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Brain Functioning Approach to Music Therapy: A Review

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Abstract: *The development of neuroscience and subsequent investigation of neurobiological approach to music revealed that music is a brain function. It is processed in different parts of the brain and activates brain's structural and functional aspects. Music influences neurochemicals that are responsible for regulating emotional, physiological, psychological and cognitive functions. With the neurobiological study, which is evidence based and empirical has made a strong base for music therapy to be scientifically use for treatment by professional and in clinical setup. The current study reviews available literature to examine that music's neurobiological processing in the brain is responsible for stimulating the brain and therefore use music as an alternative therapeutic tool.*

Key words: *Music, Brain, Neuroscience, Cognition, Music therapy*

Introduction:

Music existed with the existence of human being throughout the history, culture and evolutionary process. It is because of a unique bonding with human life and it helps in expression, regulation of emotions, feelings and evoking pleasures. The curative potential of music is another reason for its strong association with human being. Music is universally used as a stimulant and relaxant to manage day to day situations and believed that it has influence on the body and mind. It is observed that both body and mind of human being respond to music consciously or unconsciously (Clark et al. 2016).

Music has potential to induce emotion and as such music listening acts as powerful means of affect regulation which is essential for mental wellbeing and therefore, has clinical application (Carlson et al. 2015). One of the perceptible influences of music is the aesthetic pleasure that enhances the meaning and quality of life, making one creative, promotes spirit and acts as a source of hope (Storr, 1992). Darwin once had told that music has the ability to generate and enhance emotions and a loss in it reduces happiness. He also suggested that music may serve in preventing atrophy of neural circuits that regulates emotions (Zatorre & Salimpoor, 2013). The

prominent psychological effects of music are on the behaviour and temperament of an individual and listening or participation in music also greatly influences emotions, feelings and thoughts (Khandelkar, 2005).

In healthcare, it is believed that pharmacological intervention is a primary source of treatment. But gradually various types of alternative treatments or therapies mostly for physical and psychological wellbeing came into use. The prominent therapies are Yoga therapy, Art therapy, Dance therapy, Aroma therapy and Music therapy. Through research studies music therapy has emerged as one of the most effective therapies for clinical practice.

Music therapy is an evidence based scientific method of clinical use of musical intervention leading to improved health condition and quality of life. In the process of musical intervention, the therapist uses different approach of music i.e. physical, emotional, aesthetic, and spiritual to improve the health condition of the client's emotional, physical and cognitive conditions by applying active and receptive musical experience.

In the last two decades there is development in neuroscientific studies. Observing the long history of curative potential of music researchers of neuroscience started investigating the complex relationship between music and brain using structural and functional brain imaging technology. Multiple studies in this area revealed that while music is processed in different parts of the brain it changes the structural and functional aspect of the brain and regulates the neurochemicals that are responsible to manage emotional, physiological and cognitive functions. This created a strong base to use music in therapeutic set up. Findings by researchers suggested that music therapy helps to release stress, improves heart rate, stimulates brain and reduces depression, anxiety, stress and many other illness related to body and mind (Gandhe and Tare, 2020).

The present paper is an attempt to review the available literature to show that music therapy is an outcome of music's influence on different regions of the brain and regulation of neurochemicals.

The Concept of Music Therapy

Music therapy is defined by the Australian Music Therapy Association (AMTA) as “the planned and creative use of music to attain and maintain health and wellbeing. It may address physical, psychological, emotional, cognitive and social needs of individuals and groups within a therapeutic relationship”. Brushia (2018) has given the working definition of music therapy as a reflective process wherein the therapist helps the client to optimize the clients' help using various facets of music experience and the relationships formed through them as the impetus for change. There are three agents in music therapy- the client, the therapist and music. Music therapy is basically a health focused interaction between the therapist and the client which helps in optimizing client's health and as such it is considered as a positive beneficial and health enhancing therapeutic tool particularly for psychological wellbeing. The therapeutic purposes of music experiences are generally psychological, emotional, physical and relational. Primarily, the therapist gives musical experience to the client during the therapeutic process using four methods i.e. listening, composing, recreating and improvising. In one way music therapy aims

at distracting clients' attention from unpleasant condition and divert it to an entertaining experience and thereby manages emotion.

For an effective music therapy session it is necessary to develop a mutual therapeutic relationship between the therapist and the client through practical music making or improvisation as the primary medium. The effective relationship between them facilitates the changes to take place in the condition of the client. Using music creatively in a therapeutic setup the therapist generally establishes an interaction and musical experience to achieve therapeutic goals which would be emotional, physical or psychological (Odell, 1988).

Evidence based research from European initiatives suggest two conceptual frameworks of music therapy in modern days (Groke et al. 2008), Community Music Therapy (CMT) and Resource oriented music therapy. The goal of community music therapy is to integrate groups of people to pursue a common goal i.e. forming a community choir (Pavlicevic & Ansdell, 2004). On the other hand, resource oriented music therapy is directed towards recovery model of psychiatric care and with an emphasis on strength and resources (Rolvjord, 2004).

The History of Music Therapy:

Research evidences are available to show that music is associated with human life from prehistoric period. The characteristic features of music always has remained a source of pleasure and entertainment but at the same time it is assumed that it functions for maintaining psychological wellbeing of individual. It is believed that music therapy and its effectiveness as alternative way of healing various diseases, particularly mental illness is in existence in the prehistoric time (Hedge 2017). There is mention of music therapy and awareness regarding healing potential of music in the literature of Egypt, Greece, Rome, Arab, China and India. Greek philosophers like Plato, Pythagoras and Aristotle also mentioned that music could influence emotions and feelings and it has the power to restore health and normalcy for the individuals suffering from uncontrollable emotion. In addition to entertainment, music has a long association in human life in social, traditional and in the context of health and wellness. In ancient period it was believed that music has magical and mystic power to heal certain physical and psychological illness through curative and therapeutic rituals. But it was considered a superstition, black magic or myth and therefore it was not legitimized socially or scientifically. But as time progressed, through various researches it has now been established as an alternative therapy for physiological and psychological wellness. The earliest known reference of music therapy was found in 1789 and is considered as the early account of music therapy in the alleviation in mental distress in medieval time. In 1940's music therapy came up as a professional discipline in the US in veteran hospitals and gradually spread in the areas of special education, rehabilitation, aged care and palliative care ((Davis et al. 1999). In 20th century the understanding of music therapy was explored with modern scientific approaches to discover music's potential to influence health, and music therapy has been established as a paramedical profession across the world (Sonke 2011). Music therapy was formally used as a clinical discipline only after the World War II, to work with war victims to heal their post war traumatic stress disorder and thus in 1950 music therapy emerged as professional healthcare discipline and in the

treatment of patients with wide range of disabilities. 21st century music therapy was expanded for use in diverse areas of medical practice and clinical care (Dileo & Bradt 2005). During the last two decades neuroscientific studies establish a new dimension in music therapy with the structural and functional brain imaging technology that revealed music as a brain function and its processing in the brain induce emotion, thought and cognition which is a scientific evidence based therapeutic tool in clinical practices. When music is interpreted in the brain, it induce the biochemical reactions within the body which can be used towards improving the wellbeing of patients (Salimpoor et al. 2011). Recognised organizations and music therapy associations were established in different parts of the world to popularise music therapy and carry out further researches and practice.

Use of music as a healing tool started in the prehistoric period and gradually developed as a discipline of scientific method and neuroscience. In present day, music therapy had emerged as a specialized branch of cognitive neuroscience and psychology and, is termed as neuro-musicology, music cognition or music psychology (Hegde 2017).

Music, Brain and Therapeutic use

There is a growing interest and development in neuro-scientific research on music perception which opens the door of understanding the brain function of music which is undergoing a rapid transformation discovering the roll and function of music in its therapeutic use. The brain engaged in music is changed by engaging in music (Thaut 2005). The neurobiological studies revealed the relationship among neuroscience, music therapy and music cognition. The neurobiological foundation of music in the brain showed how musical behaviour through learning and experience can change the brain and behavioural function.

Music is a very complex phenomena integrated from very early in life which activates neural activities and sensory perception (Papatjikas et al. 2019). A number of studies based on structural and functional neuro-imaging technique revealed the relationship between music and brain functions that has significant therapeutic use to alter psychological, physical and cognitive states. The processing of music in the brain starts from auditory cortex and continues to the motor system during active and passive music listening or playing. This correlates a neuro-plastic changes which has a strong link with brain function through neuro-imaging (Lin et al. 2011). Music's processing in different parts of the brain has an implication in the context of emotional, social, cultural and biological influences (Peretz, 2006; Koelsch, 2018). While processing, music activates different brain region and can make structural and functional changes. Studies revealed that during this process music can adjust a wide range of complex cognitive, emotional, behavioural and psycho-physiological responses that influence and improve various psychological disorders (Lin et al. 2011). In addition to activating different brain region music triggers and induces various biochemical reactions in the brain which in turn influences manifestation of emotions, physiological and psychological states. The brain chemicals particularly the neurotransmitters, Cytokines and hormones are responsible for regulation of different emotions and feelings, physiological growth and maintenance of immune function (Gangrade, 2012). Music's influence on these

neurochemicals determines behavioural reactions through psychological mechanism with establishing a connection between mind and body. The prominent neurochemicals influenced by music are endorphins, dopamine, serotonin, cortisol, noradrenalin, prolactin and oxytocin (Gangrade, 2012) that in turn regulates emotions, feelings, cognition and learning, and are responsible to manage psychological ailments like depression, anxiety, stress and other mental disorders. Music's processing in the brain that regulates the neurochemicals has promising effect on therapeutic benefits. The results of neurobiological investigations as discussed above is very crucial to understand the structure, function of the human brain and music's influence on these opens an avenue for further therapeutic investigations for overall wellbeing of individuals. Music commonly alters the mood and arousal that becomes appropriate to meet the needs of a situation, activity in a given context (DeNora, 2000). The autonomic nervous system is very sensitive to musical meaning which causes neural excitement and heighten arousal at one extreme and on the other neural inhibition with deep relaxation (Zatorre et al. 2007). Music is primarily known as a source of entertainment which according to neuroscientific interpretation is the result of an automatic synchronization of physical movement, respiratory rate, heart rate and neural activity with rhythmic use in music (Altenmuller & Schlaug 2013; Schneck & Berger 2006).

Processing of different musical elements in the brain has also strong impact in mood and emotion. Processing of melody, harmony, rhythm, tempo, timber, pitch etc has the ability to manipulate and regulate blood pressure, emotional response, cognitive function, neural activity and sensory perception as required in a given situation (DeNora, 2000; Schneck & Berger 2006). Neuro physiological responses are reported to be stimulated by complex interactions among all the musical elements which has strong influence on mood and emotional experience (Schneck & Berger 2006) which is systematically used to address different mental and physical ailments. Neurological studies showed that the rhythmic entertainment of motor function helps in treatment of movement in patients with stroke, Parkinsons disease, cerebral palsy and traumatic brain injury. Recovery of speech function is also improved with music (Thaut et al. 1998; Fernandez & Cudeiro 2003). Music's neurobiological processing influences cognitive functions and showed that music and rhythm has an impact in critical aspects of timing in learning, attention, memory and executive function.

Discussion & Conclusion:

Music's communication of information to the brain and its processing in different region has an impact on learning, development, therapeutic use and aesthetic engagement. Multiple studies have been conducted to show the evidence that auditory rhythm and music can effectively influence the body and mind and can be used for specific therapeutic purposes (Thaut 2005). There is a progress in the investigations of music's therapeutic potential in the areas of neurobiology comprising of neuroscience, psychology, musicology, medicine and other branches of science and technology. These together will create a neurologic music therapy in a new clinical model and would find recognition and acceptance as an evidence based and scientific healthcare discipline.

So far neuroscientific studies on music has found that different brain regions and neurochemicals are involved in music processing in the brain but the exact roll of each region needs to be discovered through neuro-imaging to find out specific contribution of the brain.

Using healing potential of music is evidenced throughout the history and across culture. Gradually, music has been used as a therapy and health promotion by professionals and therapists to overcome physical, psycho-emotional, cognitive and spiritual challenges (Wheeler, 2015). Music therapy in clinical setup has emerged as a new phenomenon in many countries. But in health sector the main stream health professionals particularly in hospitals are still not convinced that music therapy can be used as interventions in health care (Schneck & Berger 2006). But the evidence based neuroscientific studies have revealed that music has strong curative potential and can be used as alternative therapy even in clinical setup. It is a challenge to establish music therapy in main stream health care system. Popularization of neuro-psychological approach of music as alternative therapy has to be initiated in the large interest of people as it is cost effective, safe and free from any adverse side effects. The neurobiological studies have to further continue to discover the secret and mystery about the complex relationship of music and the brain so that the findings of neuropsychology of music will be helpful for everyday practice of wellbeing of people.

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