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Non-Pharmacological Intervention: The Supportive Role of Music Therapy for Alzheimer's Disease Patients and Their Caregivers

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Abstract. Alzheimer's disease (AD) is one of the most common neurodegenerative diseases in today's society. It not only leads to cognitive decline and emotional problems in patients but also brings psychological stress and illness to family members who take on caregiving responsibilities. In today's society, as the problem of population aging becomes more serious, drug treatment alone can no longer meet the needs of patients and caregivers. Therefore, finding effective non-pharmacological treatments and interventions has become an important issue. Music therapy is a form of healing that has gradually emerged in recent years, with unique regulatory effects on the nervous system and emotions. This article combines academic literature from the past five years, through theoretical analysis and empirical research, to explore the role of music therapy in improving cognitive functions, relieving emotional problems, and reducing caregiver stress in patients with AD. Research results show that music therapy can help patients alleviate memory and language deficits, as well as effectively relieve anxiety and depression. At the same time, it can also provide caregivers with emotional and psychological support and companionship, thereby improving the well-being of patients and their families. In summary, music therapy should be regarded as an important part of AD treatment and caregiving, as it helps patients and their families receive more warmth and hope.

Keywords: Music therapy, Alzheimer's disease, cognitive functions, emotional regulation, caregivers

1. Introduction

Alzheimer's disease (AD) is a chronic and progressive neurodegenerative disease that affects memory, thinking, and behavior, and its prevalence has exceeded 50 million worldwide, and this number is expected to increase sharply in the coming decades [1]. This not only shows the scale of the disease but also emphasizes the necessity of using non-pharmacological interventions such as music therapy. At the same time, in facing this social problem, those affected are not only the patients themselves but also their families and caregivers. In addition to the decline in the quality of life of patients and families, the health of caregivers may also be negatively affected by psychological and physical stress [2]. Thus, family members of patients also face long-term mental

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and physical pressure in the caregiving process. They often need to balance work and caregiving, which makes them more likely to experience anxiety and depression. This demonstrates that Alzheimer's disease is not only a medical problem but also a social problem.

Drug treatments such as acetylcholinesterase inhibitors and memantine can only provide limited symptomatic relief, but cannot control the worsening of the disease or address the psychiatric symptoms of patients [3]. This indicates that relying solely on drugs cannot improve the lives of patients and their families. Therefore, non-pharmacological interventions have become an important research direction. Music therapy is one type of intervention that has gained attention in this context. Research shows that patients with dementia usually respond best when exposed to music that resonates with their personal experiences. Even when language skills decline, music can stimulate emotional engagement and promote communication [4]. This shows that music therapy not only has medical value but also helps patients and families rebuild connections. This study will examine four aspects: cognitive foundations, emotional and psychological support, practical evidence, and future directions.

2. Theory one: the role of music therapy in cognitive improvement

Among Alzheimer's disease patients, cognitive decline is one of the most prominent symptoms. The reason why music therapy has special value in cognitive intervention lies mainly in its ability to activate multiple brain regions. Neuroscientific research shows that music can stimulate systems related to language and emotions, as well as the hippocampus involved in memory. This makes music therapy an effective cognitive intervention method.

Ting et al. point out that Rhythmic Music Therapy (RMT) and Active Music Therapy (AMT, including AMT with singing) are most effective: "The results indicated that RMT, AMT + Sing, and AMT all significantly improve cognitive functions in dementia patients" [5]. This shows that rhythm training and singing activities can enhance memory and attention in dementia patients. This indicates that music can not only provide passive sensory stimulation but also promote active learning and practice. When patients practice and imitate melodies, they can reactivate degenerated brain pathways, thereby delaying cognitive decline.

Jiménez-Palomares et al. state, "Focusing on the effects on cognitive functions, we found that the application of active music therapy techniques improved cognition in general and showed improvements specifically in verbal fluency, orientation, and memory" [1]. This finding shows that music can not only improve emotions but also improve cognitive impairment. It can effectively influence communication ability and life skills of patients.

As Bahrami et al. point out, "Music memory is preserved in AD as it is partially separate from other memory processes, and patients with AD still retain some of their musical recall while having significant cognitive deterioration" [3]. This statement shows that music memory is more stable than other types of memory. This explains why some patients may no longer recognize their family but can still sing familiar songs. Therefore, music is not only a therapeutic method but also a bridge for maintaining dignity and communication.

By activating musical memory and multiple brain functions, music therapy can effectively improve cognition in Alzheimer's disease patients. This lays the scientific foundation for its clinical application.

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3. Theory two: the role of music therapy in emotional regulation and psychological support

In addition to cognitive decline, Alzheimer's disease patients often suffer from emotional problems such as anxiety, depression, and agitation. These symptoms not only increase the suffering of patients but also add to the burden on caregivers. The advantage of music therapy in this regard lies in its emotional regulation function. According to Flo et al., "A systematic review summarized the results of 38 systematic reviews on various non-pharmacological interventions and found that music interventions were best at reducing behavioural symptoms, specifically agitation and anxiety, in dementia" [6]. This statement shows that music therapy is particularly effective in reducing behavioral symptoms such as anxiety in dementia patients. This is very important. Emotional distress not only affects the quality of life of patients themselves but also increases the stress of caregivers. If music can be used as an effective and low-cost method to improve these problems, then it has the potential to become a common tool in caregiving. This finding suggests that music therapy can bring significant psychological improvement in a short period of time.

At the same time, Zhang points out: "By using the music emotion classification algorithm, an intelligent algorithm, therapists can more accurately select emotionally appropriate music to achieve better treatment outcomes" [7]. This viewpoint shows that artificial intelligence algorithms can not only enhance the scientific aspect of music therapy but also increase its precision. I think the advantage of this method lies in its ability to avoid subjective bias when selecting music, making music therapy more effective for patients. This represents the development of music therapy toward personalization and technology, allowing for treatment plans that consider individual differences. This trend makes music therapy more universal.

Furthermore, Shirsat et al. point out, "Music can activate the limbic system, subcortical circuits, and emotionally related systems, inducing the sensation of well-being" [4]. This emphasizes that music can directly act on the brain's limbic system and emotional system, bringing positive psychological feelings. This mechanism explains why music plays such an important role in regulation. It does not rely on language understanding or logical reasoning but directly reaches the emotional core, making it particularly effective for patients with cognitive decline or language impairment. This shows that music therapy deserves broad clinical application.

In summary, in terms of emotional regulation and psychological support, music therapy can not only reduce patients' emotional symptoms but also relieve caregivers' stress.

4. Case analysis and comparison

The effectiveness of theories needs to be validated in practice. Recent research cases provide strong evidence for the application of music therapy in different contexts.

Popa et al. conducted a study using music and art therapy on Alzheimer's patients and their caregivers. The results showed that the psychological state of the patients improved, and at the same time the burden of the caregivers was reduced [2]. This shows that caregivers are not the "invisible people" in the care process, and their mental health also needs attention. I think this point is particularly important, because only when caregivers receive support can they better take care of patients.

Feng and Wang quantitatively studied the effect of music therapy on emotional resilience in a non-AD population. Their results showed that music therapy can enhance psychological resilience and overall well-being [8]. Although the research subjects were not specifically Alzheimer's caregivers, the conclusion is still applicable. By participating in music activities, caregivers can also gain psychological strength and enhance their ability to provide long-term care.

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Flo et al. designed a randomized controlled trial to compare music therapy and physical activity in patients with AD or those at risk for AD. They attempted to compare the different effects of music therapy and physical activity on brain plasticity and depressive symptoms [6]. This shows that music therapy is not an isolated method but can be combined with other interventions to form comprehensive care plans. I think this type of interdisciplinary research is helpful in finding more efficient intervention models.

Baroni Caramel et al. conducted a randomized controlled trial in nursing homes to test individualized music therapy for patients with AD. The study showed that individualized music therapy can significantly improve patients' well-being, reduce discomfort, and decrease their reliance on psychiatric drugs [9]. This shows that music therapy is not only suitable for family care but can also be promoted in institutional care. I think this scalability provides possibilities for broader application of music therapy.

Therefore, from case analysis, music therapy has shown significant effectiveness in different scenarios, not only improving patients' cognition and emotions but also reducing caregivers' psychological stress. Although these studies differ somewhat in populations and methods, the results all demonstrate the effectiveness of music therapy in supporting the psychological and cognitive aspects of patients and in reducing caregiver stress. However, this still requires long-term evaluation. In addition, Tang et al. conducted a meta-analysis of 55 randomized controlled trials on music interventions for the treatment of depression. The analysis found that both music therapy and music medicine significantly reduced depressive symptoms, with music medicine having a greater effect [10]. This indicates that the role of music in improving emotions is stable. For the care of Alzheimer's disease, this further strengthens the application value of music interventions in alleviating the psychological and emotional aspects of patients and caregivers.

5. Suggestions and discussion

Although music therapy has already shown great potential, it still faces challenges in its development. Different studies obtain very different results, and intervention methods lack unified standards, which limits its promotion.

In methodology, the problem is particularly obvious. Music therapy lacks standardized operating protocols and unified evaluation tools in clinical practice. This makes it difficult to directly compare different studies. If a recognized system of norms can be established in the future, research will become more scientific and replicable. In addition, personalization is also very important. With the development of artificial intelligence and big data, music therapy can completely provide patients with individualized music prescriptions, which not only makes intervention more effective but also allows patients to truly feel warmth. At the same time, most current research consists of short-term interventions, and there is little tracking of long-term effects. Only by extending the observation period can it be determined whether music therapy really provides lasting help. Finally, this study suggests that music therapy should not exist in isolation. It can be combined with other non-pharmacological interventions, such as exercise, art, or reminiscence therapy, to form a more comprehensive system. Only in this way can the challenges of Alzheimer's disease intervention and treatment be fully addressed.

Overall, the future development of music therapy should be more standardized and personalized, with attention to long-term effects and integration with other methods. Only in this way can it play a greater role in Alzheimer's disease intervention and caregiving.

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6. Conclusion

In conclusion, as a non-pharmacological intervention, music therapy has shown great potential in supporting Alzheimer's disease patients and their caregivers. Increasing research indicates that music therapy can not only help patients achieve certain improvements in cognitive functions but also effectively regulate and relieve emotional symptoms. At the same time, music therapy is also important for caregivers. It can not only reduce their daily caregiving stress but also create moments of joint participation through music activities. This can help them find new emotional connections in their relationships with patients, thereby alleviating loneliness and helplessness. Of course, current research still has some limitations. But precisely because music therapy is low-cost and easy to implement, it appears particularly important. Unlike drugs, it has no side effects and does not require expensive equipment, instead being closer to people's daily lives. Music is the shared language of humanity, allowing it to play a role across different cultures and social contexts. The value of music therapy is not only reflected in clinical use but also in humanistic care. It reminds us that even in the process of gradual cognitive decline, patients are still individuals with emotions and dignity. Music allows them to retain their true selves and helps family members find ways to communicate with them. This power is very special, because it is not just treatment but companionship and understanding between people. With future in-depth research on music therapy, it has the potential to become a routine intervention in Alzheimer's disease care, rather than only an auxiliary method. At that time, it can bring patients a better quality of life and inject more warmth and hope into families and society. For me personally, this makes me see that medicine and art can be combined. Music can not only heal diseases but also touch people's hearts.

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