the brain's mirror neuron system, regulating emotional state, and strengthening social interaction motivation, it can significantly improve the core social deficits of children with ASD. Specific manifestations include enhancing the initiative for social participation, increasing the frequency of eye contact and social responses, strengthening the ability to recognize and understand emotions, helping children acquire basic social rules such as turn-taking, sharing, and cooperation, and optimizing the quality of interpersonal interaction.

By leveraging the natural inclusiveness and nonverbal communication qualities of music, it can effectively alleviate social anxiety and avoidance tendencies in autistic children and reduce resistance to interpersonal interaction. In collective music activities, instrumental collaboration and interactive singing, children can be gradually guided to develop social rule awareness of cooperation and sharing, enhance the ability to recognize and understand others' emotions and social signals, and effectively improve active social willingness, social response ability, and interpersonal adaptation. Sustained and standardized music intervention can continuously improve the quality of social interaction for autistic children over the long term, help them gradually integrate into the collective environment, and lay an important foundation for social development.

3.3. Effects on behavior

ASD is a lifelong disability characterized by severe impairment of social function, deficits in speech and language, and unusual behavioral manifestations such as habitual repetitive movements and severe distress caused by environmental changes [8].

As a safe, non-invasive and highly compliant non-pharmacological auxiliary means in behavioral intervention for ASD children, music therapy relies on its unique emotional soothing and multi-sensory stimulation characteristics. By modulating the limbic system, strengthening the rhythm-behavior linkage, alleviating negative emotions, and enhancing intervention motivation, it has a significant corrective and improving effect on the abnormal behaviors of children with ASD. It can promote the development of their adaptive behaviors.

Clinical studies and meta-analytic data show that a study including 13 randomized controlled trials with a total of 1,160 children with ASD confirms that music therapy can significantly improve the behavioral symptoms of children. It can effectively reduce typical abnormal manifestations such as repetitive stereotyped behaviors, social withdrawal, emotional irritability, and impulsive aggression, and significantly reduce scores on the Autism Treatment Evaluation Scale, Autism Behavior Checklist, and Childhood Autism Rating Scale. Among them, studies on Chinese children with ASD show that music therapy has a more obvious effect on improving behavioral symptoms.

From the perspective of action pathways, soothing music melodies and stable rhythms can effectively alleviate negative emotions such as anxiety and irritability of children with ASD and reduce emotional impulsivity and aggressive behaviors. Structured music activities can help children establish a sense of regularity and order and guide them to shift their attention from purposeless, repetitive behaviors to positive activities. In contrast, gamified music interaction forms can strengthen children's positive behaviors and gradually cultivate their behavioral self-control and adaptability.

4. Application status of music therapy in autism intervention

4.1. Current music therapy cases

Currently, the majority of autism treatment cases focus on mild to moderate preschool and school-age children with autism, selecting those exhibiting issues such as repetitive stereotyped behaviours, emotional impulsivity, social withdrawal, poor language expression, and inattention as research samples.

LaGasse's study aimed to examine the effects of group music therapy intervention on eye gaze, joint attention, and communication in children with autism spectrum disorder. In the study, 17 children aged 6 to 9 years with autism were randomly assigned to the music therapy group or the non-music social skills group. The children attended 10 group sessions of 50 minutes over 5 weeks, and all group courses were designed to target social skills improvement. The study confirmed that a group music therapy intervention improves the social skills of autistic children, especially joint attention, which is of great significance for their overall development and social interaction [9].

Case 1: Xiaoyu (7-year-old male, moderate autism, social phobia)

Basic situation: 7-year-old boy, moderate autism, extreme social withdrawal, screaming and hiding in cabinets when seeing strangers, sensory sensitivity (covering ears to avoid sounds), no active communication, and easy emotional tension.

Intervention plan: Combination of one-on-one and group sessions, twice a week, 40 minutes each time, for 16 weeks. Mainly improvisational performance on xylophone/glockenspiel, with soothing background music (60–80 beats/min), gradually adding two-person turn-taking performance and simple chorus.

Intervention outcomes: Ceased screaming and evading strangers, smiled at the therapist for the first time; proactively engaged with instruments, participated in turn-taking activities; sensory sensitivity markedly diminished (no longer covering ears); emotional stability substantially enhanced, capable of remaining quietly in the group for over 20 minutes.

Case 2: Xiaoyun (6-year-old female, moderate autism, anxiety + attention deficit)

Basic situation: 6-year-old girl, moderate autism, high anxiety, easy irritability, difficult to concentrate (sitting still < 5 minutes), vigilant to the environment, no active social interaction, little language expression, sensitive to piano timbre.

Intervention plan: One-on-one piano-based, three times a week, 35 minutes each time, for 16 weeks. From one-handed key pressing and scale imitation to simple two-handed pieces (such as *Twinkle Twinkle Little Star*), interspersed with music games (rhythm cards, instrument matching).

Intervention effect: Able to sit still for 30 minutes continuously to participate in treatment; anxiety attacks reduced by 80%; learned to play simple pieces with both hands; showed active sharing (showing her performance to the teacher); language expression increased, able to speak 5–8-word short sentences.

The above case practices further confirm the effectiveness and feasibility of music therapy as a non-invasive, highly compliant non-pharmacological intervention in improving behavioral symptoms, enhancing social adaptation ability, and regulating the emotional state of children with ASD. It also shows that the intervention effect of music therapy is closely related to the severity of the disorder, age, children's individual interests, and the pertinence of the intervention programs. Formulating differentiated intervention strategies for children with ASD with different characteristics, combined with long-term standardized intervention and multi-scenario generalization practice, can further optimize intervention efficiency, provide solid case practice

support for the standardized application of music therapy in clinical intervention of children with ASD, and offer practical references for the formulation of individualized intervention programs.

4.2. Current problems of music therapy and suggestions for improving implementation methods

There are still many shortcomings in the clinical application and academic research of music therapy, hindering its standardized, high-quality development. The industry generally faces problems such as insufficient public awareness, a lack of institutional guarantees, fragmented disciplinary research, and inconsistent industry standards. Meanwhile, there are defects such as an imperfect theoretical system, limited research on the mechanism of action, difficulty in quantitatively evaluating the curative effect, and low social recognition. Current music therapy research mostly focuses on verifying the effectiveness of established intervention measures [10, 11]. In the future, it is necessary to consolidate research conclusions based on large-sample, standardized clinical trials of children and adolescents [12].

5. Conclusion

In summary, as a safe and highly compliant non-pharmacological intervention, music therapy has significant value and clinical application potential in the rehabilitation intervention of autistic children. The non-verbal characteristics and emotional regulation functions of music can effectively improve the language expression, social interaction, and behavioral performance of autistic children. By activating relevant neural pathways and regulating emotional state, it helps children reduce repetitive, stereotyped behaviors and improve social skills and emotional stability. Many clinical cases and research data have confirmed its intervention effectiveness.

At present, music therapy has been widely used in autism clinical intervention, but there are still many deficiencies: at the research level, there are problems such as methodological heterogeneity and lack of long-term follow-up data; at the practical level, it faces dilemmas such as a shortage of professionals, inconsistent intervention standards, and imperfect medical insurance guarantee, which restrict the full play of its clinical efficacy.

In the future, it is necessary to improve the research system further, unify intervention and evaluation standards, expand the research sample size, extend follow-up cycles, and deeply explore the mechanism of action. Meanwhile, improve the professional training and certification mechanism, optimize intervention programs, and promote the standardized, precise development of music therapy, so that it can better serve the rehabilitation needs of autistic children and provide stronger support for the social integration and physical and mental health of the autism group.

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