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A HOLISTIC APPROACH ON THE NEUROLOGICAL BENEFITS OF MUSIC

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SUMMARY

A holistic perspective on human beings allows health carers to achieve an understanding of all the physiological, psychological and social disturbances of the patient as a whole. Through this article we wish to focus on how music has holistic neurological benefits.

Music-therapy interventions can be more accessible and even "self-managed" by the patient's relatives. They can reinforce social cohesion, family ties and patients' self-esteem and thus produce a better quality of life. Overall, it is important to consider the benefits that an evolutionary understanding of musical behaviour and a holistic clinical perspective of the role of music may bring for rehabilitation of a wide range of symptoms and conditions.

Key words: *music – therapy – neuroscience - holistic approach*

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A holistic perspective on human beings allows health carers to achieve an understanding of all the physiological, psychological and social disturbances of the patient as a whole. Through this article we wish to focus on how music has holistic neurological benefits.

In 2011, Zatorre stated that music allows us also to comprehend brain organization and functioning. Underpinning musical cognitive mechanisms may help provide support to double dissociation study cases.

Language and music involve unique cognitive skills that distinguish human beings from other species. It is not surprising that scientist like Nettl (2000) and Sacks (2007) consider that language and music are what defines us as humans. Sacks (2007) says "we humans are a musical species no less than a linguistic one". The human need to communicate through expressive aesthetics has prehistoric origins.

In spite of the contrasting opinions of whether or not music evolved due to an adaptation, there is no doubt it is universal across cultures (Cross 2015). Music has been considered as a pre-language that is related to spatial-temporal access and spatial-temporal reasoning. In 2009, Conrad suggested that music evolved even before language did. An example of pre-language can be baby babbling; babies start learning language through simple distinct tonal and inclusive melodic vocalizations. Not surprisingly, Welch (2006) considers that baby vocalizations are precursors of musicality and language intonation skills.

On the other hand, Freeman (2000) concluded that music and dance have shared biological evolutionary traits deep in the brain chemistry, which in a cultural behaviour led to the facilitation of altered states of consciousness. Freeman's perspective focuses on the social traits that possibly promoted music for social cohesion; this will be explored later. Researchers like Huron (2001) have considered that music evolved to be an important technology for social communication.

Music-based medicine has experienced a paradigm shift, from a rather intuitive approach where the doctor is a 'treater', to one that is evidence-based and where the doctor becomes a coach-facilitator.

Advances in neuroimaging have shown in vivo the contribution of music to cognitive, affective and sensorimotor processing and retraining of the injured brain, and there has been a movement from being an ancilliary treatment to a core method (Thaut 2014).

Music therapy provides a friendlier "un-stigmatized" therapeutic approach than CBT, "… where mood and anxiety affect participation in rehabilitation programs, we have outlined how improvisation and music-assisted relaxation can assist patients to cope with their current situation and release intense emotions, enabling them to channel their attention and concentration into redeveloping functional skills" (Baker 2006).

Musical intervention has been used for a wide range of symptoms and conditions, including: as an anxiolytic, for memory loss in several domains, on a variety of symptoms and behaviour in Alzhiemer's and related dementias including nutritional intake, for speech rehabilitation in Broca's aphasia, disorders of consciousness, neuromuscular coordination, emotion regulation, Cerebral palsy, addictions, social cognition and locked-in syndrome (Akanuma 2015, MacDonald 2003, Magee 2015, Miranda 2011, Moore 2013, Rice 2013, Silverman 2014, Tomaino 2013, Wigram 2013). It can also be used as a diagnostic tool, for example with patients with low awareness states (Magee 2007). Rehabilitation of all kinds aims to improve the physical and psychological independence of the patient, as well as their functioning and abilities so that they may engage in daily living activities (Thaut 2014).

The links between the motor system and limbic system provide evidence that body movement leads to pleasure responses. Syncopation, defined as the temporary interruption of a normal series of accented beats

whereby part of the measure usually unaccented receives an accent (Weaver 1939), is a rhythm phenomenon that elicits a powerful psychological response. Certain styles of music which use extensive syncopation to create a feeling of tension and release correlate with an intense emotional experience (Solberg 2014).

Witek and colleagues (2014) developed an index of syncopation composed by 50 tracks against participants' self-reported desire to move, and pleasure experienced. The findings showed an inverted U-shaped relationship between syncopation, body-movement and pleasure, and that syncopation appears an important structural factor in embodied and affective responses to musical groove.

Moving in a synchronised way to the beat presents as more than just an ability, but a compulsion (Witek, 2014). It would appear natural and spontaneous to do so with a systematic degree of accuracy (with the exception of amusia).These movements are of a structured kind: replicating those of the player's (air guitar), (Godøy 2006) or keeping in synch with the music's pulse by e.g. foot tapping (Burger 2013). Even when the listener makes no physical movement, a proactive and sensory-guided process, engaging the cranial neural network occurs -known as beat induction (Desain 1999, McAngus Todd 1999).

The human mirror neuron system (MNS) in conjunction with the limbic system may allow the human brain to comprehend complex patterns of musical signals (Overy 2009). Music making is frequently a social activity, so this discovery has wide implications in the context of social bonding, learning development, and the role of human agency in rhythm perception (Keller 2014). Agency inference was found to require a combination of sensorimotor cues and perceptual cues (Knoblich 2009) – lending some support to the aforementioned internal models of rhythmic action. This leads to the utilization of bodily awareness and rhythm in gait training and other aspects of rehabilitation (Benoit 2014, Kannape 2012).

Considering all this into a clinical perspective, studying music from a reverse engineering process – understanding it as a tool - can lead to better interventions focused on the socio-emotional benefits. They could focus on providing patients, as well as their social environment, with the best tools for their patients' reintegration and to help them improve their self-acceptance. Moreover, taking into account that music intervention has no side effects and low drop-out rates, there is no real loss to try to approach the patient's rehabilitation through a different clinical musical technique (Maratos 2008).

Music-therapy interventions can be more accessible and even "self-managed" by the patient's relatives. They can reinforce social cohesion, family ties and patients' self-esteem and thus produce a better quality of life. Overall, it is important to consider the benefits that an evolutionary understanding of musical behaviour and a holistic clinical perspective of the role of music may bring for rehabilitation of a wide range of symptoms and conditions.

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