Music and Emotion:
Seven Questions, Seven Answers
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From a lay person’s perspective, few issues in music psychology are more important than to explain how music evokes emotions in listeners. This is because such experiences are one of the primary reasons for engaging with music. Perhaps it may be a surprise to learn, then, that systematic efforts to understand emotions to music are quite recent (Juslin & Sloboda, 2010). Shaped by its origin in late 19th century general psychology with its focus on psychophysics and experimental control, music psychology mostly came to explore more ‘basic’ perceptual and cognitive processes involved in music listening (Deutsch, 1999). Sloboda was one of the driving forces in establishing ‘music cognition’ as a thriving research field in the 1980s. Yet, by the time his influential book, The Musical Mind (Sloboda, 1985), began to have an impact on the field (for a discussion, see, e.g., Sections 5 and 7 of this volume), Sloboda, always the restless scholar, had already moved on to another field that would blossom in the early 1990s: music and emotion. Still, in reviving Leonard B. Meyer’s (1956) classic theory about musical expectations, Sloboda (1991) showed that ‘cognition’ and ‘emotion’ might not be as far apart as one would think. Indeed, emotional responses to music require cognition (broadly defined). Sloboda would later be one of the researchers who helped to bring ‘music and emotion’ to the forefront, as a primary topic in music psychology (e.g., Thompson, 2009).

However, while being an enthusiastic contributor to, and patron of, music and emotion research, it was also Sloboda who posed the greatest challenges for the field. For instance, in his commentary on a special issue on the ‘Currents trends in the study of music and emotion’ (Juslin & Zentner, 2002), Sloboda raised the question ‘to what extent the research reported in this issue points to, explicates, and encourages an understanding of diversity and complexity in musical experience’ (Sloboda, 2002, p. 242). And in the closing chapter of his most recent book, he urged scholars to consider the social benefits of their work, and underlined the need
to provide ‘better answers’ to important questions (Sloboda, 2005). What is good about such challenges is that they may indeed motivate researchers to look for ‘better answers’.

In this chapter, I shall address seven questions that currently define the field of music and emotion. The goal is to demonstrate that the field has made some progress in answering these questions since Sloboda’s early work, and that the answers, even those that come from basic as opposed to applied research, could have important implications for broader society.

1. Does music arouse emotions in listeners?

It seems generally accepted that music is often perceived as expressive of emotions, and some progress has been made in mapping the musical factors involved in this process (Juslin, 2005, Table 5.1). But does music also arouse felt emotions? The answer to this question might seem obvious to the reader. Yet this question is to some extent still debated in the field, and it is not trivial, because it raises important issues about the definition and measurement of emotion. In regard to the first of the issues, note that whereas lay people tend to consider emotions mainly in terms of the phenomenological feelings they engender, researchers tend to define emotions in terms of a wider range of phenomena: emotions can increase our heart rate; activate certain brain regions; make us cry, laugh, or trash furniture; make us more prone to remember certain memories than others; and change our perception of the world – however momentarily.

A working definition of emotion that adopts this broader view may look like this:

Emotions are relatively brief, intense, and rapidly changing reactions to potentially important events (subjective challenges or opportunities) in the external or internal environment - often of a social nature - which involve a number of subcomponents (cognitive changes, subjective feelings, expressive behavior, and action tendencies) that are more or less ‘synchronized’ during an emotional episode.
Given this definition, it becomes pertinent to ask: to what extent may listening to music produce reactions in the various components of emotion? The most obvious form of evidence concerns subjective feeling. Listeners have repeatedly reported that they experience ‘feelings’ during music listening in experiments (Pike, 1972), survey studies (Gabrielsson, 2001), diary studies (Juslin et al., 2008), and qualitative interviews (DeNora, 2000). Although it may seem unlikely that people are mistaken about their own feelings (Griffiths, 1997), some researchers have claimed that verbal self-reports of musical emotions may be unreliable – either because listeners confuse the emotions expressed in the music with their own emotions, or because the listener is reporting an emotion simply because this is expected by the experimenter, so-called ‘demand characteristics’ (Orne, 1962). Therefore, several researchers have attempted to obtain other types of evidence, which cannot be explained (away) in such ways.

One emotion component which is far less subject to demand characteristics than verbal self-report of feelings – because it is not usually possible to control by will – is physiological response. Several experiments have shown that music listening can give rise to physiological responses very similar to those shown to other ‘emotional’ stimuli, including changes in heart rate, skin temperature, skin conductance, breathing and hormone secretion (see Hodges, 2010, for a recent review). Different pieces of music can produce different patterns of physiological response (Krumhansl, 1997), such that it is possible to discriminate among emotions based on psychophysiological variables by using multivariate techniques (Nykliček et al., 1997). More intense subjective feelings tend to involve more pronounced physiological reactions (Rickard, 2004), which may include ‘chills’ (Panksepp, 1995).

Independent support for emotional reactions to music also comes from recent studies of brain activation. Listeners’ responses to music involve many brain areas that are known from previous studies to be implicated in emotional responses. These include both sub-cortical and cortical areas (e.g., the thalamus, the hippocampus, the amygdala, the orbitofrontal cortex, the
insula, and the nucleus accumbens; see Blood & Zatorre, 2001; Brown et al., 2004; Koelsch et al., 2006).

Further evidence of emotions to music comes from expressive behavior. Music listening makes people cry, smile, laugh, and furrow their eyebrows – as indicated by observations and electromyographic (EMG) measures of facial muscles. Such responses have been documented under controlled laboratory conditions (e.g., Witvliet & Vrana, 2007), but may, of course, also be observed informally during concerts where facial, vocal, and bodily expressions of emotion are common. Crying to music seems to occur frequently (Frey, 1985), and may begin within a few seconds of hearing a piece of music. Expressive behavior is usually a distinct indicator of an emotion: As observed by Sloboda (1992), ‘it is very difficult to be mistaken about whether you cried or not to a piece of music’ (p. 39).

Music may also influence people’s action tendencies, such as the tendency to help other people (Fried & Berkowitz, 1979), to buy certain products (North & Hargreaves, 2010), or to move, whether overtly or covertly (Harrer & Harrer, 1977). Some musical contexts encourage overt actions in the listener (e.g., rock concerts, music in shops), whereas other contexts force the listener to listen ‘respectfully’; that is, still and silently (e.g., symphony concerts).

One final component of emotions involved in listening to music is regulation. Listeners regulate their own emotional responses to music with regard to what are deemed ‘appropriate’ responses in the social context (Becker, 2004; Gabrielson, 2001). For instance, a listener may become embarrassed if he or she is moved by a piece of music and starts to cry, and may thus attempt to regulate this emotion (e.g., by breathing slowly).²

It could be argued, perhaps, that several of the above studies have looked at only one of the components, and that this should not count as evidence if an emotion involves all or most of the components. Thus, Scherer and Zentner (2001, p. 363) proposed the quite conservative criterion that an emotion to music should involve ‘evidence of a synchronized response of all
or most organismic subsystems’ (or components). Such synchronization in response to music has recently been demonstrated. An experimental study measured self-reported feeling, facial muscle activity (EMG), and autonomic activity in 32 subjects while they listened to pieces of pop music that were composed with either a ‘happy’ or ‘sad’ expression. The results revealed a coherent manifestation in the experiential, expressive, and physiological components: Thus, for instance, ‘happy’ music produced more zygomatic facial muscle activity (smiling), greater skin conductance, lower finger temperature, more felt ‘happiness’, and less felt ‘sadness’ than ‘sad’ music. Furthermore, the effects of the music were generally large, suggesting that music can be a rather potent elicitor of emotions (Lundqvist, Carlsson, Hilmersson, & Juslin, 2009).

Such evidence of a synchronized reaction in multiple emotion components obtained in focused music listening in a controlled laboratory environment, is difficult to explain (away) for those who argue that music does not evoke emotions: If such a reaction is not an emotion, what is it? Synchronization is most easily observed during intense emotions, and seems to be stronger between feelings and expression, than between feelings and physiology (Mauss et al., 2005). Still, its presence may help us to distinguish arousal of emotions from mere perception, which is still a problem in the field (for a discussion, see Gabrielsson, 2002).

2. Which emotions does music arouse?

To the extent that we can agree that music arouses emotions (and most researchers do), the next question is which emotions music arouses. This is the issue of prevalence – that is, the relative frequency of occurrence of a phenomenon, such as emotional reactions to music, in the population of interest. This issue is commonly debated in the field, yet few studies have actually addressed it. Prevalence data are important, since they describe the phenomena that any theory of music and emotion must be able to explain. Sloboda (1992, Table 1) provided some seminal findings (see also Wells & Hakanen, 1991): Seventy-six college students were
asked to indicate which of 25 emotions they had experienced to music. Sadness and joy were the two emotional states experienced by most listeners (96.2 and 93.4 percent, respectively).

As interest in music and emotion has increased, more attention has been devoted to this issue. Recent evidence from a handful of survey studies suggests that music can evoke quite a wide range of affective states. Among the most frequently felt musical emotions, according to these survey studies, are: happiness, calm, nostalgia, love, sadness, interest, hope, excitement, and longing, as well various synonymous emotion terms (see Juslin & Laukka, 2004; Sloboda, 1992; Wells & Hakanen, 1991; Zentner, Grandjean, & Scherer, 2008).

However, the above studies share certain limitations. First, they relied on retrospective and aggregated estimates, which are subject to certain biases (e.g., Robinson & Clore, 2002). Second, the studies did not use a representative sample of participants – and it is well-known that precisely who participates in an investigation might have a profound effect on the results. Finally, the data were based on ratings of terms selected by the researcher. It could be argued that this issue should ideally be investigated using an open-ended response format, so that the participants are not influenced by the researcher’s pre-conceptions.

Of particular interest then are findings that are not subject to such limitations: In a large scale survey study (Juslin et al., 2009), based on a randomized and statistically representative sample of the Swedish population, over 700 participants reported their most recent emotional experience of music. They could describe their feelings in their own words rather than using a pre-selected list of terms. This unique set of episodic data revealed several notable tendencies: First, 84% of the episodes referred to positive as opposed to negative affective states. Second, 92% of the episodes referred to specific emotions, as opposed to broader (positive or negative) affect states. Third, of the specific emotion episodes, 89% featured ‘single’ emotions, whereas 11% featured ‘mixed’ emotions (e.g., happiness and sadness). Figure 1 presents the prevalence of specific emotions, in terms of the ten most frequently reported emotion categories. As seen,
music aroused a fairly broad range of emotions. The five most frequent emotions were happy elated, sad-melancholic, calm-content, nostalgic-longing, and aroused-alert. It can further be noted that affective states like wonder, awe, and chills seem to be experienced rarely to music in everyday life, as previously suggested by Huron (2006).

(Insert Figure 1 about here)

In sum, the findings from studies so far suggest that music listeners could experience anything from mere arousal, chills, and ‘basic’ emotions (e.g., happiness, sadness) to more ‘complex’ emotions (e.g., nostalgia, pride), and even ‘mixed’ emotions. This, then, is what any satisfactory theory of musical emotions must be able to explain.

Prevalence data from open-ended formats (such as those presented in Figure 1) may be especially useful to develop new reporting schemes for this domain (see Nielsen & Kaszniak, 2007). Indeed, several authors have proposed novel self-report scales specifically for musical emotions (e.g., Bartel, 1992; Juslin & Laukka, 2004, Table 5; Zentner et al., 2008). Although these scales are interesting and may be quite useful, it may be premature to commit ourselves to specific response formats until we have more prevalence data from different contexts. This is because the prevalence of specific emotions varies depending on the precise context, which leads us to consider the next question.

3. In what contexts do musical emotions occur?

Why is this issue important? If there is anything we have learned, it is that emotions to music can never be predicted from musical characteristics alone. Different listeners react differently to the same piece of music. And even the same listener reacts differently to the same music in different contexts. All musical emotions occur in a complex interplay between the listener, the music, and the situation. This interplay is obviously difficult to capture in a laboratory. Hence, to understand musical emotions, we must study them as they naturally occur in everyday life.
When the ‘social psychology of music’ blossomed in the early 1990s (e.g., Hargreaves & North, 1997), it helped music psychology move away from the typical 1980s paradigm of laboratory-based experiments concerning cognitive processes to a broader exploration of the ways in which music is utilized and experienced in everyday life. Again, Sloboda’s research was at the center of a new trend (Sloboda, O’Neill, & Ivaldi, 2001), which would offer novel opportunities for exploring ‘when’ and ‘where’ musical emotions actually occur, for instance using the *Experience Sampling Method* (ESM).³

Preliminary results (e.g., Juslin et al., 2008; see also North, Hargreaves, & Hargreaves, 2004; Sloboda et al., 2001) indicate that music in some form occurs in circa 30-40 percent of the episodes sampled randomly in everyday life by means of the ESM. However, music does not always evoke an emotion: Preliminary estimates indicate that we are only ‘moved’ by the music in 55-65% of the episodes featuring music; further, musical emotion episodes are most prevalent in the evening (followed by the afternoon, and the morning). Emotions to music are also more frequent during weekend days than during workdays. These patterns largely reflect patterns of work vs. leisure, with music occurring more often during leisure.

Moving on to the question of ‘where’, it is clear that musical emotions occur in a wide range of settings in everyday life. The settings have been characterized in terms of activities, physical locations, and social conditions. Survey (Juslin et al., 2009) and ESM data (Juslin et al., 2008) both indicate that the most common activities during musical emotions are focused music listening, travel, movie or TV watching, work/study, social interaction, and relaxation. Note, however, that in a random sample of 573 musical emotion episodes from everyday life, only a minority (15%) of the episodes featured focused music listening (Juslin et al., 2008). It further seems that attending a concert is a rare activity, even among people who are interested in music. Therefore, ‘live’ music is rarely the source of musical emotion in everyday life. The most common sources of music heard are instead: stereo equipment, personal computers, TV,
Walkmans/MP 3 players, and radio. The most commonly heard (and preferred) musical genre in emotion episodes in everyday life is ‘pop/rock’, suggesting that more research should focus on this musical genre in order to have ecological validity (Juslin et al., 2008, 2009 – the latter study featured a statistically representative sample of listeners from the Swedish population).

The settings in which emotions to music occur have also been analyzed in terms of the location. A few studies have shown that listeners are especially prone to experience emotions to music ‘at home’ and ‘outdoors’ (Juslin et al., 2008; North et al., 2004; Sloboda et al., 2001). However, in at least one of these studies (Juslin et al., 2008), the emotions were most frequent at home and outdoors mainly because participants spent most time there. Yet musical emotions can occur in a variety of locations, indicating that they are not really dependent on a particular location, with the exception of special concert experiences. This may seem to suggest that the context is not important after all. However, as noted earlier, the context might influence which emotions are evoked.

For example, consider the influence of social condition (i.e., if other people are present or not in the musical event): though music often occurs in social settings (e.g., with partner or friend), a significant proportion (circa 40%) of musical emotion episodes seem to occur when the listener is alone. Moreover, the social condition (alone vs. with others) seems to influence which emotions are induced. Some emotions, such as happiness-elation, pleasure-enjoyment, and anger-irritation, often occur in ‘social’ settings (during social interaction, among friends). Others, such as calm-contentment, nostalgia-longing, and sadness-melancholy, often occur in ‘solitary’ settings (listening alone). That the prevalence of specific emotions varies depending on the context – activity, location, social condition – highlights the need to use representative samples of situations in order to obtain valid estimates of prevalence (Juslin et al., 2008). Yet, claims about the prevalence of specific emotions to music are frequently made on the basis of data that do not involve representative samples of either listener or situations.
If the context affects which emotions are aroused by music, we might be tempted to ask: Can musical emotions even be **predicted** based on the context? Many scholars have noted that musical emotions may be ‘too subjective’ to be predictable (Gutheil, 1952, p. 11). Fortunately, data from a survey study indicate that musical emotions *can* be predicted to some extent from information about the context. Fifteen predictors were featured in a discriminant analysis, five for each of the main factors (i.e., listener, music, situation). The analysis focused on predicting three common emotion categories in a representative sample – *happy-elated*, *sad-melancholic*, and *nostalgic-longing*. Results revealed that these emotions could be predicted with an overall accuracy of 70% correct (compared to an accuracy of 33% that would be expected by chance). This success, however modest, suggests that musical emotions may not be too subjective to be modeled, in principle. However, the prediction was far from perfect, even though this analysis included many predictors in the music, the listener, and the situation (Juslin et al., 2009). Why is that? Is it perhaps because the analysis neglected another important variable: the underlying mechanism responsible for the arousal of the emotion. This leads us to the next question.

4. How does music arouse emotions?

Lay people are frequently puzzled by musical emotions, and so, it seems, are philosophers of music: ‘Music provides neither the objects nor, therefore, the belief-opportunities that would make it possible for musical works to arouse such emotions as anger, sadness, joy …’ (Kivy, 1990, p. 165). How, then, can music evoke these emotions, as well as numerous other states? To me, this is the most important question in the field. And it is an issue that indirectly holds the key to many other issues currently debated (see Section 7).

How emotions to music are caused has been addressed in two different ways: One way has been to map those factors (in the listener, the music, and the situation) that, in some way, influence emotions. Another way has been to develop a theory about the specific mechanism
that mediates among musical events and experienced emotions. I shall consider each of these approaches in turn.

The most common approach has been to explore causal factors. Research has revealed a number of factors in the individual that could potentially affect emotional responses to music, such as the listener’s age, gender, personality, musical training, music preference, and current mood (Abeles & Chung, 1996). Similarly, Gabrielsson (2001) suggested several factors in the situation that may potentially influence emotions, such as ‘physical factors’ (e.g., acoustic and visual conditions, time and place), ‘social factors’ (e.g., listening alone vs. with others, type of audience), and ‘special occasions and circumstances’ (e.g., a vacation). However, most studies have focused on causal factors in the music itself. In Sloboda (1991), 83 participants aged 16-70 (most of them musicians) were required to mention specific pieces of music, to which they could recall having experienced various physical manifestations associated with experiencing emotions. Having identified such pieces, which came mostly from classical music, they were then asked to specify the exact location within the music that provoked these reactions. Most participants reported whole pieces, movements, or sections of movements, which suggests an emotional response to the ‘overall’ character of the music (Table 3 in Sloboda, 1991). Such a response might reflect ‘emotional contagion’, based on the emotional expression of the piece (discussed in a section below). However, about a third of the participants were able to locate their reaction within a theme or smaller unit. The data showed that musical events associated with ‘tears’ (i.e., crying, lump in the throat) commonly contained melodic appoggiaturas and melodic or harmonic sequences; events associated with ‘shivers’ (i.e., goose pimples, shivers down the spine) usually contained a new or unprepared harmony; and events associated with ‘heart reactions’ contained syncopations or prominent events occurring earlier than prepared for. What is particularly interesting about Sloboda’s study is that unlike most other studies, it does not only point to links between musical factors and emotional responses, it also attempts
to relate these links to a possible mechanism: The results are related to Meyer’s (1956) notion that schematically based *musical expectancies*, and violations of these, play an important role in emotional responses to music (discussed below). Hence, Sloboda’s early interest in the role of musical expectancy may be seen to have foreshadowed more recent approaches to emotion causation in music that focus on underlying mechanisms (Juslin & Västfjäll, 2008a, 2008b).

Understanding the important role of underlying mechanisms in accounting for emotions to music requires a broader consideration of the issue of how, precisely, emotions are evoked. General research on emotions and stress soon discovered that it was difficult to find objective situation predictors that would (invariably) affect different persons in the same way: different persons tend to react in different ways to the ‘same’ stimulus. This realization forms the basis of theories of emotion causation (for an overview, see Moors, 2009): to be able to explain the individual differences among people, it becomes necessary to describe what happens *between* objects and emotions. The term *psychological mechanism* refers to this mediation, the type of ‘information processing’ in the brain that leads to the arousal of an emotion.

The most commonly discussed mechanism is *cognitive appraisal* (e.g., Scherer, 1999). Cognitive appraisal refers to a process whereby an emotion is evoked in a person because an event is interpreted as having important implications for the person’s goals (in terms of goal congruence, coping potential, or compatibility with social norms). The problem is that music as such rarely has implications for life goals. Indeed, preliminary data indicate that cognitive appraisal is rarely the cause of musical emotions in everyday life (Juslin et al., 2008), casting serious doubts on Scherer and Zentner’s (2001) argument that componential process theories (appraisal theories) are ‘better suited to provide the theoretical underpinnings for research on the specific emotions produced by different types of music’ (p. 381). Quite to the opposite, it seems necessary to study other mechanisms that are more relevant in the case of music. Some scholars have discussed possible mechanisms, typically focusing on one or a few possibilities
(e.g., Berlyne, 1971; Dowling & Harwood, 1986; Sloboda & Juslin, 2001; Scherer & Zentner, 2001), but the most comprehensive attempt to delineate the various mechanisms that underlie musical emotions is the BRECVEM model (Juslin et al., 2010), which postulates no less than seven mechanisms (besides cognitive appraisal) through which music might induce emotions: namely *Brain stem reflexes, Rhythmic entrainment, Evaluative conditioning, Contagion, Visual imagery, Episodic memory,* and *Musical expectancy.*

The point of departure is an evolutionary perspective on the emotion induction process. Mechanisms of emotion induction are regarded as information-processing devices at various levels of the brain, which use distinct types of information to guide future behavior. As Patel (2008) notes, humans are unparalleled in their ability to make sense out of sound – including music. The mechanisms are conceived of as based on a number of more or less distinct brain functions that have developed gradually and in a specific order during evolution. Because the mechanisms depend on functions of different evolutionary origins, each mechanism will have unique characteristics that influence its functioning. Some mechanisms operate at lower ‘sub cortical’ levels: their processing is largely subconscious, automatic, and independent of other psychological processes (this is so-called ‘modularity’). Other mechanisms operate at higher cortical levels: their processing is more available to consciousness, can be influenced by will to some extent, and is easily ‘distracted’ by competing stimuli or processing. The mechanisms may interact to some extent, leading to conflicting outputs under certain circumstances, hence the occurrence of ‘mixed emotions’ in response to music (see Section 2).

None of the mechanisms evolved for the sake of music, but they may all be recruited in interesting (and perhaps unique) ways by musical events. Each mechanism is responsive to its own combination of information in the music, the listener, and the situation. The mechanisms do not necessarily treat ‘musical’ events as distinct from other events, which can explain why music can evoke even emotions that do not appear to ‘make sense’ in a musical context. Each
mechanism has a tendency to arouse some emotions rather than others, but between them, the mechanisms can account for a wide range of emotions. The seven mechanisms featured in the BRECVEM framework may be described as follows (for a detailed discussion and references, see Juslin & Västfjäll, 2008a, 2008b; Juslin et al., 2010):

**Brain stem reflex** refers to a process whereby an emotion is induced by music because one or more fundamental acoustic characteristics of the music are taken by the brain stem to signal a potentially important and urgent event that needs attention. In music, this may involve sounds that are sudden, loud, dissonant, and feature fast or rapidly changing temporal patterns. Brain stem reflexes are quick, automatic, and unlearned. A response to an auditory event suggesting ‘danger’ can be emitted as early as at the level of the inferior colliculus of the brain stem. (An example of a musical stimulus that could evoke a brain stem reflex is the kettledrum stroke in Joseph Haydn’s Symphony No. 94.) This mechanism, however, will primarily evoke arousal, rather than discrete emotions.

**Rhythmic entrainment** refers to a process whereby an emotion is evoked by a piece of music because a powerful, external rhythm in the music influences some internal bodily rhythm of the listener (e.g., heart rate), such that the latter rhythm adjusts toward and eventually ‘locks in’ to a common periodicity. The adjusted heart rate can then spread to other components of emotion such as feeling, through ‘proprioceptive feedback’. This may produce an increased level of arousal in the listener. Musical properties that can contribute to such reactions are a strong pulse (e.g., ‘techno music’), preferably one that is relatively close to the natural heart rate or respiration of the listener, and a tempo *accelerando* that may help to ‘drive’ the pulse. Since ‘oscillators’ (autonomous rhythmic processes) do not synchronize instantaneously, the entrainment mechanism is a slower induction process than a brain stem reflex. However, the entrainment-inducing qualities of music might produce feelings of arousal, communion, and perhaps even trance-like altered states of consciousness (e.g., shamanic rituals, rave parties).
*Evaluative conditioning* (EC) refers to a process whereby an emotion is induced by a piece of music simply because this stimulus has often been paired with other positive or negative stimuli. For example, a particular piece of music may have occurred repeatedly together in time with a specific event that always makes you happy, such as meeting your friends. Over time, through repeated pairings, the music itself will eventually evoke happiness even in the absence of the friendly interaction. EC may occur even if one is unaware of the contingency of the two stimuli. Which element of the music best serves as the ‘conditioned stimulus’ and its degree of generalization and discrimination remain to be explored - though the melody or theme of the music could be especially effective, as illustrated for instance by Wagner in his *Leitmotif* strategy. EC depends on unconscious, unintentional and effortless processes which can be subtly influenced by mundane musical events in everyday life.

Emotional *contagion* refers to a process whereby an emotion is induced by a piece of music because the listener perceives the emotional expression of the music, and then ‘mimics’ this expression internally. Why would listeners react in such a way to music? The answer lies in the fact that music often features acoustical patterns similar to those that occur in emotional speech. One might thus hypothesize that that we get aroused by voice-like features of music because a brain module responds quickly and automatically to certain stimulus features *as if* they were coming from a human voice conveying emotion – presumably through some kind of ‘mirror neuron’ system involved in empathic responses. Instrumental teaching often aims for the voice as an ideal, and most music today includes vocals, making a contagion reaction even more plausible. However, this could also involve ‘voice-like’ instruments, like the cello or the violin. Indeed, I have theorized that a ‘contagion module’ in the brain might treat such instruments as ‘super-expressive voices’: they are reminiscent of the human voice and yet go much further in terms of their expressive features (e.g., wider pitch range).
Visual imagery refers to a process whereby an emotion is evoked in the listener because he or she conjures up inner images (e.g., of a beautiful landscape) while listening to the music. The listener appears to conceptualize the musical structure via a metaphorical, nonverbal mapping between the metaphorical affordances of the music and ‘image-schemata’, grounded in bodily experience. For instance, in listening to a piece one can hear a melodic movement as ‘upward’ and then visualize oneself ‘flying higher’. Listeners may presumably respond to these mental images much in the same way as they would to the same stimuli in the ‘real’ world. Note that the listener may influence the imagery to a considerable extent: Although images might come into the mind unbidden, in general a listener may conjure up, manipulate, and dismiss images at will. Yet, certain musical features (e.g., repetition; predictability in melodic, harmonic, and rhythmic elements; slow tempo) may be especially effective in stimulating imagery. It should be noted that there are wide individual differences between listeners regarding imagery: Some experience it regularly, whereas others hardly experience it at all.

Episodic memory refers to a process whereby an emotion is induced in a listener because the music evokes a personal memory of a specific event in the listener’s life. Music often evokes episodic memories (the ‘Darling, they are playing our tune’ phenomenon), and some of these can be strongly emotional, perhaps because the physiological reaction patterns to the original events are stored in memory along with the experiential content. Episodic memory appears to be one of the most common sources of emotions to music, judging from ESM data. Listeners actively use music to remind them of valued past events, which suggests that music serves an important nostalgic function in everyday life. Episodic memories associated with music from young adulthood seem especially vivid, perhaps because many self-defining experiences tend to occur at this stage of life development, with music playing a prominent role in establishing a self-identity. Episodic memories featuring music can truly be the ‘soundtrack of our lives’.
Musical expectancy refers to a process whereby an emotion is induced in a listener because a specific feature of the music violates, delays or confirms the listener’s expectations about the continuation of the music. However, this concept does not involve any unexpected event that can occur in relation to music. It only refers to musical expectancies that involve syntactical relationships between different parts of the musical structure. Such expectations are based on the listener’s previous experiences of the same musical style, as suggested by Leonard Meyer. Emotional reactions to music are usually evoked when the listener’s musical expectations are somehow disrupted, for instance by unprepared or unexpected harmonic changes, as shown in Sloboda’s seminal research. Syntactic processing in language and music may share a common set of processes for syntactical integration (Patel, 2008).

What, then, are the essential characteristics of these seven psychological mechanisms? By synthesizing theory and findings from various domains mostly outside music, Juslin and Västfjäll (2008a) were able to provide the first set of hypotheses that can help researchers to distinguish among the proposed mechanisms. An updated version of these hypotheses (from Juslin et al., 2010) is provided in Table 1. The crucial point is that each mechanism has some unique characteristics, and that failure to distinguish between the mechanisms in studies may lead to seemingly inconsistent findings. Most studies in the field have looked for simple one-to-one relationships between music and emotion. This is essentially a ‘behaviorist’ approach, since it focuses on stimulus-response relationships, while ignoring intervening psychological processes. The problem is that when you play a piece of music for a listener, any of a number of mechanisms can be activated, and depending on which one, the results (e.g., feelings, brain regions involved, process characteristics) may be quite different (see Table 1).

(Insert Table 1 about here)

If the above reasoning is correct – that musical emotions reflect general mechanisms of emotion induction activated by music – this raises another recurring question in the field.
5. Are musical emotions different from other emotions?

In my estimation, there is no simple ‘yes’ or ‘no’ answer to this question, because the answer depends on what we mean: ‘different’ in what sense? Indeed, the question can be approached in a number of ways.

One approach to the question is to ask whether there are types of affective states which music cannot evoke, but that occur in other contexts. Thus, for example, some scholars have argued that music cannot arouse proper emotions, it can only arouse moods. However, there are several findings suggesting that what music listeners experience are emotions rather than just moods. Besides the fact that the induction process involves a specific ‘object’ (the music or, more specifically, certain information in the music processed in relation to individual and situational factors), the states last for only a brief duration (e.g., Scherer, Zentner, & Schacht, 2002); they have a relatively strong intensity (e.g., Juslin et al., 2008, 2009); and they include autonomic responses (Krumhansl, 1997). All these features are believed to be associated with emotions, rather than moods (e.g., Beedie, Terry, & Lane, 2005). Hence, the notion that music can only arouse moods appears to be without merit.

Another approach is to argue that music can only arouse certain emotions. For example, some scholars have suggested that music does not arouse emotions of the ‘garden variety’, or ‘basic’ emotions (see Kivy, 1990; Scherer, 2003). As should be apparent, this notion has been disconfirmed by a large number of studies which clearly suggest that music can arouse ‘basic’ emotions – such as happiness, sadness, and anger – in listeners (e.g., Juslin & Laukka, 2004; Scherer, Zentner, & Schacht, 2002; Sloboda, 1992). Juslin et al. (2010) argued that the notion that music does not induce ‘basic’ emotions rests on the mistaken assumption that such states can only be aroused by cognitive appraisals in relation to life goals (Kivy, 1990), which is not the case, as we saw in Section 4 (see Table 1). ‘Basic’ emotions can be aroused by both music and non-musical stimuli through mechanisms other than cognitive appraisal (e.g., contagion).
Some scholars have argued that music – or ‘art’ more generally – might arouse ‘unique’ emotions not experienced in everyday life. Swanwick (1985) proposed that “emotions in ‘life’ … and emotions we might experience as a result of engaging with music are not the same” (p. 29). However, so far, no one has been able to present any convincing evidence of such ‘music-unique’ emotions. Proposals have involved states that either occur in other realms of life (e.g., pleasure, wonder, nostalgia, awe, feeling moved) or cannot seriously be regarded as emotions (e.g., cognitive irony).

However, although music may not evoke ‘unique’ emotions, it could involve a specific frequency distribution of emotions. Juslin et al. (2008) were the first to provide estimates of prevalence of specific emotions in response to both musical and non-musical events using a representative sample of everyday situations. There were both similarities and differences in the results. The overall trend was similar for musical and non-musical emotion episodes: For instance, calm-contentment and happiness- elation were the most frequently felt emotions and shame-guilt and disgust-contempt the least frequently felt emotions, regardless of the type of episode. Further, positively valenced emotions were more common than negatively valenced emotions in both types of episodes. But there were also some differences: Happiness- elation and nostalgia-longing were more common during musical emotion episodes than during non-musical episodes. Conversely, anger-irritation, boredom-indifference, and anxiety-fear were more common during non-musical episodes than during musical emotion episodes. Moreover, and as hypothesized, musical emotions involved a larger proportion of positive emotions than did non-musical emotions. Hence, it might be the case that, although music evokes several of the same emotions as other stimuli in life, music has a characteristic frequency distribution of emotions that is skewed towards positive emotions. This could be just one example of a more general phenomenon – that there are different frequency distributions across the spectrum of emotions as a function of the precise context sampled (e.g., music, sports, politics).
In addition, it seems likely that musical emotions could have some other characteristics. For instance, Frijda and Sundararajan (2007) proposed the notion of refined emotions, which could be relevant in a musical context. This notion does not actually refer to a special sub-set of emotions (e.g., that anger is ‘coarse’ whereas love is ‘refined’), but rather to a special mode of experiencing all the ordinary emotions - characterized by attitudes of detachment, restraint, self-reflexivity, and savoring. This mode of experiencing emotions may well occur in relation to music, but occurs also in connection with religion, gourmet food, and so forth.

Does this mean that there is nothing unique about our musical experiences? No, musical experiences are unique in many ways, I believe. But perhaps not because of the emotions they involve. This leads us to the next question.

6. What is the role of emotion in musical experience?

The answer to this question depends on what musical experiences may entail. Gabrielsson’s (2001) descriptive system indicates that they involve a number of features, such as physical, behavioural, perceptual, cognitive, existential, and developmental features. Emotion is only one of them. Hence, we should be careful not to equate ‘musical experience’ with ‘emotion’, because clearly there is much more to ‘musical experience’ than just emotion. Many musical experiences may not involve emotion at all. When emotions do occur, I think they contribute by adding a more deeply personal significance to the musical experience (e.g., by connecting it to our life history). But we should be more open to the possibility that much of what makes musical experiences unique are truly non-emotional aspects, such as the conscious perception of musical structure or form and its subtle dynamic changes over time; by avoiding to refer to such experiential qualia as ‘emotion’ or ‘feeling’, we can also avoid some of the controversy that has surrounded these concepts in musical contexts (Juslin & Västfjäll, 2008b).
On the other hand, if ‘emotion’ and ‘feeling’, as normally defined by emotion scholars, do not capture everything relevant in musical experiences, one might predict that, in the long term, the field of music and emotion may eventually be subsumed under the far broader field of ‘music experience’ to explain more comprehensively how music is experienced. This will, eventually, have to involve the thorny issue of how ‘emotion’ relates to ‘aesthetic experience’.

Common conceptions of aesthetic experience emphasize its focus on an art object’s *aesthetic properties* – its form and content. And according to Levenson (2003), it is widely agreed that aesthetic properties are *perceptual* properties relevant to the *aesthetic value* of the object that possesses them (p. 6). What, exactly, should count as ‘aesthetically valuable’ is still debated. Is it beauty? Expressivity? Originality? It is similarly unclear whether an aesthetic response is necessarily emotional.

I have argued that, although an emotion may often co-occur with an aesthetic response, it is not a *required* feature for a listener’s response to qualify as ‘aesthetic’. Rather, ‘emotion’, ‘preference’, and ‘aesthetic response’ are partly independent phenomena that, however, tend to influence each other (e.g., Juslin et al., 2010). A few examples may suffice to illustrate this point: First (as Section 4 should have made clear), it is perfectly possible for a piece of music to evoke an emotion in a listener, without the listener experiencing anything like an ‘aesthetic response’. For instance, a piece of music may subconsciously evoke sadness in a listener who does not even attend to the sounds, simply because the music has repeatedly been paired with sadness-evoking stimuli in the past (i.e., evaluative conditioning).

Secondly, it is possible to prefer a piece of music heard on the radio over a piece heard earlier, without the music arousing any emotion (with a synchronized response in experience, physiology, and expression). In addition, this liking response need not involve an evaluation of the piece’s quality as an ‘art’ object, because the music in question (say, a pop song) might not be regarded as ‘art’ and therefore does not invite an ‘aesthetic attitude’ in the listener.
Finally, despite the frequently occurring term ‘aesthetic emotion’, an aesthetic response may well occur without either emotion or liking. In fact, it has repeatedly been argued that an aesthetic response is - or should be - a ‘detached’ or ‘distanced’ consideration of an art object that does *not* let emotions ‘come in the way’. Thus, we can evaluate an art object (including a piece of music), without *necessarily* experiencing any emotional response. Members of a jury in a piano performance contest repeatedly make evaluations of the aesthetic merit of different interpretations, but the circumstances may not be optimal for experiencing emotions.

With regard to music, emotions may *co-occur* with aesthetic evaluations (being aroused independently by the seven mechanisms), or they may follow partly *as a result* of an aesthetic evaluation. (If we do value an ‘art’ object very highly, chances are that we cannot avoid being ‘moved’ by the object!) But if emotions to music in everyday life were typically dependent on an aesthetic evaluation, then emotions such as *wonder* and *awe* should be frequent reactions to music in everyday life. This is not the case – as we saw earlier (Section 2). This is presumably because emotions to music in everyday life are most commonly produced by mechanisms that are independent of the listener’s aesthetic evaluation, if any. I acknowledge that there is plenty of disagreement on all of these issues. This leads me to the final question of my essay.

7. Why can’t we ever seem to agree on any of these issues?

There are probably many factors that contribute to current disagreements, such as conceptual confusion and a lack of relevant empirical data. And because the topic of musical emotions is so close to the heart of why most of us engage with music, one sometimes gets the impression that scholars are motivated by what they *want* emotional responses to music to be, rather than what they really *are* for most people. However, the most important source of disagreement, in my view, is that scholars are talking about different things: We need to recognize that *musical emotion is not a unitary phenomenon*. Take the issue of mechanisms, for instance. We can ask
several questions, such as: Which emotions can music arouse? How early do musical emotions develop? Is the listener active or passive in the causal process? How much time does it take to arouse an emotion through music listening? Are musical emotions innate or learned reactions? For all these questions, the answer depends on the precise mechanism concerned (cf. Table 1). Thus, I would like to voice a plea for more precision in talking about musical emotions so that we can separate genuine disagreement on substantial issues from mere miscommunication.

8. Coda: The social benefits of basic research

In this chapter, I have offered a broad description of the nature of musical emotions. The goal was to highlight the primary questions in this field, and what concrete answers the field has to offer. This relates to one of the themes in Sloboda’s contribution to music psychology: that of asking the important questions (Clarke, this volume).

In this final section, I will address another recurrent theme in Sloboda’s contribution to the field, which is the ‘applicability’ of music-psychological research (Imberty, this volume). Sloboda has emphasized the responsibility of scholars to consider the social benefits of their work. The question arises as to how best to assume this responsibility as a music researcher. Because I consider John my friend, I will respectfully and in the spirit of scholarly exchange take issue with his proposal, laid out for instance in Sloboda (2005), that the highest level of ‘socially responsible engagement in research’ is to focus directly on ‘benefits’. I will submit that good basic research on theoretically relevant issues is of primary importance for applied research, and that the latter will in fact soon go astray without the foundation of the former. I will illustrate this in regard to music and emotion, the field I am most familiar with.

Current applications of research on musical emotions include music therapy, film music, marketing, health care, and the gaming industry (Juslin, 2009). Most of these applications are based on intuition, rather than systematic scientific knowledge. This does not mean, however,
that there is no research aimed at these domains; for example, there is currently an abundance of studies on music therapy and other health applications. Rather, the problem is that research thus far has primarily adopted an approach to music that Sloboda (2005) has referred to as the ‘pharmaceutical’ (or ‘vitamin’) model of music, ‘ascribing to the music a mandatory power of bringing about certain perceptual, cognitive or emotional responses in a listener’ (p. 193). One example is the music provided by the Muzak corporation. Unwittingly, perhaps, studies with a focus on social benefits have tended to follow the same model: that is, applied research – with the best of intents – has tended to focus on superficial one-to-one relations between music and response, thus by-passing the theoretical understanding that is required to obtain some control over the phenomenon in question. That this approach does not work, has been shown in many contexts, including music therapy: ‘Musical selections that are relaxing and meditative to one client can be disruptive and annoying to another’ (Guzzetta, 1991, p. 159).

An important implication of the multi-mechanism framework outlined above, which is a clear case of basic research (level 1 in Sloboda’s scheme), is that a given piece of music might not be the ‘same’ stimulus for different listeners: how the listener will respond depends on the psychological mechanism activated in the event. Only a deep theoretical understanding of the underlying mechanisms will permit a practitioner to apply the music in a manner that actively manipulates particular mechanisms so as to achieve predictable effects on emotion and health. The theory required to do this is not likely to come from applied research (Sloboda’s level 3)\(^9\), whether due to time constraints or failure to understand its important role. Yet only by having this deeper understanding may social benefits be maximized. Sloboda (2005) admits that ‘it is not always possible to make an accurate assessment of the applicability of research in advance of conducting the research’ (p. 414). More importantly, in my view, an applied approach may never discover the best solution to a practical problem.
One possible reason for this contra-intuitive fact is that basic research may afford to ask much broader questions than applied research can: the former can ask ‘how does music evoke emotion?’, whereas the latter may be forced to ask ‘what music would calm this patient?’ The irony is that approaches developed to answer the first question are likely to offer more useful answers also to the latter question, because they produce more flexible knowledge. This is an example of how basic research may lead to greater applicability and benefit (eventually) than applied research aimed directly at social benefits. I want to emphasize here that I do not wish to deny the central importance of considering social benefits in research, but rather that doing so to the exclusion of sound ‘basic’ research of theoretical relevance is likely to do more harm than good: there is no more applicable knowledge than that which derives from a theoretically sophisticated understanding of the phenomenon in question. Hence, conducting basic research may be just as valuable as research explicitly identified as ‘applicable’. Sloboda’s valorisation of basic and applied approaches, in his hierarchy of ‘levels of responsible social engagement’, rests on an over-simplified view of the roles of ‘basic’ and ‘applied’ research and their relative benefits for society – clearly, we need both.

Sloboda’s challenges to the field of music and emotion, his calls to come up with better answers, and his own landmark studies have themselves all served to ‘sharpen’ basic research approaches to exploring the music-emotional mind, by focusing on the crucial questions. This endeavor will, no doubt, continue to fascinate generations of music researchers – and will also hopefully lead to a range of social benefits.
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References


Footnotes

1. Musical emotions is used here simply as a short term for ‘emotions that were aroused by music’.

2. An additional type of evidence of emotions to music involves indirect measures such as writing speed, word association, and decision time (Juslin & Västfjäll, 2008a; Table 3).

3. The Experience Sampling Method means that the participants are provided with small palmtop computers that they carry with them at all waking hours during a week or so. During the week, the palmtop emits sound signals at certain predetermined or random intervals. Each time the participant hears the signal, he or she should respond to some questions administered by the palmtop about his or her latest musical experience (e.g., Juslin et al., 2008).

4. This may reflect the increasing use of portable music players (e.g., mp3 players, music cell phones), which tend to enhance the influences of choice (Sloboda et al., 2001), familiarity (Bartel, 1992), and liking (Juslin et al., 2008) of music – all of which may influence emotions.

5. A simple form of unexpectedness (e.g., the sudden onset of a loud tone) would instead be an example of the mechanism termed brain stem reflex. Similarly, more general surprising features of a musical event (e.g., that a concert was better than a listener had expected) would instead be an example of the mechanism cognitive appraisal.

6. The mechanisms described here do not address the lyrics of music. However, data from survey and ESM studies suggest that lyrics are rarely the cause of emotions to music (Juslin et al., 2008, 2009).

7. Preference is generally regarded in the affective sciences as a long-lasting affective state of a low intensity (e.g., liking a particular artist or musical genre).

8. It is slightly ironic that the ‘social benefits perspective’ that Sloboda (2005) has been advocating may itself contribute to the very ‘vitamin model’ of music that he clearly rejects.