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Current Emotion Research in Music Psychology

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Abstract

Music is universal at least partly because it expresses emotion and regulates affect. Associations between music and emotion have been examined regularly by music psychologists. Here, we review recent findings in three areas: (a) the communication and perception of emotion in music, (b) the emotional consequences of music listening, and (c) predictors of music preferences.

Keywords
affect, emotion, music, music preferences

Music is an essential part of being human, with important status from the earliest stages of life. For example, singing is more effective than speech at holding an infant's attention (Nakata & Trehub, 2004), and caregivers across cultures intuitively capitalize on this phenomenon by speaking to infants in a manner that is very music-like, with exaggerated pitch contours, high overall pitch, a large pitch range, and slow, rhythmic rates (e.g., Fernald et al., 1989). Caregivers appear to use musical cues to communicate with infants because they express emotions effectively (Trehub, 2003). Moreover, adults report listening to music because it expresses emotions and regulates their own affective state (e.g., Lonsdale & North, 2011). It seems certain, then, that music's prevalence is associated with its connection to emotions. The present article reviews psychological research that examined associations between music and emotion, focusing on articles published relatively recently (since 2000). We examine three main issues: (a) how emotion is expressed and perceived in music, (b) the nature of affective responses to music, and (c) factors that affect music preferences.

Musical Expression of Emotion

Universal Features of Emotion in Music

Does music from different cultures share common features? Evidence that there are universal cues to emotion in music comes from several key findings. One is that general acoustic cues (i.e., those that are not specific to music or to a specific genre of music) contribute to the emotional expressiveness of music. In fact, some cues to emotion appear to be relevant to all forms of human vocal communication, such that there are notable commonalities in the acoustic features of emotionally expressive speech and music (Juslin & Laukka, 2003). For example, angry speech is characterized by high vocal intensity, just as angry sounding music tends to be loud. High-arousal emotions (anger, fear, and happiness) are expressed using faster rates compared to low-arousal emotions (sadness and tenderness/love) in speech and in music. Moreover, happy sounding speech in English or Tamil has larger pitch intervals than sad sounding speech, just as happy sounding music in South Indian and Western music incorporates larger pitch intervals (Bowling, Sundararajan, Han, & Purves, 2012). One exception is that a lower overall pitch makes music sound less pleasant (Jaquet, Danuser, & Gomez, 2014), such that low pitches are used to express emotions with negative valence. In speech, negative emotions such as fear and anger tend to have a relatively high pitch (Juslin & Laukka, 2003).

Young children use these general acoustic cues to make judgments about emotions expressed through music before they start using culture-specific cues. Consider tempo (speed). Faster pieces are judged to be happy or positive sounding, whereas slower pieces are deemed to sound sad or negative (e.g., Gagnon & Peretz, 2003; Juslin & Lindström, 2010). Even 5-year-olds perceive and successfully decode tempo as a cue to emotion (Dalla Bella, Peretz, Rousseau, & Gosselin, 2001). They are *not* sensitive to changes in mode (major or minor), however, because mode is a culture-specific cue in Western music that becomes meaningful after 6 years of age (Dalla Bella et al.,

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2001). When asked to convey emotions by singing, 5- to 8-year-olds also modulate basic acoustic cues such as tempo, pitch, and loudness in their performances (Adachi & Trehub, 1998).

Culture-general cues allow listeners to identify emotions in music from other cultures with modest accuracy. For example, Western listeners are able to identify happiness, sadness, or anger in Hindustani (North Indian) pieces, but they have difficulty recognizing peacefulness (Balkwill & Thompson, 1999). Similarly, Japanese listeners can identify joy, sadness, and anger in unfamiliar sounding Hindustani music, as well as in more familiar sounding Japanese and Western music (Balkwill, Thompson, & Matsunaga, 2004). Listeners who have never heard Western music (the Mafa from Cameroon) can identify happiness, sadness, and fear in excerpts of Western music at above-chance levels (Fritz et al., 2009). Finally, Indian, Japanese, or Swedish listeners can identify emotions expressed in Western, Hindustani, Japanese, or Swedish music, although performance is more accurate for basic emotions (e.g., anger, fear, happiness, sadness) than for complex emotions such as solemnity and spirituality (Laukka, Eerola, Thingujam, Yamasaki, & Beller, 2013).

Culture-Specific Features of Emotion in Music

Different musical systems have different structures and ways of conveying musical meaning. In Western music, for example, listeners associate major and minor modes with positive and negative emotions, respectively (e.g., Gagnon & Peretz, 2003). Enculturation to a particular culture's music is a developmental process in which associations and regularities are internalized, at least implicitly, through repeated exposure. One view holds that the experience of emotion depends on whether culturally learned musical expectancies are fulfilled or violated (Huron, 2006; Meyer, 1956), which implies that listeners should exhibit biases favoring the music of their native culture.

Indeed, listeners are better at perceiving emotions conveyed in the music of their own culture than in unfamiliar music (Balkwill et al., 2004; Fritz et al., 2009; Laukka et al., 2013). In the cross-cultural studies noted above, Mafa listeners performed markedly poorer than Western listeners at identifying emotions expressed in Western music (Fritz et al., 2009), and Swedish and Indian listeners exhibited performance advantages for music from their native culture (Laukka et al., 2013). Listening to music from a foreign culture may also be less emotionally rewarding than listening to culturally familiar music. For example, American participants rate Indian music as "tenser" than Western music (Wong, Chan, Roy, & Margulis, 2011; Wong, Roy, & Margulis, 2009), whereas participants from rural India rate Western music as "tenser" than Indian music (Wong et al., 2009).

Emotions that are perceived reliably in music change over development, which implicates a role for learning and exposure, which would vary across cultures. For example, 3- to 4- year-olds are more accurate at perceiving happiness and sadness compared to anger, fear, and neutrality in music, whereas 5- to 7-year-olds can identify happiness, sadness, fear, and neutrality (but not anger) at above-chance levels (Stachó, Saarikallio, van Zijl, Huotilainen, & Toiviainen, 2013). In general, high-arousal emotions such as happiness and fear are easier for young children to identify than low-arousal emotions such as sadness or peacefulness, but by 11 years of age children are as good as adults at identifying emotions expressed musically (Hunter, Schellenberg, & Stalinski, 2011). Older adults exhibit impaired recognition of negative emotions such as sadness, but they recognize positive emotions in music as well as younger adults do (Laukka & Juslin, 2007). The ability to identify negative emotions in music begins to decline in middle age, whereas the ability to recognize positive emotions is stable across the lifespan (Lima & Castro, 2011). Most of the developmental research on music and emotion has focused on Western music, however, which makes it impossible to confirm whether developmental patterns differ across cultures.

In any event, these findings confirm that affective meaning in music is influenced by exposure and learning. In the past, some scholars took the extreme position that there is nothing inherently or naturally meaningful in music and that all affective meaning in music is a product of cultural interpretation (e.g., Walker, 1996). This view is belied, however, by evidence that people identify emotions in music from other cultures with some degree of accuracy. In short, the emotional expressiveness of music arises from a combination of culture-specific and universal cues.

Affective Responses to Music

It is one thing to be able to understand the emotional intention of the musician or composer, and another thing to experience actual emotions. Historically, there has been much debate about whether listeners actually experience emotion in response to music. An extreme position (the *cognitivist* view) is that music does not actually induce emotions (e.g., Kivy, 1990; Konečni, 2008a; Meyer, 1956). Instead, when affective responses occur, they are a consequence of extramusical factors, such as when music makes you angry if your neighbor plays it loudly while you are trying to sleep. Currently, however, there is much agreement that listeners perceive *and* feel emotions in response to music.

Perceived and felt musical emotions tend to be associated (Evans & Schubert, 2008; Hunter, Schellenberg, & Schimmack, 2010), such as when listeners feel sad after listening to sad sounding music (Garrido & Schubert, 2013, 2015). In general, however, emotions are perceived more strongly than experienced (Evans & Schubert, 2008; Gabrielsson, 2002; Hunter et al., 2010; Schubert, 2007; Zentner, Grandjean, & Scherer, 2008). Felt and perceived emotions may also differ qualitatively. For example, participants sometimes report feeling pleasure in response to sad sounding music (Garrido & Schubert, 2011), or negative emotions when listening to pieces they like (and presumably find aesthetically pleasing; Schubert, 2013). There are also individual differences in the extent to which felt and perceived emotions correspond. For example, individuals with higher levels of empathy are particularly likely to feel the emotions they perceive while listening to music (Egermann & McAdams, 2013).

Across a variety of age groups, participants report that they consciously use music to regulate how they are feeling—to enhance mood, to relax, for distraction, and to improve motivation (L. Chen, Zhou, & Bryant, 2007; Getz, Marks, & Roy, 2014; Juslin & Isaksson, 2014; Laukka, 2007; Laukka & Quick, 2013; Lonsdale & North, 2011; Saarikallio & Erkkilä, 2007; Shifriss, Bodner, & Palgi, 2014; Ter Bogt, Mulder, Raaijmakers, & Gabhainn, 2010). In fact, music may be a particularly effective stimulus to moderate emotional states. For example, after a sad mood is induced in the laboratory, listening to self-selected happy sounding music is more effective at improving mood than other manipulations (e.g., writing a positive reframing of the unpleasant event that was used to induce the negative mood; Sleigh & McElroy, 2014). Self-selected "depressing" music is also more effective than alternative manipulations at changing a mood from positive to negative.

One might speculate that participants often confuse perceived and felt emotions when making self-reports. Nevertheless, studies using physiological measures confirm that music listening is associated with emotional *arousal*, including increased electrodermal activity (EDA), heart rate, and respiration rate (Gomez & Danuser, 2004, 2007; Rickard, 2004; Salimpoor, Benovoy, Longo, Cooperstock, & Zatorre, 2009). Brain imaging during music listening also reveals patterns of activation associated with emotional arousal in the limbic system, including the amygdala, hippocampus, and hypothalamus, as well as parts of the paralimbic system (Blood & Zatorre, 2001; Blood, Zatorre, Bermudez, & Evans, 1999; Brattico et al., 2011; Koelsch, Fritz, Cramon, Müller, & Friederici, 2006; Menon & Levitin, 2005; Salimpoor et al., 2013). Far fewer physiological measures provide evidence that music induces changes in emotional *valence*, although facial electromyography (EMG) reveals that happy sounding music induces more zygomatic (smiling) activity compared to sad sounding music (Khalfa, Roy, Rainville, Dalla Bella, & Peretz, 2008; Witvliet & Vrana, 2007).

Music listening can also lower arousal levels to optimal levels in the presence of stressors. For example, participants who listen to relaxing music show faster recovery (measured with salivary cortisol levels) from a subsequent stressor compared to participants who listen to the sounds of nature or simply rest beforehand (Thoma et al., 2013). Even 6-month-old infants with low-baseline saliva cortisol levels show increases when they hear their mother sing, whereas infants with high-baseline levels show decreases (Shenfield, Trehub, & Nakata, 2003).

Some individuals report feeling little or no pleasure when listening to music (Mas-Herrero, Zatorre, Rodriguez-Fornells, & Marco-Pallarés, 2014), whereas other listeners—those who score high on the personality dimension called *openness-to-experience*—are particularly likely to feel actual emotions in response to music, especially positive ones (Liljeström, Juslin, & Västfjäll, 2013). The degree to which listeners become "absorbed" in music is also associated positively with their emotional responding (Kreutz, Ott, Teichmann, Osawa, & Vaitl, 2008; Sandstrom & Russo, 2013). When brain activity is measured using electroencephalography (EEG) while listening to the first movement of Beethoven's 5th Symphony, professional musicians show larger brain responses than amateurs do, which implies that they may also experience musically induced emotions more intensely (Mikutta, Maissen, Altorfer, Strik, & Koenig, 2014).

The listener's age and the context are also relevant. For example, older adults report more intense emotions than younger adults when listening to happy sounding music, and they exhibit higher levels of zygomatic EMG activity when listening to scary sounding music (Vieillard & Gilet, 2013). Listening to music with a close friend rather than listening alone is associated with more intense and positive emotional responses, whereas pieces self-selected by participants give rise to more intense emotional experiences than unfamiliar pieces do (Liljeström et al., 2013). In other words, familiarity is one mechanism that explains how music elicits emotional responding (Schellenberg, 2008). The role of other mechanisms remains unclear and contentious.

Mechanisms of Emotion Induction

Do affective responses to music result from something intrinsic to the music, or are they the result of cognitive appraisals, which are deemed to be central to emotional responding in general (Ellsworth & Scherer, 2003)? Some theorists suggest that music induces emotions without the need for cognitive appraisals. For example, one view holds that musically induced emotions are the result of automatic mirroring by listeners of the motor movements musicians use to communicate emotion (Molnar-Szakacs & Overy, 2006). Automatic mirroring is perhaps served by the mirror-neuron system, which spans cortical parieto-frontal motor regions (Rizzolatti & Sinigaglia, 2010; cf. Hickok, 2009). In line with this view, activations in cortical motor regions are evident during music listening (e.g., J. L. Chen, Penhune, & Zatorre, 2008; Koelsch, Gunter, Zysset, Lohmann, & Friederici, 2002; Maess, Koelsch, Gunter, & Friederici, 2001). As noted, however, the emotion listeners perceive in response to a musical piece is not always identical to the emotion experienced. Thus, mirroring cannot be the only mechanism of emotion induction.

Juslin and Västfjäll (2008) acknowledge the role of cognitive appraisals in emotional responding to music, but they propose six additional mechanisms that could lead to emotional responses without the need for cognition: (a) automatic brainstem reflexes to musical events such as loud, unexpected, or dissonant sounds, (b) evaluative conditioning—certain pieces are associated with pleasurable or negative events and evoke the same emotion as the original event, (c) emotional contagion—the emotion perceived by the listener is also experienced, (d) visual imagery associated with music, (e) associations between a piece and emotionally charged episodic memories, and (f) violation or fulfillment of musical expectations. Although Juslin and Västfjäll (2008) claim that these six mechanisms circumvent the need for cognitive appraisal, phenomena such as mental imagery and episodic memory are not independent of cognition (Konečni, 2008b). Whether emotional reactions to music can occur without cognitive appraisals is reminiscent of

the long-standing debates in emotion research (e.g., Lazarus, 1982; Zajonc, 1980) and unlikely to be resolved in the near future.

Which Emotions Does Music Evoke?

One relatively common emotional response to music is the pleasant experience of chills, shivers, or piloerection (i.e., goosebumps; Grewe, Katzur, Kopiez, & Altenmüller, 2010). For example, half of the sample studied by Goldstein (1980) reported experiencing music-induced chills. Musicians are more likely than nonmusicians to experience the phenomenon (Sloboda, 1991; but see Grewe, Kopiez, & Altenmüller, 2009), and people who score high on openness-to-experience are more likely than other individuals (McCrae, 2007; Silvia & Nusbaum, 2011). Huron (2006) proposes that chills are an automatic fight response in reaction to surprising stimuli that are judged initially to be threatening. Because a piece of music is non-threatening (unless it is deafeningly loud), the response turns to one of pleasure. Indeed, chills are often reported during unexpected or sudden musical events, such as sustained high pitches, unexpected harmonies, or sudden changes in loudness (Guhn, Hamm, & Zentner, 2007; Panksepp, 1995; Sloboda, 1991). Chills are also reported more often in response to slow rather than fast-tempo music (Guhn et al., 2007).

Chills that are evoked in response to self-selected music are accompanied by physiological changes indicative of emotional arousal, such as increases in electro-dermal activity (EDA), heart rate, and respiration rate, but decreases in body temperature (Grewe et al., 2009; Rickard, 2004; Salimpoor et al., 2009). The experience of chills also coincides with patterns of limbic and mesolimbic activity associated with reward processes (Blood & Zatorre, 2001; Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011).

Although chills represent a particularly intense emotional response to music, emotional responses to music vary widely in terms of quality and quantity (or intensity). Much debate centers around whether music evokes the same emotions as other stimuli such as faces or stories. In other words, does music induce *utilitarian* or everyday emotions (happiness, sadness, fear, anger, surprise) or does it induce strictly *aesthetic* emotions (such as wonder, awe, nostalgia, etc.)? Utilitarian emotions involve goal-relevant cognitive appraisals that motivate adaptive action tendencies, whereas aesthetic emotions are not goal-relevant and involve feelings of subjective pleasure in response to the structural characteristics of the stimulus itself (Scherer, 2004).

In a series of studies, Zentner et al. (2008) factor-analyzed participants' reports of felt emotions in response to music. If music induces utilitarian emotions, the solution should have revealed factors corresponding to such emotions as joy, anger, fear, disgust, and contempt. Instead, the analysis revealed nine dimensions that are more aesthetic than utilitarian in nature: wonder, transcendence, nostalgia, tenderness, peacefulness, joyful activation, tension, sadness, and power. Nevertheless, a majority of the participants were listeners who preferred classical music, a genre that may be more strongly associated with aesthetic emotions than other genres (e.g., heavy metal music may be more strongly associated with anger, the blues with sadness, etc.).

Aesthetic emotions can also occur in everyday situations. For instance, descriptions of aesthetic emotions appear to overlap in some respects with descriptions of flow experiences (Csikszentmihalyi, 1990), which arise in aesthetic (e.g., viewing a painting; Csikszentmihalyi & Robinson, 1990) as well as everyday (e.g., formal education; for review see Nakamura & Csikszentmihalyi, 2002) contexts. By definition, the goal of an activity becomes irrelevant during flow experiences, such that simply engaging in an activity (e.g., listening to music) gives rise to pleasure and intense absorption. Nonetheless, the constructs of flow (a diffuse positive affective state) and aesthetic emotions (feelings such as transcendence or tenderness) are not identical. In short, it is unclear whether music induces utilitarian or aesthetic emotions, and even whether aesthetic emotions are uniquely aesthetic.

A final issue is the ability of music to induce more than one emotion in the listener simultaneously. Fast-tempo music is considered to sound happier than slow-tempo music, just as major and minor modes are happy and sad sounding, respectively. By varying tempo and mode independently, it is possible to create music with conflicting cues (songs with fast tempo and minor mode or slow tempo and major mode), which elicits mixed emotions more so than music with consistent cues (fast and major, slow and minor; Hunter, Schellenberg, & Schimmack, 2008, 2010; Ladinig & Schellenberg, 2012; Larsen & Stastny, 2011). When participants' responses are recorded continuously as they listen to music with conflicting cues, "happy" and "sad" response keys are pressed at the same time, which suggests that they are experiencing happiness and sadness simultaneously and not simply vacillating between the two emotions over time (Larsen & Stastny, 2011).

Emotional responses are often measured along two continuous dimensions, one assessing arousal (low to high), and the other assessing valence (negative to positive), in line with the *circumplex model*, which posits that all emotions can be represented as points in two-dimensional (arousal by valence) space (Russell, 1980; Russell & Carroll, 1999). Because positive and negative emotions lie at opposite ends of the bipolar valence continuum, they cannot co-occur. Unlike the circumplex model, the *evaluative space model* (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997) proposes that negative and positive valence can be activated independently and therefore simultaneously. Findings of mixed affective responses to music are thought to provide support for the evaluative space model.

Self-reports of mixed emotions may be contaminated by confusions between perceived and experienced emotions, although listeners have been shown to distinguish mixed perceptions from mixed feelings (Hunter et al., 2010). Future research could determine whether self-reports of mixed emotions are reflected in physiological responses. EMG is likely to be particularly useful in this regard because it is sensitive to variations in valence (Khalfa et al., 2008; Witvliet & Vrana, 2007).

Music Preferences

Music preferences represent liking for individual pieces or specific genres of music, which reflect basic approach or avoidance responses. In general, adult listeners give higher liking, pleasantness, or preference ratings to happy over sad sounding music (e.g., Hunter et al., 2008, 2010; Husain, Thompson, & Schellenberg, 2002; Khalfa et al., 2008; Ladinig & Schellenberg, 2012; Thompson, Schellenberg, & Husain, 2001). Children's music liking is relatively unaffected by the valence of a piece. Instead, they prefer music that expresses high-arousal emotions such as happiness or anger, compared to low-arousal emotions such as sadness or peacefulness (Hunter et al., 2011).

Liking for a stimulus typically increases as a function of exposure (Zajonc, 1968), a phenomenon that has been demonstrated with music (Peretz, Gaudreau, & Bonnel, 1998; Schellenberg, Peretz, & Vieillard, 2008; Szpunar, Schellenberg, & Pliner, 2004). The effect extends beyond self-reports of liking, with familiarity being associated with elevated EDA (van den Bosch, Salimpoor, & Zatorre, 2013), and with activations in the limbic, paralimbic, and reward circuits of the brain (Pereira et al., 2011). These findings are also in line with claims that some sort of prior mental representation is necessary before pleasure can be experienced in response to music (Schubert, Hargreaves, & North, 2014). Nevertheless, the association between familiarity and liking is by no means linear. Overexposure to a piece within a short time frame leads to *decreases* in liking (Hunter & Schellenberg, 2011; Schellenberg et al., 2008; Szpunar et al., 2004). A slightly different pattern is evident for people who score high on openness-to-experience, who are more likely than other individuals to like novel musical pieces, and to start disliking a piece after fewer exposures (Hunter & Schellenberg, 2011).

In addition to preferring particular songs or pieces, people like some genres (e.g., classical, heavy metal) more than others. Listening to music from a preferred genre is associated with emotional benefits. For example, after participants are induced to feel anxious, exposure to music from a preferred genre reduces anxiety levels more than simply sitting in silence (Walworth, 2003). Listening to pieces from preferred genres is also associated with a larger, early EEG negativity component (Istók, Brattico, Jacobsen, Ritter, & Tervaniemi, 2013).

The study of associations between genre preferences and personality has a long history (e.g., Cattell & Anderson, 1953; Dollinger 1993; Rentfrow & Gosling, 2003). The most consistent results are evident for extraversion and openness-to-experience. Extraverts tend to prefer conventional, upbeat, energetic, or high-arousal genres such as pop, dance music, or hard rock (Dollinger, 1993; Pearson & Dollinger, 2004; Rentfrow & Gosling, 2003), whereas individuals who score high on openness tend to listen to a wider variety of genres (Dollinger, 1993; Miranda & Claes, 2008) and to like nonmainstream genres such as jazz or classical music (Dunn, de Ruyter, & Bouwhuis, 2011; Rentfrow & Gosling, 2003), or alternative music (Dys, Schellenberg, & MacLean, in press).

Liking Sad Sounding Music

Although adult listeners tend to prefer happy sounding pieces, people often seek out and enjoy sad sounding pieces. Individuals who score high on measures of empathy (Garrido & Schubert, 2011; Kreutz, Schubert, & Mitchell, 2008) or openness-to-experience (Ladinig & Schellenberg, 2012; Vuoskoski, Thompson, McIlwain, & Eerola, 2012) are particularly likely to enjoy sad sounding music, as are introverts (Ladinig & Schellenberg, 2012), and people who score high on a measure of "absorption" (Garrido & Schubert, 2011, 2013a; Kreutz et al., 2008). Music training is also predictive of intense emotional responding to sad-sounding music (Park et al., 2014).

When individuals are in a sad mood, they show mood congruency effects: increased liking for sad sounding music, and increased perceptions of sadness in music that is selected to sound neutral (Hunter, Schellenberg, & Griffith, 2011). Individuals with clinical depression may be especially likely to listen to music that expresses negative valence because it matches their chronic mood state (Wilhelm, Gillis, Schubert, & Whittle, 2013). In some instances, participants in a sad mood are less likely than participants in happy or neutral moods to choose to listen to happy sounding music, presumably because it is a poor match to how they are feeling (Friedman, Gordis, & Förster, 2012; Taylor & Friedman, 2014). A contrast effect has also been reported—preferences for sad sounding music increase after participants listen to multiple (but different) happy sounding pieces consecutively (Schellenberg, Corrigall, Ladinig, & Huron, 2012).

In general, people avoid situations associated with negative affect, which makes liking sad sounding music a puzzling phenomenon. One view holds that negative affect is inhibited in aesthetic contexts, such that it is pleasurable to experience *any* emotion when listening to music (Garrido & Schubert, 2011; Schubert, 1996). In line with this view, pieces that are perceived to sound sad also tend to be judged as beautiful (Eerola & Vuoskoski, 2010), and exposure to sad sounding music can improve sad mood states (Tsai, Chen, & Tsai, 2014; van den Tol & Edwards, 2014). Conflicting evidence emerges from behavioral and physiological studies, however, which often report that listening to sad sounding music does indeed induce negative emotions (e.g., Blood et al. , 1999; Garrido & Schubert, 2015; Green et al., 2008; Juslin, Liljeström, Laukka, Västfjäll, & Lundqvist, 2011; Mitterschiffthaler, Fu, Dalton, Andrew, & Williams, 2007; Vuoskoski et al., 2012).

Huron (2011) argues that sad sounding music induces genuine sadness accompanied by elevated levels of *prolactin*, a hormone that is associated with comfort and consolation, and released during episodes of sadness. Another possibility is that people enjoy listening to sad sounding music not because negative emotions are inhibited but because sad music simultaneously evokes both positive *and* negative emotions. In line with this view, participants report positive emotions such as nostalgia and wonder in addition to sadness when they listen to sad sounding music (Vuoskoski et al., 2012).

General Summary

Listeners perceive music as being emotionally expressive. They appear to use both basic acoustic cues, such as loudness, as well as music- and culture-specific cues, such as mode, to recognize emotions. Listeners can identify emotions expressed in unfamiliar music from other cultures with above-chance accuracy, which implies that there are universal cues to musical emotion. In addition to recognizing emotions in music, the available evidence confirms that listeners also experience emotions in response to music. Mechanisms of emotion induction are not well understood, however, and remain a central debate in the field. Also unclear is the range of emotions that music can induce, and whether these are similar to or different from everyday emotions. Music is likely to induce a wide range of emotions via multiple mechanisms. Music can also elicit mixed positive and negative responding simultaneously. Preferences for particular genres of music vary as a function of contextual factors and individual differences, whereas liking for music varies as a function of the emotion music conveys and evokes. Enjoyment of sad sounding music is poorly understood at present. All in all, the available research supports folk-psychological ideas of a deep connection between music and emotion. Emotions influence what music listeners choose to hear, and music influences how they feel.

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