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Exploration of the Intervention of Music Therapy for Children with Autism Spectrum Disorder

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Abstract: This paper delves into the intervention effect of music therapy on children with Autism Spectrum Disorder (ASD). In recent years, the prevalence of childhood autism has been on the rise at an alarming rate globally. Traditional intervention methods, which mainly rely on behavioral and educational approaches, have long been the mainstream. However, these methods have shown certain limitations. For instance, they often struggle to fully engage children with ASD due to their highly individualized characteristics, and may not adequately address the emotional and sensory aspects of these children. This situation has spurred researchers to explore alternative approaches, with music therapy emerging as a promising option. By thoroughly reviewing a vast amount of relevant literature on various academic platforms over the past decade, this study aims to comprehensively summarize the current research status, intervention effects, underlying mechanisms, and existing problems of music therapy for children with ASD. The results indicate that music therapy can significantly enhance the social interaction, language skills, and emotional management abilities of these children. Nevertheless, issues such as inconsistent intervention models and unclear long-term effects still persist. Thus, this paper emphasizes the need for continued research to unlock more possibilities for effectively helping children with ASD through music therapy.

Keywords: Autism Spectrum Disorder, Music Therapy, Children, Intervention Effect

1. Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder characterized by persistent deficits in social communication and social interaction in multiple contexts, as well as restricted and repetitive patterns of behavior, interests, or activities [1]. In recent decades, the prevalence of ASD has been on the rise globally. For example, the Centers for Disease Control and Prevention (CDC) in the United States estimates that approximately 1 in 54 children in the United States has ASD [2]. Traditional intervention approaches for ASD, including Applied Behavior Analysis (ABA), Speech - Language Therapy, and Occupational Therapy, have been widely used. ABA modifies behavior through positive and negative reinforcement; Speech - Language Therapy aims to improve communication skills; and Occupational Therapy focuses on enhancing daily living and sensorimotor functions. Although these traditional methods have achieved certain results, they also have limitations. For some children with ASD, ABA may be too rigid and lack flexibility in meeting their diverse emotional and social requirements. Speech - Language Therapy may not fully address the unique communication patterns of children with ASD. Music therapy, as a

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complementary or alternative intervention for ASD, has emerged as a promising approach. Music therapy is defined as the use of music interventions by professional qualified personnel who have completed an approved music therapy program, based on clinical and evidence - based principles within a therapeutic relationship, to achieve personalized goals [3]. Music has unique characteristics that can attract the attention of children with ASD. It does not rely solely on verbal communication, which is often a challenge for children with ASD. Music contains elements such as rhythm, melody, harmony, and timbre, which can stimulate multiple senses and brain regions.

This research utilized a literature research method to explore the intervention effect of music therapy on children with Autism Spectrum Disorder (ASD). The research was conducted on academic platforms like Google Scholar, Web of Science, and EBSCOhost, using search terms such as "music therapy for children with autism spectrum disorder", "the intervention effect of music therapy on autistic children", and "the mechanism of music therapy in treating autism". After screening, 10 high-quality research papers were selected as analysis samples. The study aimed to provide a more scientific and effective theoretical basis for treatment practices in this field. Music therapy can improve social interaction, language skills, and emotional management abilities, enhancing children's integration into society and quality of life. Research on the underlying mechanisms of music therapy can deepen our understanding of neurodevelopment and psychological activities, guiding the development of more targeted intervention strategies. Studying existing problems and exploring solutions is beneficial for promoting academic research, standardizing and regularizing music therapy, and enabling it to play a greater role in the treatment of children with ASD.

2. Literature review

2.1. Search strategy

The search terms were carefully crafted to encapsulate the essence of the research area. Phrases such as "music therapy for children with autism spectrum disorder", "the intervention effect of music therapy on autistic children", and "the mechanism of music therapy in treating autism" were used. These terms were designed to be broad enough to cover a wide range of relevant studies, yet specific enough to filter out irrelevant literature. For instance, “music therapy for children with autism spectrum disorder” directly zeroes in on the core subject matter. “The intervention effect of music therapy on autistic children” concentrates on the outcome dimension, while “the mechanism of music therapy in treating autism” delves deep into the underlying physiological and psychological mechanisms. Following the initial search, a rigorous screening process was carried out based on well - defined inclusion and exclusion criteria. The inclusion criteria were set to ensure that the selected studies were relevant, methodologically sound, and contributed meaningfully to the understanding of music therapy for ASD children.

2.2. Research status

2.2.1. Intervention effects

Multiple studies have demonstrated that music therapy exerts a positive influence on diverse aspects of children with ASD. First and foremost, a randomized controlled study by Yum et al. revealed that music therapy significantly enhanced the engagement and initiative of autistic children with mild intellectual disabilities [4]. In comparison to the control group, children in the music therapy group showed a marked increase in participation and initiative behaviors.

Subsequently, a meta - analysis carried out by Kim et al indicated that music - based interventions had a beneficial impact on the social interaction of children with ASD [5].

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Specifically, through group music - making activities, these children were provided with more opportunities to interact with their peers, collaborate on music - related tasks, and respond to others' musical cues, thereby enhancing their social skills.

Moreover, the research of Li et al., which utilized functional near - infrared spectroscopy (fNIRS), demonstrated that the rhythm and melody in music could function as cues for language learning [6]. This, in turn, assisted children with ASD in better processing and expressing language.

Finally, a randomized controlled trial conducted by Wang et al. discovered that music rehabilitation therapy had a positive effect on the emotional management of children with ASD [7]. Put simply, music enabled children to express their emotions, alleviate anxiety, and manage their emotional states more effectively.

2.2.2. Underlying mechanisms

At the neural level, Li et al. discovered that music - based language intervention could activate relevant brain regions in children with ASD, promoting neural connections related to language processing [6]. Some studies also suggested that music might affect the connectivity between different brain regions in children with ASD, which might contribute to the improvement of their behavior and social communication.

At the psychological level, music provides a non - verbal and creative way for children with ASD to express themselves. For example, through improvisational music therapy or singing, children can freely express their emotions and inner thoughts, which helps to enhance their self - awareness and emotional regulation ability. Collaborative music - making experiences can also cultivate their social skills by promoting joint attention and interaction with others.

2.2.3. Existing problems

The current lack of a unified and standardized intervention model for music therapy for children with ASD is largely due to differences in understanding and application of music therapy by different research institutions and clinical workers [8]. Theoretical approaches like psychodynamic and behaviorist theories have different practical applications, making it difficult to unify intervention models. Cultural backgrounds, medical resources, and educational levels also contribute to differences in music therapy implementation. Areas with rich resources and in-depth research may adopt more complex and diverse intervention models, while areas with scarce resources may adopt simple and single models. Additionally, different studies and clinical practices may adopt different music activities, frequencies, durations, and treatment methods. Some focus on individual sessions, while others emphasize group music activities for social interaction. Inconsistencies in research results make it difficult to effectively compare and integrate results, hindering the promotion and application of music therapy in clinical practice.

2.2.4. Unclear long - term effects

Currently, the majority of studies on music therapy for children with ASD are short - term, and the long - term effects of music therapy remain unclear. From the perspective of research design, since the growth and development of children with ASD is a long - term and complex process, short - term studies are difficult to comprehensively observe the effects of music therapy at different growth stages. Additionally, during the research, it is challenging to control the influence of numerous external factors on children, such as alterations in the family environment and modifications to educational approaches. These factors may confound the assessment of the long - term effects of music therapy. From the perspective of clinical practice, there is currently a lack of an effective mechanism for long - term tracking and evaluation of the effects of music therapy.

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Many rehabilitation institutions and medical institutions pay more attention to the achievement of short - term goals, such as improving a certain behavior or skill of children in the short term, while ignoring the continuous monitoring and analysis of long - term effects. In addition, due to the lack of a unified long - term effect evaluation standard, it is difficult to compare and summarize different studies and practices. This makes it uncertain whether the positive effects observed in the short term can be maintained in the long term, and whether continuous music therapy is needed to achieve long - term stability of the treatment effect, restricting the scientific application of music therapy in long - term treatment plans [9].

3. Comparison of different music therapy methods

Receptive music therapy principally encompasses children listening to either recorded or live music and then offering responses. It has the capacity to elevate mood, reduce stress and pain, enhance relaxation, and decrease anxiety. For example, in some studies, the anxiety levels of children with ASD decreased after listening to soothing music. However, it must be noted that receptive music therapy alone may have limitations in promoting active social interaction and communication skills. On the other hand, active music therapy encourages children to directly participate in music - making activities such as singing, playing musical instruments, composing, and songwriting. This method can better stimulate children's creativity, self - expression ability, and social interaction ability. In group active music - making activities, such as a group drumming activity where children with ASD need to coordinate their rhythms with others, it helps to improve their social skills, enhancing their sense of cooperation and social connection. Nevertheless, this method requires more time and resources, and some children may have difficulty participating due to a lack of musical skills or physical limitations. In light of the features of both receptive and active music therapy, a multitude of current research endeavors and clinical practices are inclined to integrate these two modalities. For example, starting with a receptive music - listening session to relax the children and then conducting an active music - making activity to promote their participation and social interaction. In this way, this integrated method can take advantage of the benefits of both methods and show better intervention effects in some cases.

3.1. Summary

Each of the three music therapy approaches—receptive music therapy, active music therapy, and integrated music therapy—possesses distinct advantages and disadvantages. In real - world applications, it is crucial to make selections and adjustments tailored to the specific circumstances of children with Autism Spectrum Disorder (ASD). Receptive music therapy is relatively easy to operate, requires a lower musical foundation from children, and can quickly improve the emotional state, but its effect in promoting social interaction is limited. Active music therapy is outstanding in stimulating children's creativity and social skills, but it is more difficult to implement. The integrated music therapy combines the advantages of both, providing a more comprehensive intervention for children with ASD. However, currently, there is a lack of clear guiding principles and standards on when and how to choose a single therapy or an integrated therapy, and how to make dynamic adjustments according to children's responses. Further research and practical exploration are needed to optimize the application of music therapy and make it better serve children with ASD.

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4. Future research directions

4.1. Establishing standardized intervention models

Future research efforts should concentrate on formulating standardized music therapy intervention models for children with ASD. This endeavor entails defining the ideal blend of music - based activities, the appropriate frequency and duration of treatment sessions, and the most suitable treatment methods for different characteristics of children with ASD. For example, through large - scale multi - center studies, different intervention models can be compared and evaluated to identify the most effective one.

4.2. Long - term follow - up studies

The current research on music therapy's effects on children with ASD primarily focuses on short-term efficacy. However, understanding the long-term effects is crucial for assessing its effectiveness and sustainability. Long-term follow-up studies help determine the treatment's sustainability and develop more scientifically sound intervention strategies. This paper aims to track the development of children who have received music therapy over several years, observe initial positive effects, identify new changes, and determine if additional music therapy is needed at different stages. Long-term follow-up studies are essential for assessing the long-term effects of music therapy on children with ASD.

4.3. Personalized music therapy

In - depth exploration of the individual differences of children with ASD should be carried out to develop more personalized music therapy programs. This may entail the utilization of cutting - edge technologies, such as brain - computer interfaces (BCIs), to gauge children's neural reactions to diverse musical components. Although personalized music therapy has great potential, it also faces some challenges. For instance, BCI technology equipment is expensive, making it difficult to be widely used in clinical settings; and monitoring brain activity in children may cause discomfort and resistance. To address these issues, the development of low - cost, portable BCI devices can be explored, while optimizing monitoring methods to reduce interference with children. In addition, there is a need to strengthen the training of therapists so that they can become proficient in the use of BCI technology and individualized treatment plans [10].

5. Conclusion

Music therapy holds significant promise in the intervention of children with Autism Spectrum Disorder. It has the potential to effectively enhance these children's social interaction skills, language proficiency, and emotional management capabilities. Nevertheless, several issues remain to be addressed. For instance, the lack of consistent intervention models and the uncertainty surrounding long - term effects pose challenges. Future research should be focus on establishing standardized models, conducting long - term follow - up, and developing personalized therapies. By doing so, music therapy can play a more important role in the treatment and development support of children with ASD, ultimately improving their quality of life and social integration ability. Moreover, it is necessary to create a safe, comfortable, and interesting treatment environment for children with autism. This can enhance their music perception and expression abilities and help them better integrate into the social environment.

The study also has limitations, including a lack of comprehensive literature review, reliance on existing research results, and a lack of in-depth quantitative comparison research for comparing

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different music therapy methods. This may lead to an incomplete analysis of research status, and the reliability of conclusions may need improvement. Additionally, the application of advanced technologies in personalized music therapy may have limited feasibility and operability under current technical conditions and resource constraints. Future research should address these limitations and conduct more in-depth and comprehensive research to promote the development of music therapy in the field of ASD children's intervention.

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