Review: Music Therapy for Neurological Disorders

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Abstract

Nearly 1 billion people worldwide are affected by neurological disorders such as Alzheimer's disease and Parkinson's disease. Several of these disorders are most common in the geriatric population and still do not have effective cures. In recent years, there has been an increase in supplementary treatment methods such as music therapy for these disorders. Clinical depression which affects individuals of all age ranges might also be alleviated with music therapy. Music therapy is defined as the use of music to treat the physical, emotional and social needs of an individual. This could involve playing an instrument, singing or dancing, or simply listening to music. It triggers parts of the brain associated with emotion, motor skills, and memory retention with the intention of improving the affected individual's deteriorating condition. This article reviews three neurological conditions: Alzheimer's, Parkinson's, and Clinical Depression, and compares the clinical effects of different types of music therapy on all three of them. Research has shown that patients performed better on standardized clinical assessments that measured their motor skills, anxiety, and happiness levels, after undergoing music therapy. However, more studies are still needed to assess what combinations of musical therapy techniques improve symptoms the greatest and the time frame needed for long-lasting changes. It is also important to compare how the benefits of music therapy are similar or different among patients of different age ranges. With this information, we can improve existing music therapy techniques and understand what types of intervention would best suit patients, apart from their prescribed medication.

Introduction

With regards to testing music therapy's effects on neurological disorders, this review will focus on Parkinson's Disease, Alzheimer's Disease, and Clinical Depression. Parkinson's Disease is a neurological disease through which motor skills, such as balance and coordination, and memory deteriorate and exacerbate over time.[1] This occurs because the nerve cells in the basal ganglia lose function and stop producing dopamine.[2]Alzheimer's Disease is a neurological disorder that primarily impairs memory and cognition, typically appearing in the geriatric population, and affects the hippocampus and entorhinal cortex, the parts of the brain involved in memory formation.[3] Clinical Depression is a mood disorder that can result in perpetual sadness and hopelessness, as well as a general loss of interest in daily activities, and affects the hippocampus, amygdala, and dorsomedial thalamus.[4] While these neurological disorders have distinguishable aspects, they also have similarities. AD and PD both can affect memory, even though memory problems occur when the severity of Parkinson's progresses, and both of these neurological disorders can lead to depression because of the difficulty of living with those motor and memory problems. Currently, there are pharmacological treatment methods for Alzheimer's, Parkinson's, and Clinical Depression, but they do not completely eliminate the symptoms of the illness. Alzheimer's and Parkinson's are both terminal neurological disorders, and even though they have treatment methods through medication and other clinical trials, these methods do not get rid of the symptoms or the disease permanently. Because the existing treatment methods do not completely solve the problem, we need more treatment methods to alleviate the physical and mental pain associated with these conditions. An alternate treatment

method for these neurological disorders that has emerged in the last century is music therapy. Music therapy is a form a therapy used to improve mood and self-expression and to reduce stress, and some benefits of music therapy include improving memory, social skills, pain management, metacognition, and motor skills.[5] Some common examples of music therapy include dancing, singing, listening to music, playing an instrument, making music and talking about lyrics. [6]Approximately, 1.6 million people undergo music therapy per year for treating various neurological disorders.

Effect of Music Therapy on Parkinson's Disease

Due to Parkinson's multidimensional effects and symptoms, such as issues pertaining to motor skills, cognition and mental health, studies have taken various approaches to music therapy. Studies often use singing to improve memory, speech, cognition, and respiratory strength, and participants also sang in choir for emotional and social benefits.[7] Additionally, many studies used dance as a method to improve motor skills primarily, as well as cognition and quality of life. [8]Since PD causes significant gait impairment, many studies took the approach of dancing for music therapy, involving rhythmic development and coordination. To measure these effects, the studies often use scales to measure balance, reaction time, velocity, and other movement assessments, including Berg Balance Scale, Stride Length, Walking Velocity, UPDRS-Motor Score, and Quality of Life, and all of these scoring methods involve motor skills assessment, excluding Quality of Life.[9] Through these assessments, gait-related music therapy demonstrated the most improvement, comparing the control group and music therapy group. While patients did perform better on the UPDRS- Motor Score and Quality of Life, the results were not significant. Based on these studies of music therapy primarily catering towards gait and motor skill development in patients with PD, music therapy did show the best results in motor skill improvement rather than cognition and mental health. The improvement in motor skills over cognition and mental health occurred due to the rhythmic focus of the music rather than the mood of the song. In these studies, patients with PD did not show significant improvement in quality of life and cognition.

Effect of Music Therapy on Alzheimer's Disease

Alzheimer's Disease effects involve impairment in memory and cognition, followed by deterioration in mental health, so music therapy studies primarily focus on mental health and cognition. Through music therapy, participants experience triggers in memory retention and emotions due to the memories associated with the mood of the music or with the music itself.[10] Research has shown that patients with AD can still respond to music even when lacking the ability to verbally communicate. As AD progresses, parts of the brain experience amyloid build up and glucose metabolism, but regions of the brain associated with musical memory retrieval, which include areas of the temporal, frontal, and parietal lobes, remain unaffected. Some common approaches to music therapy for these patients include singing and listening to music. By listening to music, AD patients can enhance verbal communication, trigger memories, and become more relaxed. [11]Comparing the control group and the music therapy

group in these studies, the participants in the music therapy group demonstrated reduction in aggression, depression, and anxiety, which were typically measured with the Hamilton Scale for anxiety and the Geriatric Depression Scale.[12] The majority of the studies conclude that music therapy is successful in treating mental health issues and emotional stability rather than for memory retention.

Effect of Music Therapy on Clinical Depression

For Clinical Depression, music therapy studies usually consisted of having the participants listen to music, and this was measured with the Hamilton Rating Scale for Depression, Beck Depression Inventory, and the Hospital Anxiety Depression. The participants in the music therapy group of the studies demonstrated improvement in depression, anxiety, and general function, revealing the success of music therapy as a supplementary treatment for clinical depression.[13] In the Clinical Depression studies, there was an overlap with Alzheimer's because some patients became involved in these studies to focus on fixing their depression. Similarly, people dealing with numerous illnesses, such as cancer and psychological disorders, joined the studies due to depression being a symptom. Because of this overlap, music therapy for Alzheimer's and music therapy for Clinical Depression showed similar results, correlating with an improvement in mood.[14] This improvement in symptoms of depression occurs as a result of the secretion of dopamine and endorphins from listening to music. Endorphins are neurotransmitters that relieve pain, and when attached to opiate receptors, the brain releases the neurotransmitter dopamine. [15]This process creates a sensation of pleasure, and music therapy can allow for this to happen.

Similarities and Differences Among Studies

Overall, all of the studies consisted of a similar framework. Each study typically had one control group that followed the treatment schedule prescribed by the doctor and one experimental group that followed the doctor's prescribed treatment paired with music therapy methods, and these typically occurred in randomized controlled trials.[16] The studies for music therapy's effect on all three of these diseases covered relatively short periods of time, ranging from a few weeks to a few months, so their results were based on the short term effects of music therapy rather than the long term effects. The most common music therapy method for the treatment of all three of these diseases is simply listening to music, but certain studies focused on different symptoms to treat. Studies on Parkinson's disease focused on improving motor skills, which involve gait-related music therapy, such as dancing. Alzheimer's and Clinical Depression treatment rely on emotional treatment, which involved listening to music and singing. In general, Parkinson's Disease and Alzheimer's Disease studies primarily focus on the geriatric population, while clinical depression studies cover a broader range of ages with the majority being geriatric.[17] Furthermore, the sample sizes of the studies vary, ranging from tens to hundreds of participants. With Alzheimer's Disease and Parkinson's Disease being terminal, participants with those diseases approach music therapy more positively, which could have influenced their results and demonstrated more improvement. On the other hand, due to the symptoms of

clinical depression being more manageable and treatable, the participants of the music therapy studies on people with clinical depression did not approach the treatment as enthusiastically.

Discussion

When comparing the effects of all approaches of music therapy treatment, most improvement was noticeable when using a specific type of music therapy to target a specific symptom. For Alzheimer's, studies that targeted emotional improvement specifically, such as for depression, anxiety, and aggression took the approach of engaging the participants by listening to music or singing rather than something like playing an instrument or dancing.[18] However, for Parkinson's, some studies focused on improving motor skills through methods like dancing, gait-related music therapy, and playing instruments, while other studies focused on the memory or emotional aspects through listening to music or singing.[19] For both Alzheimer's and Clinical Depression, the emotional symptoms demonstrated more improvement compared to improvements in memory retention for Alzheimer's. For Parkinson's, because most studies focused on improving motor skills, the symptom of Parkinson's that demonstrated the most improvement was gait related. Therefore, the efficiency of music therapy depends on the particular symptoms and which symptom the therapy is tailored towards. However, it must be acknowledged that music therapy cannot cure AD, PD, or Clinical Depression and can only assist with lessening the effects of certain symptoms.

Limitations of Studies and Future Outlook

As indicated by research on music therapy for different types of neurological disorders, music therapy catered to the treatment of specific symptoms have been proven to be the most effective. For example, when treating Parkinson's Disease through music therapy, the studies focused on treating the most impairing and more apparent symptoms, and for this particular disease, the deteriorated motor skills are the primary focus.[20] Because of the focus on motor skills rather than auditory, those symptoms demonstrated the most improvement after music therapy.

Examining these results, we can create more effective treatment methods. Most of the music therapy studies for these neurological disorders focused on the short term progress of music therapy intervention during the time period of the study, but we would need to examine the long-term progress as well to see how impactful music therapy can be. Additionally, by opening the music therapy to larger groups of people, we can broaden the research and expose people of more diverse backgrounds to music therapy. Because these studies were primarily conducted for people of the geriatric population, there has not been much research on its effects on younger people. Alzheimer's and Parkinson's do mostly affect the older population, but Clinical Depression covers a large spectrum of ages. We can learn from these studies that have already been conducted to create much more effective music therapy for a larger group of people.

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