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Autor: Zentner, Marcel
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Emotions Aroused by Music: An Empirical Analysis

MARCEL ZENTNER (York) – KLAUS R. SCHERER (Genève)

1. The Legacy of Music and Emotion

Since the beginning of Western thought, music has consistently been linked to emotion. When music made its first appearance in Western literature 2800 years ago, its effects were primarily described in terms of their potential for emotion. In the *Odyssey*, seamen who sailed near the Sirens were lured by their ravishing music and voices to become shipwrecked on the rocky coasts of southern Italy. Only by having his sailors plug their ears with beeswax and tie him to the mast could Ulysses resist the musical temptations of the Sirens. Plato and Aristotle also endorsed the idea that music creates emotive states. Apart from describing music's moral benefits, they also gave relatively detailed descriptions of the emotional effects of music. Thus, the Phrygian mode would inspire enthusiasm, whereas the Mixolydian mode tended to make people sad (*Politics*, book VIII). Augustinus loved music but worried that its inebriating effects would detract from the biblical messages in the songs. This ambivalent attitude to music's emotions is characteristic of the Middle Ages, notably in its condemnation of "wrong" tone combinations that could stir sinful passions. A more balanced view of musical emotions resurfaced in the Baroque period, for example, in Mattheson's *Affektenlehre*.

Music's emotionality became a topic of prime interest in the 19th century (Robinson, 2007). Music was seen not only as a potent source of emotion, but also as a source of unique emotions that have special characteristics compared with day-to-day emotions or with emotions generated by other arts. In *The Power of Sound*, Gurney (1880) stated,

The prime characteristic of Music, the alpha and omega of its essential effect [is] its perpetual production in us of an excitement of a very intense kind, which yet cannot be defined under any known head of emotion (p. 120).

By the middle of the 19th century, thinking about music became so emotionalized that Hanslick (1854) saw the need to steer against this trend by articulating an anti-emotivist view of music. His main point was that although music can be described in emotive terms, emotions are irrelevant

to the value of music. More recent authors defending anti-emotivist views of music (e.g., Kivy, 1990; Meyer, 1956) concede that listeners may feel some diffuse excitement in response to music. However, their reports of specific emotions are seen as the result of an “attribution error”; listeners mistake the emotion they perceive in the music for an aroused emotion. That music can be described in emotional terms (e.g., this music sounds sad) has never been questioned – not even by Hanslick. However, recognizing emotion is unlike feeling emotion. Johann Strauss’ *Tritsch-Tratsch-Polka* (op. 214) sounds joyous to us even when we feel down. That does not mean that it makes us feel joyous. We can “read” the emotion, but we cannot feel it. While philosophers and musicologists are generally concerned with the expressive nature of music, psychologists are generally more interested in if, and to what extent, music is able to *induce or arouse* specific emotions in the listener. And this remains a matter of debate.

We have proposed to address this issue, which seems opaque to conceptual analysis, through empirical research (Zentner – Grandjean – Scherer, 2008). We believe that empirical evidence is of fundamental importance in the debate on the effects of music, or the power of music, not only in general terms (does music produce emotional feelings), but also in terms of the more specific question about the types of feeling states that music tends to arouse. The latter issue has recently surfaced in psychology and the neurosciences, with some music psychologists (e.g., Juslin – Västfjäll, 2008) claiming that the emotions that music arouses are like any other extra-musical emotions. An almost caricatural interpretation of this view can be found in numerous neuroscience studies that categorize music’s emotional effects into happy and sad or into positive and negative. We have argued (Zentner – Scherer, 2008; Zentner – Grandjean – Scherer, 2008) that emotions evoked by music cannot be broken down in such a rustic way and that it is necessary to examine the characteristics and nuances of music-evoked emotions through careful empirical study.

2. Characterisation of Music-Evoked Emotions

Despite rapidly expanding research on music and emotion (Juslin – Sloboda, 2010), a deeper understanding of the emotive states induced by music is hampered by three serious problems: (i) the prevalence of preconceived ideas about the links between emotions and music (Konečni, 2008); (ii) a lack of well-supported concepts, definitions, and measures (Scherer – Zentner, 2001), and (iii) the absence of an established corpus

of empirical findings on exactly what it is that discerning listeners feel when listening to music. As a consequence, researchers continue to superimpose concepts and measures of from non-musical areas of emotion research upon musically induced emotion. Thus, in current studies on musical emotion induction, participants are typically asked to listen to music and then to choose, from a predetermined list, the affect terms to describe what they feel in response to the music. Almost invariably, either these terms reflect basic (or discrete) emotion theory such as angry, fearful, surprised, happy, or sad, or, alternatively, they are derived from the affective circumplex and its variants, such as bored, alert, hopeless, energetic, sleepy, and satisfied (see Zentner – Grandjean – Scherer, 2008).

To date, over 80% of studies have studied music-evoked emotions from the perspective of these models (Zentner – Eerola, 2010a). Yet, as music theorists and musicians would be quick to point out, these terms are unlikely to represent the range of emotive states that music tends to elicit. Our work, to be described next, was motivated by a desire to characterize this range of music's emotive states. To this end, we carried out a series of surveys and laboratory and field studies. In a first study of music experts, we found evidence that music may generate emotional states other than the standard basic emotions (Scherer – Zentner – Schacht, 2001–2002). In an extension of these initial results, we systematically compiled a list of music-relevant emotion terms. The result of this work consisted of 66 emotive states that had been judged to be more than just occasionally experienced or perceived across a variety of musical genres (Zentner – Grandjean – Scherer, 2008, studies 1 and 2).

Subsequently, we studied the relative frequency of occurrence of these emotive states and also examined whether emotive states induced by music could be classified into sub-units. Data collection was carried out during a music festival that takes place in Geneva every June, the *Fête de la Musique*. Examining emotional responses to music in this context has several advantages: The festival visitors typically come from different age groups and socioeconomic strata, it is relatively easy to recruit a large sample because of the profusion of visitors, and the performances of the festival cover a relatively broad spectrum of musical genres. To cover a broad range of performances of classical, jazz, rock, and world music, a team of 10 research assistants was specifically trained for this event. They approached festival visitors by asking them to fill out a rating list containing 66 emotional adjectives either during or right after the performances.

Of the 801 questionnaires that were returned, 72% related to a broad range of classical music, 11% to rock music, 10% to world music, and 7% to jazz. The percentage of listeners reporting to have felt any of the emotions printed on the rating sheet “somewhat” or “a lot” is presented in

Affective state	Weighted totals	Affective state	Weighted totals
Relaxed	44.6	Spiritual feeling	15.3
Happy	41.5	Affectionate	13.8
Joyful	39.0	Exciting	13.7
Dreamy	37.1	Feeling of transcendence	13.7
Stimulated	35.4	Mellowed	12.4
Dancing (bouncy)	33.5	Disinhibited	12.3
Enchanted	32.8	Caressing	12.0
Nostalgic	32.1	Shivers (thrills)	11.2
Allured	31.0	Electrified	11.2
Touched	30.9	Agitated	10.6
Free	30.7	Fiery	10.4
Calm	28.0	Sad	10.2
Sentimental	27.5	Triumphant	10.1
Energetic	27.4	Voluptuous	9.6
Filled with wonder	26.5	Goose bumps	9.1
Amused	23.6	Solemn	8.3
Passionate	23.4	Languorous	7.8
Animated	22.6	Heroic	7.2
Melancholic	22.5	Impatient	6.8
Light	22.5	Serious	6.6
Moved	21.9	Irritated	6.6
Inspired	21.6	Proud	6.4
Dazzled	21.3	Revolted	6.3
Serene	21.3	Annoyed	6.2
Tender	19.8	Nervous	5.5
Euphoric	19.7	Tense	5.2
Meditative	18.4	Bittersweet	4.7
Floating	18.3	Indifferent	4.6
Sweet	18.2	Aggressive	4.2
Soothed	17.8	Anxious	3.4
In love	17.8	Sorrowful	3.4
Sensual	17.5	Depressed	2.7
Strong	15.3	Angry	2.4

Tab. 1: Percentage of listeners that reported having felt each affect state somewhat or a lot (adapted from Zentner – Grandjean – Scherer, 2008).

Table 1. Percentages were calculated for the entire sample and for each genre of music separately. Because classical music was overrepresented as a result of the festival's emphasis on classical music, we used the average across the five within-genre percentages. The relative frequencies of reported emotion states in the music festival study are of note because they closely match the reports of felt emotion from the Swedish sample of adults (Juslin – Laukka, 2004) and the elderly (Laukka, 2007). Specifically, feeling moved, nostalgic, relaxed, enchanted, and tender were all among the most frequently reported emotions. "Admiring," a frequently reported state in the Swedish study, was the term most often added in the free response spaces of the current study. These consistencies across studies are noteworthy considering the differences in samples of listeners, in music-listening contexts, and most likely also in music excerpts.

The second aim of this study was to take a closer look at the structure of the underlying ratings of musical affect. On the basis of a series of statistical analyses of the factors or dimensions that best describe the organization of the emotion labels into separate groups, we found that a model with nine emotion factors best fitted the data. The nine categories with the respective marker terms are reproduced in Table 2.

Musical emotion factors with characteristic feeling terms

WONDER	Filled with wonder/amazed*, allured, dazzled, admiring, moved
TRANSCENDENCE	Inspired, feeling of transcendence, feeling of spirituality, overwhelmed, thrills
TENDERNESS	In love, sensual, affectionate, tender, mellowed
NOSTALGIA	Nostalgic, melancholic, dreamy, sentimental
PEACEFULNESS	Calm, relaxed, serene, soothed, meditative
POWER	Energetic, triumphant, fiery, strong, heroic
JOYFUL ACTIVATION	Stimulated, joyful, animated, feel like dancing, amused
TENSION	Agitated, nervous, tense, impatient, irritated
SADNESS	Sad, sorrowful, blue

* Both terms are equally valid translations of the French "émerveillé."

** The full, short, and ultra-short versions of the GEMS (GEMS-45, GEMS-25, GEMS-9) are available from M. Zentner on request.

Tab. 2: The Geneva Emotional Music Scales (GEMS) derived from a series of data reductive analyses of ratings of emotions evoked by various genres of music.

This model presents some distinctive features in comparison with mainstream emotion models such as the discrete emotion model. In contrast to the latter, most of the emotions of the current model are positive. Furthermore, the domain-specific model contains emotion categories such as wonder, nostalgia, and transcendence that are not a central part of any current model of emotion. Although some of the current emotion

components seem similar to emotion components from other emotion models, similarities in the general factor labels may obscure subtle differences in meaning. For instance, we found that musically induced joy implies an action tendency to dance, which is unlike the common meaning of joy. Similarly, “musical” sadness may not be quite the same as basic emotion sadness, because the aversive aspects of sadness, such as feeling gloomy, depressed, or unhappy, were only very rarely reported in response to music.

Although the previous considerations offer an explanation for the relative scarcity of negative emotional responses and the presence of refined positive emotional responses to music, they do not account for the specific kinds of positive emotions identified in the current research. One possibility relates to the functions of music in both daily life and evolutionary history. One of the striking findings across studies in this area is the prominence that nostalgia occupies in the spectrum of music-induced feelings. This puzzling finding can be better understood in light of the functions that music serves in daily life. For example, one of the most frequently mentioned functions of music in daily life is as a reminder of a valued past event (Sloboda – O’Neil, 2001; North – Hargreaves – Hargreaves, 2004). These findings not only suggest a link between functions of music and music-related emotion, but they also point to the mediating role of memory and imagery in musical emotion induction (see Konečni, 2008).

Also prominent in the list of musically induced emotions is love, especially as it appears in two different, though complementary, ways. Whereas the tenderness component in our classification relates to feelings of love, affection, and tenderness, wonder relates to the arresting qualities of music: feeling enchanted, charmed, dazzled, amazed. Although largely ignored in today’s research on music and emotion, the wonder-related feelings are perhaps the most potent emotive states generated by music, the most rewarding ones, those that “hook” people on music. Gabrielsson collected autobiographical memories of strong experiences to music that nicely illustrate some states belonging to our category of wonder:

Suddenly I experienced a tremendously strong feeling that was felt in my body and in my head. It was ... like an intoxication. It made me ecstatic, inconceivably exhilarated, everything concentrated to a single now.

A century ago Marcel Proust (1913) had given a remarkably similar description music’s wondrous effects:

But then at a certain moment, without being able to distinguish any clear outline, or to give a name to what was pleasing him, suddenly enraptured, he had tried to grasp the phrase or harmony – he did not know which – that had just been played and that had

opened and expanded his soul, as the fragrance of certain roses, wafted upon the moist air of evening, has the power of dilating one's nostrils. (Proust, 1913, p. 250)

Feelings of attraction and seduction were also central to Darwin's (1871) evolutionary views on the emotions induced by music. In *The Descent of Man*, Darwin observed that the sounds that some species produce during the mating season seem musical in that they resemble short melodic phrases or songs. Whereas the distal function is the propagation of the species, Darwin proposed that the proximal function of these musical vocal utterances is to call, charm, and excite the opposite sex (1871, p. 880). Current evolutionary theories of the origins of musically induced passions have expanded these views, including the notion that emotive vocal utterances were also used to express triumph over mating rivals and as a means of territorial defence. Hence, the emergence of a power factor in the current model could also be related to evolutionary mechanisms. Although these views are speculative and unlikely to provide a complete answer to the kinds of emotions felt in response to music, they attract increasing interest and may ultimately provide valuable insights into differentiation of musically induced emotion (e.g., Levitin, 2006; Miller, 2000).

Awe, though an emotion that is sometimes cited in the context of music and other arts (e.g., Haidt – Keltner, 2003; Konečni, 2005), seems to be lacking in the current classification. However, this absence may simply be due to the lack of a French term for awe (as will be remembered, the study was carried out in a francophone city). In substantive terms, transcendence (e.g., feeling overwhelmed, inspired) and wonder (e.g., feeling moved, admiring) seem to both be related to the English awe. Of interest is that the current musical emotion factors do not include a direct equivalent for happiness in a general sense. Rather, musically induced happiness either takes the form of bliss or enchantment – as in wonder – or takes the form of joy combined with a curious, yet universal “affordance” of music, its tendency to trigger movement – as in joyful activation.

Peacefulness and tension turned out to be further important classificatory units of musically induced affects. Peacefulness and relaxation seem an obvious affective consequence of the prototypical mental state of the music listener – one in which there is a certain detachment from the “real” world with its physical and psychological threats. The calming effects of music on emotional as well as physiological arousal have been put to use since the Middle Ages. In Fez, Morocco, an asylum for the mentally ill had been built in the 13th century, and musico-therapy figured prominently among the various treatments. Today, there is growing research evidence for the usefulness of music as a relaxant in medical settings (see chapters 29 & 30 in Juslin – Sloboda, 2010, for an overview).

The factor tension lends itself to two possible interpretations. In the influential writings by Meyer (1956), surprise, tension, and relief were the principal musical emotions because harmonic, rhythmic, and melodic progressions create expectations that are fulfilled or violated (see Huron, 2006, for a modern elaboration). However, like other researchers, we did not find surprise to be among the more important musical emotions. This inconsistency may be linked to a listener's musical expertise: Thus, an unexpected shift in tonal key or melody, while evoking surprise in a music expert, may induce a thrill or a delightful sense of amazement in the non-expert auditor.

A second meaning of tension relates to irritation. We believe that in rare cases irritation or anger can be driven by the inherent properties of music (rather than extra-musical factors such as objecting to noise), for example, when it contains an inordinate amount of successive sharp unresolved dissonances. Although Arnold Schönberg (1984) believed dissonance aversion to be a pure product of acculturation, it has been observed in young infants (e.g., Zentner – Kagan, 1996; 1998) and it is probably universal. However, more typically, irritation and anger arise when people are exposed to music they dislike, fail to understand, or even abhor. A good case in point is heavy metal music, which is generally thought of as a prototype of aggression-inducing music. However, heavy metal music does not evoke anger in people who identify with it; only listeners who do not like heavy metal show elevated levels of anger when listening to it (Gowensmith – Bloom, 1997).

The general absence of fear in the spectrum of musically inducible emotions will surprise some readers. However, when people refer to the fear-inducing capacities of music, they usually think of sound tracks in thrillers. Because in the thriller or horror movie the content of the narrative and the music are confounded, it is difficult to know whether the music acts as producer, as amplifier, or as neither. In addition, the wide diffusion of sounds accompanying thrillers may easily have led to fearful reactions occurring, not because of the sounds themselves, but because of a learned association. Hence, although fear and anger reactions to music may occasionally be driven by the inherent qualities of the music, more typically, these emotions may arise from conditioning (fear) and from violation of certain tastes or attitudes (anger).

3. Elicitation of Emotive Responses to Music

Although the previous section may give the impression that music leads almost automatically, if not inevitably, to the experience of an emotion, matters are much more complex. For example, in the festival study, we found that even the emotions most commonly evoked by music were experienced by less than 50% of the festival attendants. In general, less than 25% of the festival attendants reported to have felt any emotion to a significant degree (Table 1). This is rather striking given that most listeners probably picked concerts that they expected to be engaging. What this finding suggests is that the elicitation of an emotion by music is a fragile process that depends on multiple interacting factors. We introduced a model that formalizes the complexity of factors involved in musical emotion induction (Scherer – Zentner, 2001). Specifically, we suggested that an emotion that is actually experienced by a listener is determined by a multiplicative function of several factors, as illustrated in Table 3.

Experienced Emotion =			
Structural Features X	Performance Features X	Listener Features X	Contextual Features
Where:			
Structural Features	Segmental Features X	Suprasegmental Features	
Performance Features	Performer Skills X	Performer State	
Listener Features	Musical Expertise X	Stable Dispositions X	Mood State
Contextual Features	Sound Acoustics X	Location X	Event

Tab. 3: A model of musical emotion induction (adapted from Scherer – Zentner, 2001).

A distinctive feature of the model is that it postulates multiplicative, rather than additive, functions for two reasons. First, it is unlikely that any of the constituent factors in and of themselves, in the absence of other factors, can lead to marked, reliable emotional effects. Second, even if 90% of the emotion-eliciting conditions are met perfectly, one single lacuna in the chain of elicitors may nullify their conduciveness to emotion. Consider an extremely moving passage, performed perfectly, in an atmospherically and acoustically powerful surrounding. In an additive model, these features should ensure a high probability of emotion elicitation, independent of the listener state. However, in our model, if a listener is distracted or in a flat mood, the probability of emotion induction will be low.

This feature is illustrated by the following computation. Assume that musical, performer, and context features are near perfect, say 90%; assume further that the receptiveness of the listener is reduced to say 40%. In the additive model, the probability of successful emotion induction would

remain high, namely, 70%. In the current model, the probability would drop to 29%. It is of note that even in the presence of near-optimal conditions across all four categories of elicitors ($.9 \times .9 \times .9 \times .9$), the probability of emotion induction is only 66% according to the current model. This estimate is consistent with the findings from the festival study, in which the prevalence of felt emotions was relatively modest, even in the presence of circumstances highly conducive to musical emotion elicitation. Clearly, more research is needed to examine the predictive power of the model. For example, the various factors postulated in our model may not be of the same importance, and appropriate weighting of the factors will be necessary to improve its predictive acuity.

4. Measurement of Music-Evoked Emotion

One of the fundamental problems for empirical research on emotive responses to music is the difficulty of measuring these effects. One reason is the transient, fleeting nature of music. After a concert of 2 hours, most listeners find it difficult to recall and describe the flow of affective feelings they may have experienced during this long period. Furthermore, many individuals find it hard to categorize and label their emotions in a precise fashion, even for relatively frequent everyday emotions, partly because most emotional episodes reflect a blend of different emotion qualities (see Scherer, 2009). This is particularly the case for the affective experiences during listening to music. Often, listeners are hard-pressed to mention a particular label to characterize their affective experiences and take resort to fairly general descriptions such as “I found it most interesting,” “I greatly enjoyed it,” or “I thought it was beautiful.”

In consequence, the use of free self-report to study emotional reactions to music is fraught with problems, particularly because individuals differ with their readiness to label their experiences or have a preference for certain types of descriptors. It is to be hoped that the specific musical emotions scale that we have proposed will help to standardize research in this area and produce data that are comparable across investigators. This outcome is all the more desirable because alternative methods for more objectively assessing the emotional response to music are difficult to use and to interpret.

Attempts have been made to measure emotive responses to music physiologically (see chapter 11 in Juslin – Sloboda, 2010, for an overview). However, quite apart from the difficulty of using the invasive methods

with more than a handful of listeners, the interpretation of the results are generally difficult and often disappointing. This is not surprising, as it has been virtually impossible to identify physiological markers for the major basic emotions (except to some extent for intense states of anger and fear; Stemmler, 2003). The day in which a neuroscientist can confidently tell whether a listener experienced a brief period of amazement, a momentary state of tenderness, or a pang of nostalgia just by looking at the listeners' brain activation profiles may not be very near. Thus, it is much easier to obtain a fine-grained differentiation of musical affect at the experiential level compared with the neurobiological level.

Another approach is measuring emotion via use of motor expression, especially in the face. There is good evidence that activation of the zygomaticus muscle (which produces smiling) is consistently linked to positive experience. For example, in a recent study on rhythmic engagement with music in infants, Zentner and Eerola (2010b) showed that infants engage in more rhythmic movement to music and other rhythmically regular sounds than to speech. Interestingly, the degree of infants' rhythmic coordination with music was positively related to the frequency of their smiling. In contrast, the corrugator muscle (producing frowning) generally indicates that the person is puzzled or irritated. This is a reaction that has also been reported in infants exposed to sensory dissonance (Zentner – Kagan, 1998). The posture, particularly of the head and upper body, of the listener might also be used to infer emotional reactions. However, adults are usually quite controlled in their facial and postural expression to music. This may be one of the reasons for the lack of conclusive studies that use these techniques to assess emotional reactions in music listening.

Another methodological challenge is that studies have adopted a post-performance approach to emotion assessment, whereby a single retrospective rating is provided after stimulus exposure. However, as we all know, music unfolds in time, and affective experiences also change as a function of time. To capture the moment-by-moment fluctuations in the affective experience, new tools are currently being created and tested. For example, Guhn, Hamm, and Zentner (2007) asked individuals to listen to various excerpts of classical music. They recorded chills (emotional reactions of great intensity) and physiological responses in real time. The real-time analysis allowed the authors to discern that chills tended to occur in particular passages. A music theorist then characterized these passages in formal terms and it was found that chill passages were characterized by similar dynamic, harmonic, and structural characteristics. Further, the subjective chill response tended to coincide with distinct patterns of heart rate and skin conductance increases.

Recent technological advances allow researchers to use real-time recordings of feelings and physiology in concert settings. For example, McAdams, Vines, Vieillard, Smith, and Reynolds (2004) asked more than 100 concert visitors to continuously rate the felt “emotional force” at a concert premiere. The work in question was a contemporary composition, *The Angel of Death* by Roger Reynolds, which contained interesting textures and structural cues and was studied separately in detail by the same group (Lalitte – Bigand – Poulin-Charronnat – McAdams – Delbe – D’Adamo, 2004). The experiment was carried out in two separate cities (Paris and La Jolla), where the audience responses were captured by using small responses boxes specifically made for the occasion. In both instances, the researchers instructed the participants thoroughly before the concert and the participants could rehearse the rating paradigm with another work before the actual recording began. The results from both premieres demonstrated that meaningful mean ratings of emotional force were obtained that were related to the musical structure.

5. Issues in the Study of Music and Emotion

If our work may lay claim to be the first to provide a domain-specific representation of music’s emotions that is derived empirically, we are still far from a comprehensive understanding of the nature of complex music-induced emotions. One reason for caution is that from all possible music excerpts and listening contexts, the music we used is only a selection. Thus, more research is needed to examine whether the current feeling terms and term groupings generalize to forms of music that differ strongly from the music studied in the current research (e.g., serial music, heavy metal, music from non-Western cultures).

A second thing we learned is that emotions evoked by music do not readily fit the corset of “utilitarian” emotions. Utilitarian emotions are triggered by the need to adapt to specific situations that are of central significance to the individual’s interests and well-being. Such emotions tend to be high-intensity reactions that prepare the individual for action. In contrast, musical emotions are triggered in situations that usually have no obvious material effect on the individual’s well-being and only rarely lead to specific goal-oriented responses. In the case of music-evoked emotions, appraisal tends to be intrinsic to the auditory stimulus, based on forms and relationships. As a consequence, musically induced emotions are more diffusely reactive than proactive. In musical experiences, the

individual can savour the nuances of the emotional stirrings for their own sake – just as the wine taster savours the delights of different vintages (Scherer – Zentner, 2008; Zentner – Grandjean – Scherer, 2008).

A wine taster who lacks a language for describing the flavour of various wines cannot communicate his experience to other people. However, there is a rich and vocabulary that has been developed to describe the tastes of various wines. Ironically, such a language was never developed for describing musical sensations or musical emotions. In a way, the Geneva Emotional Music Scales (GEMS) provide a vocabulary through which persons can express their musical feelings, just as wine tasters can describe nuances of taste and flavour with their wine-specific language. Although we see this as progress, we recognize that emotional responses to music are sometimes difficult, and occasionally impossible, to verbalize. In the end, verbal reports of feeling are, at best, approximations or circumscriptions of the inner emotive experience of a listener; they are not direct mirror images of this experience. This seems to be the meaning of Rilke's as "Sprache, wo Sprachen enden" (R.M. Rilke, *An die Musik*, 1918).

Because music is generally seen as the art whose power goes beyond words, it is sometimes argued that attempts to understand musical experiences by means of language are doomed to failure. In a recent book, Daniel Barenboim declares at the outset: "I firmly believe that it is impossible to speak about music" (Barenboim, 2009, p. 5). The great 20th century conductor Sergiu Celibidache held even more extreme views. In a televised interview, he proclaimed that the term "music" as such should be abolished. Thus, whenever his interviewer nonetheless used the word music by error, reflex, or habit, the maestro would scold him for not respecting his veto of the word.

The idea that words should not be used to describe music is somewhat reminiscent of the ban on creating pictorial images of Jesus in the heydays of Byzantine iconoclasm. For iconoclasts, the only real religious image must be an exact likeness of the prototype, which they considered impossible. But such a view, which is comparable to the rejection of words as means of "depicting" music and its meanings, confounds the value of the subjective experience with the value of its objectification through a process of rational inquiry. No one would criticize wine experts because their verbal characterisations cannot replace the sensual experience of drinking a good glass of wine. Nor would anyone criticize physicists because their formulas for the sun's declination are strangely removed from the experience of a beautiful sunset. Sometimes, then, words do have a place in our attempts to grasp music's emotionality. Anyone worried that a linguistic scrutiny of music would take something away of its enigmatic

charm should rest reassured that “Music can never reveal its ultimate secret” (O. Wilde, *The critic as an artist*).

Abstract

One reason for the universal appeal of music consists of the emotional experience that music offers to its listeners, which is generally perceived as uniquely rewarding. But what makes these rewards so special? We review a series of in which we examined emotions that can (and cannot) be induced by music – a line of work that eventually led to a model of musical emotions, comprising nine categories of music-evoked emotions. Subsequently, we turn to the question of the conditions under which an emotion may be successfully elicited by music. We present a model that formalizes the complexity of factors involved in musical emotion induction. After a brief summary of measures of musical emotions, we conclude by taking a look at some unresolved issues in the study of music and emotion and suggesting possible solutions.

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