

Does Music Induce Emotion? A Theoretical and Methodological Analysis

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Is music ubiquitous in part because it is causally linked to emotion? In this article, a comprehensive theoretical and methodological reevaluation is presented of a classical problem: The direct induction of emotion by music (M→E). The author's Prototypical Emotion-Episode Model (PEEM) is used in the conceptual critique. A close scrutiny of the major published studies, and the author's new data regarding some substantive and methodological issues in several of these, reveal weak support for the M→E model. The conclusion seems justified that music may induce low-grade basic emotions through mediators, such as dance and cognitive associations to real-world events. However, it is suggested—on the basis of the recently developed Aesthetic Trinity Theory (ATT; Konečni, 2005) and its further development in the present article—that *being moved* and *aesthetic awe*, often accompanied by *thrills*, may be the most genuine and profound music-related emotional states.

Keywords: music and emotion, Prototypical Emotion-Episode Model (PEEM), Aesthetic Trinity Theory (ATT), awe, thrills/chills

An important aspect of the recent surge of interest in affective science (e.g., Barrett, 2006a, 2006b; Buck, 1999; Davidson, Scherer, & Goldsmith, 2003; Ekman & Davidson, 1994; Izard, 2007; Lewis & Haviland-Jones, 2000; Panksepp, 2007; Russell, 2003; Scherer, Schorr, & Johnstone, 2001; Zajonc, 1998) has been the study of the relationship between music and emotion (hereafter M-E; e.g., Gabrielsson, 2001-2002; Grewe, Nagel, Kopiez, & Altenmüller, 2007; Juslin & Sloboda, 2001b; Konečni, 2003; Konečni, Brown, & Wanic, in press; Konečni, Wanic, & Brown, 2007; Krumhansl, 1997; Panksepp, 1995; Scherer, Zentner, & Schacht, 2001-2002). Historically, and limiting oneself to Mediterranean civilizations, opinions concerning M-E can be found as early as in Plato, who, in Book III of *The Republic*, insists on tethering music to high-minded words and banishing from his ideal city-state several modes, such as the Ionian and Lydian, which—through their alleged effects on emotion—are “associated with drinking and laxity. . . softness [and] indolence” (trans. 1985, p. 96).

There subsequently arose a long tradition of speculative writing on M-E by aestheticians and musicologists, with notable contributions by Avison (1752/2003), Hanslick (1854/1957), Gurney (1880/1966), Langer (1942) and Meyer (1956), whose ideas are

very much alive in the contemporary thought of philosophers of music, such as Davies (1994, 2001); Kivy (1989, 1990); Levinson (1990, 1996); London (2001-2002), and Zangwill (2004). In *The Descent of Man*, Darwin (1871/1902, pp. 735–737) famously pursued M-E with regard to sexual selection—an idea recently addressed by Miller (2000).

In perusing this voluminous literature, one is struck equally by the brilliant insights of the authors (sophisticated music lovers, as well as first-rate scholars, all) and the frequency of quirky errors, such as seeming to forget that music is not a sentient being. In addition, arguments often seem overly influenced by folk parlance and music teachers' implicit and explicit M-E “theories” and stereotypes. It is not an exaggeration to say that with regard to M-E, romanticism and sentimentalism often obscure both the facts and their absence even in highly technical papers.

Perhaps the central analytical and empirical M-E issues are expression and induction of emotion by music. In addressing this issue, Kivy (1989; 1990, p. 146) has outlined the *cognitivist* versus *emotivist* dichotomy to contrast the view toward M-E in which music is thought merely to represent or “express” emotion from the one in which it is also seen as an *inducer* of emotion in the listener (M→E). Psychologists (e.g., Grewe et al., 2007, p. 774; Krumhansl, 1997, p. 338; Scherer & Zentner, 2001, p. 361) generally cite this dichotomy—which undoubtedly has a classical pedigree—approvingly, as a basic issue. Although Kivy's dichotomy will turn out to be an oversimplification and that even viewing these terms as poles of a continuum (Gabrielsson, 2001-2002, p. 124) is unsatisfactory, the fact remains that music's ability to express emotion will in a sense form the backdrop for the discussion of induction.

The present article will demonstrate that, in contrast to the remarkable popularity, seemingly of long standing, among both music psychologists and the general public of the view that music can directly induce emotion in the listener, the body of research that purports to support M→E is recent and unconvincing. The actual number of relevant studies is quite small. The common

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I thank the following UCSD students who provided invaluable assistance in the collection of the data reported in this article during the period 2001–2007: Melia C. Avansino, Amy Gonzales, Laura Lindberg, Scott T. Mitten, Jay Moses, Kim Nguyen, Kevin Rainey, Rayik Samara, Liana Salaymeh, Shadi Sedighzadeh, and Sally A. Smith.

My thanks are also due to Alf Gabrielsson of Uppsala University, Sweden, for the permission to quote two brief excerpts from our personal correspondence.

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impression of the existence of a multitude of relevant studies has been created primarily by not distinguishing between emotion and mood—a key substantive distinction based on suddenness-of-onset, duration, intensity, and other criteria and commonly accepted in affective science (e.g., Konečni, in press, section 5.1.; Larsen, 2000, pp. 129–130; Oatley, Keltner, & Jenkins, 2006, p. 30; Parkinson, Totterdell, Briner, & Reynolds, 1996, including Table 1.1, p. 8; Scherer & Zentner, 2001, Table 16.1, p. 363), as well as by an uncritical attitude toward the serious methodological shortcomings of some of the allegedly relevant studies.

The following general themes will be examined in the article:

1. Various aspects of M-E have frequently been confounded in the literature. Perhaps most notably, the claim that music expresses emotion has often been conflated with the view that music induces emotion. Even when the expression-induction distinction is made, this is often done in a cursory or superficial manner, with authors continuing to draw conclusions that clearly ignore the implications of the distinction.
2. There are important theoretical differences of psychological nature between the two claims. For the sake of illustration, one can consider a human example. Assume that person A's tears expressing sadness are correctly interpreted by person B: They may then cause B to feel sympathy for A (pity, but not sadness), or empathy (sadness, just like A's), or *schadenfreude* (happiness that A is sad), or nothing whatsoever. Thus, even with a sentient source (A), the induction of emotion in B is only one of the possibilities—and one that is both logically and experientially separable from B's perception that A's tears express sadness. Matters are presumably one step removed in terms of impact when A is an actor crying on the stage and B is an audience member.¹ As for music's "tears," they have the considerable handicap, with regard to inducing genuine emotions *directly*, of having a non-sentient source.
3. There are important empirical implications of the two claims. One of them is the prediction that music's expressiveness would be judged as significantly more extreme than one's felt emotion to that music. Another is that when directly compared on the same rating scale, judgments of own emotional state (induced, e.g., by the recall of real-world events) would be significantly more extreme than the response to musical stimuli—including those specifically chosen to induce the corresponding emotion.
4. If music is unlikely to induce powerful basic emotions, what are the affective reactions, other than moods, that it does induce? A detailed analysis of recent studies reveals some of the advantages of the recently developed Aesthetic Trinity Theory (ATT; Konečni, 2005).

The article consists of five sections. In the first, assumptions concerning emotion are specified, using the author's prototypical emotion-episode model (PEEM; Konečni, 1982, 1984, 1991, in

press) as a vehicle. Making the author's theoretical and definitional preferences in the discussion of M-E explicit will be useful when the merits of the concept of "musical emotions" (e.g., Juslin & Sloboda, 2001a; Kivy, 1989, 1990; Krumhansl, 1997; Peretz, 2001; Scherer et al., 2001-2002; Sloboda & Juslin, 2001), and the significance of certain physiological consequences of listening to music, such as "thrills" or "chills" (e.g., Blood & Zatorre, 2001; Goldstein, 1980; Konečni et al., 2007; Panksepp, 1995; Sloboda, 1991), are evaluated later in the paper.

The purpose of the second section is to call for a greater degree of precision and rigor in the discussion of M-E, and especially M → E. A data-based attempt is made to illustrate, with reference to a well-known experiment by Sloboda and Lehmann (2001), how researchers' choice of wording in key portions of an article—perhaps as a function of their unstated causal assumptions—may inadvertently contribute to misconceptions regarding M → E.

In the third section, some key M-E studies are reviewed. The review of those dealing with the expression of emotion is brief, because the evidence appears conclusive that music can indeed depict, allude to, and represent emotion. The far fewer and more recent studies purporting to have demonstrated M → E are reviewed in greater detail—in one case with the aid of new data. The conclusions are more complex and cautiously negative with regard to a direct causal music-emotion link. The fourth section deals with the theoretical implications of the previous discussion. Among other issues, ATT (Konečni, 2005) – in which the responses of aesthetic awe, being moved, and thrills are proposed as replacements for the ill-defined "musical emotions" – is discussed. Finally, in the fifth section, Conclusions, the relationships among the various emotional, pseudoemotional, and explicitly nonemotional responses to music are specified and discussed.

Emotion in the Music-Emotion Relationship

Some Criteria for Emotion

Many of the contributors to the seminal volume *Music and Emotion*, edited by Juslin and Sloboda (2001b), seem to be confident that music can directly induce emotion (but see Juslin & Laukka, 2004; and also Dibben, 2004, and Gabrielsson, 2001-2002). It is perhaps significant that the most cautious chapter, by Scherer and Zentner (2001), is also the one that delves most deeply into the nature of emotions and carefully distinguishes them from moods, preferences, attitudes, and personality traits. In the present view, such distinctions are considered essential for both conceptual and heuristic reasons.

In developing PEEM (Konečni, 1982, 1984, 1991, in press), the author has adopted the view that emotions can be profitably treated as dynamic episodes with feedback-loop features and interacting cognitive, physiological, facial, and motor components. They typically have an unambiguous mental or physical cause *and* object,

¹ The degree of impact would presumably depend on the extent of audience identification with the actor or, in turn, on the perceived genuineness of the actor's portrayal of sadness that would facilitate identification. In the Stanislavski "system" (Stanislavski, 1936; Stanislavski & Rumyantsev, 1975), actors strive to increase the genuineness of emotional expression in various ways, including by means of the "emotion memory" technique (Konečni, 1991; Konijn, 2000).

and they guide and energize behavior in situations with serious biological consequences—thus becoming memorable events in human phenomenology. Additional attributes of emotions are their acuteness and their high physiological and psychological cost (due to the intense involvement of numerous bodily systems operating simultaneously and in tandem). Emotions are usually readily identifiable by the experiencing person and frequently, though not necessarily, by observers; they are also usually readily and accurately reportable and nameable. Of course, they do not have to be verbally announced by the experiencing person to others, including experimenters—the point is that they can be. Such states flood consciousness and are thought by many to be pan-cultural in terms of experience and expression.

The above criteria that underlie PEEM are meant to form a relatively noncontroversial set; one can reasonably expect that the majority of authors cited at the beginning of this article for the purpose of documenting the rise of affective science would not seriously challenge either the inclusion or the significance of the listed criteria.

These criteria generally fit models of “natural kinds” (Barrett, 2006a) of both the basic/discrete emotions (e.g., Buck, 1999; Ekman, 1973, 1999; Izard, 2007; Levenson, 2003; Panksepp, 2007) and appraisal (e.g., Frijda, 1988; Lazarus, 1991; Scherer, 1984) variety. Although it is not necessary, for the purpose of this article, to discuss issues, such as the number of basic emotions or their autonomic specificity, real-world ecology—with regard to the frequency and distribution of powerful and biologically significant stimuli emanating from social sources—constrains the variety of emotional reactions to a rather small number (cf. Oatley & Duncan, 1994). In fact, in the present view, because of their biological significance, the term “emotions” should be reserved for the “basic” ones—despite the various reservations by authors like Barrett (2006a, 2006b) and Ortony and Turner (1990).

Prototypical Emotion-Episode Model (PEEM)

The criteria from which to examine the M-E literature can be made even more explicit by introducing a process model of emo-

tion, PEEM (Konečni, 1991; see Figure 1). The episode begins with an event that is usually an array of stimuli emanating from another person (e.g., insulting comments, gestures), but can also be largely nonsocial (e.g., locking oneself out of the house); significantly, the event may consist of rumination and mental images concerning a prior anger-producing occasion. The event, once perceived or brought to consciousness, is subjected to a rapid, but multifaceted, attributional analysis and interpretation. Perception and interpretation are linked by feedback loops, and this essentially unitary, largely unconscious (Scherer, 2005) process—although its initial stage necessarily precedes (as indicated by the sequential position of the components in Figure 1) the occurrence of arousal, and the changes in the facial and postural configuration—is linked to the bodily processes by feedback loops (indicated by the two-directional arrow in the sequence). Furthermore, arousal and, for example, facial expression influence each other (e.g., Ekman, Levenson, & Friesen, 1983; Laird, 1974; Lanzetta, Cartwright-Smith, & Kleck, 1976; Schwartz, Fair, Salt, Mandel, & Klerman, 1976; Strack, Martin, & Stepper, 1988) and jointly—in some case additively, in others multiplicatively—provide information for cognitive analysis (in which the degree of deliberateness and awareness may differ) that results in the labeling of one’s emotional state.

An aggressive action (in the example in Figure 1) is only one of the possible subsequent behavioral alternatives. Its probability depends on the outcome of a complex attributional analysis that includes an assessment of cause, situational constraints, and likely consequences—because the same insulting, harsh words directed at the 12-year-old Johnny may result in his anger when they have been uttered by his 10-year-old brother, but fear when uttered by his father. Johnny’s chosen behavior leads to counterbehaviors by the brother or father (escape when Johnny attacks or forgiveness when Johnny apologizes) that constitute the *initiating event for the next passage* through the emotion-episode sequence (see Figure 1). This second initiating event may lead to the diminution or augmentation of the emotional state (e.g., due to the removal of the noxious source or renewed insults), or a drastic change in the

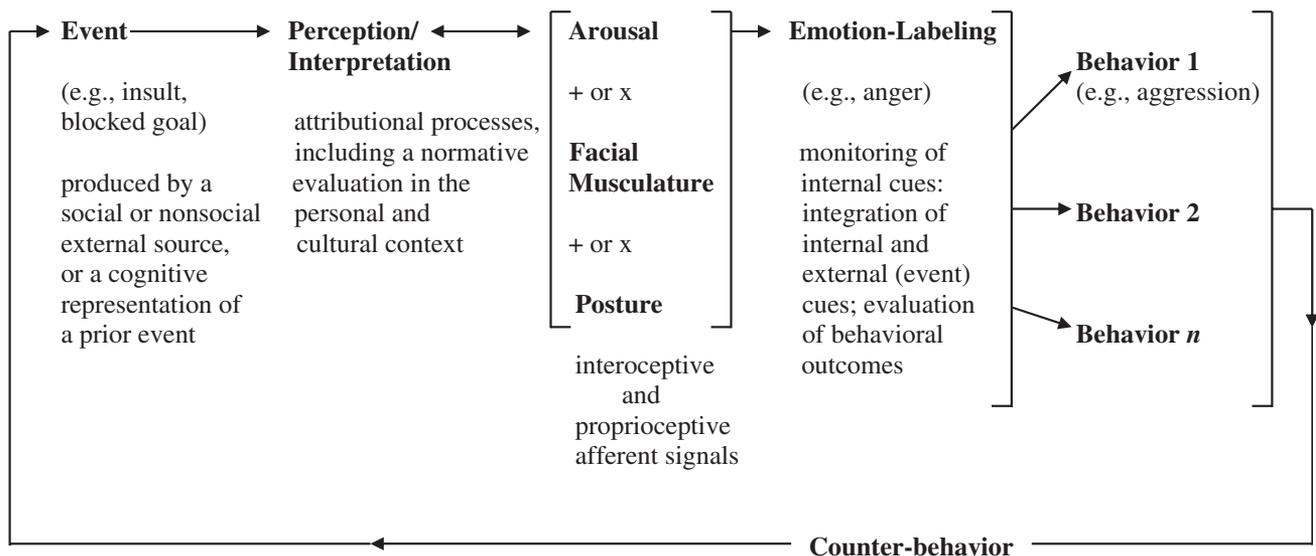


Figure 1. The Prototypical Emotion-Episode Model (PEEM).

emotion label following reattribution (such as when the second event is the comment “I was only joking!”). These shorthand scenarios highlight the structural flexibility of PEEM in handling the temporal dynamics of emotion labeling through a continuous process of appraisal/attribution/reattribution.

PEEM is broader than models that largely limit themselves to one or another subsystem or source of information (autonomic arousal, facial expression) and it allows for the possibility of individual stereotypy of the physiological response (Fehr & Stern, 1970). Its account of emotion as a loop of multiple episodes or passages through the basic sequence and the explicit inclusion of the possibility of emotional relabeling through reattribution jointly distinguish it from various appraisal models and counter some of the criticisms that Barrett levels at natural-kinds models (2006a; Barrett, 2006b, Figure 1, p. 21). Also, although Scherer’s (1994) notion of “modal” emotions seems sound from the standpoint of PEEM, it is essential to remember that just because some appraisal profiles occur more often than others does not mean that the overall frequency of genuine emotions is high in the stream of daily life—on the contrary, full-fledged emotion episodes are relatively rare (Oatley & Duncan, 1994) and metabolically costly.

An essential assumption of PEEM is that both an unambiguous subjective experience (that is, in brief, the unambiguous and accessible emotion-event-related contents of one’s consciousness—cf. Frijda, 2005; Gabrielsson, 2001-2002) and a pronounced visceral response (e.g., Bernardi, Porta, & Sleight, 2006) are necessary for an authentic emotion episode to take place (cf. Scherer, 1984; Stemmler, Heldmann, Pauls, & T. Scherer, 2001). There are some important similarities of this view with those of Schachter and Singer (1962) and Mandler (1975), respectively, but also considerable differences in both scope and many significant details that need not be discussed here (compare Figure 1, p. 241, in Reisenzein’s 1983 review of Schachter’s theory). In addition, there is a kinship between certain features of the “cognitive labeling” model (Konečni, 1975; fully incorporated into PEEM) and Zillmann’s (1978) “excitation transfer” model. Finally, note that the cognitive operations listed in the interpretation and emotion-labeling components of PEEM in Figure 1 may be largely performed at an unconscious level, but such processing, in the present view, *must* occur. When Barrett says, “context shapes the experience of emotion in a . . . direct and automatic fashion” (2006b, p. 40), she begs the question of how context is processed.

It is with reference to PEEM and other criteria that have been outlined so far that M-E, and specifically the evidence for the induction of emotion by music, will be evaluated in a later section. To anticipate the central question: When music is the “event” in Figure 1, how likely is it that an emotion will be the outcome at the labeling stage?

Some Sources of Confusion Regarding M→E

Before examining, in a later section, the empirical evidence from studies specifically designed to test the M→E model, it is of interest to consider the possibility that some major studies in music psychology, which do not involve the induction of emotion, may inadvertently contribute to the prevalence of the lay and semi-lay M→E view through imprecise wording.

Wording that suggests that emotion was experienced by the participants—without the induction of emotion actually being a

part of the research design—is sometimes found in the very titles of articles. For example, Juslin’s (2000) paper is entitled “Cue utilization in communication of emotion in music performance: Relating performance to perception.” This title suggests that some *person’s* emotion, presumably the performer’s, but certainly not the music’s (for music is not a sentient being), was communicated. Yet the study actually deals entirely with the expressiveness of the sound achieved in performance.

An attribution to music (in this case the scores by Mozart and Beethoven) of emotion-experiencing personhood occurs in the title of Krumhansl’s (1998) article; but here the confusion of the music’s expressiveness and induced emotion goes further and enters the instructions to the research participants. Before listening to a music composition, participants were told: “Your next task is to adjust the slider continuously to indicate the amount of emotion at each point in time” (Krumhansl, 1998, p. 126). On the basis of this, it is impossible to determine whether a participant was rating the expressiveness of the music or own emotional state, or a combination of both, or sometimes one and sometimes the other.²

In short, imprecision in wording may have serious methodological and conceptual consequences. It may also confuse readers and thus contribute to the prevalence of views regarding M→E. The extent of the readers’ erroneous inferences about what an article deals with can sometimes be empirically assessed, as is reported in the next section.

Sloboda and Lehmann (2001)

This well-known music-psychology experiment did not involve any measure of the participants’ emotional state; it was limited to ratings of “emotionality” (expressiveness) of Chopin’s Prelude Op. 28, No. 4. In order to examine empirically the conceptual impact of the authors’ write-up of the experiment on sophisticated readers, key elements of the Sloboda and Lehmann (2001) article were gradually and cumulatively revealed to an audience of nonmusic-psychologists (faculty and graduate students) at the University of California, San Diego (UCSD; Sample A, $N = 12$) who were repeatedly asked to choose, from among the offered M-E alternatives, a statement that best described what the article was about.³

The respondents (who all first signed a consent form) received a booklet in which, at the top of the first page, the correct full title of the Sloboda and Lehmann article was given in quotation marks: “Tracking performance correlates of changes in perceived intensity of emotion during different interpretations of a Chopin piano prelude” (2001, p. 87). The title was followed by:

“An article with the above title recently appeared in the journal *Music & Cognition*. [A fictitious publication.] This article is very likely to conclude that:

A. The Musical Piece Expressed Emotion(s)

B. Subjects Felt Emotions While Listening

² Note that with regard to another dependent measure in Krumhansl’s (1998) experiment, the judgment of the music’s “memorability,” the term quite unambiguously refers to the stimulus characteristic, not the subjective reaction.

³ This work is part of a set of the author’s systematic empirical assessments of methodological issues in the published M-E research.

C. Both A. and B.

D. Neither

E. Cannot Decide.”

After the respondents chose one of the five alternatives, they turned the page in the booklet and encountered the verbatim text of the “first half” (which was true) of the Sloboda and Lehmann (2001, p. 87) Abstract (98 words of the total of 191, ending with the words “perceived emotionality”). Having absorbed the Abstract, the participants then read, “An article with this title and Abstract is very likely to conclude that:” – followed by the same five alternatives as above.

Having given their second response and turning to the next page, the respondents encountered the word “Procedure” – followed by the first 68 words of the Procedure section in the Sloboda and Lehmann article (2001, p. 93, ending with the words “relevant emotion”); the quoted portion was the most pertinent to the issues at hand.⁴ Participants then chose one of the same five alternatives in response, on this third occasion, to the question: “An article with this title, Abstract, and description of Procedure is very likely to conclude that:”

Identical data collection was carried out (with written informed consent) at the beginning of a guest lecture to junior-year honors-thesis candidates at UCSD (Sample B, $N = 44$). None of the 56 research participants in Samples A and B had previously read the article or expressed suspicion concerning the existence of the journal *Music & Cognition*.

The data for both samples are presented in Table 1. Although the correct response, given the structure of the experiment by Sloboda and Lehmann (2001) was A., only 25% of the group of faculty and graduate students and 2% of the junior-year students came to that correct conclusion on the basis of the title alone (with 20% being chance). In fact, in both samples no more than a quarter came to the correct conclusion even after reading the title, Abstract, and first part of Procedure. In both samples A and B, a considerable proportion of respondents initially felt that the subjects’ own emotions were measured (25% and 34%, respectively); and while in both samples this proportion gradually decreased or disappeared as more information became available, the proportion of those who erroneously thought that both expression and induction of emotion were measured increased or remained high throughout, reaching two thirds in both samples.

The meaning and significance of these illustrative data can be challenged in various ways (and adequate possible rejoinders to such challenges can be easily mustered), but the fact remains that highly educated psychology professionals and upperclassmen remained woefully uninformed about what had actually been measured in the Sloboda and Lehmann (2001) experiment even after reading key parts of the article—keeping in mind that this was an influential study that was published in one of the premier journals in the field of music psychology. And note that the “communication error” was committed overwhelmingly in the direction of the conclusion that people experience emotion when listening to music (that is, that there is induction of emotion by music). It remains an open question whether the authors’ possible private endorsement of $M \rightarrow E$ was responsible for their inadvertently sending the “wrong message” to readers.

Table 1
Music-Emotion Responses (%) by Two Samples After Reading Partial Information From the Article by Sloboda and Lehmann (2001)

Sample	Response Alternative	Information Read		
		Title Only	Title and Abstract	Title, Abstract, and Procedure
A	A.	25	42	25
	B.	25	0	0
	C.	25	42	67
	D.	8	0	0
	E.	17	17	8
B	A.	2	14	23
	B.	34	18	9
	C.	64	66	66
	D.	0	2	0
	E.	0	0	2

Note. Samples A ($N = 12$) and B ($N = 44$) are described in the text. Response alternatives were: A., “The Musical Piece Expressed Emotion(s);” B., “Subjects Felt Emotion(s) While Listening;” C., “Both A and B;” D., “Neither;” and E., “Cannot Decide.” Respondents were forced to choose one of the five alternatives on each of three successive occasions – having read only the title; or title and Abstract; or title, Abstract, and Procedure. Entries in columns within samples should add up to 100% (except for rounding error).

Empirical Evidence on the Expression and Induction of Emotion by Music

The Juslin (2000), Krumhansl (1998), and Sloboda and Lehmann (2001) experiments dealt only with expressiveness but may have appeared to many participants and readers to deal instead with the induction of emotion or with both expression and induction. In this section, the experimental evidence for music’s expressiveness is briefly presented first, followed by a more extensive review of the much smaller body of work on the allegedly direct induction of emotion by music.

Music’s Expressiveness

Perhaps the most complete recent reviews of the effects of musical structure and performance attributes on expressiveness are by Gabrielsson (1999, 2003) and by Gabrielsson and Lindström (2001). Gabrielsson and Lindström point out that the listeners of composed music usually judge simultaneously both the “properties of the composed structure and properties of the actual performance” (2001, p. 223) and review studies from the end of the 19th century (e.g., Downey, 1897) to the most recent work (e.g., Balkwill & Thompson, 1999) by way of Hevner’s (1936, 1937) remarkable research. Gabrielsson and Lindström consider numerous studies that used a variety of measurement techniques and involved an examination of the effects of over 20 structural factors both in isolation and in real music.

Although Gabrielsson and Lindström (2001) note many methodological problems and gaps in the evidence, there seems to be

⁴ The words “. . . the experimenter (JS)” in Sloboda and Lehmann (2001, p. 93) were replaced by “. . . the experimenter (NN).”

little doubt—even, to some extent, cross-culturally—that music can depict, allude to, and represent (a) the auditory patterns commonly associated with emotions such as anger, joy, and sadness; and (b) the specific vocal and physical behavior of an organism experiencing and displaying such emotions.

Induction of Emotion by Music

Key, widely cited, and arguably methodologically the soundest studies in the limited body of research that purports to support the M→E hypothesis are reviewed in this section.

Nykliček, Thayer, and van Doornen (1997). The title of the study by Nykliček et al. is “Cardiorespiratory differentiation of *musically induced emotions*” (italics added). The study provides cardiorespiratory data showing that listening to different musical pieces produces different physiological patterns. Since different musical pieces contain different combinations of acoustic and structural variables—which are generally classifiable among the psychophysical, “ecological,” and “collative” variables with “arousal potential” (Berlyne, 1960, 1971; Leman, Vermeulen, De Voogdt, Moelants, & Lesaffre, 2005) – the main results obtained by Nykliček et al. (1997) convincingly document the physiological effects of music’s expressiveness (cf. Bernardi et al., 2006). In terms of PEEM, participants were differentially physiologically aroused by the various pieces of music, but their cognitive operations were unlikely to have resulted in the labels of emotions (cf. Schachter & Singer, 1962).

Such a conclusion can be reached because the foundation for the promise in the title of the article by Nykliček et al. (1997) is difficult to determine. In the “music selection stage” of their experiment, the participants were specifically asked to indicate on a rating scale “how strongly *each emotion is expressed by the music*” (p. 307, italics added). The authors cite Thayer’s 1986 doctoral dissertation to justify their measure, to the effect that the ratings of expressiveness and own emotion are “highly correlated” (p. 307) but provide no data in the 1997 paper. Even if the two measures were correlated in the 1986 study, the justification for the title of the 1997 study (that did not collect a measure of own emotion) is questionable—as is the authors’ reference, in their Results section, to the participants’ responses as “self-report” (Nykliček et al., 1997, p. 310).

An aspect of the above discussion refers to a conceptual and measurement issue of major significance for the M-E field, one that has been noted by a number of authors (Dibben, 2004; Gabrielsson, 2001-2002; Juslin & Zentner, 2001-2002; Kivy, 1989; Konečni et al., in press; Meyer, 1956; Scherer & Zentner, 2001): When asked to rate their emotional response to music, participants have a tendency to take into account the music’s expressive qualities. The extent of this misattribution (and of the consequent artifactual inflation of the ratings of own emotion) apparently depends on the instructions and the experimental design and will be discussed in more detail later.

Van Oyen Witvliet and colleagues. These researchers (van Oyen Witvliet & Vrana, 1996; van Oyen Witvliet, Vrana, & Webb-Talmadge, 1998) exposed participants to musical selections “that varied in emotional valence and arousal” (van Oyen Witvliet & Vrana, 1996, S91) and obtained differential effects in terms of heart rate, skin conductance, and the facial electromyographic response. These findings support and extend those of Nykliček et al. (1997), but, significantly for the main matter at hand, van Oyen

Witvliet and colleagues also did not obtain ratings of their participants’ own emotional state.

Waterman (1996). In this study, participants were asked to “press the button when the music causes something to happen to [them]” (p. 56), in response to different pieces of music. Participants thus identified the structurally significant events in the music, but did not necessarily report any emotional response. In terms of PEEM, increased heart rate, facial activity, or foot-tapping are not sufficient for the conclusion (from both the participant’s and the experimenter’s points of view) that the participant is experiencing a genuine emotional state—although such responses may *intensify* an emotion once it has been established by cognitive means (cf. Konečni, 1975; Zillmann, 1978). Waterman (1996) took an important further step and asked the participants to indicate retrospectively why they had pressed the button. However, only one of the 13 categories in Waterman’s coding scheme (category A, “sensual/physical reactions;” see Waterman’s Table 2, pp. 58–59) dealt with reactions that can be described as emotionally relevant (Waterman gives two examples: “I felt a lump in the throat” and “I felt calm”) and this category was one of the five least frequently applied (see Figure 4, p. 62).

Krumhansl (1997). Foremost among studies that are generally cited in support of the M→E model is Krumhansl’s (1997). In this work, one group of 10 Cornell participants was “instructed to continuously adjust . . . the slider . . . to indicate the amount of sadness they experienced while listening” (p. 340) to six 3-min classical selections (of which two each were chosen by the experimenter to represent “sadness,” “happiness,” and “fear,” respectively). Three other groups of 10 Cornell participants each continuously adjusted the slider to “judge fear, happiness, and tension, respectively” (p. 340) in response to the same six selections.

This procedure is of questionable validity as a way to measure the participants’ emotions. Faced with the unusual task of reporting, for example, their “fear,” “continuously,” in response to six different 3-min selections of different valence successively, participants might be especially prone to be judging the musical stimulus, rather than their own state.⁵ Such a tendency would be strengthened by another aspect of the procedure, which is that it is essentially a vigilance task where “continuous” refers to monitoring (cf. Konečni, 2003), rather than measurement, as is sometimes asserted (e.g., Schubert, 2001); and it seems self-evident—and is supported by attribution-theory research, for example, on the actor-observer effect (Jones & Nisbett, 1972; Storms, 1973) – that human beings are far more likely to monitor the external stimulus

⁵ In this regard, the study by Nykliček et al. (1997, p. 307) falls at the other methodological extreme, one that is frequently encountered in the M-E literature: Participants listened in succession to 25 music selections with a duration of 65–230 s each. Can it be realistically expected that a human being’s full-blown emotions—serious and expensive responses with a long evolutionary history—can change once a minute *ad infinitum*? In such experiments, the music’s expressiveness is more likely to be measured instead. Note that while PEEM allows both the sudden and gradual emotional change through reattribution in the successive passages through the episodic loop, it is likely that an organism repeatedly exposed to biologically and psychologically undemanding stimuli would habituate and cease to respond, for example, physiologically.

continuously than the (miniscule or nonexistent?) changes in their internal state.

Additional methodological issues regarding Krumhansl's (1997) study. Even if one allows the possibility that at least some of Krumhansl's Cornell subjects were rating their emotional state rather than the music, the issue arises of the *reference* for that emotional response. The reader of the published article perhaps assumes that participants responded in terms of the totality of their past full-fledged emotional reactions—but she would be wrong in that assumption. Prior to listening to the six music pieces and using the slider, Krumhansl's participants read the following verbatim and complete (but unpublished) instructions (courtesy of Carol L. Krumhansl, personal communication, November 15, 2001): "*Music is thought to have many effects on people, including influencing their emotions. Indicate how much fear you are experiencing from moment to moment by moving the slider from left to right. The slider should be at the far left if you feel none of that emotion, and at the far right if you feel that emotion as strongly as you have in response to music in the past*" (italics and bold lettering added).

There are two notable statements in these instructions to participants. First, the last statement clearly limits the emotional experience ("fear," for this group of participants) to the *musical* domain. (In fairness to Krumhansl, the title of her paper contains the words "musical emotions," but this limiting of generalizing intention is partially lost both within the article and in the sense in which the article is generally cited.) Second, the first sentence of the instructions *asserts* that music influences emotions; this may create an emotion-inflating "response set" (in outmoded, but adequate, terminology) – one that would be operative regardless of whether participants rated the music or themselves or both.

In addition to making the slider responses, Krumhansl's (1997) participants in both the Cornell and University of California, Berkeley (in R. W. Levenson's laboratory), parts of the study also rated the six music selections, after listening to each, on 13 9-point scales (e.g., AFRAID: 0 = *Not at all*; 8 = *Very much*). The (unpublished) instructions read: "Using the following scale, rate how you felt WHILE LISTENING TO THE MUSIC SELECTION" (capitalization in the original; note "you felt" in lowercase).

New data regarding Krumhansl's (1997) findings. In some conditions of a much broader study using musical and theater stimuli (with 153 UCSD undergraduate participants run individually in the author's laboratory), the students heard the "sad" pieces from Krumhansl's (1997) study (Albinoni's *Adagio* in G minor for Strings and Barber's *Adagio* for Strings, op. 11) and rated them on the "sad" scale (0 = *Not at all*; 8 = *Very much*). However, for some of these UCSD participants, the first sentence of the otherwise bland cover page read exactly as did Krumhansl's instructions, quoted above, for her participants' slider use ("Music is thought to have many effects on people, including influencing their emotions"), whereas for other UCSD participants the first sentence read: "Researchers disagree on whether or not music has an effect on emotion." This change in the wording had massive effects: Krumhansl's instructions caused UCSD subjects to rate "sadness" as 5.70 for Barber and 5.03 for Albinoni, whereas the "Researchers disagree. . ." instructions produced analogous ratings of significantly less "sadness," 3.32 and 4.25. Note that the overall mean of these UCSD "sad" ratings (4.58) is almost identical to Krum-

hansl's means for Barber and Albinoni (around 4.50; see the top panel of Figure 1 in Krumhansl, 1997, p. 341).

Another set of variations, this time in typographic emphasis, compared the effect of the instruction, "Using the following scale, rate how YOU **FELT** while listening to the music selection," to Krumhansl's that is quoted above. The hunch that typographically emphasizing own state (as opposed to the music's attributes) would decrease the ratings proved wrong and the "sad" ratings of 5.35 and 5.52 for Barber and Albinoni with the "YOU **FELT** while. . ." instruction did not differ from the analogous ones with Krumhansl's "you felt WHILE. . ." emphasis.

However, when the Krumhansl instruction was replaced, in an explicit music-rating variation, by "Using the adjectives below, describe THE **MUSIC** selection you just heard," the "sadness" means for Barber and Albinoni soared significantly to 6.12 and 6.87. This predicted pattern of the ratings of the music's expressiveness being considerably more extreme than the ratings of own state was subsequently also obtained in the Konečni et al. (in press) study (described later).

On the example of Krumhansl's (1997) influential study, UCSD data demonstrate precisely how small changes in the wording of instructions—perhaps reflecting a researcher's partly unstated theoretical assumptions—may drastically affect the data and the conclusions. This was a methodological exploration with important *substantive* consequences: UCSD data and the associated methodological discussion suggest that Krumhansl's study cannot be unequivocally accepted as supporting the M→E model.

Such a conclusion is strengthened when one examines another aspect of the UC Berkeley part of Krumhansl's study. Although there were physiological differences in response to the various musical selections, "few of the correlations between self-reports and average physiological measures were either significant or marginally significant. . . [n]or did they correspond with correlations using dynamic measures of physiology and emotion" (Krumhansl, 1997, p. 347). Differences in the physiological response to the various selections and the low correlations between these responses and the self-reports justify, in effect, the author's insistence—captured by PEEM – that the physiological response does not necessarily equal, or lead to, emotional experience.

Finally, Krumhansl took an important additional analytic step and compared her physiological data to those obtained in three major published studies of emotion physiology, finding, significantly, "little correspondence with [her] results" (1997, p. 349).

Konečni et al. (in press). This study was perhaps the first in the literature to compare the effects of "sad," neutral, and "happy" music on the participants' emotional state to the effects of the same participants' recall of sad, neutral, and happy life-events on their emotional state (in both cases using the same 13-point happy-sad scale). In the case of recall, participants provided measures of both how they felt at the time that the event originally occurred and how they felt in the laboratory immediately after thinking about the event. Music selections were by Albinoni, Respighi, and Vivaldi, with the first and third of these being the same pieces that had been used by Krumhansl (1997).

The results were that for both the "sad" and "happy" tasks, participants rated their emotional state at the time the (nonmusical) real life-event occurred as considerably more extreme than both (a) their emotional response to it at the time of recall and, importantly, (b) their response to the musical stimuli. In addition, even the

effect of the emotional state experienced in the laboratory after having recalled the life-event was significantly more extreme than the effect of the music (though only in the “sad” condition). In summary, thinking of a real-life emotional event is a far more powerful stimulus than is listening to music of the same valence.

The above results can be interpreted as weakening the $M \rightarrow E$ model and supporting a model of the form $M \rightarrow \text{Assoc} \rightarrow E$ (Konečni, in press), according to which the causal effect of music on emotion is mediated by mental associations—memories and imagery of the emotionally significant aspects of prior exposures. However, the fact remains that the participants’ ratings of their emotion in response to music—especially in the condition in which they listened to music before recalling a life-event—were significantly different from zero. This finding is addressed later in the article.

The Konečni et al. (in press) study included another dependent measure, the participants’ ratings of the “happiness” and “sadness” expressed in the music (on the same “happy-sad” scale). These ratings could be compared to the ratings of own emotion in response to music. The findings were identical to those mentioned earlier regarding one of the variations of Krumhansl’s (1997) instructions at UCSD: The Konečni et al. participants’ ratings of music’s expressiveness were significantly more extreme than those of their own emotional response to it. These, predicted, results show from another angle that the direct induction of emotion by music is a weak phenomenon at best.

Theoretical Implications

Zangwill, a philosopher, begins his polemical essay entitled “Against emotion: Hanslick was right about music,” as follows: “I argue that Hanslick was right to think that music should not be understood in terms of emotion. In particular, it is *not essential* to music to possess emotions [it cannot], arouse emotions [not directly, and even if it does, a paler version], express emotions [but it can], or represent emotions [but it can]. All such theories are misguided” (2004, p. 29). All comments in brackets and italics have been added; some of Zangwill’s claims, because of the “not essential” qualification, are essentially straw-man positions.

Zangwill’s statement is a useful vehicle through which to summarize some of the present author’s M-E positions and as an illustration of the seemingly unbridgeable divide that exists between the views of at least some philosophers-aestheticians and the music-psychology “mainstream” represented, for example, by most of the contributors to the *Music and Emotion* volume (Juslin & Sloboda, 2001b). However, several points in Zangwill’s article—some of which were made even more forcefully by Stravinsky (1936/1998) – provide a welcome check on the sometimes excessive $M \rightarrow E$ enthusiasm.

So far, the following has been accomplished in the present article:

1. Imprecise wording in influential M-E experiments that did not involve the induction of emotion (perhaps reflecting the authors’ unstated M-E beliefs) was identified as one of the possible causes for the prevalence of the view that music induces emotion, in general, and without mediation, in particular. This problem was demonstrated empirically (see Table 1) in the case of the research report by Sloboda and Lehmann (2001).

2. A methodological and substantive critique was presented of a number of influential papers that are commonly treated as having demonstrated the correctness of the $M \rightarrow E$ model experimentally.
3. In addition, it was shown experimentally that subtly changing some (but not other) aspects of Krumhansl’s (1997) instructions to participants could dramatically decrease the degree of reported “sadness” in response to “sad” musical pieces.
4. Finally, it was pointed out that the participants’ recall of (nonmusic) life-events tends to lead to considerably more pronounced emotional states than does exposure to music of the same valence (Konečni et al., in press).

In summary, the evidence for the direct induction of emotion by music is weak and fragile—in sharp contrast to the view held on this issue by the general public and many music and other psychologists.⁶ There is, however, one experimental finding that needs to be explained, a finding common to the studies by Krumhansl (1997) and Konečni et al. (in press). With regard to the former study, one could chip away at the participants’ ratings of own state by changing instructions; in the latter, one could show that a shift to the nonmusical world, even in thought alone, created more powerful emotional responses than did music. However, in both studies there remained a residual reported emotion, or “emotion,” that was significantly greater than zero.

This finding can be explained in several ways other than as supporting the $M \rightarrow E$ model. One possibility is that this is an example of the linguistic habit to connect the two terms, which was mentioned by Stravinsky (1936/1998, p. 54), and which has even found its way, at least with regard to the expression of emotion, into top-tier dictionaries (Juslin & Zentner, 2001-2002). When they hear music and are asked to rate their emotional response, the participants feel foolish circling “zero” (perhaps due to “evaluation apprehension”). Another possibility, which has been outlined earlier in this paper, may go hand-in-hand with the first, although it is conceptually distinct: Participants neglect to look “inside themselves” and misattribute the expressive features of the stimulus music to their own state, or, rather, apply them to the numeric response without considering their own state.

The above two explanations may be all that one needs to account for the residual report of emotion in the study by Konečni et al. (in press) and the findings obtained at UCSD when Krumhansl’s (1997) instructions were altered. However, such explanations seem fundamentally unsatisfactory when one thinks beyond the laboratory and considers, for example, Gabrielsson’s (2001; Gabrielsson & Lindström Wik, 2003) respondents’ “strong experiences with music” (SEM; Alf Gabrielsson has accumulated some 1350 reports from 950 respondents; Gabrielsson, personal communication, April 7, 2006).

⁶ The $M \rightarrow E$ view has caused some emotion researchers to recommend using music as a method of inducing emotions in the laboratory (e.g., Gaver & Mandler, 1987). Such advice seems misplaced: Music is at best a weak inducer of emotions even when the associative elements are introduced by the participants; and once they are, music loses its apparent advantage as a convenient, “appraisal-free” stimulus.

Two mutually nonexclusive possibilities suggest themselves. The first involves the mediation of the effects of music and can be divided into two parts: the predominantly cognitive, that is, the mediation of music's effect by mental associations; and the motor-cognitive, the mediation by music-driven behavior, such as dance (cf. Dibben, 2004, p. 113). The second possibility is to postulate the existence of "musical emotions" – or, instead, to propose *aesthetic awe*, *being moved*, and *thrills/chills*, as the replacements for "musical emotions" (Konečni, 2005) – which is considered in a later section. These various causal models and postulated internal states may be operative at different times in a given person's relationship with music.

Effects of Music and Their Mediation

It is proposed here (cf. Konečni et al., Figure 1, in press) that there is a "royal road," or central route, from music to genuine emotional states. The proposition is that for music to produce emotions, its effects must be cognitively mediated by memories and associations regarding powerful real-world events. Because emotional responses are to mental *representations* of (nonmusical) real-world emotion-inducing events that were temporally contiguous in the past with exposures to music, such emotions would fall at the low end of the intensity range.

It is possible that the prevalence of the M→E view (in comparison to the M → Assoc → E model) may in part be due to the fact that the presence and details of the associative-memory content—and their causal influence on the generation of weak but genuine emotions—are not readily mentally accessible when people are asked to give their M-E views retrospectively. Nevertheless, the notion that relatively weak basic emotions can be induced by music through associations can be found at least as early as Darwin's thinking (1871/1902, p. 736), and is accepted by a number of contemporary philosophers and psychologists of music (e.g., Davies, 1994; Levinson, 1990; Sloboda & Juslin, 2001, pp. 94–95).⁷

In addition, it is explicitly recognized in the present view that the direct or mediated effects of music on mood, motor behavior (e.g., foot-tapping), facial expression, and physiological responses may themselves give rise to memories and associations, and *therefore* result in genuine emotions by means of a two-mediator causal chain (cf. Konečni et al., Figure 1, in press).⁸ The implication, based on PEEM, is that without cognitive intervention, the music-induced changes in mood, facial configuration, and physiology are "dead ends" – as far as genuine emotions are concerned. An important example of a possible multisegment route from music to emotion is one that runs from physiological and motor responses to dance (cf. Dibben, 2004) and sexual display (cf. Miller, 2000), and, from there, to cognitive labeling and reattribution. The end result might be genuine emotions that are, however, primarily induced by nonmusical aspects of the situation, such as the close interaction with one's dance partner and the behavior of possible romantic or sexual rivals.

"Musical Emotions" – or Aesthetic Awe, Being Moved, and Thrills?

"Musical emotions." Along with recognizing the possibility of M → Assoc → E, Darwin and some of his contemporaries put

forward the notion of music inducing strong emotions but of a kind qualitatively different from the basic emotions—hence "musical emotions." For instance, according to Gurney, "[m]usic's . . . essential effect. . . [is a] production in us of an emotional excitement of a very intense kind, which yet cannot be defined under any known head of emotion" (1880/1966, p. 120). Recent users of the term—albeit with a different (and fluctuating) degree of connection to the concept as Gurney defined it—have been Kivy (1989, book title), Krumhansl (2002, p. 45), Peretz (2001, p. 105), and Scherer et al. (2001–2002, p. 154), among others.

A century and a quarter after Gurney's (1880/1966) book, no discernible profit has been gained by references to "musical emotions" and the term remains deeply unsatisfying. Zangwill has stated the core problem bluntly: "Why call it [that is, musical emotion] an emotion if it does not stand in any of the rational relations that we normally think characterize emotions? We are left with a potentially obscurantist view which speaks of emotion but which is not prepared to pay the price. . ." (2004, p. 35). Perhaps for such reasons, Sloboda and Juslin (2001) seem to take the view that there is no special set of "musical emotions."

Nevertheless, Gurney's (1880/1966) statement cited above rings true—at least for some, probably quite rare, exposures to music. With regard to the rarity of such occasions, it is important to remember, for example, that in the aforementioned SEM research, "[p]articipants were asked to describe 'the strongest, most intense experience of music that [they] have ever had'" (Gabrielsson & Lindström Wik, 2003, p. 163).

The dissatisfaction with the term "musical emotions;" the realization (reached by Plato, Darwin, and Gurney, among others) that music can, at least on rare occasions and in special settings, have profound emotional or quasi-emotional effects that are subjectively different from the experience of the basic emotions; the data from Gabrielsson's (e.g., 2001) SEM approach, as well as the studies by Scherer et al. (2001–2002); the aforementioned UCSD replications of Krumhansl (1997); the study by Konečni et al. (in press); the work of Keltner and Haidt (2003) on awe and Shweder and Haidt (2000) on emotion cross-culturally; the results from the author's and his graduate students' (musicians' and nonmusicians') use of controlled introspection: All of these considerations have led the author in the formulation of ATT (Konečni, 2005), a theory postulating the singular significance in the arts of the related states of aesthetic awe, being moved, and thrills or chills (see Figure 2). An experimental investigation of these concepts has already been initiated (Konečni et al., 2007).

Aesthetic awe and the sublime. Aesthetic awe is regarded as the most profound and memorable human aesthetic response—a prototypical response to a *sublime* stimulus-in-context. The first

⁷ "Emotional contagion" (Davies, 2006) has been given the role—instead of, or in addition to, associations and memories—of a mechanism for converting the expressive attributes of music into the listener's emotional responses. At least to the present author, however, "contagion" appears to be an "empty" metaphor—one without any obvious functional counterparts.

⁸ For example, Bartlett (1996, p. 374) has stated on the basis of his extensive review of studies that have examined the physiological effects of music that "there is [now] greater understanding of the significant contribution of imagery experience in conjunction with the music stimulus in altering subject [physiological] response."

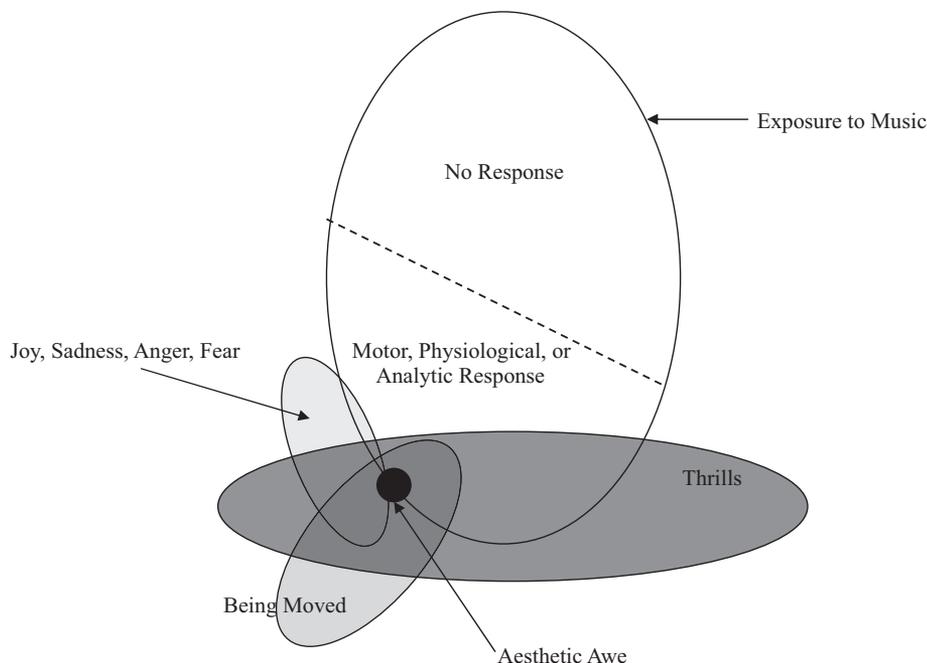


Figure 2. Relationships among the various emotional, pseudoemotional, and nonemotional responses to music, including a provisional estimate of their relative frequency.

recorded mention of the sublime is in a now lost first-century treatise by Caecilius of Calacta to which a reference is made by Longinus in the 3rd century (or else by a later pseudo-Longinus; Berlyne, 1971; Konečni, 2005). It has been discussed by philosophers ranging from Burke (1757/1990) and Kant (1790/1986) to Derrida (1978) and Tarozzi Goldsmith (1999) – sometimes, unlike in ATT, as a response—or else as a stimulus—divorced from its natural milieu. In ATT, the sublime is epitomized by objects of great rarity, exceptional beauty, and physical grandeur (among other features, such as relative inaccessibility, discussed by Konečni, 2005). The Cheops (or Khufu) pyramid of El Gizeh, Egypt, is the prototypical sublime stimulus to which, under appropriate circumstances, aesthetic awe is proposed as the prototypical response.

Aesthetic awe may have originated in primeval times in response to natural wonders, which was later extended to colossal human artifacts. It is a mixture of joy and fear, but, in comparison to the basic emotions, it can be more easily “switched off” by altering the focus of attention: The sublime does not urgently press, from an existential point of view (Konečni, 2005); it is nonsocial and noninteractive. Nevertheless, the perception of existential safety is crucial, especially for the natural sublime: Niagara and Denali are immense, of extraordinary beauty, powerful and moody beyond measure, but the experiencing person is—although very close by—safe.

Being moved and thrills or chills are postulated as always accompanying aesthetic awe, but are far more frequent responses (especially thrills/chills; see Figure 2). Aesthetic awe presumably shares with both joy and sadness the state of being moved. The requirement of existential safety differentiates it from fear, but it is on the same continuum: Whereas aesthetic awe shares thrills with

joy, they are experienced as chills when there is a modicum of danger.

Can music induce aesthetic awe? The pinnacles of composed and performed music are often enough called “sublime,” but in the present view music formally becomes sublime and may induce aesthetic awe only when it is performed in vast architectural spaces with superb acoustics, which are also of extraordinary beauty (Konečni, 2005; also see Figure 2).⁹ European mediaeval cathedrals are prototypes and they, certainly not coincidentally, are the locations with the longest tradition of performance of Western music of the highest caliber. Such sublime stimulus combinations of sound and space are also likely to give rise to a wealth of personal associations in the listener—perhaps having been classically conditioned since childhood (cf. Berlyne’s, 1971, idea of “ecological” stimulus dimensions of art objects) – and of this the Roman Catholic Church must have been intuitively, but intimately, cognizant. There is ample evidence to be found for this conclusion in both cathedral design and the composition and performance of church music (Konečni, 2005).

⁹ Size obviously also plays a major role in paintings and sculptures, not to mention many contemporary installations, such as those by Richard Serra (e.g., at the Guggenheim Museum in Bilbao), Olafur Eliasson (*The Weather Project* at the Tate Modern in London), and Christo (Javacheff; e.g., his *Running Fence* in Northern California). From the definition of the sublime in ATT, it follows that small paintings would be unlikely to induce aesthetic awe. This would include, for example, the *Mona Lisa* (77 × 53 cm) – unless there are additional considerations with regard to place and circumstances of viewing. Of course, small paintings and sculptures may move viewers and perhaps induce thrills. Large objects might induce all three aesthetic responses (cf. Konečni et al., 2007).

Being moved or touched: A profound response to music. Being moved is considered in ATT to be a genuine subjective state that can be reliably reported, in addition to being measurable physiologically (Konečni, 2005; Konečni et al., 2007). It is often accompanied by thrills or chills (see Figure 2) and can occur in the nonaesthetic contexts of “real life” when witnessing poignant acts of generosity and self-sacrifice, of overcoming long odds, and experiencing epiphanies (cf. Haidt’s, 2000, “emotion of elevation;” Konečni, 2005; Konečni et al., 2007). It is important to note that it can also be induced by the artistic depictions of such events—through plot and narrative elements, and structural and dynamic features—in poetry, theater, film, and operatic and religious music. There is a kinship between the concept of being moved and *catharsis* (Konečni, 1991) – as Aristotle (1962) used the term in *Poetics*, with reference to the spectators’ reactions to tragedy.

However, the being-moved response to instrumental, abstract (“absolute”) music may be the most compelling and interesting case. Scherer and Zentner (2001) have suggested that being moved is a good descriptor for an intense response to music (cf. Grewe et al., 2007) and, like Konečni (2005), have pointed out that there are many languages that, unlike English and French, possess a substantive form of this term. According to ATT, being moved to instrumental music is characterized by a large role of personal associations (greater than in aesthetic awe) and structural features conducive to thrills. It is reasonable to infer that many of Gabrielsson’s (e.g., 2001) SEM-project respondents experienced such a state, sometimes accompanied by a “lump in the throat” or tears (cf. Scherer et al., 2001-2002).¹⁰

Thrills or Chills. This interesting phenomenon has been described as an “archaic physiological response of short duration to aesthetic (and other) stimuli, [usually consisting of] piloerection on the back of the neck, [and] shivers down the spine that can spread to arms and other parts of the body” (Konečni, 2005, p. 36). The response can be reported by the participants with a high degree of reliability (Konečni et al., 2007). Since Goldstein’s (1980) survey and pharmacological study (an opiate-receptor antagonist, naloxone, reduced the incidence of music-induced thrills in 3 of 10 participants), there has been a fair amount of work on thrills in response to music (e.g., Blood & Zatorre, 2001; Konečni et al., 2007; Panksepp, 1995; Rickard, 2004; Sloboda, 1991), as well as to stories, paintings, and architectural objects in combination with music (Konečni et al., 2007).

In the study by Konečni et al. (2007), it was demonstrated that thrills could be reliably induced in U. S. college students by carefully chosen music (in 40% or more of the participants by the 4-min ending of Rachmaninoff’s 2nd Piano Concerto and by the U. S. national anthem—a significantly greater proportion than in the various control conditions, including the Australian anthem). However, thrills to music could not be primed by prior thrills that had been induced by other music or stories. In addition, the experience of thrills had no impact on measures (such as mood) that should have been affected if the thrills experience were psychologically significant. One could therefore conclude that, although thrills may often serve as the physiological platform for profound aesthetic experiences and frequent as they may be in the lives of many people (Goldstein, 1980; Panksepp, 1995), thrills are fleeting events that can hardly—in and of themselves—be considered genuine emotional responses (Konečni et al., 2007).

Blood and Zatorre (2001): Thrills or being moved? How can the conclusion reached on the basis of the study by Konečni et al. (2007) be reconciled with the influential article by Blood and Zatorre (2001) that refers to chills as “intensely pleasurable responses to music” in its title? A likely answer may involve a causal chain that leads from physiological effects (including thrills) to the state of being moved via an associative network and other mediators, such as imagery (see Figure 1 in Konečni et al., in press). The contention is that participants in the Blood-Zatorre study were not only experiencing thrills (as was presumably the case in Konečni et al., 2007), but were also *moved* by the music.

A close inspection of the procedural details in the study by Blood and Zatorre (2001) and their comparison with those in the Konečni et al. (2007) study support the above conclusion. Whereas Konečni et al. drew their participants from the general student population, Blood and Zatorre used musicians—who had been “selected on the basis of their reports of frequent, reproducible experiences of chills in response to certain pieces of music” (p. 11818). Whereas Konečni et al. “imposed” the music selections on the participants (relying on pretesting), each of the Blood-Zatorre participants themselves “selected one piece of music [instrumental, classical genre] that *consistently elicited intensely pleasant emotional responses, including chills*” (2001, p. 11818; italics added; in other words, more than chills). For each participant, Blood and Zatorre selected a 90-s excerpt, “including the section that elicited chills” (p. 11819), for positron emission tomography. On the basis of these facts, it seems likely that the Blood-Zatorre participants subjectively experienced the more profound and consequential state of being moved – *in addition* to thrills; and it is also possible that they experienced a postmusic (post-thrills) improvement in mood (these data were apparently not collected), which was rarely the case for the Konečni et al. participants.

It is possible that participants in the study by Blood and Zatorre (2001) became moved by virtue of associations that occurred concurrently with thrills. In addition to the mentioned considerations, such a suggestion is supported by another procedural feature of the Blood-Zatorre experiment, namely, that one participant’s powerful thrill-inducing music selection served as another participant’s neutral control piece, and that “chills were never reported for control music” (p. 11820).¹¹ Furthermore, Blood and Zatorre state that they have statistically verified that the effects of thrills induced by each participant’s own piece on the increases in cerebral blood flow (CBF) in left ventral striatum and dorsomedial midbrain, and decreases in CBF in right amygdala and other areas, were “not simply due to differences in attention, familiarity, or acoustic features between subject-selected and control music” (p. 11821).

¹⁰ Gabrielsson wrote to the author as follows: “I think [of “being moved” in Konečni, 2005] as a combination of cognitive and emotional aspects, a [partial] loss of control. . . [and] I think, as you [do], that being moved is a far more common response than [aesthetic] awe” (Alf Gabrielsson, personal communication, April 7, 2006).

¹¹The fact that participants in the study by Blood and Zatorre (2001) never experienced chills to the objectively powerful pieces chosen by other participants is not in agreement with the results of Panksepp’s (1995) studies.

The Blood-Zatorre statement that the acoustic features of the pieces and any differential familiarity with them could not account for the effects supports the conclusion that the participants' private and individualized mental associations must have been responsible. However, in contrast, Blood and Zatorre explicitly state: "[S]ubjects reported that their emotional responses were intrinsic to the music itself, producing minimal personal associations and/or memories" (2001, p. 11819). This contention, based apparently on the participants' informal reports, is in disagreement with the previous methodological analysis and with Goldstein's (1980, p. 127) findings. Rickard (2004, p. 384) also seems to think that the participants' personal associations played a part in the thrills they reported to their own selections in her study. Apart from that, if the acoustic features, familiarity, and personal associations are all eliminated, one must wonder what precisely Blood and Zatorre had in mind when they wrote of thrills as "responses . . . intrinsic to the music itself" (p. 11819). Only two possibilities remain. One is that there existed a set of interactions between the subjective preferences and structural features (untapped by the acoustic analysis) in own versus others' pieces. This explanation is weakened by the fact that all participants were musicians, but cannot be eliminated altogether.

The second, a more likely and theoretically very interesting alternative, is that the first chords of their own often-heard piece acted as a powerful classically conditioned stimulus for the induction of the participants' thrills in the experiment by Blood and Zatorre (2001). The data in the Konečni et al. (2007) paper show that for many people their national anthem has just such an effect. In other words, the entire personal associative context of the musical piece may be condensed as a classically conditioned stimulus for thrills induction.

Thrills may be elicited in people in general and by music and other aesthetic stimuli not of their choice (Konečni et al., 2007), but in order to have the participants reach more profound states—such as being moved—one needs to resort, as Blood and Zatorre (2001) and Rickard (2004) did, to special populations and procedures.¹²

In summary, it seems logically defensible to think that the participants in the study by Blood and Zatorre (2001) were moved by music (with an extensive personal associative content) and that this being-moved state—not merely thrills—correlated with the cerebral blood flow (CBF) changes "in brain regions implicated in reward and emotion" (p. 11818). After all, there is no evidence in the Blood-Zatorre experiment for basic emotions having been induced by the music that the participants had selected. For example, "none of [the] psychophysiological measurements [heart rate, EMG, respiration depth] correlated significantly with rCBF changes in ventral striatum, dorsomedial midbrain, amygdala, [and] hippocampus/amygdala" (p. 11821). However, the extension of ATT that is graphically presented here allows for the state of being moved to change into a low-grade basic emotion (through the influence, e.g., of the associative network); the possibility of such a qualitative transformation is explicitly acknowledged in Figure 2 by the overlap of the state of being moved and the basic emotions.

Conclusions

An attempt is made in Figure 2 to place exposure to music in perspective with regard to the responses and resultant states that have been discussed in this article, and to provide a provisional

estimate of the relative frequency of the various emotional, pseudoemotional, and nonemotional responses.

Twenty-five years ago, the present author (Konečni, 1982) made a plea for music psychologists to take into account in their research and theorizing that much listening to music does not occur in a social, emotional, and cognitive vacuum, but in the stream of daily activities (cf. North & Hargreaves, 1997). Since then, the proliferation of public and private places where music is heard has been relentless. As just one empirical demonstration, Sloboda and O'Neill (2001), using the experience sampling method, found that no less than 44% of the events somehow involved music, but, tellingly, in only 2% was listening the principal activity. Because an enormous proportion of all the incessant and mediocre sound is heard unwillingly, it seems virtually certain that most people, in order to remain functional, do not respond to it in any manner whatsoever (except for the occasional conscious effort required to block the noise). The grotesquely vast "No Response" area in Figure 2 reflects the following about the role of music in the contemporary world: Much, if not most, music is "sonic wallpaper"—meant in a sense far more derogatory than Kivy's (1993, p. 348). Therefore, the present author's new plea—this time to psychologists who work in the M-E area—is to maintain a sense of proportion, because so much exposure to music is utterly inconsequential—in emotional or any other terms (except as marketing pressure).

Several other aspects of Figure 2 are worthy of note. It is proposed that joy, sadness, anger, and fear occur in response to music only if mediated by associations (as reflected by the miniscule overlap between the "Exposure to Music" and the "Joy, Sadness, Anger, Fear" ellipses). Motor and physiological responses (including foot-tapping, dance, whistling to music, thrills) are here treated as pseudoemotional responses, some of which, however, can develop—again through cognitive mediation—into full-fledged emotional states (joy, sadness, grief; being moved; aesthetic awe). Tears are considered an occasional aspect of the being-moved state.

The relative sizes and the degree of overlap of the geometric forms designated as "Aesthetic Awe," "Being Moved," and "Thrills" reflect their theoretically posited relationship. It is also indicated that aesthetic awe, being moved, thrills, and the basic emotions can occur – *and mostly do occur* – without exposure to music. The same is obviously true for the motor and physiological responses (although it was impractical to indicate it in Figure 2). Stravinsky's (1936/1998) ideal response to music—analytic—has also not been forgotten in Figure 2.

To summarize the main points of the article: (a) There is an impressive array of musical means by which to express, allude to, and depict nonmusical, emotion-laden events and processes—which is facilitated by music's temporal nature and the fact that composers, performers, and listeners are all intimately familiar with the behavioral morphology of basic emotional states; (b) Sound organized as music can lead to a variety of responses by the listeners, most of which are explicitly nonemotional or pseudo-

¹² The issue of selection of "appropriate" participants is complicated and certainly not restricted to the M-E area or the psychology of music, but applies to all of psychological aesthetics (e.g., Konečni & Karno, 1994; Swain, 1994).

emotional; (c) Even absolute music may produce pseudoemotional physiological and motor consequences; (d) There is a sizable variety of linguistic and methodological pitfalls for researchers in the M-E area, which have sometimes resulted in dubious conclusions that emotion has been directly induced by music; (e) Basic emotions—albeit usually of low intensity—may be induced even by absolute music, but probably only through the mediation of personal associations to emotionally compelling events, or through dance; (f) *To be moved*, sometimes with a lump in the throat, tears, or thrills, appears to be the most interesting, memorable, and profound music-related subjective state; and (g) Being moved is rare and rarer still is the listening environment that can help music be sublime and elevate the response to aesthetic awe.

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Received September 18, 2007

Revision received February 28, 2008

Accepted February 29, 2008 ■