

The Impact of Music Therapy on Alzheimer's Patients

Adetunji Taiwos Adesoji P.h.D

University of Lagos, Department of Music

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ABSTRACT

This study explores the efficacy of music therapy as a non-pharmacological intervention for Alzheimer's disease (AD) patients, emphasizing enhancements in cognitive function, mood, and quality of life. The research was conducted in Lagos, Nigeria, focusing on a diverse group of Alzheimer's patients within clinical and community settings. Participants, aged 65 to 85, engaged in music therapy sessions featuring a mix of familiar Nigerian tunes and classical music known for therapeutic properties. The methodology combined active and passive participation, with sessions held twice a week over three months, each lasting approximately 60 minutes. Systematic examination of empirical research demonstrates how music therapy engages neurological pathways that promote memory recall, emotional expression, and social interaction. Notable findings reveal that familiar music evokes autobiographical memories, facilitating cognitive engagement and emotional connectivity. Music's rhythmic and melodic elements activate specific brain regions tied to memory and emotion, leading to reduced symptoms like agitation and depression. Group sessions enhance social interaction, fostering a sense of community and belonging among participants. Despite variations in methodologies, including session lengths and music types, music therapy has shown promising outcomes as an adjunct to traditional treatments, significantly benefiting behavioral management and overall patient well-being. The study underscores the need for standardized protocols to ensure consistent results and calls for future research to refine therapy practices and expand demographic inclusivity, enhancing the generalizability of these findings.

Keywords: Music Therapy, Cognitive Function, Alzheimer's Disease, Memory Recall

INTRODUCTION

Tahami et al., (2022) define Alzheimer's disease (AD) as a progressive cognitive decline and memory impairment. According to Albert (2011), Alzheimer's disease represents the most significant health challenge in the geriatric population. The increasing prevalence of Alzheimer's disease underscores the need for innovative interventions that not only target the symptoms but also enhance the overall quality of life for individuals impacted by this condition. Traditional pharmacological treatments, while beneficial, are not devoid of limitations and side effects. There is a need for alternative therapeutic strategies that are both effective and non-invasive (Dyer et al., 2018).

Lyu, Zhang, Mu, et al (2018) note that Music therapy as a non-drug treatment improves cognition, mood, and brain adaptability in Alzheimer's patients. Studies suggest that music engages attention, memory, and emotions, offering significant benefits for Alzheimer's patients (Bottiroli et al., 2014). Literature on music therapy for Alzheimer's lacks standardized methods, complicating outcome comparisons across studies. Variations in therapy protocols, session lengths, and music types contribute to inconsistencies in music therapy.

Anecdotal and initial empirical evidence suggests that music therapy is beneficial (Sharma et al., 2022). However, researchers have yet to fully comprehend the neurological mechanisms by which music affects cognitive and emotional processes in individuals with Alzheimer's disease. Research primarily concentrates on affluent, Western populations, with a scarcity of studies that include a variety of demographic groups (Gulliver et al., 2021). This lack of representation restricts the generalizability of findings and overlooks culturally specific responses to music therapy.

Historical overview of Music therapy in Clinical settings

Music therapy originated in ancient civilizations such as the Greeks and Egyptians, who used music for spiritual and physical healing (Irish et al., 2006). Basaglia-Pappas et al (2013) note that, Plato and Aristotle recognized its power to influence emotions and behaviors, attesting to music's therapeutic impact on both the soul and body (Leggieri et al (2019). In medical settings, psychiatric hospitals use music to soothe and treat conditions such as depression and anxiety.

Music therapy became a recognized clinical discipline in the 20th century after effectively treating shell-shocked World War soldiers. Sperling, Aisen, Beckett, et al (2011) assert that the establishment of the National Association for Music Therapy (NAMT) in 1950 was a pivotal moment. This period marked the growth of music therapy to cater to a variety of conditions, such as developmental disabilities and neurological disorders.

The field of music therapy witnessed significant expansion and professionalization in recent decades. Technological advancements enhance therapeutic tools through the integration of digital devices, software applications, and a variety of musical instruments. Recent studies focus on the neurobiological effects of music therapy and its efficacy in various clinical settings such as oncology and intensive care (Moreno-Morales et al., 2020). This ongoing evolution reflects a broader recognition of music therapy's role in enhancing life quality and promoting comprehensive health.

The Connection Between Music, Memory, and Emotion

Dyer, Harrison, Laver, Whitehead et al (2018) note that, Music engages multiple regions of the brain that handle emotion, memory, and sensory input. According to Verghese et al (2003), the limbic system processes emotions, while the hippocampus, critical for memory formation, activates when we listen to music. This connection is noticeable in individuals with cognitive disorders like Alzheimer's disease. Music according to Satoh; Yuba; Tabei, et al (2015) evoke memories and emotions when other types of memory are failing. This suggests that musical memory is preserved in parts of the brain less affected by dementia.

Critics argue that much of the research on music's psychological effects relies on self-reporting, which introduces bias (Zhang, and Liu, 2020). While certain brain regions like the limbic system and hippocampus are highlighted in studies, the broader network of interactions within the brain is complex and not fully understood.

Ponce, Acosta, Cruz, et al (2021) posits that, establishing a clear causal relationship between music, memory, and emotion is complex. Research indicates correlations; however, it remains difficult to ascertain whether music genuinely elicits these responses or if individuals are merely reflecting their existing emotions onto the music (Vink, Zuidersma, Boersma et al., 2013). Individual responses to music vary widely based on personal tastes, cultural backgrounds, and situational contexts.

Neurological Mechanisms of Music Therapy

Music therapy capitalizes on the brain's ability to adapt and reorganize itself, a phenomenon known as neuroplasticity. According to Matziorinis et al (2023), this is beneficial for rehabilitation from neurological injuries like strokes, where music helps reinforce and create new neural pathways related to motor control, speech, and emotional regulation. Music's ability to evoke emotions plays a central role in its therapeutic effects (Meilán et al., 2012). It interacts with the limbic system to aid in emotional regulation, making it effective in treating mood disorders such as depression or anxiety.

The relationship between music and memory is powerful, offering significant benefits in managing conditions like dementia and Alzheimer's disease. Familiar tunes activate memories and emotions, aiding in cognitive function and personal recall. Music therapy has been shown to reduce pain perception by altering sensory pathways and providing psychological distraction and relaxation. This help in lowering stress hormones and managing pain.

According to Hofbauer, Ross, and Rodriguez (2022), rhythmic elements in music therapy enhance motor skills, which is vital for patients with movement disorders such as Parkinson's disease. The rhythm improves coordination in the patients and facilitates smoother movements. Music therapy supports speech and language recovery. Techniques such as melodic intonation therapy utilize musical aspects of speech to recover verbal abilities in patients with conditions like aphasia (Proverbio et al., 2015). These diverse neurological engagements underscore music therapy's versatility and effectiveness across various therapeutic settings.

Clinical Applications of Music Therapy in Alzheimer's Care

Music therapy is increasingly recognized for its effectiveness in Alzheimer's care, particularly in stimulating memory recall. According to El Haj et al (2015) notes that, familiar tunes evoke autobiographical memories, prompting conversation and engagement in patients who are withdrawn. This technique helps in recalling past memories and supports emotional expression. It provides comfort and a sense of identity to individuals with Alzheimer's.

The therapeutic benefits of music extend to emotional and behavioral management. It moderates mood and alleviates symptoms such as agitation and depression. Arroyo-Anlló, Díaz, Gil (2013) assert that Music therapy enhances cognitive functions and motor skills through activities such as singing, instrument playing, and rhythmic clapping. These activities improve hand-eye coordination, and mental agility, and contribute to maintaining cognitive functions.

Music therapy fosters social interaction and communication in group settings. It helps reduce feelings of isolation among Alzheimer's patients. It aids in maintaining speech and language skills, with melodies and rhythms facilitating the recall of words and phrases. The integration of music therapy in Alzheimer's care offers a holistic approach that improves the cognitive and emotional well-being of patients. It also significantly enhances their quality of life.

Empirical Evidence on Music Therapy's effectiveness

Studies suggest that music therapy helps improve cognitive functions by engaging different brain areas when Alzheimer's patients interact with music (Strange et al., 2014). Music therapy fosters emotional and social engagement, providing a sense of comfort and reducing feelings of isolation by encouraging participation in group activities. This improves mood and decreases symptoms of depression and anxiety.

The research on music therapy's effectiveness in Alzheimer's care faced criticism due to inconsistencies in study designs. These according to Kinney et al (2018), include variations in session length, music type, and therapy frequency. The majority of studies suffer from small sample sizes and short-term follow-ups, limiting the ability to draw firm conclusions and reducing their applicability to broader settings. Outcomes are assessed using subjective measures reported by caregivers, introducing potential bias and questioning the reliability of the findings.

Music Therapy Outcomes for Alzheimer's Patients

Music therapy is a beneficial therapeutic intervention for Alzheimer's patients, offering enhancements in cognitive functions through engaging activities such as singing and listening to familiar songs. These activities aid in memory recall and improve attention and executive functioning. The repetitive elements of music help in reinforcing memories (Koelsch et al., 2016). Music therapy facilitates emotional expression and relaxation, significantly reducing symptoms like depression, anxiety, and agitation, which are common in Alzheimer's patients.

Music therapy is critical in improving the lives of those with Alzheimer's. Group music therapy sessions foster interactions that alleviate feelings of isolation by connecting patients through shared activities like singing and playing simple instruments. This enhances social interaction and builds a sense of community and belonging among participants.

Music therapy serves as an effective tool for behavioral management. It soothes agitation and positively redirects negative behaviors in a positive manner. It also assists in maintaining physical coordination through dancing or rhythmic movement, improving motor skills and muscle control. Music therapy uplifts the quality of life for patients by providing a non-verbal medium for expression, increasing social connectivity, and offering a joyful respite from the daily challenges posed by Alzheimer's disease.

Behavioral and Psychological Outcomes of Passive Music Therapy

Passive music therapy, or receptive music therapy, involves listening to music without actively engaging in its creation (Eysenck et al., 2007). Passive music therapy influences the listener's mood and emotional state across various settings such as healthcare and community outreach. The therapy according to Thompson et al (2005), reduces stress and anxiety, lowers cortisol levels, and helps in mood enhancement. It affects neurotransmitters such as dopamine, which enhance the brain's pleasure centers. The therapy is effective in improving cognitive function in individuals with impairments such as dementia. Passive music also helps in memory recall and mental sharpness through the recognition of familiar tunes.

The therapy has benefits in pain management and sleep quality improvement. It serves as a distraction and relaxation aid, reducing the perception of pain, which is useful in palliative care. Slow, rhythmic music helps individuals suffering from sleep disorders. It slows down the heart rate and lowers blood pressure, thus promoting better sleep patterns.

In behavioral contexts like educational or residential care settings, passive music therapy regulates behaviors in those with emotional disorders (Simmons-Stern et al., 2012). It reduces episodes of agitation and aggression. It facilitates emotional processing and healing, providing a non-verbal outlet for individuals dealing with psychological distress or depression. Therapists carefully select the music for therapy to elicit specific responses. This makes passive music therapy a personalized and evolving field that continues to gain traction in mental and physical healthcare.

The physiological basis for the enhancement of memory through music

Music's role in enhancing memory is underpinned by its interaction with complex brain structures and functions. It engages key areas like the auditory cortex, hippocampus, and prefrontal cortex, which are crucial for memory processing. The hippocampus, is vital for forming new memories, and its activity increases during musical exposure. Emotional connections to music play a role, as it intensifies the memory encoding process, making recollections more vivid and easier to retrieve (Dunlap, & Lowenthal, 2010).

Neurochemical changes induced by music, such as the release of dopamine, contribute to memory enhancement. This neurotransmitter, associated with pleasure and reward pathways in the brain, creates an optimal learning environment. It elevates mood, reduces anxiety, and facilitates concentration. Music's rhythmic and repetitive patterns aid in memory by providing mnemonic support that simplifies the recall of complex information.

Music regulates stress and mood, factors that are essential for effective learning and memory retention. Reducing cortisol levels and mitigating stress responses, music protects the hippocampus, enhancing its ability to function properly. Music increases neural synchronization across different brain regions, improving the coherence and connectivity that support efficient memory processing. These physiological effects make music a valuable tool in educational and therapeutic settings.

Dopamine pathways

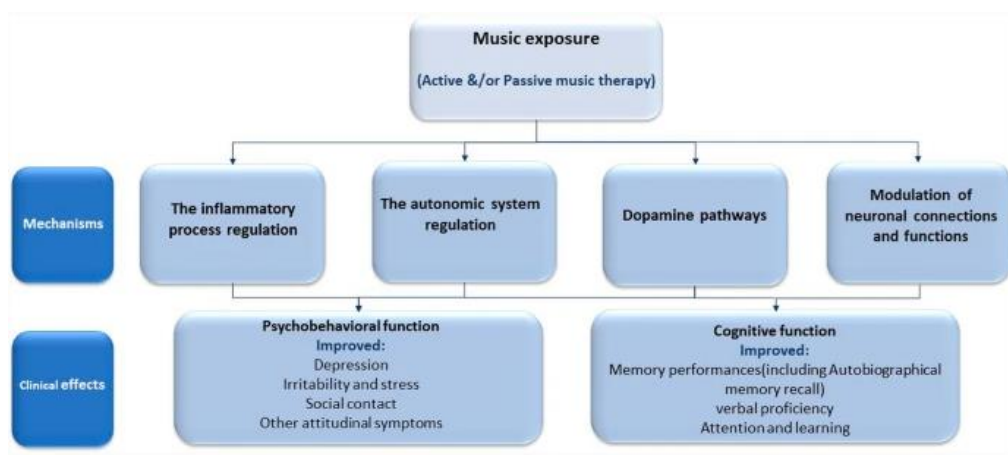
Music influences dopamine pathways in the brain, similar to other pleasurable activities like eating or socializing. Listening to music triggers dopamine release, generating feelings of enjoyment and contentment. Veitch, Weiner, Aisen et al (2019) notes that, this release is noticeable during peak emotional moments in a song, which is highlighted by neuroimaging studies like fMRI and PET scans. These scans reveal activity in

dopamine-rich areas of the brain, such as the striatum, as listeners anticipate and experience their favorite parts of music.

The impact of music on dopamine enhances mood and the therapeutic potential of the patients. It is employed in various settings to manage mood disorders, reduce stress, and improve the quality of life for individuals with depression or neurological conditions. The intrinsic pleasure derived from music, coupled with its ability to regulate mood through dopamine modulation, supports its use in therapeutic practices to foster emotional well-being.

The engaging nature of music, whether through listening or participating in musical activities like playing an instrument or singing in a group, enhances learning and memory. Music serves as a social glue, enhancing bonds among group members by providing shared experiences that increase social satisfaction. This dual role of music in cognitive and social realms underscores its unique and multifaceted impact on human life.

Visual depiction of the beneficial effects of music therapy on AD and the mechanism of music as a memory enhancer



Source: <https://ejnpn.springeropen.com/articles/10.1186/s41983-024-00836-6>

The autonomic system regulation

The autonomic system regulation speaks to how various musical elements (i.e. tempo, rhythm, melody, and dynamics) impact the ANS, affecting physiological responses. Faster-tempo music elevates heart rate and arousal by activating the sympathetic nervous system. On the other hand, slower music induces relaxation through parasympathetic activation, illustrating music's capacity to modulate bodily states.

Music's interaction with the ANS is pivotal in emotional regulation, helping to alleviate stress, reduce anxiety symptoms, and improve mood. This effect on emotional health is one reason music therapy is widely employed in clinical environments to bolster emotional well-being. Music affects brain function by engaging brain areas linked to emotion, memory, and reward, which influences the ANS both directly and indirectly, altering brain chemistry and neural pathways.

Music is therapeutically used for a range of conditions including cardiovascular diseases, sleep disturbances, and anxiety disorders. It supports rehabilitation post-stroke. The therapeutic potential of music depends on individual differences, such as personal musical preferences and cultural backgrounds. Research uncovers the complex relationship between music, the nervous system, and health, revealing music's potential as a powerful tool in enhancing physiological and psychological well-being.

Music selection affecting the effectiveness of music therapy

The effectiveness of Music therapy hinges on the choice of music, influenced by several key factors. Personalizing music selections to a patient's preferences greatly enhances their emotional engagement and

responsiveness, both crucial for successful therapy outcomes. Incorporating music that aligns with a patient's cultural background promotes a sense of comfort and familiarity, essential for reducing anxiety and enhancing receptivity to therapy.

The specific goals of therapy dictate the type of music selected. Classical music is used to alleviate anxiety or improve sleep, while upbeat, rhythmic tunes which assist in physical rehabilitation or stimulate cognitive functions. The tempo and rhythm of the music are vital; faster tempos energize patients, while slower rhythms have a soothing effect, influencing physiological responses like heart rate and aiding mood regulation.

The content of the music, especially the lyrics, plays a significant role in therapeutic outcomes. Songs with positive, affirming lyrics bolster mood and self-esteem, crucial for therapies aimed at emotional and psychological healing. Negative lyrics counteract therapy goals. Understanding the impact of mode and harmony where major keys and consonant harmonies evoke calm and uplift, and dissonance or minor keys induce sadness. The effective selection of music for therapy requires a detailed understanding of these elements and a collaborative approach between the therapist and patient to ensure the music contributes positively to the therapeutic aims.

METHODOLOGY

The study was conducted in Lagos, Nigeria, focusing on Alzheimer's patients within clinical and community settings where music therapy sessions is being implemented. The study targeted a diverse group of Alzheimer's patients. Participants were between the ages of 65 to 85 years, inclusive of both genders. This age range was selected based on the typical onset age of Alzheimer's disease.

Music used in therapy sessions were combination of familiar Nigerian tunes and classical music known for its therapeutic properties. The selection of music was tailored to the cultural background and personal preferences of the participants to maximize engagement and response. This approach acknowledged the emotional and cognitive connection individuals had with music from their cultural context.

The music therapy intervention consists of both active and passive components. In active participation, patients engaged in singing and clapping along with familiar tunes to improve cognitive function, motor skills, and social interaction. Conversely, during passive listening, patients listened to a pre-selected playlist of calming music aimed at reducing agitation, improving mood, and promoting tranquility and well-being.

The process began with an initial assessment to establish baseline cognitive and emotional data for each participant. Therapy sessions were scheduled twice a week for three months, with each session lasting about 60 minutes, incorporating both active and passive activities. Behavioral changes, such as mood alterations, cognitive function, and social interactions, were observed and recorded throughout. A post-intervention assessment concluded the program, re-evaluating participants to measure changes and compare them to initial assessments.

CONCLUSION

Music therapy offers a valuable non-pharmacological intervention that enhances the quality of life for individuals with Alzheimer's disease by stimulating memory recall, emotional expression, and social interaction. The study highlights music therapy's ability to engage brain areas associated with emotion and memory, which can alleviate symptoms such as agitation, depression, and anxiety. Importantly, music therapy fosters a sense of community and belonging among patients through shared musical activities, which are crucial for their cognitive and emotional well-being.

However, the study also notes that the effectiveness of music therapy was influenced by factors such as session length, music type, and patient demographic diversity. These variations underscore the need for standardized methods in music therapy to better compare outcomes across different settings and populations. Despite these challenges, music therapy remains a promising tool for behavioral management and improving motor skills and should be considered a complementary treatment alongside traditional pharmacological approaches to

provide a holistic care model for Alzheimer's patients. The ongoing research and refinement of therapy protocols will further solidify the role of music therapy in Alzheimer's care, enhancing its effectiveness and applicability.

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