Emotion and Music: Inherent Responses and the Importance of Empirical Cross-Cultural Research

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ABSTRACT

Although it is generally accepted that enculturation plays an important role in the association of emotions with musical stimuli, there is still debate over whether inherent pre-programmed responses to psychophysical cues also play a role. This paper reviews and evaluates existing theoretical arguments and empirical results and proposes ideas for future research. An emphasis is placed on the importance of cross-cultural empirical studies.

It is well known that certain types of music are able to evoke emotional responses in certain listeners. The mechanisms that cause these responses are not clearly understood, however. It is also uncertain whether these mechanisms can operate across cultural boundaries or if they are culture-specific.

The overwhelming body of psychological research to date has involved Western subjects listening to Western tonal music. Although there do not appear to be any immediately and easily available explanations of exactly how humans are able to express and interpret emotions in music, valuable insights could be gained through the study of a wide variety of cultures. Cross-cultural studies in particular could prove valuable in understanding the relative importance of enculturation and biologically pre-programmed emotional responses to particular musical stimuli. An extension of the cultural breadth of research and a refinement of experimental methods could provide valuable insights into a potentially very fertile area of study.

There is little doubt expressed in the current literature that enculturation plays an important role in affective responses to music. There is still debate, however, over whether culturally universal psychophysical perceptual cues also play a role, perhaps acting in concert with learned associations, or perhaps influencing the development of leaned associations themselves. A number of theoretical arguments have been presented that contend that any emotional meaning gleaned from music is due entirely to enculturation.

Meyer (1956) argues that musical expressivity is linked primarily to the structural aspect of music. Expectation and deviation from expectation lead to the perception of emotion. Since these expectations must be learned, the implication is that affective responses to music are also learned. Sloboda and Lehmann (2001) present a more recent illustration of this perspective.

Although these arguments likely do have some validity in relation to Western music, they are of limited applicability in a broader context, as the music of most cultures tends to place much less emphasis on strict structure and formalisms than Western music (Nettle et al., 1997). Meyer's perspective is cast into further doubt by a study by Tillman and Bigand (1996). The authors broke several Western musical excerpts into very short segments, which were then played in the original order to some subjects and in reverse order to others. Not only were the subjects able to perceive emotion when the segments were played backwards, but they did so in ways similar to the subjects who heard the segments played forward. This appears to indicate that the role of global structure may be overstated even in Western music.

Sloboda (1985) argues that musical stimuli acquire emotional meaning through association with words that often accompany them. In order for two people to have similar affective responses to a musical stimulus, then, they must both have learned to associate the stimulus with words with the same semantic meaning. The consistency and precision of inter-participant agreement arrived at in numerous recent experiments linking psychophysical stimuli with emotional responses (Balkwill and Thompson, 1999; Behrens and Green, 1993; Campbell, Krysciak and Schellenberg, 2000; Crist, 2000; Gabrielson

and Juslin, 1996; Gabrielson and Laukka, 2000; Juslin, 1997; Juslin and Madison, 1999; Kamenetsky, Hill and Trehub, 1997; Kaminska and Woolf, 2000) calls Sloboda's emphasis on semantic meanings into question.

Kivy (1980) has suggested that musical expression is linked to what he calls the "emotive life" of a culture, which is to say expressive gestures, postures and speech. Kivy argues that, since the emotive life of each culture is presumably distinct, the links made between various musical stimuli and particular emotions must also be distinct. The music of cultures with unfamiliar emotive lives will therefore sound neither musical nor expressive to uninitiated listeners.

In a somewhat similar vein, Tolbert (2001) suggests that musical expression is learned at an early age through processes related to modelling of facial expressions, expressive gestures and body movements in general. Some indirect support for this position is offered by the research of Davidson (1993), who found that the visual aspect of a musical performance can be more informative as to a performer's expressive intentions than the music itself.

Although the influences outlined by Kirvy and Tolbert may well play important roles in the development of emotive responses to music, it would be a mistake to say that other factors are not significant as well. Musical traditions can evolve separately from a culture's emotive life, for example, yet still influence expressive practices. It is also important to consider the possible existence of cross-cultural commonalities in emotive life itself, perhaps with biologically preprogrammed causes. For example, a review of cross-cultural studies (Frick, 1985) revealed that many cultures use similar techniques to express emotion vocally. It would be interesting to perform further cross-cultural research searching for links between commonalities in musical expression and commonalities in gestural and verbal expression.

Feld and Keil (1994) contend that all meaning that we perceive in music is socially constituted through experiences of sounds in our listening histories. They present this as an explanation for the variety of ways in which different individuals can interpret a given piece within the same culture.

Walker (1996) argues that it is impossible to understand the music of another culture in any sense without having learned about its music through experience. He contends that the music of each culture is dependant entirely on its circumstances, technology and ways of thinking, all of which give rise to unique musical values that lead to music that cannot be translated between cultures.

While the above perspectives do present some interesting ideas, they are unfortunately based primarily on theoretical arguments. This approach can certainly lead to important insights and ideas, but one must rely on empirical evidence in the end in order to resolve theoretical dispute. Although it is conceivable that musical expression is a result solely of enculturation, reliable and repeatable empirical evidence is needed before any definitive stance can be adopted. There is an important need for empirical cross-cultural research to test the above theoretical models.

Now that factors related to enculturation in a broad sense have been discussed, it is appropriate to turn our attention to the effects of localized psychophysical parameters. Although it was once argued that affective responses to music are due only to high-level elements, recent research has made it clear that isolated variations of specific psychophysical parameters can elicit specific emotional responses (Balkwill and Thompson, 1999; Behrens and Green, 1993; Campbell, Krysciak and Schellenberg, 2000; Crist, 2000; Gabrielson and Juslin, 1996; Gabrielson and Laukka, 2000; Juslin, 1997; Juslin and Madison, 1999; Kamenetsky, Hill and Trehub, 1997; Kaminska and Woolf, 2000). Specifically, manipulations of timbre (Behrens and Green, 1993; Gabrielsson and Juslin, 1996), tempo (Crist, 2000; Gabrielsson and Juslin, 1996), timing patterns (Gabrielsson and Laukka, 2000; Juslin and Madison 1999), pitch (Campbell, Krysciak and Schellenberg, 2000; Kaminska and Woolf, 2000) and dynamics (Crist, 2000; Kamenetsky, Hill and Trehub, 1997) can all evoke emotional responses in listeners. These studies have also shown that skilled performers are able to consciously control the affective content of their music, although certain emotions are harder to evoke and perceive than others, and only a limited number of emotions have been consistently tested (primarily anger, fear, happiness and sadness).

Unfortunately, only Westerners listening to Western music were studied in these experiments. This limits the meaningfulness of the spe-

cific results of each of these studies to the sphere of Western music and listeners familiar with it. These studies are valuable, however, in that they show that manipulations of isolated and well-defined psychophysical parameters can cause affective responses, even if it is possible that these responses are due only to associations arrived at through enculturation.

The next step, then, is to carry out comparative studies on the music of multiple cultures in order to discover if similar psychophysical cues evoke similar responses across cultural boundaries. If they do, then this could imply that there are inherent mechanisms at play, and that affective responses may not be due only to enculturation.

Gregory and Varney (1996) carried out one such study. Indian and British subjects were instructed to listen to short excerpts of Western classical, Indian classical and new age music. The subjects were asked to describe the mood of each excerpt and, in some cases, to match a piece of music with its title and/or a season that it was meant to represent. Although the results did show a high overall level of agreement between the responses of the Indian and Western subjects, the results should be treated with some caution. As the authors acknowledge themselves, the Indian subjects had previously had significant exposure to Western musical traditions. In addition, the musical excerpts themselves were shorter than may have been appropriate.

Another study was carried out by Hoshino (1996), involving Japanese subjects listening to traditional Japanese and Western modes. The results implied that there might be cross-cultural emotional associations relating to modal patterns. Unfortunately, there were some flaws in the methodology that may have compromised the results. This study is discussed in more detail later in this text.

Balkwill and Thompson (1999) have obtained the most reliable results so far. Western listeners were presented with excerpts involving different Hindustani ragas, each of which is traditionally associated with joy, sadness, peace or anger. The subjects stated which of these four emotions they felt to be dominant in each excerpt and provided ratings of their perceptions of the tempo, rhythmic complexity, melodic complexity and pitch range of each excerpt. The results showed that the Western listeners were sensitive to the intended emotions of joy, sadness and anger, but not peace. There were also relatively consistent links between the ratings for type of emotion and the ratings of the psychophysical dimensions.

What is particularly interesting about the results is that the authors found a correspondence between the psychophysical dimensions of music that other researchers had previously mapped to certain types of emotional responses in Western music and the dimensions that the listeners in this experiment matched with the same types of responses. This implies that Hindustani and Western musicians may use similar psychophysical manipulations in order to evoke similar emotions. This offers some limited support for the existence and importance of psychophysical cues that evoke emotional responses independently of enculturation.

This research was of limited scope, of course, and does not prove anything definitively. The data could be compromised by the relative similarity of Western and Indian classical music, as opposed to the more distinct music of many other cultural groups. Nonetheless, this study does provide some interesting empirical evidence that at the very least justifies further research into the notion of inherent cross-cultural psychophysical cues that provoke emotional responses. The remainder of this text will focus on this notion and on ideas for future empirical studies relating to it.

The first step in this direction is to precisely define the meaning of a “psychophysical cue” in the context of this discussion. Balkwill and Thompson (1999) define a psychophysical dimension as: “any property of sound that can be perceived independent of musical experience, knowledge, or enculturation.” (p. 44) The tempo of a piece of music would thus be a psychophysical dimension, while a perfect cadence would not. Other psychophysical dimensions include melodic patterns, melodic contour, melodic complexity, pitch range, harmonic organization, harmonic complexity, rhythmic complexity, rhythmic patterns, articulation, dynamics, texture and timbre. A psychophysical cue can thus be understood as stimuli occurring in a psychophysical dimension(s) that evokes an emotional response in a listener that is not due to the effects of enculturation. This terminology will be used in the remainder of this text.

If emotional meaning is determined exclusively by enculturation, then listeners should be unable to perceive performer-intended emotional content in music from unfamiliar cultures. If,

instead, psychophysical cues do play an important role, then listeners should be able to perceive performer-intended emotional content in at least some music from unfamiliar cultures. These two realizations provide a basis for the kinds of hypothesis testing that can be incorporated into future studies.

The previously discussed work of Gregory & Varney (1996), Hoshino (1996) and Balkwill & Thompson (1999) provides a template for the beginnings of future research. Cross-cultural studies provide a way of attempting to circumvent the influence of learned cues that could overwhelm the effects of psychophysical cues. It is hoped that the absence of recognizable culturally specific cues in unfamiliar music will force listeners to rely on psychophysical cues, if present, that might otherwise be overlooked.

Some refinement of techniques is necessary. Emotions and music are by nature subjective, which makes them difficult to study under the best of conditions. Cross-cultural studies, with their vulnerability to biases and miscommunications, introduce further complications. To make matters worse, experiments with simulated musical expression (Clarke and Windsor, 2000; Juslin, 1997) have shown that the psychophysical parameters that can evoke emotional responses can be coupled in very complex and subtle ways. Different performers can also successfully express the same emotion in a given piece by manipulating parameters in entirely different ways (Gabrielson and Juslin, 1996; Juslin 1997), a redundancy that further complicates matters. It is therefore necessary to carefully consider how experiments should be carried out.

It will not be possible for every listener to perceive emotion in any arbitrary piece of music. For example, music that is not intended to be expressive may not contain the appropriate psychophysical cues. Alternatively, the influence of learned culturally specific influences might dominate a particular piece of music to the extent that psychophysical cues are no longer significant. It will therefore be necessary to carry out research involving a large variety of pieces from a large variety of cultures.

The choice of the music to be studied should be carefully considered. While Indian and Western traditions do consider emotional expression to be a valuable aspect of music, this is by no means universal to all cultures. Research should focus on types of music that are intended to carry emotional content. It would, however, be valuable to use listeners from cultures that do not value emotional expressivity in music, as the influences of enculturation will be less likely to interfere with their perception of psychophysical cues.

It would also be wise to use music and listeners that come from less analytical musical traditions. Increased levels of formalism indicate an increased rationalization of music, which could be related to an emphasis on learned musical values over innate psychophysical cues. The choice of Western and Hindustani music by Balkwill and Thompson (1999) was perhaps a bad one, as these are among the most formalised musical traditions in the world. The fact that Balkwill and Thompson had good results even with such formalised traditions may be an indication of the significance of psychophysical cues. Studies of less formalized traditions could potentially provide refined results.

Studies should involve musically naive subjects as well as musically sophisticated subjects. Increased musical training could emphasize enculturation to the exclusion of psychophysical cues in some cases, but could elevate awareness of psychophysical cues in others.

In addition to studies in the vein of Balkwill and Thompson (1999), the performance practices and theoretical frameworks of multiple cultures should be examined in order to search for commonalities relating to techniques for emotional expression. Although some commonalities will likely be due to cultural exchanges, strong correlations across many cultures or among isolated cultures could indicate that some cues that are disseminated through enculturation are in fact due themselves to the formalisation of psychophysical cues.

Comparative studies of syncretic music could also prove fruitful. One could look at which elements of each of the parent musics are preserved and which are discarded. The results from studies of many different types of syncretic music could be compared. Those elements that are most consistently kept could have an elevated likelihood of being related to psychophysical cues, since such elements would be the most likely to consistently act as a common ground for multiple cultures.

It would also prove useful to step back and examine music and emotion from a broader perspective. A holistic field approach could be used to compliment attempts in laboratories and li-

braries to isolate variables and determine causal relationships. Field studies of performers interacting directly with their typical audiences could prove informative, for example. Existing resources, such as commercial research into music marketing and jingles, studies of international film music and the work of ethnomusicologists should also be examined.

Another approach would be to do studies on animals, if possible, since it is conceivable that animals that are genetically similar to humans could be pre-programmed to respond to similar psychophysical cues. It would be interesting to see if animals have a tendency to exhibit emotional responses to expressive pieces of music and, if so, if these responses show any similarity to the intended emotional content of the music.

Infants and young children could also be a very valuable source of information, since the effects of enculturation are less significant at a very young age. It might be possible to study the effects of psychophysical cues before they are overwhelmed by learned responses. Of course, methods must be devised to reliably gauge children's emotional responses and to overcome the inherent difficulties involved in studying young subjects.

Of all culturally universal emotional responses to auditory stimuli, the effect of a baby's cry is perhaps the most obvious. In addition, studies have found that adults in different cultures use similar variations in pitch contours and rates of speech when attempting to evoke mood changes in babies, such as calming them down or emotionally arousing them (see David Huron's response in Walker, 1996). It therefore seems apparent that even infants are pre-programmed to have emotional responses to certain auditory stimuli. This does not necessarily mean that this pre-programming extends to the more complex realm of music. It does, however, raise the possibility that if there are pre-programmed responses to musical stimuli, then these responses may be active even in very young children. Since they have had less time to learn the musical conventions of their culture, they may be more sensitive to psychophysical cues, and it could be possible to study these cues in relative isolation from the interference of enculturation. Cross-cultural studies could enhance this isolation so that the children's responses might be due almost entirely to psychophysical cues. Of course, there is the possibility that responsiveness to psychophysical cues does not develop until children have grown to a certain age, but the previously discussed responsiveness of infants raises hopes that this is not the case.

Adachi and Trehub (1998) conducted a study of 160 Western children between four and twelve years of age. The children were asked to sing familiar songs in a manner that would make listeners either happy or sad. Aside from facial expressions, the children relied primarily on variations in tempo, dynamics and overall pitch level in order to convey these emotions. Use of *tenuto* and a nasal vocal quality were also used when trying to convey sadness. The authors noted that these techniques parallel those often used in speech. This could mean that the children were linking techniques for musical expression with techniques that they had already learned to use when speaking, which would provide for support for positions such as that of Kivy, discussed above. Alternatively, it could mean that the children were capitalizing on pre-programmed psychophysical cues in both their speech and music. It would be informative to conduct similar studies of children from other cultures to see if they use similar expressive devices.

Kratus (1993) found that Western children between the ages of six and twelve years of age are able to perceive sadness or happiness in music very well, with only small differences between different age groups. Kratus suggests that this implies that formal music education has little effect on children's perception of emotion in music, since most of the twelve-year-olds had six years of musical education and the six-year-olds had none. If Kratus is correct, then this implies that either some inherent mechanism is responsible, or that most of the enculturation has already been completed by the age of six.

A more recent study (Adachi and Trehub, 2000) found that, while six- to seven-year-old children could distinguish between happy and sad music, they were less proficient than eight- to ten-year-old children and adults. Several other studies (Dolgin and Adelson, 1990; Meerum, Terwogt and van Grinsven, 1991) have found that four-year-olds and five-year-olds are not able to perceive emotion in music as well as older children.

This could indicate that the effects of enculturation become increasingly apparent as children grow older, with a plateau being reached between the ages of approximately six to eight years of age. It could be that the usually strong

effects of enculturation are minimal at a young age, leaving children to rely on weaker psychophysical cues. Alternatively, it could be that there are no psychophysical cues to be capitalized on, and young children are less able to perceive emotional content because the effects of enculturation have not yet had the opportunity to fully develop. Once again, cross-cultural studies of children could be informative in helping to sort out these possibilities. This kind of research could prove useful in determining the ideal age to study children, as one would want to use children that are old enough to communicate well, but not so old that the effects of enculturation overwhelm the effects of psychophysical cues.

Research by Kastner and Crowder (1990) found that Western children as young as three- or five-years-old were able to detect affective differences between music based on either the major or minor modes. If this research is correct, it could indicate that there is some truth to the stereotypical Western notion that the minor mode is related to sadness and the major mode is related to happiness. It could be that this relation is due to innate pre-programmed responses, since the effects of enculturation could be minimal on children of such a young age. Although it is well known that these major/minor associations are by no means culturally universal amongst adults, this could be because stronger learned associations have dominated the weaker innate minor/major associations in some cases.

More recent research (Gerardi and Gerken, 1995), found that children were unable to make affective distinctions between the modes until the age of eight-years-old. If these results are correct, then this could indicate either that the major/minor associations are due to enculturation or that they are due to some innate pre-programming that does not manifest itself until the later years of childhood.

The conflicting results of these two studies may be due to differences in experimental methods. Kastner and Crowder used accompanied melodies, while Gerardi and Gerkin used unaccompanied melodies. It may be that children have pre-programmed emotional responses to major and minor harmonic relationships, but not to the corresponding modal patterns. Perhaps humans only learn to assign unaccompanied major and minor modes affective meaning when they gain the ability to process melodic material so that it has meaning in a harmonic sense (e.g. arpeggios).

A cross-cultural study by Hoshino (1996) had adult Japanese listeners associate Western and traditional Japanese versions of major and minor modes with various colours. The results showed that the listeners were able to make associative distinctions between all of the modes, even though the use of the modes in traditional Japanese music is not intended to express the emotion of the performer. Unfortunately, these results may have been compromised by the listeners' previous exposure to both Western and Japanese music. In addition, the use of colours makes it difficult to draw specific conclusions. Nonetheless, the results do provide tentative support for the notion that there may be some inherent emotional associations with major and minor relationships, particularly when considered in conjunction with the results of Kastner and Crowder discussed above.

What is clear from all of this is that there is still much research to be done before any decisive conclusions can be drawn regarding the existence and relative importance of mappings of psychophysical stimuli to innate emotional responses. The existing body of research does seem to imply, however, that it is certainly possible, and perhaps likely, that psychophysical cues play a significant role in our perception of emotion in music. Research by Peretz, Gagnon and Bouchard (1998) found that the perception of emotion in music is more resistant to brain trauma than more cognitive interpretations of music. This is at least consistent with the idea that there is a deep neural encoding of emotion in music that could be related to innate pre-programming.

In summary, there is a great deal of potential for further research into the perception of emotion in music in general. There is a reasonably large body of theoretical work in existence and a number of meaningful experiments have already been conducted relating to Western music and listeners. It is now necessary to expand the scope of this work by focusing on careful empirical research in a cross-cultural context. The methodologies used in the few existing studies of this sort can be used as a starting point that can be built upon and refined. This research should attempt to distinguish between and isolate the effects of learned associations and innate associations whenever possible.

In regard to the effects of enculturation, empirical cross-cultural research should be conducted regarding musical structures, learned as-

sociations between particular musical events and the semantic meanings of words, symbolic associations made with particular types of sounds, general sonic environments experienced during childhood, learned ways of thinking about music and materials available for sound making. Links between musical expression and expressive gestures, speech patterns, postures and facial expressions should also be considered.

In regard to the existence and importance of inherent pre-programmed emotional responses to psychophysical stimuli, empirical cross-cultural research should employ multiple methodologies. Listeners from many cultures should be monitored for emotional responses to music from many other cultures. Attempts should be made to find listeners who have had as little previous exposure to the musics being studied as possible. Efforts should also be made to find some listeners from cultures that do not employ music as an expressive device. Both musically naive and well-trained listeners should be studied. Particular attention should be paid to studying the music of cultures with less formalized musical traditions. Lab research should be complimented with holistic field studies of performers interacting with typical audiences, and existing commercial and ethnomusicological research should be taken advantage of. Reviews should be made of performance practices and theoretical frameworks of a variety of cultures in order to search for common devices used for emotional expression. Comparative studies of syncretic music could also prove valuable, as could experiments on animals. Finally, cross-cultural experiments examining how children perceive and express emotion musically could prove to be very valuable.

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