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ARE MUSICAL EMOTIONS CHIMERICAL? LESSONS FROM THE PARADOXICAL POTENCY OF MUSIC THERAPY

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Abstract

The dominant psychological model of emotion posits that a cognitive process (the appraisal) precedes, and results in, the corresponding emotion, including any induced state of physiological arousal: the cognitive component of emotion mediates the effect of the external cause on the internal arousal component. If emotions in music were naturalistic, the same mechanism should apply. However, a study in which a group of people with autism were compared with matched controls showed a normal level of physiological responsiveness to music in the autism group, coupled with a reduced capacity to verbalize their responses to it. It is hard to account for these results in terms of the standard mechanism for emotion induction; I suggest that musical emotions are in fact chimerical, consisting of components of separate naturalistic emotions combined in non-natural ways. This fact can not only explain the ability of music to generate a response in individuals with impaired emotional understanding, but can also suggest ways to exploit this effect in order to teach such individuals about naturalistic emotions by pairing musically induced states of autonomic arousal with the kind of naturalistic context provided in, for example, opera.

Keywords: autism, music, emotion

1. Introduction

The practical experience of music therapists appears to show that music evokes powerful and beneficial responses in people with emotional or social difficulties (Boso et al., 2007, Kern et al., 2007, Wigram & Gold, 2006). It is reasonable to assume that it is music's raw emotional power that is responsible for these effects: music is after all the "language of the emotions" (Heaton, 2009, p. 2897). But this leads to a paradox: if a person is emotionally unreactive, how can it be that they respond so well to music, when by definition they have difficulties with understanding the language of emotions, which music is supposed to embody?

I will attempt to resolve this paradox by arguing that whilst the responses induced by music do indeed have something in common with ordinary emotions (which is why music can be therapeutically helpful in dealing with emotional problems), they also differ in key respects from naturalistic emotions (which is why they can induce meaningful responses in people with emotional difficulties). I suggest that experiencing musical emotions in the right context can represent a kind of half way house in the journey towards learning about naturalistic emotions. Key to this conclusion is a comparison between the responses to music in typical adults and high-functioning adults with autism.

2. Musical emotions: the same and yet different

The current dominant explanation for naturalistic emotions is the appraisal theory. This postulates that emotions arise from an individual's interpretation of the implications of external changes for their personal wellbeing. This interpretation is, at least in the most basic version of the theory, cognitive, and therefore neither automatic nor particularly rapid. Since this conflicts with the observed ability of emotions to arise very quickly, more sophisticated models have been proposed, though there is some disagreement about details (Marsella & Gratch, 2009; Smith & Kirby, 2009).

All models, however, have in common the idea that emotions involve some form of appraisal of the relationship between a person and their environment, and that this appraisal is relevant to the overcoming of problems, or the achievement of goals, which are important to the individual. The appraisal may – in fact, usually does – result in the arousal of the autonomic nervous system, preparing the individual for what are sometimes referred to as the "four f's", which include fighting, fleeing and feeding.

If we accept this model, one can see objections on purely logical grounds to the idea that this process of appraisal can operate in the context of listening to music, at least in its purest, instrumental form. There appears to be nothing to appraise, suggesting that musical emotions cannot be fully naturalistic. Perhaps the first author to express this objection clearly (not, of course, in terms of modern theories of emotion) was the nineteenth century critic Eduard Hanslick (Hanslick, 1854/1986), but his lead has been followed by a number of subsequent workers in the fields of both psychology and philosophy (Kivy, 2001, 2009; Konecni, 2005, 2008; Zangwill, 2004, 2007, 2011).

This case has not gone unanswered. A number of authors (e.g. Zentner, Grandjean & Scherer, 2008) have maintained that there are considerable overlaps between the musical and naturalistic emotions.

3. Fast and slow emotions

Although we have so far mentioned only the appraisal theory of emotion, other possibilities are sometimes considered. For example, it has been suggested that emotions can be induced via a "fast", subcortical route, providing a mechanism to respond to emergencies which might need more urgent action than is possible via the slower, cortical route used by the appraisal mechanism (see, for example, LeDoux, 2000). The initial response to this fast route alert is to prime the autonomic nervous system for fight or flight, and cognitive appraisal is brought in subsequently to monitor the appropriateness of the response. If musical emotions are indeed naturalistic, this seems a more likely route for their induction. The fast route allows for subsequent cancellation of the emotion by the higher centres of the brain, if they assess the threat as being a false alarm. Indeed it has been suggested (Huron, 2011) that this is the explanation of why we can enjoy listening to "sad" music: the music induces a kind of "sham pain" via the fast route, but the conscious brain realizes that the situation is not threatening, and responds with relief, so that the net effect is pleasurable.

4. Evidence from autism: fast or slow route?

Psychologists have perhaps been a little late to appreciate the importance of music in the lives of people with autism. *A priori* arguments, based on theories of the evolution of musical aptitude in humans for which empirical evidence is lacking, have been used to suggest that people with autism will not have an aptitude for, or any deep appreciation of, music (for a fuller discussion and references, see Allen & Heaton, 2010). However, the first in-depth study to explore the actual experiences of high-functioning adults with autism found that their uses of music in their daily lives followed a very similar pattern to that already found in the typical population (Allen, Hill & Heaton, 2009). Here again, we can see the paradox of music's effectiveness: some of our participants clearly used music in their daily lives to overcome emotional crises, despite

having, by their own account, limited understanding of their emotional experiences.

Following up this work, an experimental study comparing matched control and autism groups found that the autonomic arousal induced by music in the two groups was comparable, whereas the verbally reported level of emotional arousal in the autism group was lower than in controls (Allen, Davis & Hill, 2013). This partly explained why our previous autism participants had reported finding music so moving: music was leading to normal levels of autonomic arousal in them. At the same time, the results had implications for deciding between alternative mechanisms for the production of musical emotions.

In a subsequent paper (Allen, Walsh & Zangwill, 2013), we drew on these results to suggest that if musical emotions were naturalistic at all, they must be using the fast, not the slow route. This is because the appraisal route is inconsistent with reduced appraisal activity in the autism group coupled with normal levels of autonomic activity. Reduced cortical activity in the autism group should have resulted in reduced autonomic activity if indeed the autonomic component was downstream of the cognitive component, but this was not observed. It appeared that on the contrary, the autonomic response came first, and was then interpreted only subsequently by the higher centres of the brain. In other words, musical emotions must be using the fast track, not the slow track.

However, there are difficulties even with the fast track explanation. The conclusion of our paper was that the most probable scenario was that musical emotions exploited a combination of subcortical fast route mechanisms, including brain stem responses and emotional contagion (as claimed in Juslin & Västfjäll, 2008) together with top down cortical responses induced by means such as the expectation induction/resolution process described in the "ITPRA" mechanism (Huron, 2006). Musical emotions should in fact be regarded as chimerical, not in the sense of being absurd or imaginary, but in the original meaning of the word as describing an animal composed of parts of other animals. We proposed that musical emotions involve activation of parts of different naturalistic emotion circuits. These components are in themselves naturalistic, but experienced together in non-naturalistic combinations. Typically, the autonomic components of standard emotions will be found in combination with an incongruent activation of the higher brain centres, as in the case of Huron's example of sad music. The higher brain centres will be engaged by the ITPRA mechanism, and the sub-cortical responses will be induced by, for example, brain stem and emotional contagion responses (Juslin and Västfjäll, 2008).

Incidentally, in a remarkable series of studies (Salimpoor et al., 2009; Salimpoor et al., 2011; Salimpoor & Zatorre, 2013) it has been shown that the brain's pleasure and reward circuits are crucial in determining individual musical preferences. It appears likely that if musical emotions are characterised by possession of any one common feature, it is that they include (but are not confined to) activation of this dopaminargic network. Such activation is the probable outcome of the ITPRA mechanism: dopamine is key to modulating expectation as well as pleasure. It may also be the outcome of other, sub-cortical cues. It is known for example that rhythmic entrainment is represented and mirrored at a fundamental neurological level (Nozaradan, Peretz & Mouraux, 2012) and that it can affect higher level functions such as attention across modalities (Bolger, Trost & Schon, 2013). Much work remains to be done to clarify the details of these mechanisms, even if the outlines are now becoming clearer.

5. Uses of music in learning about emotion

I have suggested that a partial answer to the paradox of the unreasonable effectiveness of music therapy is that musical emotions are non-naturalistic: music is effective because it relies on responses which are preserved in disorders which disrupt the experience, or understanding, of the more complex naturalistic emotions. But this is to explain only half of the paradox. How is it possible to use music to learn about real emotions if musical emotions are not real? It would be like attempting to

give a blind man sight by talking to him about the visible world.

One explanation was offered by the second author of Allen, Walsh and Zangwill, 2013, who has autism and who independently and empirically developed a method of using music to learn about emotions. Walsh's preferred musical repertoire largely consists of pieces which in some way tell a story, such as a musical or an opera, where the lyrics give a plot or a context. The emotions felt and expressed by the characters are articulated in the dialogue, as well as being expressed in the characters' reactions to the events affecting them. The cognitive aspects of the emotions, in terms of the circumstances which cause their emotions, can therefore be studied, in order to learn about their nature and origins. At the same time, the physiological components of the emotions are automatically induced by the music. The two components of emotion, cognitive (in the plot) and visceral (evoked by the music) are distinct and complementary.The affective response to music is experienced, by Walsh, as something different from, and less threatening than, a genuine emotion. It might be described as a purified, distilled, predictable form of affective experience, cut loose from its causes and the person undergoing it. These purified affective experiences are presented in a form which is ordered, and therefore accessible.

Walsh believes that many (though not all) individuals with autism have an unfulfilled craving for emotional experience. The non-naturalistic emotions in music help to satisfy this craving, but without the difficulties involved in engaging in an emotional relationship with another human being, where the unpredictability of the emotional responses may be terrifying.

By learning the links between the physiological correlates of emotion (induced by the music) and the cognitive aspects (as conveyed simultaneously in the lyrics or the plot), Walsh has found that it is possible to apply this to the arena of day to day human relationships. By learning to identify the physiological correlates, induced by the music, of certain real emotions, it is then possible to begin to identify the same correlates of real emotions in other people. A further effect is a heightened ability to empathise actively with others: the emotions of other people can not only be identified more easily, but also the learned association of a similar emotion in music enables Walsh to feel that same emotion, as a consequence of concern or attachment to the other individual, so that it is possible to experience pleasure in another's happiness, and regret at another's sadness. In this way, Walsh considers, the correlation between the two factors of emotion, cognitive and physiological, can be learned in a deliberate, intelligent way, by people – such as individuals with autism – who may never have formed these associations in the usual way during infancy and childhood.

It seems likely that these ideas already form part of at least some standard applications of music therapy, as discovered empirically by individual practitioners. They were instrumental in the design of a pilot study made possible by the generous support of the Baily Thomas Charitable Fund. The results of this study, so far incomplete, suggest a degree of validity for the approach (Allen, Shah & Bird, 2012). If this is confirmed, it would also provide some support for the theoretical background outlined in the present paper.

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