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Significance of Music Therapy in Stroke Rehabilitation: A Systematic Review of Research From 2012-2023

Anima Rana, Research Scholar, Department of Psychology, Sunrise University, Alwar (Rajasthan)
Dr. Kamlesh Kumar Pandey, Professor, Department of Psychology, Sunrise University, Alwar (Rajasthan)

Abstract

Stroke is associated with a high rate of disability and mortality, and survivors are usually affected by dysphagia, aphasia, motor dysfunction, cognitive impairment, depression, and other complications. In the past decades, many studies have been conducted to reveal the pathogenesis and pathological mechanisms of stroke. Furthermore, treatment methods developed that contribute to the elevated survival rate of stroke patients. Early rehabilitation poststroke is becoming recognised as essential and has been increasing attention to improving the patient's quality of life. As an emerging method of poststroke rehabilitation, music therapy can help attenuate dysphagia and aphasia, improve cognition and motor function, alleviate negative moods, and accelerate neurological recovery in stroke patients. This review helps summarise the recent progress made using music therapy in stroke rehabilitation and is aimed at providing clinical evidence for treating stroke patients. (2)

Stroke can be approached from various points of view, one of which is music therapy—a complementary therapy to a pharmacological one. This work aims to compile the scientific evidence published in the last eleven years (2012–2023) on the effects of music therapy in patients with Stroke. A systematic review was done using the flintrehab.com Web of Science, PubMed, the World of Stroke Organization, Research Gate, shodhganga, and Scopus databases with the descriptors “music therapy” and “Stroke.” All articles were reduced to papers after applying the inclusion and exclusion criteria. The results, which display a diverse range of evidence, confirm the positive effects of music therapy on various spheres. These comprehensive benefits of music therapy should reassure us about its effectiveness in stroke rehabilitation. All the patients mentioned above with Stroke had experienced different music therapy programs, each tailored to their specific needs. This individualised approach to music therapy, which ensures that each patient's unique needs are met, should make the audience feel understood and cared for.

Keywords: Stroke, music therapy, CVA, review therapeutic approach

1. INTRODUCTION

Stroke is a severe cerebrovascular disease that is associated with high morbidity, mortality, and disability. It seriously affects the patient's daily lives and imposes a heavy burden on families and society. There are over 12.2 million new strokes each year. Globally, one in four people over age 25 will have a stroke in their lifetime. Globally, there are over 101 million people currently living who have experienced stroke. Stroke is the second most common cause of death in India. About 1,85,000 strokes occur every year in India, with nearly one stroke every 40 seconds and one stroke death every 4 minutes. (8)

Music therapy is not just a source of comfort; it is a powerful empathic bridge that therapists can use to connect with their patients. As a unique addition to any stroke survivor’s rehabilitation regimen, it provides a wide variety of benefits. Stimulating multiple brain regions can significantly impact stroke recovery when incorporated into rehabilitative activities. This unique role of music therapy can help stroke survivors regain a wide range of functions, including movement, speech, and cognition. These are the exact effects of music therapy observed in various studies, inspiring hope and optimism in the process and encouraging both patients and healthcare professionals.

1. Promotes improved gait (walking) patterns
2. Improves affected hand functions
3. Helps improve speech for individuals with aphasia
4. Boosts cognitive functions
5. Helps to alleviate post-stroke depression
6. Improves post-stroke anxiety: Post-stroke anxiety is a common issue among stroke

survivors, affecting their mental health and overall recovery. Music therapy is effective in alleviating this anxiety, providing [specific ways music therapy helps with anxiety]. This potential of music therapy to address post-stroke anxiety should reassure the audience about its comprehensive benefits in stroke rehabilitation.

7. Promotes a powerful mechanism for recovery

1. Promotes improved gait (walking)patterns: One of the most common secondary effects of a stroke is hemiparesis, which involves weakness on one side of the body. Almost 80% of survivors struggle with hemiparesis, which often affects their ability to walk. **Music therapy** can address affected gait patterns through a technique called rhythmic entrainment. This technique involves synchronising movement to a rhythm, which has been shown to significantly improve gait patterns and explain the specific benefits of this technique. This is a clear example of how music therapy can be applied to stroke rehabilitation, with tangible benefits for the patient.

2. Improves affected hand functions: According to one controlled trial pilot study published in Pubmed in **May 2015,** "**Music-Supported therapy(MST)** improves post-stroke patient's motor functions rehabilitation. In this clinical trial, two groups of post-stroke patients, **MG (Music audible group) and CG (Mute music group)** were observed to compare motor function rehabilitation. However, significant improvements in motor functions of the upper limb after four weeks of treatment were noted.**MG** demonstrated more significant improvement than **CG. MG** received four weeks of audible instrumental training, and CG received mute music training for several weeks. This study supports the idea that MST, combined with conventional treatment, is effective for recovering motor skills in post-stroke patients. Additionally, it suggests that apart from the repetitive practices of MST, music may play a unique role in improving upper-limb motor function for post-stroke patients. **(4)**

3. Helps improve speech for individuals with aphasia: Sometimes, language and communication are affected by a stroke. This often occurs when the left hemisphere, where the brain's language centre resides, is concerned. For example, a left hemisphere stroke may result in aphasia, which impairs one's ability to produce and understand speech. To improve speech and
language skills, therapists may recommend melodic intonation therapy or "singing therapy." This music therapy involves teaching individuals how to speak again through singing. 30% of stroke patients are affected by aphasia. Music therapists use **melodic intonation therapy** to improve speech and language.

4. Boosts cognitive functions: Along with movement and speech, music therapy can also help with cognitive recovery in areas such as memory and attention after a stroke. Studies have found that listening to music for at least an hour daily helped stroke survivors improve verbal memory and focused attention.

According to an article published in Pubmed in June 2022, Music therapy mainly strengthens patients' perception of sound through the rhythm and melody of music. It improves patients' language understanding ability through lyrics and singing, as well as speech frequency and rhythm**.** The anatomical basis of music therapy is mainly the different processing of music by the brain hemispheres, with the left brain responsible for understanding lyrics and distinguishing rhythms, while the right brain deals with melody [2]. There needs to be more discussion about the impact of **MT** on the quality of life for neurology patients, although **MT** is increasingly used in neurorehabilitation. In neurology and neurologic rehabilitation, **MT** is used as an adjunctive form of therapy during various stages of treatment. Neurological **MT** includes using **MT** in sensorimotor rehabilitation and cognitive function therapy, including language functions. The subject literature throughout the world since the 1980s has been describing positive results achieved with **MT** methods (such as singing popular
songs or group improvisation) in pediatric rehabilitation **(Kennelly & Brien-Elliot, 2001),** adults in comas or with post-injury amnesia **(Aldridge et al., 1990; Gilbertson, 2005;**

Tamplin, 2000) as well as speech rate, articulation, and intonation problems for persons with neurogenic
communication disorders **(Cohen & Masse, 1993; Tamplin, 2005).** Additionally, rhythmic auditory stimulation effects in physiotherapy and gait training were analyzed **(Thaut, 1999; Paul & Ramsey, 2000; Hurt & Thaut, 2009; Bukowska, 2012).** Music therapy has a beneficial effect on many neurological diseases, including chronic neurodegenerative diseases, neuropsychiatric disorders, acute brain injury and epilepsy. Many clinical trials have been suggested and provided strong evidence for the effectiveness of music therapy during disease remission. (7) A study shows that listening to music has short- and
long-term effects on the recovery of cognitive function in stroke patients. The research indicates that listening to pleasant music can have a short-term facilitating effect on visual awareness in patients with visual neglect, which is associated with functional coupling between emotional and attentional brain regions. Daily music listening can improve verbal and auditory memory, mood, and attention and induce structural grey matter changes in the poststroke stage in stroke patients. The psychological and neural mechanisms potentially underlying the rehabilitating effect of music after a stroke. (10)

Music is a highly complex and versatile stimulus for the brain that engages many temporal, frontal, parietal, cerebellar, and subcortical areas involved in auditory, cognitive, emotional, and motor processing. Regular musical activities have been shown to enhance the structure and function of many brain areas, making music a potential tool in neurological rehabilitation. A **voxel-based morphometry (VBM)** analysis was performed in **April 2014 by Frontiers in Human Neuroscience journal** published in **PubMed** on the patient's acute and 6-month post-stroke stage structural **(MRI)magnetic resonance imaging** data. The study was conducted in three groups of patients: **MG(Music Group)**, **ABG(Audio Book Group)**, And **Control Group(CG)**. Although all groups showed significant **grey matter volume (GMV)** increases from the acute to the 6-month stage, there was a specific network of frontal areas [left and right **superior frontal gyrus (SFG),** right medial **SFG]** and the limbic regions [left ventral/**subgenual anterior cingulate cortex (SACC)** and right **ventral striatum (VS)**] in patients with left hemisphere damage in which the **GMV** increases were more significant in the **MG** than in the
ABG and in the **CG.** (11)

5. Helps to alleviate post-stroke depression: Aside from these physical benefits, music therapy is also proven to help improve mood and reduce feelings of depression after a stroke. The study shows that out of three, one will have post-stroke depression. Individuals with depressive disorders have low levels of dopamine; when we listen to music, our brains release more dopamine, which helps to improve mood.

Research revealed that psychiatric symptoms and depression status of schizophrenia patients are improved after using group music therapy, indicating that music therapy may be an economical and easily implemented method that enhances mood and mental state. It is important to note that the choice of music and the degree of the patient's illness affect treatment during music therapy. (7)

6. Improves post-stroke anxiety: One out of five stroke survivors used to be affected by Post-stroke anxiety. Music therapy can help improve anxiety symptoms by reducing cortisol, a stress hormone. The study of **Elizabeth Denslow (reviewed May 4, 2022)** on Flint Rehab has demonstrated that simply listening to music can reduce anxiety, even in the acute stages of rehabilitation. **(1)**

7. Promotes a powerful mechanism for recovery: In another study, Sonal Wadhwa concluded that there was a significant reduction in psycho-physiological parameters like anxiety, pain,
stress, depression, relaxation, blood pressure, and heart rate in most cases. (Music therapy could relate to the medical treatment of the patient in a variety of ways and came as a highlight of music listening to reduce anxiety or suppress pain.)

Another randomised control study shows that when Individual music therapy combined with standard care was introduced among working-age people with depression, it was found very effective for depression published in Cambridge University Press Journal in 2018(**14**)

1. As a primary/alternative intervention for a medical condition (for example - the use of music listening during the medical treatment)
2. Supportive to medical treatment (for example - the use of music listening during the medical procedure)
3. As an equal partner to medical treatment (for example, singing with medication to treat respiratory disorders).

Active Music Therapy forms like singing, drumming, or playing an instrument have been seen as highly effective in treating developmental disabilities and psychological and neurological disorders, among other things. It is probably because the brain actively creates music, enhancing cognitive and communicative skills.

Music therapy consists of two different types: the active type and the passive type. Active music therapy is when patients directly participate in singing, playing instruments, or moving with music during treatment. Passive music therapy, or sensory music therapy, allows patients to listen to familiar music. Passively listening to music has no special requirements, but it can create an

environment that makes people feel comfortable and safe **[2].** For music selection, music with a strong sense of rhythm is chosen during active music therapy, while the piece is selected mainly based on personal preference during passive music therapy. Music selection and treatment plan design tend to be diverse according to the degree of disease, the patient's age, gender, and cultural background **[2].** For example, if an individual is relearning how to walk after a stroke, a therapist may use a musical beat to help pace their steps.

2. ROLE OF MUSIC THERAPY IN POST-STROKE REHABILITATION: LITERATURE REVIEW

As we already learned, Music therapy mainly strengthens patients' perception of sound with the rhythm and melody of music and improves patients' language understanding ability through lyrics and singing. Our left brain understands lyrics and distinguishing rhythms, while the right brain deals with melody. Music selection and treatment plans are assorted according to the degree of disease, patients' age, gender, and cultural background. Another study in which traumatic brain injury patients receive three months of neurological music therapy as a supplementary treatment has shown significant changes in prefrontal areas. (**2**)

Music therapy improves **Dysphagia:** Post-stroke dysphagia is a common complication of stroke and is mainly characterised by dysphonia, dysarthria, abnormal spontaneous cough, salivation, and choking after swallowing. Moreover, is common among the elderly. About 28%-67% of stroke patients develop dysphagia. Dysphagia can cause aspiration pneumonia, electrolyte disorders and malnutrition. Additionally, stroke patients with dysphagia develop psychological problems (e.g. fear of eating, anxiety, and depression), which affects patients' quality of life. Early rehabilitation plays an essential role during recovery from dysphagia. Earlier, there was swallowing training, acupuncture electrical stimulation, and transcranial magnetic stimulation, which can improve dysphagia and swallowing dysfunction in stroke patients. (16)

In recent years, many studies have shown that music therapy can effectively improve patients' dysphagia post-stroke. A clinical study enrolled six stroke patients with mixed dysarthria. All patients underwent individual music therapy sessions. The therapy lasted 30 minutes, and 12 sessions were conducted in total. Significant changes were noted in these sessions. **(15)**

Music therapy enhances Cognitive recovery post-stroke: Post-stroke cognitive impairment refers to a series of cognitive damages, such as learning ability disorder, attention disorder, and sensory and perceptual disorder. Recent studies show that Music therapy, whether playing a musical instrument, listening to music, or singing, can improve the cognitive function of stroke patients. Vocal Music can help improve memory recovery after a stroke.

3. MATERIALS AND METHODS

Systematic review studies may serve as up-to-date knowledge troves on topics of interest. In contrast to an original research study, a systematic review of the literature analyzes the cumulative nature of scientific knowledge about a given body of knowledge, thus constituting a tool that informs and develops relevant practices and typically invites more extensive discussion in further academic work.

Eligibility Criteria and Risk of Bias: The following inclusion criteria were used to assess the risk of bias as shown in Table 1:

Table 1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
1a. Scientific papers published in the form of peer-reviewed scientific articles 1b. Research (experimental, review, descriptive) 1c. Publications indexed in databases between 2012 and 2020, provided they are in English, at least in their title, abstract, and keywords.	2a. Publications that do not have access to at least the abstracts 2b. Music therapy is not part of the treatment of PD patients. 2c. Duplicate items

4. OBSERVATION

Database searches carried out during June 2023, including the articles resulting from the following combination of the descriptors [“Stroke” AND “Music Therapy”] and the selection of search fields title, keywords, abstract, or subject. The age filter used was 2012–2020.

Author/Country	Year of Publication	Sample Size	Mean Age	Type of Study	Results
Elizabeth Denslow, OTR/L Flint Rehab	May 4, 2022	-	-	Blog writing	The use of music therapy improves the motor, cognitive, and emotional sphere
Chengyan Xu China	2023	No data	-	Article	Benefits of Music Therapy on Neurologic Disease
Yanna Tong China Rehabi	2015	33	-	Article	Use of Music Therapy on Motor Function
Wen Hao Huang China	2021	598	61.09	Systemic review	Effectiveness of Music Therapy on hand functions of stroke patients
Chengyan Xu,	2022	40	-	Controlled trial study	Enhance motor function, improve cognitive impairment,
Jaakko Erkkilä	2018	79		Randomized Comparative	Significant improvement was
				study	found in those depressive patients who received Music therapy along with Standard care.
Teppo Särkämö	2012	-	-	Pilot Study	Enhance improvement in cognitive, emotional, and motor function.
Teppo Särkämö	2014	14	-	Trial Study	Grey Matter Volume significantly increased after MT
Sonal Wadhwa	2013	0	-	Systemic review	Music Therapy -An Analytical Study

5. CONCLUSION

An analysis of the 12 articles was carried out via a thorough individual reading, and research categories were identified and filtered according to the criteria of music therapy and its different treatment alternatives for Stroke. The review aimed to analyze the effects of Music Therapy on Stroke patients, especially those affected with aphasia, Hemiparesis, or paraparesis, psychological or psychiatric disorders associated with stroke. Music Therapy is a holistic and supportive therapy along with medical rehabilitative therapy. Significant improvements were noted in pilot and trial studies, and remarkable changes were seen in stroke associated with depression, anxiety, and motor or cognitive & neurological disorders who received Music therapy.

6. SCOPE OF THE STUDY

More studies can be carried out to determine the impact of music therapy on Stroke Survivors, Parkinson's disease, epileptic disease and other cognitive psychiatric and psychotic disorders.

7. ABBREVIATIONS

CVA: Cerebral Vascular Accident
b. MT: Music Therapy
c. MST: Music Supported Therapy
d. MG: Music audible Group
e. CG: Mute Music Group
f. MIT: Melodic intonation therapy
g. VBM: Voxel-based Morphometry
h. ABG: Audio Book Group
i. MRI: Magnetic resonance imaging
j. GMV: Grey Matter Volume
k. SFG: Superior Frontal Gyrus
l. SACC: Subgenual Anterior Cingulate Cortex
m. VS: Ventral Striatum

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