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MUSIC, RELIGION AND HEALTH; A SCIENTIFIC PERSPECTIVE ON THE ORIGIN OF OUR RELATIONSHIP TO MUSIC

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SUMMARY

Why do we react emotionally to music? Does music appreciation have an adaptive value? What is the role of music in spiritual and healing practices? Music is a fascinating area of research for evolutionary theory, psychological development, and emotional perception and elicitation. It is a highly valued feature of all known living cultures and societies, pervading many aspects of daily and devotional life and playing many roles. The question that still lingers among music researchers however is why is this so. This paper will discuss the influence of music on our emotional life, psychological wellbeing, spiritual practices and finally on physiological processes present in our body. The aim is to examine the origin of our relationship to music through the mentioned perspectives and to attempt to link the various theoretical perspectives on this subject across two major domains; health and spirituality.

Keywords: music, religious ritual, trance, brain plasticity, music therapy

INTRODUCTION

Musicians and music lovers have always been curious about the true nature and function of music. What is its purpose and why do we listen to it? Does music need to relate to extra-musical material to be meaningful or does it simply exist for its own sake? This debate became a central theme of argument between musicologists and composers in the early 19th century Europe, and continued well into the 20th century with Wagner's idea of Gesamtkunstwerk where words and music are indissoluble and Hanslick's opposing view of 'pure' music (Robinson 1997).

In the past 20 years certain musicologists have raised suspicion that the current widely accepted method of music analysis that concentrates exclusively on formal features of the pieces can fully explain the meaning and nature of music. A variety of different interpretations of musical meaning emerged. Some theories hold that music conceives its meaning only in social and historical context (Adorno 1976, Born et al. 2000, McClary 1991, Kramer 1995): These theories tend to see music as a social construct which meaning we can explain only by analysing the processes that relate to the contexts within which music is produced and received (Cross 2008). Alternatively, other musicologists see music's aesthetic meaning in the elicitation and expression of emotions: Cross argues that questions such as whether the affective states that music elicits arise through empathic processes (Davies 2001), arise directly in response to objective properties of musical structures, or both, still need to be thoroughly investigated. However, emotional dimensions of specifically musical meaning have been explored from both sociological and psychological perspectives: DeNora (2000) and Sloboda

(2001) suggest that music can be meaningful in being employed by listeners to do 'emotional work' in regulating their emotions and moods in everyday life and Juslin (2013) and Zentner (2008) point out that music can be expressive of not only basic emotions but additional layers of more complex emotions and affects.

MUSIC AND EMOTIONS; THE ORIGIN

But why do we react emotionally to music? Does music appreciation have an adaptive value? Music is a highly valued feature of all known living cultures and societies, pervading many aspects of daily and devotional life and playing many roles. Researchers (Parncutt & Chuckrow 2019, Teie 2016) have looked for the origin of musicality in human gestation period, namely the prenatal development (Parncutt 2009). The complex web of associations among patterns of sound, movement and emotion that characterise music they argue, may ultimately be of prenatal origin. The fetus may acquire information about these relationships by passive exposure: The internal patterns of sound and movement to which the fetus is repeatedly exposed (the mother's voice, breath, heart-beat, digestion, and body movements) depend in consistent ways on her physical and emotional state (Mastropieri & Turkewitz, 1999). Patterns of sound and movement that largely depend on the mother's emotional state can also be associated with hormonal changes by classical conditioning. Since the behavioural correlates of a change in maternal emotion (sound and movement patterns) are perceived before the physiological correlates (hormonal changes), the behavioural correlates may predict the physiological correlates. After many repetitions of such patterns in a given context, the fetus may begin to respond emotionally to changes in sound and movement patterns that occur in a similar context - that is, to anticipate the corresponding hormonal changes (Parncutt & Chuckrow, 2018). Music-like sequences may be created postnatally when the patterns of sound and movement produced in motherese resemble patterns of sound and movement that had been heard before birth.

According to this theory, protomusical aspects of motherese, play and ritual may have emerged during a multigenerational process of conditioning on the basis of prenatally established associations among sound, movement and emotion. The infant's multimodal cognitive representation of its mother (mother schema) begins to develop before birth and may underlie music's personal qualities, religion's supernatural agents, and the link between the two, Parncutt (2009) suggests. His prenatal theory contributes to an explanation of musical universal such as associations between music and body movement, commonalities of musical and religious behaviour and experiences such as meaning, fulfilment, and altered states of consciousness when listening to music. The emotions typically associated with music and religion are according to this theory evolutionary 'side effects' of prenatal auditory and kinaesthetic development. The adaptive value of these prenatal developments lies in the promotion of postnatal infant-mother bonding, motor development, and language acquisition. Even emotions associated with music and religion may ultimately be a by-product of those adaptations.

MUSIC, ALTERED STATES OF CONSCIOUSNESS AND RELIGIOUS RITUAL

The connection between music, spirituality and religious experience has long been established. This long lasting bond is mainly achieved through a state of trance which occurs through the means of music, dance and other ritual practices. In fact, traditional forms of music therapy consider trance as an important aspect of the healing process: Helen Bonny, an American violinist and a music therapist, explored the connection between music and altered states of consciousness and developed a type of therapy called Guided Imagery and Music (GIM). In her novel approach she combined music programmes (empirically developed from the Baltimore research project of psychotherapy based on hallucinogens) with the technique Guided Affective Imagery to achieve therapeutic goals with clients. In GIM clients listen to a series of classical music pieces in a state of deep relaxation and as a result, develop spontaneous imagery that is presumably related to the music's temporal structure (Bonny 1995). The types of imagery emerging vary from person to person and can include descriptions of various settings (from natural environments to human made structures), descriptions of different characters that appear (real or imagined), developments of various physical and mental situa-

tions in which the protagonist of the story (always the client) engages, and a wide array of emotional states that the clients experience in reaction to the elicited imagery. Clients report imagery such as the following:

'*I'm on a meadow. I'm wearing a white dress. It's sunny and there are flowers. There are people around me... Playing different instruments. They are smiling. I can see a shining light nearby. Small animals are around me. A rabbit, a deer.*' (one client)

If the music is chosen carefully and correctly, it is able to access the feelings associated with the imagery events, allowing a reliving of the original experiences (Bonny 2000). The images the clients experience are somewhat like dream images, but unlike dreams, are not lost once the client comes to the normal state of consciousness. This allows the client to have very direct insights into their otherwise unconscious emotions and behavioural patterns. During the listening experience, the images are immediately told to the therapist thus bringing the experience into the 'here and now' in order to relieve the experience in the present time. Images can also involve other four senses: olfactory (smell), gustatory (taste), auditory (hearing), and kinesthetic (touch). The imagery is interpreted on the basis of Freud's concept of the mental apparatus, individual maps of experience, or Fischer's cartography, as well as Jung's theory of archetypes (Aldridge et al. 2006). Bonny's technique is thus in the nature of trophotropic trance (Bonde 1999) in which the music is used for both healing and spiritual purposes. Her intentions of GIM therapy were twofold (Muller 2010): On the one hand she insisted that GIM is a type of music psychotherapy that offers the clients an opportunity to work on their therapeutic aims. This is primarily true for the individual therapy sessions where it is possible to have a longer discussion concerning the client's aims and therapeutic goals and in which the latter can be directly addressed in therapeutic and musical guidance during the listening. On the other hand, Bonny has often referred to group GIM sessions as non-therapeutic, but educational, spiritual and designed for personal growth (Bruscia 2002).

Besides healing effects, musical trance was often used in religious rituals as a means of achieving spiritual connection with various divine beings. In fact, music is a universal feature of religious rituals around the world. All these rituals share basic structural components of formality, pattern, sequence and repetition (Alcorta et al. 2005). Described by Bloch (1989) as 'distinguishing marks of ritual', these elements include music, chanting, and dance and constitute recurrent and important components of religious ritual across cultures. Even in the most ritually constrained religions, music remains a key consistent feature (Atran 2002). Not only is music an important component of religious ritual across traditional cultures, it is inseparable from it (Becker 2001). The use of music in religious rituals is closely connected to the states of trance that often accompany the rituals. Trance is, according to Rouget (1985), always associated with greater or lesser degree of sensory overstimulation (noises, music, smells, agitation) whereas a somewhat similar state of ecstasy is on the contrary, most often tied to sensorial deprivation (Fachner 2011). Trance thus has a more direct relationship to the body and its function, and may thus be, as Parncutt argues, one of the emotional 'side effects' of prenatal auditory and kinaesthetic development. Every trance occurs in a ritual context and gains its power through the particular music used during the different phases of the ceremony. The function of the music is to provide the atmosphere, to evoke identification processes in groups and to induce a trance. Rouget (1985) differentiates emotional, communal and shamanic trance, noting that emotional trance has the most direct connection to music as it draws its power out of a high degree of correspondence between words and music. Such a powerful relationship in perfect harmony overwhelms the listener (Rouget 1985). Most common features during ceremonies where emotional trance is induced include: continuous accelerations, mostly in tempo and volume, focused use of accelerando and monotony during ecstasy, long duration (over hours), simple musical forms with minimal variations and many repetitions, ostinato or bordun, no exact motives but step by step progressions, a play around tones often with slow glissandi and a narrow tonal range. Complex parts and crossing voices may occur but only occasionally, and they do not allow a unifying resolution. A constant low timbre and pulsating structures, as well as sharp high-pitched modulations (acoustic 'roughness') seem to be appropriate to support trance induction. Acoustic triggers of trance are mostly certain transitory processes as well as slow, constantly increasing and decreasing amplitude curves (Aldridge et al. 2006). If we take a closer look at the musical features described above, we can see some similarities between them and the intra-

uterine auditory environment to which the foetus is exposed during prenatal development.

Features of music that are based on sounds that are present in the uterus include heartbeat, respiration, mother's voice and footfalls. They can be compared to musical structural elements (Parncutt & Chuckrow 2019). Heartbeat pulse is compared to musical pulse, the amplitude contour of pulse to the amplitude contour of a musical sound, combined heartbeat and footfalls may represent the origin of musical meter, spoken syllables of the maternal voice can be compared with musical notes, and the prosody of maternal speech can be compared with melodic phrasing. Finally, the frequency range of an adult female voice can be related to the typical frequency range of melodic instruments (Parncutt & Chuckrow 2019, Teie 2016). Prenatally audible sound stimuli are not always constant; stress causes physical, psychological, and behavioural variation, changing the usual heart rate, breathing, digestion and voice patterns (Kim et al. 2018). When presented with a stressful stimulus, subjects usually show a faster heart rate, quickened breathing, more active digestion and shaky or uneven voice (Van Puyvelde et al. 2018). These changes in physical parameters change the sounds the fetus perceives in the uterus, and he or she presumably perceives and reacts to those changes. It is thus logical to presume that similar musical sounds made during the ritual religious practices may induce profound and intense emotions in the adult individual.

Besides being able to induce a trance and altered states of consciousness, music has also been reported to elicit pronounced physiological and behavioural reactions including out-of-body experiences, a feeling of intimate physical contact with music and loss of awareness of self, body, time or space. The prenatal mother-schema concept described above has the potential to explain these intense experiences and to account for some of the most salient universal features of music: its robust personal qualities, its strong link to dance and movement, and its connection with religion (Parncutt & Kessler, 2006).

MUSIC AND HEALTH

As we have seen, music has the ability to induce strong emotional experiences and trance like states, but alongside this, has important neurophysiological effects that include its ability to synchronize body rhythms to external stimulus, change the hormonal levels, reduce stress and impact the immune system.

Music's impact as a 'rhythmic driver' on the autonomic functions is interesting. It synchronizes 'internal biophysiological oscillators to external auditory rhythms' (Scherer & Zentner 2001) which can help in stress reduction as well as promote empathy. The coupling of respiration and other body rhythms to the outside rhythmic drivers affects a wide array of physiological processes; brain wave patterns, pulse rate, and diastolic blood pressure (Gellhorn & Kiely 1972, Lex 1979, Mandel 1980). This effect has been shown to be present in humans at a very early age (Scherer & Zentner 2001). Music acts as a type of rhythmic driver and amplifies and intensifies the coupling through the use of instruments, thereby providing a means of synchronizing individual body rhythms within a group of people. This effect is also used in music therapy sessions as means of communication and understanding between a particular individual and the group. Additionally, research by Levenson (2003) has shown that synchronized autonomic functions, including such things as pulse rate, heart contractility, and skin conductance are positively and significantly associated with measures of empathy, which further extends the positive effects of music on not only physiological well-being but also on psychological health.

Music has thus demonstrated effects on measures of stress and immunocompetence. A significant negative correlation between exposure to relaxing music and salivary cortisol levels was found in experiments conducted by Khalfa et al. (2003) which shows that music has indeed a direct impact on the body's biochemistry, therefore regulating both physical and psychological parameters. Music does not only relax, but also contributes to the feelings of well-being, autonomy and sense of purpose mainly regulated by the release of two neurotransmitters; dopamine and oxytocin (Dukić 2018). These neurotransmitters are capable of influencing the emotions linked to prosocial behaviours (Thompson 2007) arousal (Schultz 2015) and feelings of happiness and well-being (Fessler 2001), all of which are important factors in enhancing the psychological resilience.

Other research demonstrates significant positive correlation between music and immunocompetence as measured by salivary immunoglobinA (SIgA), with active musical participation correlating most highly with immune competence and no music expo-

sure correlating the least (Hirokawa & Ohira 2003). These associations between music and measures of stress and health are mediated by music's ability to alter autonomic functions and evoke emotions. Most striking changes however can be seen in certain areas of brain in both children and adults who practice music (actively or passively) on a regular basis, demonstrating the fact that music actively changes the mind of an individual.

THE MUSICAL MIND

Many studies have shown that music training in particular has an effect on brain development. Research has shown structural and functional differences in the brains of adult instrumental musicians compared to those of non-musicians, with intensity and duration of instrumental training and practice being important predictors of the differences (Schlaug et al. 2005). Schlaug also studied the effect of music training on the developing brains of children (aged 5 to 11) and found that in 5 to 7 year olds (14 months after the beginning of training), cognitive and brain effects from instrumental music training can already be found, mainly in domains of fine motor and melodic discrimination. In 9 to 11 year olds with an average of four years of musical training, the observed effects become more pronounced, as well as the new transfer effects begin to emerge, namely those in closely related motor and auditory domains. Thus, their research has demonstrated that music training in children results in long-term enhancement of visual-spatial, verbal, and mathematical performance, although the underlying neural bases of such enhancements is still unknown, as are the contributions of factors such as the intensity and duration of instrumental training, extracurricular activities, attention, motivation, or instructional methods.

Most recent studies in neuroplasticity show that adult brains can also be shaped by music. Researchers (Pinel et al. 2004, Piazza et al. 2007) have come to a conclusion that music making can enhance the function and structure of many brain areas in adults, proving that training-induced plasticity is not restricted to the developing brains of children. Studies demonstrate that music making leads to structural and functional changes in the vicinity of the intraparietal sulcus (IPS) which is the region for neural representation of all types of numerical representation and operations and also involved in the meaning of symbols and the mental manipulation of symbolic representation. Thus, music making can lead to not only changes in primary and secondary motor and auditory regions of the brain but also in multi-modal integration regions in the frontal and parietal regions (Wan & Schlaug 2010).

Even more relevant is the effect of music listening on the brain plasticity in adults.

Daily music listening, research shows, can improve auditory and verbal memory, attention, and mood as well as induce structural grey matter changes in the early post-stroke stage (Särkämo ët al. 2012). Further research on stroke patients done by Särkämo ¨ et al. (2014) confirmed these results: Voxel-based morphometry (VBM) analysis was performed on the 6-month post-stroke stage structural magnetic resonance imaging data of the patients who either listened to their favourite music (MG- music group), verbal material (ABG- audio book group) or did not receive any listening material (CG- control group) during the 6-month recovery period. All groups showed significant grey matter volume increases. However, there was a specific network of frontal areas and limbic areas in patients with left hemisphere damage in which the grey matter increases were larger in the MG than in the ABG and in the CG. The study thus showed that music listening after stroke enhances behavioural recovery and induces neuroanatomical changes in the brain.

Finally, Stegemoller (2014) has pointed out three principles of neuroplasticity that explain why music therapy in particular is effective in promoting changes in patients' behaviour. First, music affects the release of neurotransmitters such as dopamine and serotonin which are responsible for the reward system in the brain and for the induction of feelings of happiness. Since the stimulation of dopaminergic neurons has been shown to result in cortical remapping (Bao et al. 2001) it is well accepted that dopamine plays a vital role in neuroplasticity. The second principle is based on the Hebbian theory; 'neurons that fire together, wire together'. This means that neurons that fire together within less than tens of milliseconds, will make a new connection or strengthen an existing one. Musical rhythm is a feature in music that can be entrained or synchronised to a diverse palate of non-musical behaviours inducing synchrony in the neural networks underlying the behaviours. In other words, by pairing music with movement, vocalization, breathing, and heart rate, therapists might be

able to elicit simultaneous firing of neurons in areas that control the described behaviours. Third, continuous listening to noise can negatively affect brain plasticity; it increases stress, which consequently impairs both cognition and memory (Amemiya et al. 2010). Long term exposure to music however, leads to improvements in learning, due to changes in the hippocampus in animal models (Kim et al. 2006). This is probably due to the fact that the acoustic signal of song is more consonant than that of speech (Stegelmoller 2008). Music therapists, as professional musicians, are thus in advantage because of their ability to optimize the level of noise in the vocal and instrumental sounds. In the end, we can see that the significant differences observed in the brains of individuals who practice music and those who do not point to the fact that there can indeed be a term called 'a musical mind' to describe the joint effects of music on psychological, physical and biochemical changes in an individual.

CONCLUSION

In this paper we saw that the capacity of music to entrain autonomic states and evoke emotions in listeners provides the basis for creating and synchronizing motivational states in ritual participants and also presents the basis on which most music and health practices operate. Consequently, it is plausible to assume that such a profound connection with music can only stem from our earliest developmental stages; the prenatal life of the foetus and its physical and emotional connection to the mother (Parncutt 2009). In other words, we appreciate music because the understanding of its elements (simple rhythms and pitch changes) was important for our survival and adaptations in the intrauterine environment and in the early postnatal stages of development. The happy 'by product' of these adaptations are our emotional and physical reactions to music that can be profound, meaningful and beneficial in many areas of human activity, including spiritual and healing practices.

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SAŽETAK

Zašto reagiramo emocionalno na glazbu? Da li glazba ima adaptivnu vrijednost? Koja je njezina uloga u religijskim i iscjeljujućim obredima? Glazba je izuzetno zanimljivo područje istraživanja za teoriju evolucije, psihologiju te percepciju i elicitaciju emocija. Vrijedan je dio svakodnevnih duhovnih i svjetovnih rituala u gotovo svim kulturama svijeta. Usprkos njenoj rasprostranjenosti, pitanje koje se još uvijek nameće jest zašto je tako. Ovaj članak će diskutirati utjecaj glazbe na naš emocionalni život, psihološku dobrobit, duhovne obrede i konačno na fiziološke procese u našem organizmu. Cilj je istražiti podrijetlo našeg odnosa s glazbom i pokušati povezati različite perspektive i teorije o ovoj temi kroz dvije velike domene; duhovnost i zdravlje.

Ključne riječi: glazba, religija, rituali, trans, plastičnost mozga, terapija glazbom