



# Humans' Association of Emotion with Music: A Literature Review

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**Abstract.** This literature review aims to address the current state of research regarding the relationship between classical and other predominantly non-vocal music and human emotion. The specific focuses of this review are three-fold: first, the correlation of specific musical components with emotion; second, the ways in which children associate music with emotion throughout their development and third, the extent to which instinctual behaviors play a role in the association of music with emotion. Finally, some potential future avenues of research and improvements to research strategies are suggested based on the review of current literature addressing the relationship between music and emotion.

**Keywords:** music · emotion · musical components · development

## 1 Introduction

Investigating the connection between emotion and music not only gives us insights into why humans associate music with certain emotions, but also assists us in better understanding the relationship between innate and learned behaviors. Additionally, understanding how people respond to music emotionally may assist in developing artificial intelligence technologies that are similarly capable of understanding and reciprocating human emotion. This may open up new avenues of music composition and make robots better companions for humans.

There is currently a moderate amount of research regarding the connection between music and emotion. Because this literature review paper focuses largely on how human beings react emotionally to music, the majority of research reviewed in this article is closely related to psychological and physiological responses of humans to music.

## 2 Emotion and Categorization of Emotion

### 2.1 The Three Categories of Emotion

Although most research concentrated in this area involves measuring levels of valence and arousal in participants when listening to music, this literature review will focus on a more comprehensive framework for the categorization of emotional reactions, including verbal reports of consciously experienced emotion, otherwise known as subjective

feelings [1]. However, more recent studies have focused on measuring objective emotional responses including physiological arousal, changes in temperature, cardiovascular responses, and muscular fluctuations, as well as motor expression such as postural, facial, and teeth clenching. Measuring these quantitative aspects of emotional responses to music has led to a generally more consistent and quantifiable set of data compared to results that are not altogether consistent across studies [2]. This is due to factors including the amount of attention people pay to their emotion when listening to music versus an unconscious emotional response to music.

The categorization of emotions varies across different studies. However, the framework to be discussed in this paper include the aforementioned subjective feeling, physiological arousal, and motor expression.

Aside from the categorization of emotion measurement, researchers have similarly utilized a framework for evaluating emotion types. There are two major categories for subjective feelings: utilitarian and aesthetic emotion. Aesthetic emotion consists of reactions to music that illustrate appreciation of intrinsic qualities of a piece of music, while utilitarian emotion derives from concerns with relevance of a perception to personal needs and values [1]. This aesthetic appreciation of music is yet to be thoroughly researched, and there is currently little reasoning for why humans find music beautiful, other than the postulate that it sounds expressive [2]. However, some scientists suggest that music humans perceive as beautiful may be so due to its complexity, order, and symmetry [2].

### **3 Correlation of Specific Musical Components with Emotion**

Along with the common discussion of how and in what ways music affects emotion, the topic of whether music really does have an emotional effect on people has also been addressed in multiple studies [3]. Generally, however, researchers agree that emotional reactions to music occur in all human societies of the world, not purely in the common tonal music from Western European areas [4]. Although there are certain people who claim that they do not enjoy listening to music, many people listen to music for the emotional effect that it brings.

Over multiple studies, it has been determined that certain specific music components contribute heavily to the processing of emotion as a result of musical stimuli. This stems from various acoustic characteristics of music, including level of onset, pitch, range, and energy [1]. This connects to emotion through what is measured as mainly physiological defense responses. It is important to note that these responses are elicited in a pre-consciously and often unintentionally [2], and do not need to be translated into words like subjective feelings do via standard rating sheets. Evaluating such musical components may give researchers deeper insight into how similarities between sound and music contribute to human behavior.

Many compositional systems consist of dimensions that establish psychological distance from a home or a stability point, and returning to such a point provides a reduction of tension [3]. Studies have suggested that it is this structure of music, paired with other measurements of such distance including rhythm and meter (strong beats are stable, weak beats and syncopations are unstable) and tonality, that people are highly sensitive to, and hypothesize that it is this sensitivity that provides the structural cues that enable people to be able to attach emotions to music [4].

Another study corroborates this point: asking participants to evaluate their subjective feeling through descriptions of their emotions when a specific chord structure was played [5]. Chord structures were organized based on responses, and it was found that structurally irregular and unexpected chords that sounded odd to listeners produced increased reports of perceived tension and discomfort throughout the listening experience [6]. In an unexpected modification trial of multiple tweaked versions of a Bach Chorale, great differences were shown in the electrodermal activity and heart rate recorded while participants listened to the versions [6]. These physical changes are another indicator, along with the subjective reports, that musical structures unfamiliar to the listener of traditional western tonal music are likely to cause emotions linked to fear and an unsettled demeanor [6].

There also has been numerous studies linking brain activity and emotional processing. By separating musical excerpts into unpleasant and pleasant, a study tested participants' brain activity while listening to the two excerpts separately. It was found that the activation of all structures including the amygdala, temporal poles, insula, and ventral striatum were stronger during excerpts that had more erratic jumps in pitch and structure [6]. However, another study offers another perspective: such changes in the amygdala were not due to the generation of emotions, but for inhibitory processes that prevent the hippocampus from harm during exposure to harmful stimuli [6]. Whatever the purpose of increases in brain activity, unexpected or less culturally common musical structures led to more intense brain activity and emotional discomfort.

## **4 Development of Emotional Association with Music**

### **4.1 Instinctual Explanations to Emotional Behaviors**

Some researchers argue that certain qualities of music result in the natural inclination of listeners to ascribe emotion to music [2]. Many sounds resemble those that are produced by people in different emotional states [2]. This is suggesting the possibility of humans' evolutionary history that resulted in the alertness they are required to have to avoid predators and the requirement for the ability to recognize other humans' emotions and effectively communicate. Such an explanation of emotion provoked by music is one important biological aspect of emotional reactions to music through an evolutionary perspective [8].

Some studies suggest that the emotional reactions to music stem from instinctual detection of threat [2], and is in fact not entirely based on development as a child, as previously mentioned. This analysis of surroundings is essential for survival, and is inherited, and the perception of the sounds in music is what controls emotions. A direct neural link from the auditory nuclei in the thalamus to the 'fear effector system' in the amygdala is responsible for this immediate reaction to surroundings, including sounds in music [2].

Interestingly, innate emotional responses seem to branch out farther than just the expected predatory or fear-inducing sounds that was previously suggested [9]. It has been observed in a study that young children seem to spontaneously break into motion when they hear certain types of music, and even children 3–4 years of age are able to recognize different emotional expressions in music with better than chance accuracy [2], illustrating

that even very young people who have largely yet to be under a strong effect or influence of musical culture have innate abilities to perceive different emotions in music.

#### **4.2 Learned Emotional Association with Music**

Despite the studies claiming that emotional association of certain musical sounds is inherent, other researchers disagree. Another research was conducted to collect verbal information from participants about the origin of their emotions, and found that people often described an emotional association to music as coming from specific phases of life, particularly from childhood [7]. In addition, many participants connected their emotional associations of music to their own values and morals that they have learned, such as devotion, empathy, and availability [10].

Because so much of musical-emotional association seems to come from the earliest stage of life, infancy, and development before and during that time, it seemed imperative to investigate more regarding how emotions were developed as a response to music in this time.

#### **4.3 Explanations of Inherent Emotional Association with Music: Infancy**

Interestingly, material speech has been described by some studies as possessing a similarity to music because of its song-like features such as rhythmicity, repetitiveness, vowel elongation, and distinctive pitch contours [6]. This demonstrates that material pitch may contribute to early developments in emotional-musical interpretation [11]. Because infants are more attracted to speech's emotive quality, infant directed or not, this may suggest that infants' attention may be more commonly directed to the similar emotive qualities of music. This may help develop an emotional awareness of music as they grow up, even if they are born with no inherent understanding of emotional meanings in speech and music [12]. However, the inherent ability of infants to distinguish between more emotive infant-directed and adult-directed speech and actively listen to the former, in itself, be a type of inherited recognition of emotional qualities in music [13]. An additional hypothesis may be that such emotional expressions present in music may be sought after by adults, partly because it brings a call back to the beginnings of emotional development with sounds as an infant, acting as a source of comfort like it did during their childhood.

As of now, there is no agreed upon conclusion as to whether emotional connections with music are inherited or developed - it appears that it may be a combination of both. However, there is a big missing factor in the discussion of emotional development: how such musical sounds translate to emotion, and what general aspects of music produce emotional trends in people listening to them. Thus, in order to better understand the reactions to music talked about in the previous section, it is important to also discuss specific elements of music and how they influence emotion in listeners.

### **5 Individual V.S. Collective Emotional Experience: Future Research Avenues**

Bringing back the discussion of more broad emotional perceptions of music influenced by culture, it has been argued in some studies that specific types of music elicit specific

emotions [5]. However, some studies note the disconnect between music, especially classical music, and consistent shared emotion, and that emotional reactions to music are highly individual rather than collective. This results from an interplay between factors in the music, in the individual, and in the situation [1]. This disconnect, although conflicting with evidence of shared emotion for a particular work, suggests that musical influence on emotion depends largely on the individual's connection, or lack thereof, to the music they listen to. When measuring what features of music elicit what types of emotion, researchers should be wary of the sample size of the group being researched, as well as the level of variation in the personal background of the group. They should take advantage of large samples with a variety of people to determine the emotional effect of an element of music on a group of listeners varied in backgrounds and cultures, being wary of the variation of music perception when emotional responses to music are looked at as a case-by-case basis. Case-by-case analysis, although more nuanced, may be less conclusive of the effect of emotion on music.

Another major element of investigating how emotion is elicited by music depends on how the listener articulates their own emotional response to the music. Although there have been external, directly observable factors in measuring emotion such as physiological arousal and motor expression, the most direct measure of emotion, subjective feeling, has yet to have a uniform method of measurement. The discrepancy caused by a difference in the way listeners articulate their emotional responses in standard rating sheets to researchers as mentioned in previous sections suggests potential for a new technological innovation to mediate and better quantify an individual's results in the scheme of the results of the entire group. A piece of technology, such as one that could monitor brain activity, could be a much more encompassing way to standardize emotional reactions, being able to better measure factors such as the intensity of activity in a specific part of the brain of an individual and accurately compare such factors to the research group as a whole. This leads the study to be able to not only perform a more uniform approach to gathering data, but also rely on specific data from physical reactions that is more comparable across the scale to develop more meaningful outcomes from data for a research group.

## 6 Conclusion

This literature review paper has addressed topics regarding classical and other predominantly non-vocal music and human emotion, with a specific focus on topics including relationships between 1. Select musical features with human emotion, 2. Development in infants and children and their association of music with emotion. Finally, some potential future avenues of research and improvements to research strategies were suggested, including research strategies that included a better format for evaluating emotional responses, as well as technological developments that could better our understanding of the relationship between music and emotion. Though there has been lots of research on this topic, there should be more attention on how infants react to non-traditional Western music that is normally more discomfort-provoking to adults. Focus on if and how these emotional reactions change as people age would also be a worthwhile step in this research.

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