A Constructionist Approach to Emotional Experiences with Music

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Conflicts of interest

None

Abstract

People often experience a variety of affective responses while listening to music. The study of this phenomenon has flourished during the last two decades; however, the theoretical frameworks that have attempted to explain this phenomenon have neglected the symbolic dimension of music, and the effect of situational factors. The aim of this article is to overcome these shortcomings by proposing a model based on contemporary constructionist theories of emotion. This novel approach proposes that listening to music activates automatic perceptual mechanisms that produce fluctuations of affect, and that the activation of associative and appraisal mechanisms transform the fluctuations of affect into a variety of emotional and nonemotional responses. The main proposal is that adopting this constructionist model constitutes a fruitful approach, as it reinterprets past contradictory findings, resolves enduring debates, and provides a heuristic framework for future investigation of affective experiences with music.

Keywords: *Music; Emotion; Constructionism; Music Listening; Musical Emotions*

People often experience a variety of affective responses while listening to music. At times, it reminds listeners of emotional events from the past (F. S. Barrett et al., 2010), at other times, music helps them focus on the present situation (Diaz, 2011; Lamont, 2011). Music can facilitate feeling more connected to other people (Boer et al., 2011), and relieve feelings of loneliness when listening to it solitarily (van den Tol & Edwards, 2014). Music can motivate people to move along to it (Witek et al., 2014), or to adopt an attitude of still contemplation (DeNora, 2000). Music listening can lead listeners to experience calm and joy, and have positive effects on listeners' mental and physical health (Papinczak et al., 2015), but it can also arouse grief, irritation, anxiety and boredom (Sloboda et al., 2001). Sometimes emotional experiences with music can be so striking that we can remember them for years (Gabrielsson, 2001); but on many other occasions, affective reactions to music are fleeting and unmemorable (Sloboda, 2010). Moreover, most of us have had the experience that listening to a favourite piece can transform our mood, while at other times, it leaves us indifferent.

How does music evoke such a wide variety of emotional experiences? The paradigmatic example used to explain the process of emotion elicitation is the experience of fear provoked by encountering a bear in the woods, wherein, the evaluation of the event as threatening triggers the emotional response. However, this explanation seems inadequate to the case of emotional experiences with music, since listening to music does not have any immediate consequence for our survival or for the realisation of our goals. Recently, three theories have been put forward to circumvent this problem: the BRECVEMA framework (Juslin, 2013, 2019; Juslin et al., 2010; Juslin & Västfjäll, 2008), the Multifactorial Process Model (Scherer, 2004; Scherer & Coutinho, 2013; Scherer & Zentner, 2001) and the Aesthetic Trinity Theory (Konečni, 2005, 2008). These theories coincide in the assumption that emotional experiences with music emerge from the interaction of factors in the music, the individual, and the situation. However, they fail to explain how exactly this interaction happens, and consequently, they find it difficult to account for the wide variety of emotional experiences with music outlined above.

The **aim** of this paper is to overcome this shortcoming by proposing a new theoretical model based on constructionist approaches to emotion (L. F. Barrett, 2017; Russell, 2003). This model attempts to explain how the listener's bodily and affective state are influenced by the musical structure, the meaning of the situation, the symbolic connotations of the music, and extra-musical information, producing the emergence of a variety of emotional experiences.

What type of affective reactions occur while listening to music?

Scientists have found it difficult to agree on a definition of the “emotion” construct (Beck, 2015; Kleinginna & Kleinginna, 1981; Russell, 2012; Scarantino, 2012; Scherer, 2005). However, a review of the proposals of scholars as varied as Scherer (Mulligan & Scherer, 2012; Scherer, 2005), Moors (2009), Frijda (2008), Juslin & Sloboda (2010), Clore & Ortony (2013), Cunningham *et al.* (Cunningham et al., 2013), and Barrett (L. F. Barrett, 2014), yields several points of agreement that can be summarized as follows:

Emotions are reactions of short duration to events or objects that are valued as relevant for the person's well-being, goals, and/or personal values. This evaluation of an object or event as good/bad, pleasant/unpleasant, attractive/repulsive, moral/immoral, etc. occurs in several subsystems or components which tend to become synchronized. The components involved in emotional episodes (can) include: a *cognitive component* (i.e. appraisals of the meaning of the event, situation or object), a *somatic component* (i.e. central and peripheral neurophysiological changes), a *motor component* (i.e. expressive behaviour), a *motivational component* (i.e. action tendencies, urges, or states of action readiness), and a *feeling component* (i.e. the subjective emotional experience).

Such an encompassing definition may make one be skeptical about the power of music to elicit proper emotions (e.g. Kivy, 1999; Konečni, 2008). However, although it might be argued that musical sounds *by themselves* may not be the only (or even the most important) causal factor that drive emotional reactions in listeners, there is accumulative evidence that listening to music is *associated* with emotional experiences, as observed in subjective reports of experienced

emotions, and measured changes of other emotion components such as physiological arousal and facial behaviour (e.g. Grewe et al., 2007; Lundqvist et al., 2009). In fact, most researchers have assumed that music *induces* distinct, discrete emotional states, and in consequence, implement experiments in which participants listen to music and then describe their experiences by selecting one or more emotion adjectives from a list (Eerola & Vuoskoski, 2013; Zentner et al., 2008). However, studies on people's experiences with music in everyday contexts suggest that affective responses to music are much more varied, and probably much less discrete (i.e., more unspecific) than experimental research has assumed (c.f. Sloboda, 2010). Although the conclusions that can be drawn from qualitative studies are limited by their reliance on retrospective reports, they have the advantage of capturing listeners' descriptions of their affective experiences without the restrictions imposed by the categories defined a priori by researchers.

A first line of evidence of the variety of affective responses while listening to music comes from qualitative studies about musical experiences in everyday life (e.g. Greasley & Lamont, 2011; Istvandy, 2015; Peltola & Eerola, 2016; Saarikallio et al., 2021; Wilhelm et al., 2013). These studies have found that people use music for a variety of functions, such as relaxing, passing the time, and helping concentration, and that to some extent, music fulfils these functions thanks to its effects on people's moods and emotional states (Sloboda & O'Neill, 2001). Notably, although participants in these studies display detailed knowledge about the music they need to listen to in every circumstance, they do not always talk about their affective experiences in terms of *discrete* emotions. Instead, they often use unspecific expressions such as music "creating an atmosphere", helping them "release tension", "become energized" or "have a better feeling" (Saarikallio & Erkkila, 2007), getting them "going", or "in the mood" (DeNora, 2000), making them feel "awake, thinking and functioning well", or experiencing music as a "reflection", or "extension" of themselves (Hays & Minichiello, 2005).

A second line of enquiry that demonstrates the existence of a great variety of affective experiences with music is Gabrielsson's research into strong experiences with music (Gabrielsson, 2001). His participants reported a variety of positive and negative feelings which

go beyond basic emotions (e.g. gratitude, bliss, sexual feelings, pride, patriotism, jealousy, despair, worry, confusion, longing, etc.). The participants' reports often include mixed feelings (e.g. feeling tired and happy at the same time), quasi-physical reactions (e.g. feeling weightless, floating, carried away, charged, out of the body), and feelings that they could not describe with words (e.g. "it was an experience that goes far beyond my verbal and intellectual capacity, something I can only slightly touch with words") (Gabrielsson & Lindström, 2003, p. 170). Similarly, a study that used an open-ended questionnaire found that participants consider that music expresses and elicits both discrete emotions and unspecific feelings, but they reported the later type more frequently (Scherer et al., 2002).

In summary, empirical evidence from qualitative research suggests that people's affective experiences with music are varied, and do not always correspond to intense and discrete emotions. On some occasions, music elicits affective states that are not as diffuse and long-lasting as moods, but at the same time, are less discrete and object-focused than full-blown emotions. These experiences are characterised by being quick, automatic, not entirely conscious, and sometimes, by containing little cognitive elaboration. Several researchers have described these experiences with terms such as "proto-affects", "primitive emotions" (Ortony et al., 2005), "automatic affects" (Baumeister et al., 2007), or "micro-valences" (Lebrecht et al., 2012). Unfortunately, most current theoretical developments on affective experiences with music are based on quantitative studies that focus on discrete emotions (Eerola & Vuoskoski, 2013; Warrenburg, 2020), and therefore, they do not explain how these subtle and diffuse affective experiences are elicited. In consequence, current theorization on these phenomena has neglected a large portion of people's everyday affective experiences with music.

Current theories of emotional experiences with music

Several theories have proposed mechanisms as responsible for emotional experiences with music (e.g. Davies, 2013; Huron, 2006; Meyer, 1956; Overly & Molnar-Szakacs, 2009; Witek et al., 2014; see Warrenburg, 2020 for a review). However, in this review, I concentrate on three recent theories that have adopted a comprehensive approach by mapping all the psychological

mechanisms potentially responsible for emotional experiences with music: the BRECVEMA framework (Sloboda & Juslin, 2001; Juslin, 2013; Juslin et al., 2010; Juslin & Västfjäll, 2008), the Multifactorial Process Model (henceforth referred as MPM) (Scherer, 2004; Scherer & Coutinho, 2013; Scherer & Zentner, 2001), and the Aesthetic Trinity Theory (Konečni, 2005, 2008). Despite their apparent differences, an examination of these theories reveals that they propose similar mechanisms, which can be grouped according to their type of processing (according to the classification proposed by Moors, 2009):

Appraisal mechanisms. These mechanisms involve computation of appraisals of the significance of the music for the individual's goals. These appraisals can be quick, non-conscious, and based on perceptual representations, such as the **musical expectancy** mechanism, included in the BRECVEMA and MPM theories. In this mechanism, the appraisal consists of a comparison between the predictions about how the music will unfold, and the sensorial input from the musical stimulus. When a discrepancy is detected, an affective response is elicited. The **intrinsic pleasantness** check proposed by the MPM also consists of implicit appraisals of aspects of the music as specifying “goodness” or “badness” (e.g. consonance or dissonance).

The BRECVEMA framework and the MPM include mechanisms based on slow, conscious appraisals, too. **Evaluations about the aesthetic value** of the music tend to depend on conscious considerations about the music's novelty, expressiveness, and beauty (Juslin, 2013). Furthermore, several **appraisal checks** in the MPM that evaluate how well the music fits the goals of the individual, the level of control that listener has over the music, and its relation to the listener's social identity are probably based on relatively slower processing of propositional representations. Finally, the **empathy** route proposed by the MPM involves identifying and simulating the appraisal processes that cause the musicians to feel the way they do, and therefore, this mechanism also involves slow appraisal processing (Scherer & Coutinho, 2013, p. 139).

Associative mechanisms. In these mechanisms, associations of music with past emotional experiences lead to the reinstatement of the same emotional responses when the listener encounters the same (or similar) music. This can occur without any conscious awareness of the association, as in the case of **evaluative conditioning**, or with complete awareness of it, as in the case of the **episodic memories** mechanism (Juslin & Västfjäll, 2008), - called the **memory** route in the MPM (Scherer & Coutinho, 2013). The **visual imagery** mechanism proposed in the BRECVEMA framework is also based on associative processing, because the mental images that the listener evokes while listening to the music (which lead to emotional responses), usually emerge from the links that the person makes between the music and past concepts and events. The Aesthetic Trinity Theory also emphasizes that music elicits emotions when its effects are “mediated by **memories** and **associations** regarding powerful real-world events” (Konečni, 2008, p. 123, emphasis added).

Sensory-motor mechanisms. In these mechanisms, an aspect of the music generates a sensory-motor resonance in the listener’s brain, and this activation in turn activates other components of the emotional response. The **brain-stem reflexes** mechanism proposed by the BRECVEMA framework, and included by the MPM as part of the **novelty check**, works under this principle, by eliciting a startle response to sudden musical events. In the **rhythmic entrainment** mechanism, a sensory-motor resonance of bodily rhythms with musical ones produces a cascading effect (i.e. a spreading of activation) to other components of the emotion system. Similarly, in the **emotional contagion** mechanism, proposed by the BRECVEMA framework and the MPM, the internal mimicry of either the melodic aspects of the music (Juslin et al., 2010), or the motor expressions involved in the production of the music (Scherer & Coutinho, 2013) produces the activation of a complete emotional response.

Besides the emphasis that the MPM theory has on appraisal mechanisms, the most important difference between these theories is the way they conceptualize the link between the activation of

particular mechanisms, and the elicitation of discrete emotions. The MPM proposes that the activation of particular mechanisms produces changes in other subsystems (physiological reactions, action tendencies, attention shifts, etc.), which when combined, produce the emergence of an emotion (Moors, 2014). In consequence, for the MPM, the mechanisms can lead to a potentially infinite number of emotions. The BRECVEMA framework, by contrast, maps the correspondence between each mechanism and the induction of particular, discrete emotions, regardless of the influence of contextual and personal factors (Juslin, 2013, 2019). Unlike these two theories which aim to explain a large number of emotional experiences with music, The Aesthetic Trinity Theory focuses on a limited set of rare, profound emotional responses to music: awe, being moved, and thrills, and does not specify the underlying psychological mechanisms responsible for these phenomena.

Limitations of current theories

Undoubtedly, the BRECVEMA framework, the MPM, and the Aesthetic Trinity theories have made significant contributions to our understanding of how musical emotions are aroused, and have inspired research by proposing empirically testable hypotheses. Nevertheless, they also have important limitations:

1. As mentioned above, although these theories submit that emotional experiences with music emerge from the interaction of factors in the music, the individual, and the situation, they do not specify how exactly these factors interact. This limitation is particularly evident in the BRECVEMA framework, which predicts that the activation of particular mechanisms leads to the induction of specific emotions (e.g. Juslin et al., 2010 p. 626), regardless of any consideration of how situational factors might mediate these phenomena.
2. The notion that musical experiences (including affective ones) vary according to the cultural background where they take place is commonplace, and has been abundantly demonstrated by ethnomusicological (e.g. Becker, 2010; Bonini Baraldi, 2009), sociological (DeNora, 2000; Martin, 1995), and psychological research (Gregory & Varney, 1996; North &

Hargreaves, 2008; Saarikallio et al., 2021). However, this cultural dimension of music is almost completely absent in these theories, which do not offer any hypotheses about the role that cultural connotations of music and cultural traditions of musical practice and listening play in the elicitation of emotional experiences with music.

3. These theories contain few, if any, explanations or predictions about how and why affective reactions to music vary in intensity, ranging from intense, discrete, full-blown emotions to fleeting affective responses that are barely conscious.
4. The BRECVEMA framework does not represent a “unified theoretical framework” (Scherer & Coutinho, 2013, p. 132). In other words, it offers limited explanations of how the different mechanisms interact with each other. Although the question of the interaction is addressed in the latest version of the theory (Juslin, 2019), the discussion of this interaction is restricted to the possibility that the simultaneous activation of several mechanisms can lead listeners to experience “mixed emotions” (Juslin, 2019, p. 491-504), but it does not specify general rules about which mechanisms take precedence over others, and the resulting emotional experiences of these interactions. For instance, nowhere in its latest version, does the theory consider what would happen in a situation when music listening activates, at the same time, sensorimotor mechanisms (such as the entrainment mechanism) and associative ones (such as the episodic memories one).
5. As mentioned, above, the Aesthetic Trinity Theory aims to explain rare, profound experiences with instrumental music of the high art tradition: awe, being moved, and “chills” (which is a physiological response, not an emotion proper). Hence, this theory has limited explanatory power to account for the variety of emotional reactions that people experience listening to music in everyday life contexts, where “absolute music” (Konečni, 2008, p. 124, i.e., instrumental Western classical music), is the exception rather than the rule. Moreover, although the Aesthetic Trinity Theory (Konečni’s, 2005) proposes some environmental conditions that facilitate the emergence of sublime emotions (e.g. that music is “performed in vast architectural spaces” p. 37); and describes a number of musical features associated

with “chills” (e.g. “crescendos” and “dissonant chords”, p. 37); this theory does not put forward the *psychological mechanisms* that mediate between the environmental conditions, the musical structures, and the elicitation of emotions in the listener.

Principles of constructionist theories of emotion

Constructionist theories share the assumption that social or psychological phenomena emerge from the interaction of more basic elements (Faucher, 2013). For these theories, mental and behavioural phenomena are not determined by structural and biological conditions, and therefore, they vary considerably according to the historical, cultural, social and/or personal context where they take place. For contemporary constructionist theories of emotion such as Russell’s (2003) and Barrett (2006, 2017), emotions emerge from the interaction of two elements: *core affect* and *categorization*.

Core affect consists of an embodied and pre-reflective representation of our well-being and of our relation to the environment, and works as a constant underlying affective tone to our waking life (Russell & Barrett, 1999). Changes in core affect are caused by multiple factors: external stimulation, bodily processes, and psychological processes (Russell, 2003). When made conscious, core affect is experienced along two dimensions: *valence*, and *arousal*. Valence consists of feelings of pleasure or displeasure. Arousal consists of feelings of being activated or deactivated. (Russell & Barrett, 1999). Core affect can be experienced as a free-floating affective tone, not particularly associated with an object (i.e. a mood); or as the inviting or repulsive property of an object in the environment, (i.e. a “proto-emotion” or “automatic affect” as explained above). In contrast, when core affect is categorised and attributed to an eliciting object, it is experienced as a discrete emotional episode.

Categorization consists of the process of bringing knowledge from past emotional experiences to conceptualize the present affective state. Barrett (2006) calls this process of categorization of core affect a *conceptual act*, and describes it as an effortless, automatic, involuntary, quick, and implicit process. The top-down knowledge that is summoned to categorize the present affective situation transforms core affect into a discrete emotional episode. This implies that the conceptual

act does not merely give a label to an already-formed emotion (Russell, 2003); instead, it shapes the experience by providing the person with a set of inferences about the cause of the situation, what is likely to happen next, what the most appropriate or useful behaviour should be, etc. Crucially, since the evoked conceptual knowledge is tailored to the needs of the person in each context, the feelings, expressive behaviours, action tendencies and neuro-physiological activity evoked during a particular emotional episode may be quite different to another episode, even if they are labelled with the same emotional adjective (L. F. Barrett, 2006). For instance, although a person may use the same word to describe two experiences (e.g. “I am feeling very sad”), the two instances may be quite different: on one occasion, the person may cry, look for someone to embrace them, and have fast cardiac activity; whereas on the other, the person may sit quietly, ask to be left alone, and have slow heart rate.

A constructionist approach to emotional experiences with music

In a nutshell, my proposal is that in any music-listening situation, some features of the musical sounds are processed quickly and automatically by perceptual processes, producing fluctuations in core affect. On most occasions, these fluctuations are experienced as low-intensity changes in mood, or as diffuse affective responses. On other occasions, factors in the music, the person, and the context activate associative and appraisal processes that make the situation personally relevant, thus producing the emergence of a distinct emotional episode.

The first premise of the present proposal is that emotions are situated evaluations that occur when information from past experiences is associated with visceral and subjective feelings (L.F. Barrett, 2017). The second premise is that music is, on one level, an acoustic stimulus that is processed by our brains as any other sonic event by psychological mechanisms that track the predictability and survival value of the stimulus; and at the same time, music is a cultural artefact loaded with personal and sociocultural connotations. Consequently, the proposed theoretical approach aims to: a) explain how acoustic qualities of music produce subjective visceral (bodily

feelings) of pleasure/displeasure, tension/ relaxation; b) explain how contextual, sociocultural and personal connotations of music trigger associations in the listener's mind; and c) explain how these two sources of affective impact interact producing emotional experiences in the listener. For the sake of clarity, I have grouped these sources of affective impact into two types of mechanisms: the mechanisms that produce changes in core affect, and the mechanisms that transform core affect changes into discrete emotions. Importantly, this classification of the mechanisms is made on the basis of the effects that they have in the listener's affective experience, not on the basis of the brain areas that support them, or their evolutionary origin.

This theoretical proposal is concerned with the psychological processes involved in the process of experiencing emotions while listening to music, rather than with the neural structures that support them; and with circumstances of individual music listening, rather than with circumstances of collective listening, or of music making. This proposal is compatible with musicological theories that have put forward the notion of musical meanings (including emotional ones) are emergent and context-dependent (Clarke, 2005; Cook, 2001; Dibben, 2001; Windsor, 2004). The theory is also consistent with other constructionist approaches to emotional experiences with music, such as Warrenburg's proposal of using constructionist methods to study the way listeners conceptualize and experience different emotions with music (Warrenburg, 2020); and with Large and colleagues' proposal that music perception arises from patterns of nonlinear neural resonance to the music periodicity (Large & Almonte, 2012; Large & Kolen, 1994), which in turn communicates core affect to the listener by modulating the person's activation and valence (Flaig & Large, 2014). Additionally, the constructionist model put forward here is also compatible with the Aesthetic Trinity Theory assumption that emotional responses to music are mediated by associations, such that music is only one factor among others, that causes emotional experiences (Konečni, 2005, 2008).

Figure 1 summarises my constructionist proposal of the process of elicitation of emotions by music, which I go on to elaborate on the following pages:

- The musical event is represented in the two boxes on the top of the figure. This event is constituted by two dimensions: the acoustic characteristics of the music, and its sociocultural and personal significance. These dimensions activate two different types of mechanisms in the listener's mind, respectively: automatic perceptual mechanisms that produce variations of *core affect* (represented on the left half of the figure); and *conceptual mechanisms*, that situate the musical event in the landscape of the cultural meaning of the music, the listener's personal history, current goals, and aesthetic values (represented on the right half of the figure).
- For the sake of clarity, the **core affect mechanisms** are grouped into two categories: mechanisms that tend to have effects on *arousal* (represented by hexagons), and mechanisms that tend to have effect on *valence* (represented by rhombuses). These mechanisms are activated automatically when we listen to music, and their interaction produces fluctuations of core affect.
- The **conceptual mechanisms** are also grouped into two large categories: *associative mechanisms* (represented by pentagons), and *appraisal mechanisms* (represented by triangles). The activation of these mechanisms and their interaction produce a *conceptual act*, which constantly shapes the variations in core affect producing different affective states.
- The multiplication sign ("x") in the centre of the diagram represents the notion that the emergent affective states interact with the type of attention that the listener devotes to the musical event. This interaction produces a variety of non-emotional and emotional responses to music, which can be grouped into three large categories (pointed by arrows on the bottom of the diagram): experiencing diffuse, world-focused affective responses to the music; experiencing emotions as expressed by the music (rather than aroused in the listener); and experiencing intense, discrete, self-focused emotions.

Figure 1: Graphic Representation of the Theory

Processes and mechanisms that lead to changes in core affect

Perception is simultaneously a process of information organization, prediction, and affective evaluation (L. F. Barrett & Bar, 2009; Clark, 2013). Therefore, perceiving music involves detecting new sounds, grouping them into percepts (gestalts), predicting what the next sounds are going to be, assessing the accuracy of these predictions (Huron, 2006; Meyer, 1956), and evaluating the significance of the sounds for the listener's well-being. These perceptual processes tend to produce small changes in experienced affect when there is a mismatch between the predicted and the actual stimulus (Moors et al., 2021).

In this view, the responses that BRECEVEMA framework calls the **musical expectancy** mechanism arise from perceptual processes involved in integrating sensorial information with top-down information, and from processes of appraisal that produce affective responses. Thus, successful predictions about how the music will continue are rewarded, reinforcing learning, and unsuccessful predictions are penalised, producing corrections in further predictions (Carver & Scheier, 1990; Colling & Thompson, 2013; Huron, 2006), and affective changes: successful predictions tend to produce positive affect and prediction errors tend to produce negative affect (Moors et al., 2021). The level of conscious awareness of these affective responses depends on how large the deviations from the predictions are. Since most of the times the music that we listen to is predictable, and violates a moderate number of expectations, the fluctuations in core affect are fleeting and non-conscious, and can only be detected by physiological measures of arousal such as variations in neuroelectric activity, skin conductance and heart rate (Koelsch et al., 2008). On other occasions, the violations of expectations are so large that they produce noticeable changes in experienced arousal, and to a lesser extent in valence (Cheung et al., 2019; Egermann et al., 2013; Steinbeis et al., 2006). Thus, listeners report them as feelings of increased tension or “emotionality” in the music (Steinbeis et al., 2006), feelings of pleasure (Cheung et al., 2019) or liking (Gold et al., 2019). On other occasions, a musical event may appear so suddenly that it provokes an “urgent” response that is observable as a surge in physiological arousal, and experienced subjectively as surprise (a response that while it lasts is not positive or negative).

This is what the BRECVEMA framework labels the **brain stem reflex** mechanism (Juslin & Västfjäll, 2008). And in those cases where the music prevents the listener from creating any stable expectations, because it departs largely from harmonic and melodic conventions, the listener usually experiences the music as unpleasant¹ (e.g. some avant-garde pieces of classical music, such as the ones used by Juslin and colleagues in their experiment (Juslin et al., 2015)).

The continuity between the **musical expectancy** and the **rhythmic entrainment** mechanisms is best understood by adopting an embodied perspective of cognition (Barsalou, 1999). In this view, the same motor neural network underlies perception and action (Bangert et al., 2006; Grahn & Brett, 2007; Wilson & Knoblich, 2005), and therefore, whenever we listen to music, mirror neuron systems simulate action plans in motor areas of our brain, as if we were about to produce the musical sounds ourselves (Leman & Maes, 2014). In turn, these simulated action plans generate changes in core affect by evoking states of *action readiness* (Frijda et al., 1989), and a kind of bodily *resonance* with the structural and affective qualities expressed by the music. On occasion, the bodily states elicited by this process of resonance are experienced as feelings of bodily tension that Huron (2006) associates with the anticipation of events in the music. On other occasions, they manifest in overt behaviours such as singing along or pretending to play the instruments (i.e. “air-playing”). And when the music repeatedly violates rhythmic expectancies producing moderated syncopation, these states are experienced as an urge to move along with the music (Witek et al., 2014).

Adopting this embodied perspective on music perception also helps to explain the correspondence between perceived arousal and tension in the music, and experienced arousal and tension by the listener. Several studies have found that compared to listening to relaxing or sedative music, music with stimulative qualities (e.g. with fast tempo, loud dynamics, rapid changes in dynamics, staccato articulation, etc.) is associated with increases in autonomic responses, such as heart and respiration rate, blood pressure, and skin conductivity (Hodges,

¹ It is possible that some listeners experience this type of music as “interesting” or artistically valuable. However, the mechanism at play in this case is a cognitively rich type of appraisal of aesthetic value. I discuss this mechanism further on.

2010). Similarly, research into musical tension has found that increased dynamics, faster or accelerating tempi, higher pitch register, and rising melodic contours are associated with higher ratings of perceived tension (as compared with the opposite patterns) (e.g. Farbood, 2012; Granot & Eitan, 2011; Illie & Thompson, 2006). Moreover, in an experiment where participants were asked to squeeze on a pair of tongs to represent the tension they perceived in the music demonstrated how easy it is for listeners to translate perceived tension into muscular tension (Nielsen, 1987).

From this embodied perspective, this correspondence between musical and experienced “arousal” emerges from two types of mechanisms. On the one hand, primitive mechanisms of adaptation, whereby we not only perceive music as groups of harmonic, melodic, or rhythmic elements, but as acoustic information that specifies *events* in the world (Clarke, 2005). Thus, on a subconscious level, musical events are appraised as providing signs that an object is approaching or moving away from us, the level of physical strain from the person making them, etc. And since from this perspective, perception is regarded as a process of preparation for action (Gibson, 1979), then these appraisal processes also provoke changes in physiological and experienced arousal. The second type of mechanism is again embodied simulation, wherein premotor areas of the brain simulate bodily states of tension as the patterns of musical tension unfold in the music, and this simulation in turn provokes changes of experienced tension in the listener.

Evidently, it is possible that the mechanisms that produce changes in the listener’s arousal can also lead to changes in valence, and in principle, it is possible that changes in one dimension are associated with changes in the other one (Kuppens et al., 2013). However, the evidence for this possibility is so far scarce and somewhat contradictory. First, regarding the **musical expectancy mechanism**, whereas several studies associate violations of musical expectancies with physiological and experienced arousal (Egermann et al., 2013; Koelsch et al., 2008; Steinbeis et al., 2006), other research associate these violations with experienced pleasantness and liking (Cheung et al., 2019; Gold et al., 2019; Shany et al., 2019). Second, regarding the evidence for the effects of **rhythmic entrainment** on valence, the evidence is contradictory: some studies have

found significant effects (Bernardi et al., 2017, 2018; Labbé & Grandjean, 2014; Witek et al., 2014) while others have found no association (Janata et al., 2012, Cespedes-Guevara & Witek, in press). And third, regarding the effects of **music on experienced tension**, perhaps the most informative evidence has been provided by Illie and Thompson (2006) who compared the effects of musical loudness, tempo, and pitch height (and their equivalents in vocalizations) on the participants' valence, and tense and energetic arousal (Schimmack & Grob, 2000). Their results suggest that tense arousal and valence are largely orthogonal dimensions: the musical parameters associated with ratings of tension, were not the same associated with ratings of valence.

This panorama of somewhat contradictory findings suggests that the mechanisms associated with the changes in valence dimension of core affect should be looked for elsewhere. My hypothesis is that changes in experienced valence are produced by implicit appraisals of “goodness”/ “badness” in the music, and to associative mechanisms derived from implicit learning.

A starting point is, again, the premise that perceptual processing involves evaluation of the significance of the present situation for the person's well-being. This evaluation happens so quickly that it contributes to the construction of the perceptual gestalt itself, and occurs unconsciously (Lebrecht et al., 2012). This appraisal, which corresponds to the **intrinsic pleasantness appraisal check** in Scherer's CPM theory (Scherer, 2009), is also present in music perception. Some of these valence appraisals may have innate origins, such as the preference for consonant over dissonant intervals (Trainor & Heinmiller, 1998; Zentner & Kagan, 1998). Other appraisals may originate in cross-modal associations, such as the association of loud low-pitched sounds with the presence of large objects (Granot & Eitan, 2011), or the association of rough timbres with bodily tension or exertion (Scherer, 1986). Although these primitive appraisals of goodness/badness happen very quickly (under 300 milliseconds, Flykt et al., 2009), they interact with the previous psychological state of the individual, such as his or her motivational state (LaBar et al., 2001). In the case of music, the observation that evaluating dissonant intervals and rough timbres as unpleasant depends on historic and musical contexts is commonplace.

A second group of mechanisms that produce changes in valence arise from processes of implicit learning. First, the phenomenon of **mere exposure**, wherein liking towards an object increases after repeated exposure, has been observed for music (Margulis & Simchy-Gross, 2016; Schellenberg et al., 2008). Second, the mechanism called **evaluative conditioning** in the BRECVEMA framework explains how having listened to a piece of music while undergoing a valenced experience biases our future affective responses to the same or similar music. And finally, people learn specific cues to the expression of musical emotions in their society during **enculturation**. For example, the association between major mode and positive affective states, and minor mode and negative ones, emerged gradually along the last seven centuries in Western classical music (Parncutt, 2014), and becomes internalised by children by age 8 (Gregory et al., 1996). Research has also found how listeners from different cultures are more sensitive to musical cues to emotion that are specific to their musical traditions, such as the association between modes and moods in classical Hindustani music (Laukka et al., 2013). (See Cespedes-Guevara & Eerola, 2018 for a critical review of evidence from transcultural and developmental studies).

How do changes in core affect become discrete emotional episodes?

On most occasions, our affective responses to music consist of fleeting, unmemorable and subtle fluctuations of core affect such as the ones I have described in the previous section. In this section, I explain the processes and mechanisms that make affective responses while listening to music go beyond this basic level, to become intense, discrete emotional episodes. In my view, both associative and appraisal mechanisms are involved in the process of transformation of a diffuse affective state into a discrete emotion (i.e. the conceptual act).

In general terms, the listener's perception of the **sociocultural significance of the musical event** as a whole represents the framework that determines the activation of the particular mechanisms that produce a particular conceptual act (henceforth called "conceptual mechanisms"). Our sensitivity to the sociocultural connotations of music implies that, in every situation where we listen to music (even solitarily), our experience is shaped by culturally-shared knowledge about the meaning of the situation. This knowledge presents us with a set of

expectations and implicit understandings such as: the role of the music in the event, what the music is about, the listening attitude we should adopt, the behaviour that is expected from us, and so on (Becker, 2010). These conventions, in turn, predispose us to take particular bodily and psychological attitudes towards the music and the rest of the elements in the situation. In this sense, the conceptual mechanisms can be regarded as bodily and psychological *contexts* that shape the fluctuations of core-affect even before the music has started to play. For instance, Bonini Baraldi (2009b), reported how gipsy communities in Romania play the same musical pieces in weddings and funerals, but the pieces facilitate the expression and arousal of very different emotions in each context.

Conceptual mechanisms I: associative mechanisms

The associative mechanism that contributes to the elicitation of the most intense emotional reactions while listening to music is the evocation of **episodic memories** of emotional reactions from past experiences with a piece of music (H. Baumgartner, 1992; Juslin & Västfjäll, 2008; Scherer & Coutinho, 2013). Importantly, research suggests that personally meaningful music can evoke strong emotions, even when the evoked memories correspond to a general time in the person's past (e.g. high-school) rather than to particular events (e.g. the prom party) (F. S. Barrett et al., 2010).

The observation that memory associations do not need to be specific to evoke musical emotions suggests that **semantic knowledge activated by music** can also have emotional consequences. Since music is part of many culturally significant events where it is used to communicate affective connotations, then music-evoked memories are never really completely idiosyncratic, and are often emotional. In consequence, we tend to experience music as “loaded” with symbolic and affective meanings.

Several lines of research have demonstrated how easy it is for listeners to evoke semantic memories when listening to music. For example, Dibben (2001) found that listeners' descriptions of music excerpts include not only their acoustic characteristics, but also cultural information about their musical genre, the typical context where they are played, and stereotypical emotional

associations. In another study, which investigated concepts associated with music genres in listeners from two cultures, Kristen and Shevy (2012) found high levels of agreement between listeners and across cultures for internationally recognised genres, and marked cultural differences for culture-specific ones. Koelsch and colleagues showed how even listening to short musical excerpts conveys semantic information to listeners (Koelsch et al., 2004; Painter & Koelsch, 2011; Steinbeis & Koelsch, 2008). More recently, Margulis and colleagues (Margulis, 2017; Margulis et al., 2019; McAuley et al., 2021) have shown that listeners easily create narratives while listening to instrumental music pieces, and match pre-existing narratives to them. Moreover, their results indicate that the content of the narratives evoked by the music is relative to the cultural background of the participants, but there are high levels of inter-rater agreement within cultures.

The evocation of semantic knowledge contributes to emotion elicitation by activating embodied conceptual knowledge. In this view, even abstract concepts such as “love”, “joy”, “divinity”, etc., are represented in the brain as embodied simulations of bodily states, sensations, introspective states, and action tendencies (Wilson-Mendenhall et al., 2011; Winkielman et al., 2015). And since the conceptual act consists in partially re-activating (i.e. simulating) sensorimotor and introspective states from past emotional experiences (L. F. Barrett, 2006), then it is conceivable that music-evoked semantic concepts contribute to emotion elicitation by activating embodied simulations. Thus, the cultural meanings associated with a musical piece can influence our emotional responses because those meanings predispose us to experience the “right” type of emotions associated with that type of music. For instance, a piece of classical music can activate the concept of “solemnity”, and facilitate the re-activation of an experience of attending a classical concert where we felt admiration; whereas a piece of pop music can activate the concept of “summer party”, and facilitate the re-activation of an experience of going to a BBQ where we felt joy.

A second source of associations corresponds to the evocation of semantic information that is not provided by personal or cultural connotations evoked by musical sounds, but by the immediate

context in which music listening takes place. These include the gestures of the performers, and verbal or visual narratives experienced along or before the music. Several studies on the emotional consequences of music listening in everyday contexts suggest that affective experiences with music vary according to the context in which music listening occurs (Juslin et al., 2008; Krause & North, 2017; Linnemann et al., 2016; Saarikallio & Erkkila, 2007; Sloboda & O'Neill, 2001), and that contextual factors explain a large proportion of the variance in emotional outcomes of music listening (Randall & Rickard, 2017).

Recent evidence suggests that the **performers' gestures** have effects on the observers' affective experience of music. For instance, Thompson and colleagues found that these gestures bias the perception of dissonance, interval size, and musical valence (Livingstone et al., 2009, 2015; Thompson et al., 2005, 2008). And a study by Miu & Balteş (2012) where participants observed performances of a dramatic opera singer, the researchers found that participants who adopted an empathic attitude towards the singer experienced more intense emotions aroused in themselves than those who adopted a detached attitude.

Despite the fact that most music that people listen everyday contains **lyrics**, few studies have investigated their influence on emotional experiences with music. Most research has focused instead in their effects on the perception of emotion (e.g. Ali & Peynircioglu, 2006; Thompson & Russo, 2004), or in their social effects (Anderson et al., 2003; Fischer & Greitemeyer, 2006). Two important exceptions are the studies by Mori and Iwanaga (2014) and Barradas & Sakka (2021). The first one used happy-sounding songs with sad lyrics in a foreign language, in three conditions: listening to the music without understanding the lyrics, reading to the lyrics translation without music, and listening to the music while reading the translation. The researchers found that listening to the music led to the arousal of positive feelings in participants, independently of their understanding of the lyrics; and that reading the lyrics without music led to the arousal of negative feelings. In Barradas and Sakka's study (2021), Swedish and Portuguese participants listened to sad-sounding songs from each culture, in three conditions: instrumental versions, listening to the songs while watching lyrics on the screen, or listening to the song with sung lyrics. These authors

found that neither the music origin, nor the presence of lyrics had an effect on ratings of experienced sadness-melancholy, but they did have a significant effect on ratings of surprise-astonishment in the Swedish participants; and on emotion intensity, ratings of happiness-elation and ratings of interest-expectancy in the Portuguese ones. In summary, these two pieces of evidence offer contradictory conclusions on the effect of lyrics on emotional experiences with music. While the first study suggests that the emotional meanings afforded by the musical materials take precedence over the message in the lyrics, the second suggests that lyrics do influence some emotions, for some cultural groups. Clearly, more research is needed to explore the interaction between these two sources of emotional meaning.

Although research in music therapy has shown how music-evoked **visual imagery** can evoke strong emotional experiences (Bonny & Savary, 1973), there are three reasons to be sceptical about the emotional power of this mechanism. First, in many circumstances, the conjured images may be just an epiphenomenon of music listening when we do not have any simultaneous visual stimulation that draws our attention (Thompson & Coltheart, 2008). Second, recent research has found that listeners perceive the emotions expressed by music, and experience emotions aroused in themselves *before* they conjure visual imagery (Day & Thompson, 2019), suggesting that the evoked images might be a secondary process to the activation of semantic knowledge by the musical sounds. And third, the above-mentioned study by Cespedes-Guevara and Dibben (2022), found that the provided narratives about the composer's circumstances biased the participants' experienced and perceived emotions consistently, but a significant percentage of participants did not report evoking mental images while listening to the musical stimuli.

An ideal starting place to investigate how **imagined or observed visual narratives experienced along with music** influence people's emotional responses would be to study people's experiences with film music and music videos. Unfortunately, there has been little research on how these sources of meaning interact to elicit *emotional* responses in the spectator. Most of this research has confirmed the finding that when visual and auditory information are paired, visual information takes primacy (Bolivar et al., 1994; Thompson et al., 1994). However,

recent investigations have found that this effect is moderated by the degree of congruence between the two sources of information (e.g. Boltz, 2001; Boltz et al., 2009; Pavlović & Marković, 2011). In contrast, a series of experiments carried out by Baumgartner and collaborators found an additive effect of music and images on the participants' emotional experience (T. Baumgartner, Esslen, et al., 2006; T. Baumgartner, Lutz, et al., 2006). These researchers presented participants with music only, images from the IAPS, or music and images simultaneously, and found that the music-only condition was associated with the lowest signs of emotional involvement, whereas the music-and-images condition was associated with the highest. Clearly, just as in the case of lyrics, more research is needed to fully understand how visual narratives interact with musical affordances, producing a variety of emotional experiences.

Conceptual mechanisms II: rule-based appraisals

So far, I have described mechanisms that enrich the fluctuations in core-affect by relating them to meaningful associations and narratives. However, I submit that most of the time, the activation of these associative mechanisms does not guarantee that the listener will experience aroused emotions, because the transformation of core-affect into discrete emotions tends to occur only when there is something in the situation, and/or in the music that is evaluated by the listener as *personally relevant*. In this sense, while all these associative mechanisms make the musical event more meaningful, and thus increases the probability of having an emotional response, only the evocation of episodic memories makes arousal of emotions in listeners almost certain, because only this process directly involves the evocation of personally significant events from the past. Indeed, if the activation of semantic knowledge, or the presence of verbal or visual narratives could lead to the transformation of core affect into a discrete emotional episode on their own, then we would experience full-blown emotional episodes every time we listen to music! Since this is clearly not the case, I propose that on most occasions, the transformation of core-affect into discrete emotions also requires the activation of appraisal mechanisms, which provide the element of personal relevancy to the situation. In this section I do not address appraisal mechanisms based on the activation of primitive, sensorimotor connections, and evaluations of perceptual

predictions, because I already described them above. Instead, here I describe appraisal mechanisms that depend on the activation of propositional knowledge, and therefore, tend to be slower, and at times, conscious (Moors et al., 2013).

The first type of appraisal evaluates the extent to which the musical event is **desirable or undesirable for our goals** in the present situation. Since in contemporary Western societies, listening attentively to music is rarely our main activity (Juslin et al., 2008; Sloboda et al., 2001), then on most occasions these appraisals evaluate the extent to which music facilitates another task we are doing simultaneously. On other occasions, we listen to music with the explicit objective of regulating our affective and motivational states, and therefore, the appraisal becomes a meta-evaluation of the degree to which the music helps us reach the desired state.

The second type of appraisal evaluates the **degree of control** that we have over the present situation (equivalent to Scherer's *coping potential checks*, (2009)). Research suggests that people are quite tolerant to the presence of music that they have not selected themselves, but the more people can handle the choice, the more they experience positive emotions (Krause et al., 2015; Sloboda et al., 2001). Moreover, this sense of control or agency can exert a powerful effect on the person's valence, to the point that perceiving greater control over the music is associated with a reduction of pain feelings in experimental and everyday situations of music listening (Howlin et al., 2022).

The third type of appraisal consists of evaluations of the **aesthetic value of the music, and/or the musicians'** ability, creativity, etc. (Juslin, 2013; Scherer & Coutinho, 2013). In this case, we make use of personal and socially-shared aesthetic criteria to approve or disapprove the music's beauty, complexity, challenge, and the musicians' gestures, technique, flair, etc. While the two types of appraisals described above increase the probability of experiencing a wide range of positive or negative emotions, the appraisals of aesthetic value tend to produce emotions such as admiration, awe, or on the contrary, disdain, contempt, or boredom.

The role of attention in shaping affective responses to music

In this section I add a final intervening element in the process of experiencing emotions while listening to music: attentional deployment. Although attention is influenced by all the mechanisms described so far, the level and type of attention that a person dedicates to a musical event is not solely determined by those processes, because attention can be modified by volition. My proposal is that listening to music can be described as occurring on a continuum of three different modes of attention, and that these modes are associated with different types of affective experiences with music:

A shallow-level. In this mode of attention, we pay little attention to the music, or listen to it without engaging in elaborating its personal and cultural meaning. The music is so unrelated to our present goals and/or has so little personal resonance, that it is only experienced as a general sonic background. When we are engaged in this mode of attending, it is less likely we have any emotional reaction to the music, and when we do, our affective reaction tends to be diffuse, short-lived, of little intensity (i.e. a proto-affect according to Ortony et al., 2005). These experiences also tend to be world-focused, rather than self-focused; in other words, we tend to experience the world as affectively valenced (e.g. the situation is experienced as “pleasant” or “unpleasant”, “calming” or “hostile”, etc.) rather than to reflect on our feelings (e.g. “I am feeling”... “well” or “bad”, “relaxed”, or “threatened”, etc.) (Lambie & Marcel, 2002).

A cognitively engaged, but emotionally detached-level. In this mode of attention, we pay more attention to the music, but it does not evoke any meaningful associations with personal memories, we do not have the goal of using the music to regulate our mood, or it is not relevant for our present goals. In this case we tend to experience emotions as if they were *in* the music, rather than in ourselves. In other words, we tend to experience the phenomenon of perception of emotions in the music, rather than the phenomenon of emotion elicitation. Even though this mode of attention can correlate with changes in

patterns of physiological activity, we do not consciously experience a shift in our own affective state.

A deep, emotionally involved level. In this mode of attention, we actively engage in constructing meanings out of the listening experience, because the music is relevant to our goals, and/or the associative mechanisms have automatically established significant connections with personal events from our life. This could happen even in those cases in which music is not the main focus of attention, but is still an important part of the present situation, such as when music is embedded in multimedia such as T.V adverts and films. When we engage in this type of attending, it is more likely that we experience a discrete and intense emotion.

On some occasions, the emotional episode can be world-focused, such as when we experience an intense emotional reaction of admiration for a performer on stage, or when we are deeply engaged in watching a film, and the combination of the visual narrative and the musical soundtrack makes us empathise with the characters on the screen. On other occasions, the experience can be self-focused, and therefore we realize that we are undergoing an emotional episode.

Emergence of full-blown, discrete emotions

I have explained how the changes in core affect elicited while listening to music are shaped into discrete emotions thanks to associative mechanisms and rule-based appraisals. All these mechanisms can be considered psychological and situational contexts, which shape and constrain the fluctuations of core affect into diffuse affective reactions or into discrete emotional episodes. There are probably other mechanisms that influence this process, which work as more “distal” contexts. These factors correspond to individual differences in cognitive and affective styles, whose activation and effect depend on the demands of the present situation. This may include differences in musical abilities (e.g. there is evidence that people with more musical training are more sensitive to dissonance, (Dellacherie et al., 2011); styles of listening and preferences (e.g.

some people prefer to pay attention to the lyrics, others pay little attention to them), personality dispositions (e.g. people high in the neuroticism trait tend to experience nostalgia while listening to music, (F. S. Barrett et al., 2010); and people with high openness and empathy traits tend to enjoy and respond with more emotional intensity to sad music (Vuoskoski et al., 2012).

As is probably already evident from the large number of processes and mechanisms I have discussed so far, discrete emotional episodes emerge from complex interactions of many factors, which are only sporadically present in the right combination, producing the “perfect emotional cocktail”. In fact, I presented a set of *definitional* criteria to establish the boundaries between diffuse affective responses and emotions proper, the question of how to *empirically* establish that threshold is still a matter of debate and investigation (e.g. Meuleman & Scherer, 2013; Sander et al., 2005; Scherer, 2009). Nevertheless, this complexity should not be taken as meaning that this phenomenon cannot be studied empirically. On the contrary, I finish this article by presenting ten hypotheses derived from the theoretical framework I laid out.

Empirical predictions

1. Music perception involves processes of neural resonance, motor planning, and musical expectancies, which have affective effects. Most of the time these affective effects are very subtle, and only detectable by physiological measures, such as skin conductance response.
2. On other occasions, the musical materials elicit more consciously-available changes in core-affect, such as feelings of tension, startle reflexes, or urges to move-along to the rhythm. When a listener is asked to reflect on these embodied sensations, they report them as feelings that the music is more “emotional”, more “tense”, “groovier” or that they are having a more intense emotional response.
3. The mechanisms of musical expectancies, rhythmic entrainment, brain stem reflexes, and of bodily adaption to musical tension and intensity, lead only to fluctuations in arousal and, possibly, but to a lesser extent, also of valence. These mechanisms lead to the elicitation of

discrete emotions only with the contribution of “conceptual” mechanisms based on associative processing and rule-based appraisals.

4. Since the perception of music and of music expressivity of emotion is supported by mechanisms of embodied simulation, then manipulating the listeners’ embodied states can facilitate or hamper the perception and the elicitation of emotions while listening to music.
5. The changes in core affect interact with mechanisms that provide conceptual information (i.e. associations and appraisals) producing a variety of emotional responses. Although this variety tends to be limited by the levels of arousal and valence expressed and elicited by the musical sounds, they are not restricted to a reduced set of so-called basic emotions; not even in the absence of an immediate meaningful social context (such as in the context of an experiment).
6. Although associative mechanisms increase the probability of having an emotional response to music, this probability depends on how personally specific the activated associations are. The more personal the associations, the more likely the listener will experience an emotion. (Importantly, this does not imply that these associations have to be accessible to consciousness while the person listens to the music).
7. In the same sense, when several mechanisms are activated at the same time, those mechanisms more directly related to the activation of personal meanings will tend to make the largest contribution to the type and intensity of the emotions experienced by the listener.
8. Extra-musical factors such as programme notes, lyrics and visual images tend to be more powerful the more they constitute narratives. Their effects, however, interact with the core affect specified by the musical material: the more congruent they are, the more powerful the effect of this extra-musical information.
9. Given the culturally relative character of some of the associative mechanisms (such as the activation of semantic knowledge, or the familiarity with the musical conventions), people from different cultural backgrounds have qualitatively different emotional experiences when they listen to the same piece of music. They have, however, some level of agreement in their

responses related to the level of arousal expressed by the musical structure and elicited by listening to the music.

10. The quality and specificity of the affective response that a listener has from listening to a piece of music depends on the mode of attention they dedicate to the music. The more a listener engages in a deep, engaged mode of listening, the more she will construct emotional meanings, and therefore, the more likely she will have a discrete emotional reaction to the musical event.

Conclusions

In this article I have presented a constructionist approach to emotional experiences associated with music listening, drawing from contemporary constructionist theories of emotion such as Barrett's Conceptual Act Theory. Although this approach overcomes some of the shortcomings and difficulties faced by other theories of musical emotions, it is evident that it does not represent a paradigmatic revolution (Kuhn, 1962). On the contrary, I consider that this constructionist approach builds upon the claims of previous theories, integrating and re-interpreting their proposals, and at some points, contradicting them.

In my view, these are some of the advantages of adopting the constructionist approach I have proposed:

- *This model assumes a holistic approach.* It provides detailed hypotheses about how musical emotions arise from the interaction of intra-individual mechanisms, with mechanisms activated by the symbolic value of music, and mechanisms activated by situational and “extra-musical” factors.
- *This model is well-suited for explaining emotional variability.* It assumes that affective responses to music are characterised by their variety, and provides propositions that explains how this variety is produced.

- *This model represents a unified theoretical framework.* It provides detailed explanations on how the mechanisms interact with and constrain each other, shaping the person's affective responses.
- *This model is parsimonious.* Despite its apparent complexity, this model can be regarded as a simplification of the proposals made by the BRECVEMA framework –which proposes eight mechanisms of emotion induction; and of the Multifactorial Process Model –which proposes six routes to emotion elicitation. The present model, by contrast, integrates mechanisms into two subtypes, corresponding to the two core systems proposed by Barrett, 2006). Moreover, this model proposes that the same principles underlie experiences of perceiving emotions in the music, and the elicitation of emotion by music.
- *This model integrates bodily and mental aspects of affective response to music.* By embracing the proposals of embodied theories of cognition (Barsalou, 2003; Leman & Maes, 2014), this model establishes links between bodily responses to music (which tend to be primitive, non-conscious and involuntary), and “mental” responses (which tend to be cognitively sophisticated, conscious, and susceptible to volition).

Finally, I expect this theoretical proposal to be relevant beyond the boundaries of the fields of music psychology and empirical musicology. Since this model offers a comprehensive account of musical affects, it enables music psychology research to dialogue with other disciplines such as music therapy, historical musicology, ethnomusicology, popular music studies, sociology of music, etc., where individual, historical, and sociocultural variability are essential.

References

- Ali, S. O., & Peynircioglu, Z. F. (2006). Songs and emotions: Are lyrics and melodies equal partners? *Psychology of Music*, 34(4), 511–534. <https://doi.org/10.1177/0305735606067168>
- Anderson, C. A., Carnagey, N. L., & Eubanks, J. (2003). Exposure to violent media: The effects of songs with violent lyrics on aggressive thoughts and feelings. *Journal of Personality and Social Psychology*, 84(5), 960–971. <https://doi.org/10.1037/0022-3514.84.5.960>
- Bangert, M., Peschel, T., Schlaug, G., Rotte, M., Drescher, D., Hinrichs, H., Heinze, H.-J. J., & Altenmüller, E. (2006). Shared networks for auditory and motor processing in professional pianists: Evidence from fMRI conjunction. *NeuroImage*, 30(3), 917–926. <https://doi.org/10.1016/j.neuroimage.2005.10.044>
- Barradas, G. T., & Sakka, L. S. (2021). When words matter: A cross-cultural perspective on lyrics and their relationship to musical emotions. *Psychology of Music*. <https://doi.org/10.1177/03057356211013390>
- Barrett, F. S., Grimm, K. J., Robins, R. W., Wildschut, T., Sedikides, C., & Janata, P. (2010). Music-evoked nostalgia: Affect, memory, and personality. *Emotion*, 10(3), 390–403. <https://doi.org/10.1037/a0019006>
- Barrett, L. F. (2006). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review*, 10(1), 20–46. https://doi.org/10.1207/s15327957pspr1001_2
- Barrett, L. F. (2011). Constructing emotion. *Psychological Topics*, 20(3), 359–380.
- Barrett, L. F. (2012). Emotions are real. *Emotion*, 12(3), 413–429. <https://doi.org/10.1037/a0027555>
- Barrett, L. F. (2014). The Conceptual Act Theory: A précis. *Emotion Review*, 6(4), 292–297. <https://doi.org/10.1177/1754073914534479>
- Barrett, L. F. (2017). *How emotions are made: The secret life of the brain*. Houghton Mifflin Harcourt.
- Barrett, L. F., & Bar, M. (2009). See it with feeling: Affective predictions during object perception. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 364, 1325–1334. <https://doi.org/10.1098/rstb.2008.0312>
- Barsalou, L. W. (1999). Perceptual symbol systems. *The Behavioral and Brain Sciences*, 22(4), 577–609; discussion 610–60. <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1693222&tool=pmcentrez&render type=abstract>
- Baumeister, R. F., Vohs, K. D., Dewart, C. N., Zhang, L., Nathan DeWall, C., Liqing Zhang, Dewall, C. N., & Zhang, L. (2007). How emotion shapes behavior: feedback, anticipation, and reflection, rather than direct causation. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc*, 11(2), 167–203. <https://doi.org/10.1177/1088868307301033>
- Baumgartner, H. (1992). Remembrance of things past: Music, autobiographical memory, and emotion. *Advances in Consumer Research*, 19, 613–620.
- Baumgartner, T., Esslen, M., & Jäncke, L. (2006). From emotion perception to emotion experience: Emotions evoked by pictures and classical music. *International Journal of Psychophysiology*, 60(1), 34–43. <http://linkinghub.elsevier.com/retrieve/pii/S0167876005001327>

- Baumgartner, T., Lutz, K., Schmidt, C. F., & Jäncke, L. (2006). The emotional power of music: How music enhances the feeling of affective pictures. *Brain Research*, 1075(1), 151–164. <https://doi.org/10.1016/j.brainres.2005.12.065>
- Beck, J. (2015). *Hard feelings: Science's struggle to define emotions*. Wwww.Theatlantic.Com. <http://www.theatlantic.com/health/archive/2015/02/hard-feelings-sciences-struggle-to-define-emotions/385711/>
- Becker, J. (2010). Exploring the habitus of listening: anthropological perspectives. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 127–158). Oxford University Press.
- Bernardi, N. F., Bellemare-Pepin, A., & Peretz, I. (2017). Enhancement of pleasure during spontaneous dance. *Frontiers in Human Neuroscience*, 11(November), 1–14. <https://doi.org/10.3389/fnhum.2017.00572>
- Bernardi, N. F., Bellemare-Pepin, A., & Peretz, I. (2018). Dancing to “groovy” music enhances the experience of flow. *Annals of the New York Academy of Sciences*, 1423(1), 415–426. <https://doi.org/10.1111/nyas.13644>
- Boer, D., Fischer, R., Strack, M., Bond, M. H., Lo, E., & Lam, J. (2011). How shared preferences in music create bonds between people: values as the missing link. *Personality & Social Psychology Bulletin*, 37(9), 1159–1171. <https://doi.org/10.1177/0146167211407521>
- Bolivar, V. J., Cohen, A. J., & Fentress, J. C. (1994). Semantic and formal congruency in music and motion pictures: Effects on the interpretation of visual action. *Psychomusicology: A Journal of Research in Music Cognition*, 13(1–2), 28–59. <https://doi.org/10.1037/h0094102>
- Boltz, M. G. (2001). Musical soundtracks as a schematic influence on the cognitive processing of filmed events. *Music Perception*, 18(4), 427–454. <https://doi.org/10.1525/gfc.2008.8.4.24>.This
- Boltz, M. G., Ebendorf, B., & Field, B. (2009). Audiovisual interactions: The impact of visual information on music perception and memory. *Music Perception*, 27(1), 43–59. <https://doi.org/10.1525/rep.2014.126.1.1.1>
- Bonini Baraldi, F. (2009a). All the Pain and Joy of the World in a Single Melody: A Transylvanian Case Study on Musical Emotion. *Music Perception*, 26(3), 257–261. <https://doi.org/10.1525/mp.2009.26.3.257>
- Bonini Baraldi, F. (2009b). All the pain and the joy of the world in a single melody: A transylvanian case study on musical emotion. *Music Perception*, 26(3), 257–261. <https://doi.org/10.1525/mp.2009.26.3.257>
- Bonny, H. L., & Savary, L. M. (1973). *Music and your Mind: Listening with a New Consciousness*. Harper & Row.
- Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, 97(1), 19–35. <https://doi.org/10.1037/0033-295X.97.1.19>
- Cespedes-Guevara, J., & Eerola, T. (2018). Music communicates affects, not basic emotions – A constructionist account of attribution of emotional meanings to music. *Frontiers in Psychology*, 9(215), 1–19. <https://doi.org/10.3389/fpsyg.2018.00215>
- Cheung, V. K. M., Harrison, P. M. C., Meyer, L., Pearce, M. T., Haynes, J. D., & Koelsch, S. (2019). Uncertainty and Surprise Jointly Predict Musical Pleasure and Amygdala, Hippocampus, and Auditory Cortex Activity. *Current Biology*, 29(23), 4084–4092.e4. <https://doi.org/10.1016/j.cub.2019.09.067>

- Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. *Behavioral and Brain Sciences*, 36(3), 181–204.
<https://doi.org/10.1017/S0140525X12000477>
- Clarke, E. F. (2005). *Ways of listening: An ecological approach to the perception of musical meaning*. Oxford University Press.
- Clore, G. L., & Ortony, A. (2013). Psychological construction in the OCC model of emotion. *Emotion Review*, 5(4), 335–343. <https://doi.org/10.1177/1754073913489751>
- Colling, L. J., & Thompson, W. F. (2013). Music, action, and affect. In T. Cochrane, B. Fantini, & K. R. Scherer (Eds.), *The emotional power of music, multidisciplinary perspectives on musical arousal, expression, and social control* (pp. 197–212). Oxford University Press.
- Cook, N. (2001). Theorizing musical meaning. *Music Theory Spectrum*, 23(2), 170–195.
<https://doi.org/10.1525/mts.2001.23.2.170>
- Cunningham, W. A., Dunfield, K. a., & Stillman, P. E. (2013). Emotional states from affective dynamics. *Emotion Review*, 5(4), 344–355. <https://doi.org/10.1177/1754073913489749>
- Davies, S. (2013). Music-to-listener contagion. In T. Cochrane, B. Fantini, & K. R. Scherer (Eds.), *The emotional power of music, multidisciplinary perspectives on musical arousal, expression, and social control* (pp. 169–176). Oxford University Press.
- Day, R. A., & Thompson, W. F. (2019). Measuring the onset of experiences of emotion and imagery in response to music. *Psychomusicology: Music, Mind, and Brain*, 29(2–3), 75–89.
<https://doi.org/10.1037/pmu0000220>
- Dellacherie, D., Roy, M., Hugueville, L., Peretz, I., & Samson, S. (2011). The effect of musical experience on emotional self-reports and psychophysiological responses to dissonance. *Psychophysiology*, 48(3), 337–349. <https://doi.org/10.1111/j.1469-8986.2010.01075.x>
- DeNora, T. (2000). *Music in everyday life*. Cambridge University Press.
<https://doi.org/10.1017/CBO9781107415324.004>
- Diaz, F. M. (2011). Mindfulness, attention, and flow during music listening: An empirical investigation. *Psychology of Music*, 41(1), 42–58. <https://doi.org/10.1177/0305735611415144>
- Dibben, N. (2001). What do we hear when we hear music? Music perception and music material. *Musicae Scientiae*, 5(2), 161–194.
- Eerola, T., & Vuoskoski, J. K. (2013). A review of music and emotion studies: Approaches, emotion models, and stimuli. *Music Perception*, 30(3), 307–340.
- Egermann, H., Pearce, M. T., Wiggins, G. A., & McAdams, S. (2013). Probabilistic models of expectation violation predict psychophysiological emotional responses to live concert music. *Cognitive, Affective & Behavioral Neuroscience*, 13(3), 533–553.
<https://doi.org/10.3758/s13415-013-0161-y>
- Farbood, M. M. (2012). A parametric, temporal model of musical tension. *Music Perception*, 29(4), 387–428. <https://doi.org/10.1525/rep.2008.104.1.92>.This
- Faucher, L. (2013). Comment: Constructionisms? *Emotion Review*, 5(4), 374–378.
<https://doi.org/10.1177/1754073913489754>
- Fischer, P., & Greitemeyer, T. (2006). Music and Aggression: The Impact of Sexual-Aggressive Song Lyrics on Aggression-Related Thoughts, Emotions, and Behavior Toward the Same and the Opposite Sex. *Personality and Social Psychology Bulletin*, 32(9), 1165–1176.
<https://doi.org/10.1177/0146167206288670>
- Flaig, N. K., & Large, E. W. (2014). Dynamic musical communication of core affect. *Frontiers in Psychology*, 5(MAR), 1–12. <https://doi.org/10.3389/fpsyg.2014.00072>

- Flykt, A., Dan, E. S., & Scherer, K. R. (2009). Using a probe detection task to assess the timing of intrinsic pleasantness appraisals. *Swiss Journal of Psychology*, 68(3), 161–171.
- Frijda, N. H. (2008). The psychologist's point of view. In M. Lewis, J. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of Emotions* (3rd Editio, pp. 59–74). Guilford Press.
- Frijda, N. H., Kuipers, P., & ter Schure, E. (1989). Relations among emotion, appraisal, and emotional action readiness. *Journal of Personality and Social Psychology*, 57(2), 212–228. <https://doi.org/10.1037/0022-3514.57.2.212>
- Gabrielsson, A. (2001). Emotions in strong experiences with music. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp. 431–449). Oxford University Press.
- Gabrielsson, A., & Lindström, S. (2003). Strong experiences related to music: A descriptive system. *Musicae Scientiae*, 7(2), 157–217. <https://doi.org/10.1177/102986490300700201>
- Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Lawrence Erlbaum Ass.
- Gold, B. P., Gold, B. P., Gold, B. P., Pearce, M. T., Pearce, M. T., Mas-Herrero, E., Dagher, A., Zatorre, R. J., Zatorre, R. J., & Zatorre, R. J. (2019). Predictability and uncertainty in the pleasure of music: A reward for learning? *Journal of Neuroscience*, 39(47), 9397–9409. <https://doi.org/10.1523/JNEUROSCI.0428-19.2019>
- Grahn, J. A., & Brett, M. (2007). Rhythm and beat perception in motor areas of the brain. *Journal of Cognitive Neuroscience*, 19(5), 893–906. <https://doi.org/10.1162/jocn.2007.19.5.893>
- Granot, R. Y., & Eitan, Z. (2011). Musical tension and the interaction of dynamic auditory patterns. *Music Perception*, 28(3), 219–246. <https://doi.org/10.1525/rep.2014.126.1.1.1>
- Greasley, A. E., & Lamont, A. (2011). Exploring engagement with music in everyday life using experience sampling methodology. *Musicae Scientiae*, 15(1), 45–71. <https://doi.org/10.1177/1029864910393417>
- Gregory, A. H., & Varney, N. (1996). Cross-cultural comparisons in the affective responses to music. *Psychology of Music*, 24, 47–52. <https://doi.org/0803973233>
- Gregory, A. H., Worrall, L., & Sarge, A. (1996). The development of emotional responses to music in young children. *Motivation and Emotion*, 20(4), 341–348. <https://doi.org/10.1007/BF02856522>
- Grewe, O., Nagel, F., Reinhard, K., & Altenmüller, E. (2007). Listening to music as a re-creative process: Physiological, psychological, and psychoacoustical correlates of chills and strong emotions. *Music Perception*, 24(3), 297–314.
- Guéguen, N., Jacob, C., & Lamy, L. (2010). “Love is in the air”: Effects of songs with romantic lyrics on compliance with a courtship request. *Psychology of Music*, 38(3), 303–307. <https://doi.org/10.1177/0305735609360428>
- Hays, T., & Minichiello, V. (2005). The meaning of music in the lives of older people: a qualitative study. *Psychology of Music*, 33(4), 437–451. <https://doi.org/10.1177/0305735605056160>
- Hodges, D. A. (2010). Bodily responses to music. In S. Hallam, I. Cross, & M. Thaut (Eds.), *Oxford Handbook of Music Psychology* (pp. 121–130). Oxford University Press.
- Howlin, C., Stapleton, A., & Rooney, B. (2022). Tune out pain: Agency and active engagement predict decreases in pain intensity after music listening. *PLoS ONE*, 17(8 August), 1–20. <https://doi.org/10.1371/journal.pone.0271329>
- Huron, D. (2006). *Sweet anticipation: Music and the psychology of expectation*. MIT Press.
- Illie, G., & Thompson, W. F. (2006). A comparison of acoustic cues in music and speech for three dimensions of affect. *Music Perception*, 23(4), 319–330. <https://doi.org/10.1017/CBO9781107415324.004>

- Istvandity, L. (2015). The lifetime soundtrack: Music as an archive for autobiographical memory. *Popular Music History*, 9(2), 136–154. <https://doi.org/10.1558/pomh.v9i2.26642>
- Janata, P., Tomic, S. T., & Haberman, J. M. (2012). Sensorimotor coupling in music and the psychology of the groove. *Journal of Experimental Psychology: General*, 141(1), 54–75. <https://doi.org/10.1037/a0024208>
- Juslin, P. N. (2013). From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions. *Physics of Life Reviews*, 10(3), 235–266. <https://doi.org/10.1016/j.plrev.2013.05.008>
- Juslin, P. N. (2019). *Musical Emotions Explained*. Oxford University Press.
- Juslin, P. N., Harmat, L., & Eerola, T. (2015). What makes music emotionally significant? Exploring the underlying mechanisms. *Psychology of Music*, 42(4), 599–623. <https://doi.org/10.1177/0305735613484548>
- Juslin, P. N., Liljeström, S., & Västfjäll, D. (2010). How does music evoke emotions? Exploring the underlying mechanisms. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 605–642). Oxford University Press.
- Juslin, P. N., Liljeström, S., Västfjäll, D., Barradas, G., & Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music, and situation. *Emotion*, 8(5), 668–683. <https://doi.org/10.1037/a0013505>
- Juslin, P. N., & Sloboda, J. A. (2010). Introduction: aims, organization, and terminology. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 3–14). Oxford University Press.
- Juslin, P. N., & Västfjäll, D. (2008). Emotional responses to music: the need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31(5), 559–575; discussion 575–621. <https://doi.org/10.1017/S0140525X08006079>
- Kivy, P. (1999). Feeling the musical emotions. *British Journal of Aesthetics*, 39, 1–13.
- Kleinginna, P. R., & Kleinginna, A. M. (1981). A categorized list of motivation definitions, with a suggestion for a consensual definition. *Motivation and Emotion*, 5(4), 345–379. <https://doi.org/10.1007/BF00993889>
- Koelsch, S., Kasper, E., Sammler, D., Schulze, K., Gunter, T., & Friederici, A. D. (2004). Music, language and meaning: brain signatures of semantic processing. *Nature Neuroscience*, 7(3), 302–307. <https://doi.org/10.1038/nn1197>
- Koelsch, S., Kilches, S., Steinbeis, N., & Schelinski, S. (2008). Effects of unexpected chords and of performer's expression on brain responses and electrodermal activity. *PloS ONE*, 3(7), e2631. <https://doi.org/10.1371/journal.pone.0002631>
- Konečni, V. J. (2008). Does music induce emotion? A theoretical and methodological analysis. *Psychology of Aesthetics, Creativity, and the Arts*, 2(2), 115–129. <https://doi.org/10.1037/1931-3896.2.2.115>
- Krause, A. E., & North, A. C. (2017). How do location and control over the music influence listeners' responses? *Scandinavian Journal of Psychology*, 58(2), 114–122. <https://doi.org/10.1111/sjop.12352>
- Krause, A. E., North, A. C., & Hewitt, L. Y. (2015). Music-listening in everyday life: Devices and choice. *Psychology of Music*, 43(2), 0305735613496860-. <https://doi.org/10.1177/0305735613496860>
- Kristen, S., & Shevy, M. (2012). A comparison of German and American listeners' extra musical associations with popular music genres. *Psychology of Music*, 41(6), 764–778. <https://doi.org/10.1177/0305735612451785>

- Kuhn, T. S. (1962). *The Structure of Scientific Revolutions* (U. of C. Press., Ed.).
- Kuppens, P., Tuerlinckx, F., Russell, J. A., & Barrett, L. F. (2013). The relation between valence and arousal in subjective experience. *Psychological Bulletin*, 139(4), 917–940. <https://doi.org/10.1037/a0030811>
- LaBar, K. S., Gitelman, D. R., Parrish, T. B., Kim, Y. H., Nobre, A. C., & Mesulam, M. M. (2001). Hunger selectively modulates corticolimbic activation to food stimuli in humans. *Behavioral Neuroscience*, 115(2), 493–500. <https://doi.org/10.1037/0735-7044.115.2.493>
- Labbé, C., & Grandjean, D. (2014). Musical emotions predicted by feelings of entrainment. *Music Perception*, 32(2), 170–185. <https://doi.org/10.1525/MP.2014.32.2.170>
- Lambie, J. A., & Marcel, A. J. (2002). Consciousness and the varieties of emotion experience: A theoretical framework. *Psychological Review*, 109(2), 219–259. <https://doi.org/10.1037/0033-295X.109.2.219>
- Lamont, A. M. (2011). University students' strong experiences of music: Pleasure, engagement, and meaning. *Musicae Scientiae*, 15(2), 229–249. <https://doi.org/10.1177/1029864911403368>
- Large, E. W., & Almonte, F. v. (2012). Neurodynamics, tonality, and the auditory brainstem response. *Annals of the New York Academy of Sciences*, 1252(1), 10–13. <https://doi.org/10.1111/j.1749-6632.2012.06594.x>
- Large, E. W., & Kolen, J. F. (1994). Resonance and the perception of musical meter. *Connection Science*, 6(2–3), 177–208. <https://doi.org/10.1080/09540099408915723>
- Laukka, P., Eerola, T., Thingujam, N. S., Yamasaki, T., & Beller, G. (2013). Universal and culture-specific factors in the recognition and performance of musical affect expressions. *Emotion*, 13(3), 434–449. <https://doi.org/10.1037/a0031388>
- Lebrecht, S., Bar, M., Barrett, L. F., & Tarr, M. J. (2012). Micro-valences: Perceiving affective valence in everyday objects. *Frontiers in Psychology*, 3(April), 107. <https://doi.org/10.3389/fpsyg.2012.00107>
- Leman, M., & Maes, P.-J. (2014). The role of embodiment in the perception of music. *Empirical Musicology Review*, 9(3–4), 236–246.
- Linnemann, A., Strahler, J., & Nater, U. M. (2016). The stress-reducing effect of music listening varies depending on the social context. *Psychoneuroendocrinology*, 72, 97–105. <https://doi.org/10.1016/j.psyneuen.2016.06.003>
- Livingstone, S. R., Thompson, W. F., & Russo, F. A. (2009). Facial expressions and emotional singing: a study of perception and production with motion capture and electromyography. *Music Perception*, 26(5), 475–488. <https://doi.org/10.1017/CBO9781107415324.004>
- Livingstone, S. R., Thompson, W. F., Wanderley, M. M., & Palmer, C. (2015). Common cues to emotion in the dynamic facial expressions of speech and song. *Quarterly Journal of Experimental Psychology* (2006), 68(5), 952–970. <https://doi.org/10.1080/17470218.2014.971034>
- Lundqvist, L.-O. O., Carlsson, F., Hilmersson, P., & Juslin, P. N. (2009). Emotional responses to music: experience, expression, and physiology. *Psychology of Music*, 37(1), 61–90. <https://doi.org/10.1177/0305735607086048>
- Margulis, E. H. (2017). An Exploratory Study of Narrative Experiences of Music. *An Interdisciplinary Journal*, 35(2), 235–248. <https://doi.org/10.2307/26417393>
- Margulis, E. H., & Simchy-Gross, R. (2016). Repetition enhances the musicality of randomly generated tone sequences. *Music Perception*, 33(4), 509–514.

- Margulis, E. H., Wong, P. C. M., Simchy-Gross, R., & McAuley, J. D. (2019). What the music said_ narrative listening across cultures. *Palgrave Communications*, 5(1).
<https://doi.org/10.1057/s41599-019-0363-1>
- Martin, P. J. (1995). *Sounds and society: Themes in the sociology of music*. Manchester University Press.
- McAuley, J. D., Wong, P. C. M., Mamidipaka, A., Phillips, N., & Margulis, E. H. (2021). Do you hear what I hear? Perceived narrative constitutes a semantic dimension for music. *Cognition*, 212. <https://doi.org/10.1016/j.cognition.2021.104712>
- Meuleman, B., & Scherer, K. R. (2013). Nonlinear appraisal modeling: An application of machine learning to the study of emotion production. *IEEE Transactions on Affective Computing*, 4(4), 398–411. <https://doi.org/10.1109/T-AFFC.2013.25>
- Meyer, L. B. (1956). *Emotion and meaning in music*. University of Chicago Press.
- Miu, A. C., & Baltes, F. R. (2012). Empathy manipulation impacts music-induced emotions: A psychophysiological study on opera. *PLoS ONE*, 7(1).
<https://doi.org/10.1371/journal.pone.0030618>
- Moors, A. (2009). Theories of emotion causation: A review. *Cognition & Emotion*, 23(4), 625–662.
<https://doi.org/10.1080/02699930802645739>
- Moors, A. (2014). Flavors of appraisal theories. *Emotion Review*, 6(4), 303–307.
<https://doi.org/10.1177/1754073914534477>
- Moors, A., Ellsworth, P. C., Scherer, K. R., & Frijda, N. H. (2013). Appraisal theories of emotion: State of the art and future development. *Emotion Review*, 5(2), 119–124.
<https://doi.org/10.1177/1754073912468165>
- Moors, A., van de Cruys, S., & Pourtois, G. (2021). Comparison of the determinants for positive and negative affect proposed by appraisal theories, goal-directed theories, and predictive processing theories. In *Current Opinion in Behavioral Sciences* (Vol. 39, pp. 147–152). Elsevier Ltd. <https://doi.org/10.1016/j.cobeha.2021.03.015>
- Mori, K., & Iwanaga, M. (2014). Pleasure generated by sadness: Effect of sad lyrics on the emotions induced by happy music. *Psychology of Music*, 42(5), 643–652.
<https://doi.org/10.1177/0305735613483667>
- Mulligan, K., & Scherer, K. R. (2012). Toward a working definition of emotion. *Emotion Review*, 4(4), 345–357. <https://doi.org/10.1177/1754073912445818>
- Nielsen, F. v. (1987). Musical “tension” and related concepts. In T. A. Sebeok & J. Umiker-Sebeok (Eds.), *The semiotic web ‘86: An international yearbook* (pp. 491–514). Mouton de Gruyter.
- North, A. C., & Hargreaves, D. (2008). *The Social and Applied Psychology of Music*. Oxford University Press.
- Ortony, A., Norman, D. A., & Revelle, W. (2005). Affect and proto-affect in effective functioning. In J. M. Fellous & M. A. Arbib (Eds.), *Who needs emotions: The brain meets the machine* (pp. 174–202). Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780195166194.003.0007>
- Overy, K., & Molnar-Szakacs, I. (2009). Being together in time: Musical experience and the mirror neuron system. *Music Perception*, 26(5), 489–504.
<https://doi.org/https://doi.org/10.1525/mp.2009.26.5.489>
- Painter, J. G., & Koelsch, S. (2011). Can out-of-context musical sounds convey meaning? An ERP study on the processing of meaning in music. *Psychophysiology*, 48(5), 645–655.
<https://doi.org/10.1111/j.1469-8986.2010.01134.x>

- Papinczak, Z. E., Dingle, G. A., Stoyanov, S. R., Hides, L., & Zelenko, O. (2015). Young people's uses of music for well-being. *Journal of Youth Studies*, 18(February), 1–16. <https://doi.org/10.1080/13676261.2015.1020935>
- Parncutt, R. (2014). The emotional connotations of major versus minor tonality: One or more origins? *Musicae Scientiae*, 18(3), 324–353. <https://doi.org/10.1177/1029864914542842>
- Pavlović, I., & Marković, S. (2011). The effect of music background on the emotional appraisal of film sequences. *Psihologija*, 44(1), 71–91. <https://doi.org/10.2298/PSI1101071P>
- Peltola, H.-R. H.-R., & Eerola, T. (2016). Fifty shades of blue: Classification of music-evoked sadness. *Musicae Scientiae*, 20(1), 84–102. <https://doi.org/10.1177/1029864915611206>
- Randall, W. M., & Rickard, N. S. (2017). Personal music listening: A model of emotional outcomes developed through mobile experience sampling. *Music Perception*, 34(5), 501–514. <https://doi.org/10.1525/MP.2017.34.5.501>
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, 110(1), 145–172. <https://doi.org/10.1037/0033-295X.110.1.145>
- Russell, J. A. (2012). Introduction to special section: On defining emotion. *Emotion Review*, 4(4), 337–337. <https://doi.org/10.1177/1754073912445857>
- Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, 76(5), 805–819. <https://doi.org/10.1037/0022-3514.76.5.805>
- Saarikallio, S., Alluri, V., Maksimainen, J., & Toiviainen, P. (2021). Emotions of music listening in Finland and in India: Comparison of an individualistic and a collectivistic culture. *Psychology of Music*, 49(4), 989–1005. <https://doi.org/10.1177/0305735620917730>
- Saarikallio, S., & Erkkilä, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music*, 35(1), 88–109. <https://doi.org/10.1177/0305735607068889>
- Sander, D., Grandjean, D., & Scherer, K. R. (2005). A systems approach to appraisal mechanisms in emotion. *Neural Networks : The Official Journal of the International Neural Network Society*, 18(4), 317–352. <https://doi.org/10.1016/j.neunet.2005.03.001>
- Scarantino, A. (2012). How to define emotions scientifically. *Emotion Review*, 4(4), 358–368. <https://doi.org/10.1177/1754073912445810>
- Schellenberg, E. G., Peretz, I., & Vieillard, S. (2008). Liking for happy- and sad-sounding music: Effects of exposure. *Cognition & Emotion*, 22(2), 218–237. <https://doi.org/10.1080/02699930701350753>
- Scherer, K. R. (1986). Vocal affect expression: A review and a model for future research. *Psychological Bulletin*, 99(2), 143–165. <https://doi.org/10.1037/0033-2909.99.2.143>
- Scherer, K. R. (2004). Which emotions can be induced by music? What are the underlying mechanisms? And how can we measure them? *Journal of New Music Research*, 33(3), 239–251. <https://doi.org/10.1080/0929821042000317822>
- Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social Science Information*, 44(4), 695–729. <https://doi.org/10.1177/0539018405058216>
- Scherer, K. R. (2009). Emotions are emergent processes: They require a dynamic computational architecture. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 364, 3459–3474. <https://doi.org/10.1098/rstb.2009.0141>
- Scherer, K. R., & Coutinho, E. (2013). How music creates emotion: A multifactorial process approach. In T. Cochrane, B. Fantini, & K. R. Scherer (Eds.), *The Emotional Power of Music, Multidisciplinary perspectives on musical arousal, expression, and social control* (pp. 121–145). Oxford University Press.

- Scherer, K. R., & Zentner, M. R. (2001). Emotional effects of music: Production rules. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp. 361–392). Oxford University Press.
- Scherer, K. R., Zentner, M. R., & Schacht, A. (2002). Emotional states generated by music: an exploratory study of music experts. *Musicae Scientiae*, 5, 149–171. <https://doi.org/10.1177/10298649020050S106>
- Schimmack, U., & Grob, A. (2000). Dimensional models of core affect: A quantitative comparison by means of structural equation modelling. *European Journal of Personality*, 14(March 1999), 325–345. [https://doi.org/10.1002/1099-0984\(200007/08\)14:4<325::AID-PER380>3.0.CO;2-I](https://doi.org/10.1002/1099-0984(200007/08)14:4<325::AID-PER380>3.0.CO;2-I)
- Shany, O., Singer, N., Gold, B. P., Jacoby, N., Tarrasch, R., Hendler, T., & Granot, R. (2019). Surprise-related activation in the nucleus accumbens interacts with music-induced pleasantness. *Social Cognitive and Affective Neuroscience*, 14(4), 459–470. <https://doi.org/10.1093/scan/nsz019>
- Sloboda, J. A. (2010). Music in everyday life: The role of emotions. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 493–514). Oxford University Press.
- Sloboda, J. A., & O'Neill, S. A. (2001). Emotions in everyday listening to music. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research*. Oxford University Press. <https://doi.org/10.1017/CBO9781107415324.004>
- Sloboda, J. A., O'Neill, S. A., & Ivaldi, A. (2001). Functions of music in everyday life: an exploratory study using the experience sampling method. *Musicae Scientiae*, 5(1), 9–32. <https://doi.org/10.1177/102986490100500102>
- Steinbeis, N., & Koelsch, S. (2008). Shared neural resources between music and language indicate semantic processing of musical tension-resolution patterns. *Cerebral Cortex*, 18(5), 1169–1178. <https://doi.org/10.1093/cercor/bhm149>
- Steinbeis, N., Koelsch, S., & Sloboda, J. A. (2006). The role of harmonic expectancy violations in musical emotions: Evidence from subjective, physiological, and neural responses. *Journal of Cognitive Neuroscience*, 18(8), 1380–1393. <https://doi.org/10.1162/jocn.2006.18.8.1380>
- Thompson, W. F., & Coltheart, M. (2008). The role of signal detection and amplification in the induction of emotion by music. *Behavioral and Brain Sciences*, 31(5), 597–598. <https://doi.org/doi:10.1017/S0140525X08005529>
- Thompson, W. F., Graham, P., & Russo, F. A. (2005). Seeing music performance: Visual influences on perception and experience. *Semiotica*, 156, 203–227.
- Thompson, W. F., & Russo, F. A. (2004). The attribution of emotion and meaning to song lyrics. *Polskie Forum Psychologiczne*, 9(1), 51–62.
- Thompson, W. F., Russo, F. A., & Quinto, L. (2008). Audio-visual integration of emotional cues in song. *Cognition & Emotion*, 22(8), 1457–1470. <https://doi.org/10.1080/02699930701813974>
- Thompson, W. F., Russo, F. A., & Sinclair, D. (1994). Effects of underscoring on the perception of closure in filmed events. *Psychomusicology: A Journal of Research in Music Cognition*, 13, 9–27. <https://doi.org/10.1037/h0094103>
- Trainor, L. J., & Heinmiller, B. M. (1998). The development of evaluative responses to music: Infants prefer to listen to consonance over dissonance. *Infant Behavior and Development*, 21(1), 77–88. [https://doi.org/10.1016/S0163-6383\(98\)90055-8](https://doi.org/10.1016/S0163-6383(98)90055-8)
- van den Tol, A. J. M., & Edwards, J. (2014). Listening to sad music in adverse situations: How music selection strategies relate to self-regulatory goals, listening effects, and mood

- enhancement. *Psychology of Music*, January 2014, 473–494.
<https://doi.org/10.1177/0305735613517410>
- Vuoskoski, J. K., Thompson, W. F., McIlwain, D., & Eerola, T. (2012). Who enjoys listening to sad music and why? *Music Perception*, 29(3), 311–317.
- Warrenburg, L. A. (2020). Comparing musical and psychological emotion theories. *Psychomusicology: Music, Mind, and Brain*, 30(1), 1–19.
<https://doi.org/10.1037/pmu0000247>
- Wilhelm, K., Gillis, I., Schubert, E., & Whittle, E. L. (2013). On a Blue Note: Depressed Peoples' Reasons for Listening to Music. *Music and Medicine*, 5(2), 76–83.
<https://doi.org/10.1177/1943862113482143>
- Wilson, M., & Knoblich, G. (2005). The case for motor involvement in perceiving conspecifics. *Psychological Bulletin*, 131(3), 460–473. <https://doi.org/10.1037/0033-2909.131.3.460>
- Wilson-Mendenhall, C. D., Barrett, L. F., Simmons, W. K., & Barsalou, L. W. (2011). Grounding emotion in situated conceptualization. *Neuropsychologia*, 49(5), 1105–1127.
<https://doi.org/10.1016/j.neuropsychologia.2010.12.032>
- Windsor, W. L. (2004). An ecological approach to semiotics. *Journal for the Theory of Social Behaviour*, 34(2), 179–198. <https://doi.org/10.1111/j.0021-8308.2004.00242.x>
- Winkielman, P., Niedenthal, P., Wielgosz, J., Eelen, J., & Kavanagh, L. C. (2015). Embodiment of cognition and emotion. In M. ; Mikulincer & P. R. Shaver (Eds.), *APA Handbook of Personality and Social Psychology: Vol. 1. Attitudes and Social Cognition*. (Vol. 1, pp. 151–175). American Psychological Association. <https://doi.org/10.1037/14341-004>
- Witek, M. A. G., Clarke, E. F., Wallentin, M., Kringelbach, M. L., & Vuust, P. (2014). Syncopation, body-movement and pleasure in groove music. *PLoS ONE*, 9(4), e94446.
<https://doi.org/10.1371/journal.pone.0094446>
- Zentner, M. R., Grandjean, D., & Scherer, K. R. (2008). Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion*, 8(4), 494–521.
<https://doi.org/10.1037/1528-3542.8.4.494>
- Zentner, M. R., & Kagan, J. (1998). Infants' perception of consonance and dissonance in music. *Infant Behavior and Development*, 21(3), 483–492. [https://doi.org/10.1016/S0163-6383\(98\)90021-2](https://doi.org/10.1016/S0163-6383(98)90021-2)