

Longing for Sadness

Alessio Plebe

Abstract

Various music enthusiasts can testify from personal experience to the powerful impact of listening to sad music, and several experimental studies have confirmed the widespread preference for this musical genre. Sadness is a negative emotion, and if someone seeks it out in real life, they are considered to be suffering from some psychological disorder. So why is the avid listener of sad music not usually a psychopath? This study attempts a reconnaissance of the various hypotheses that have been put forward, and the ensuing discussions, about the paradox of enjoying sadness in music. Ending with the observation that we are still far from a convincing explanation.

Keywords: Music and Emotions; Sad Music; Minor Mode.



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Sommario

Ogni appassionato di musica conosce bene quanto sia potente l'impatto emotivo che provoca l'ascolto di musica triste, lo confermano anche diversi studi empirici sulla diffusa preferenza per questo genere musicale. La tristezza viene catalogata come una emozione negativa, pertanto se qualcuno nella pratica di vita se la va a cercare sistematicamente, potrebbe essere affetto da forme di psicopatia. Come mai invece l'ascoltatore avido di brani musicali tristi non viene considerato psicopatico? Sono state avanzate diverse ipotesi su questa anomala preferenza, il presente lavoro ne fornisce una ricognizione e una discussione critica. Concludendo con l'osservare quanto si sia ancora distanti da una spiegazione convincente.

Parole chiave: Musica ed emozioni; Musica triste; Modo minore.

1. Introduction

The overwhelming involvement produced by some profoundly sad pieces of music is a personal experience of the author, and the reason for writing this essay, but it becomes entirely negligible compared to more illustrious testimonies. For example, Oscar Wilde, who dedicated not a little time to personal study of the piano, reported that performing some pieces by Chopin made him feel as he had been weeping over sins that he had never committed, and mourning over tragedies that were not his own. (Gabrielsson and Lindström, 1997) has collected an impressive series of descriptions of the tremendous power of certain music, especially sad music, in some listeners.

If one wants to move onto scientific grounds, personal testimonies, however illustrious (I refer to Wilde, of course), are of limited value, empirical studies are the benchmark, and there are plenty of them confirming the attraction that sad music evokes (Eerola et al., 2018). Not only that,

(Garrido and Schubert, 2012) found that there are subjects who claim not to find sad music enjoyable, yet they are attracted to it and listen to it, despite being aware that they derive no pleasure from it. Looking deeper into the psychology of avid listeners of music that induces sadness, correlations with generally admirable cognitive characteristics have even emerged. (Vuoskoski et al., 2012) found that a passion for sad music is accompanied by a greater openness to new experiences, evaluated using the BFI (Big Five Inventory). (Resnicow, Salovey, and Repp, 2005) found significant correlations between preferences for sad music and emotional intelligence, measured using the Mayer-Salovey-Caruso Emotional Intelligence Test.

Regardless of the motivations that lead to seeking sad notes, it is a behavior that clashes with the most basic biological laws of living organisms. Evidently, the ecological function of emotions is to attribute values to states of the environment, so clues that elicit negative emotions trigger actions aimed at fleeing what evokes such emotions. Conversely, positive emotions lead to seeking situations capable of provoking them. Therefore, seeking listening situations that we know will provoke negative emotions is a disturbing biological paradox. The question becomes even more enigmatic when trying to identify the musical characteristics that lead the listener to negative, sad emotions, or to positive, joyful emotions. In the case of Western music from the Renaissance onwards, the distinguishing feature can be precisely identified in the difference of a semitone between the interval of major third and minor third. A seemingly subtle, nuanced difference, but with striking musical consequences (Plebe, 2015).

The aim of this work is primarily to emphasize that the question of the pleasure that many music lovers seek from the sadness that lies in that missing semitone, expertly elaborated by composers, demands a scientific explanation. There is no claim here to advance explanations, not even hypotheses of explanations, but to try to provide an updated framework within which the problem is placed, and the various controversies that arise from it. First of all, it is controversial to want to link music and emotions, illustrious

musical theories have denied it. It is the topic of the next section, which will conclude by showing how recent neuroscientific evidence suggests a real link between musical perception and emotions. Equally controversial is attributing to the minor and major modes of western tonality the sensations of sadness or joy, a discussion which will occupy the third section. Finally, in the fourth, we will return to the crucial point, with a review of the hypotheses put forward to explain why music listeners often seek sadness in it.

2. About emotions

Certainly, it is part of common sense to consider music closely related to the emotions it arouses, and it is also a way of seeing shared by a distant philosophical tradition, which starts with Plato and continues with Descartes.

Yet one of the most authoritative musicologists of the past, Eduard Hanslick (1854), has fought very resolutely against associating music with emotions. More precisely, he denies three assumptions about the connection between music and emotions. Firstly, that a specific emotion can exist for a certain piece of music, and therefore also that the aesthetic value of that piece depends on the accuracy in representing it. Secondly, attributing a certain emotion to a musical passage cannot help to characterize it, saying for example that it is sad provides nothing that qualifies it, in a suitably musical sense. Finally, the value of a composition never consists in whether someone listening to it experiences certain emotions or not. Hanslick's firm opposition to emotions was meant to be a reaction against a vision that identified music and its sentimental effects in a taken-for-granted way, as in Immanuel Kant, and easily slipped towards the programmatic interpretation of music, championed by Hegel and Wagner. On the contrary, Hanslick maintained, music, unique among the arts, does not express any content that is foreign to its expressive means, just as a novel uses words to refer to events it recounts, or a painting whose color spots refer to objects, real or invented.

Hanslick inaugurated the formalist perspective in musicology, dominant in the last century, embraced for example by Igor Stravinsky, which met with

the approval of the early days of cognitivism, in Noam Chomsky, with influence on (Bernstein, 1976). This is a perspective that has certainly made significant progress in musical analysis, but has also intimidated research oriented towards the relationship between music and emotions.

A decisive reversal of trend was made by Leonard (Meyer, 1956), who brought emotion back to the center of music, trying first of all to clarify the categories of musical theories, with two main distinctions. One between absolutists, who consider the value of music entirely internal to the musical material itself, and referentialists, who instead locate the musical value in its representation of something external, something of the world regardless of sounds. A second taxonomy instead sees on one hand the formalists, for whom musical meaning is grasped by an intellectual process of discerning the complex relationships between sound elements, and the expressionists, who believe that musical value is emotionally experienced by the competent listener. This therefore explains Hanslick's apparent extravagance, who had the referentialists in his sights, but improperly lumped them together with the expressionists, while there is nothing inconsistent with being absolutists and expressionists at the same time, as Meyer professes.

His attempt at a unified explanation of the relationship between music and emotions draws generously from psychology, an approach that will be stimulating in the following years. In particular, he refers to the Gestalt and the principles of configuration completion, deriving from this a theory of emotional perception in music as expectation of completion, both in terms of melodic, rhythmic, and harmonic structures. In this framework, he also considers the central problem of this work, the sadness of the minor mode, considering it one of the most mysterious aspects of music. We can avoid delving into the philosophical discussion, which continues to be intricate, because for the purposes of interest here, namely to establish whether there is a direct correlation between listening to music and experiencing emotions, it has become possible to respond scientifically today. As deep as the

philosophical speculations were, and as clear as the introspective analyses by musicologists were, both routes are notoriously unreliable.

Since the beginning of this century, knowledge from experimental neuroscience studies has been accumulating, contributing to a picture, albeit partial, of the neurobiological principles of musical perception (Peretz and Zatorre, 2003). These studies converge to provide an affirmative answer to the question considered here, whether music is capable of activating brain centers responsible for emotions. (Pallesen et al., 2005) was one of the first to undertake this kind of study, comparing only chords, major, minor, and dissonant. Among the significant results were the marked divergences in activation between minor and major chords in brain centers involved in emotion, such as the amygdala, areas of the brainstem and retrosplenial cortex. A couple of years later, (Mitterschiffthaler et al., 2007) confirmed these results, with significant involvement in the brain network involved in the process of emotions when listening to happy or sad music, such as the anterior cingulate and medial temporal areas. The major mode significantly activates the ventral striatum, a dopaminergic center typically responsible for gratification, while the minor tone mainly activates the hippocampal-amygdala area. Therefore, firstly it is now difficult to support independence between music and emotion processing, secondly the confirmation of the specific role of the minor or major third in directing emotional valence emerges, even though clearly the sample of human subjects and musical pieces calls for caution with this last result.

3. Sadness and minor third

The neuroscientific studies mentioned in the previous section, while highlighting the associations between minor third and negative emotions, and between major third and positive emotions, leave open the question of whether these are cultural effects, typical only of Western music from a certain period onwards, or whether there is a biophysical relationship between

the frequency intervals in question and the neural activations that result from them.

Even though studies on music and emotions have multiplied in recent decades, those specifically aimed at the major and minor modes are not many. One of the first psychological studies was due to Kate (Hevner, 1935), on a large number of subjects, over 200, but all students from the University of Minnesota, to which the author belonged. The results showed a strong correlation between the emotional valences of adjectives that the subjects had to choose, and the major or minor mode of the musical stimuli. This study has remained rather isolated, as said, the dominant trend of the subsequent ones has been to neglect the crucial node of the major or minor mode. An eminent example is Peter Kivy (1989), not too distant from Hanslick in denying a direct relationship between music and emotions, yet engaged in providing a theoretical framework on the causes that induce the listener to experience sensations aroused by music. For this purpose, Kivy uses the notion of contour, implicit imitations present in musical pieces of emotionally connoted human attitudes. The role of the major/minor mode in determining feelings is, according to Kivy, purely conventional, there is nothing that rigidly binds minor mode and sadness. Even in the cognitive strand, the role of the major/minor modes is minimized, Aniruddh Patel (2008) compares them to the categorical perception of some phonemes, those typical of English are imperceptible to a Japanese person, and vice versa.

To get into the issue of the major/minor mode, a brief premise is necessary on the organization of tones in music. This is a fundamental characteristic of it: a discrete set of sounds which, unlike natural or animal ones, are composed of a particularly poor spectrum, concentrated around a single frequency. Only musical instruments, or more precisely some of them, possess this prerogative. The discretization adopted in Western music is with twelve subdivisions between one frequency and its double, proposed by Vincenzo Galilei in 1581, but systematically adopted only a century later. The minimum distance between notes is therefore the twelfth root of 2, corresponding to

about 1.059, this interval is however called semitone, while the full tone is its double.

Musical modes are a relatively recent musical introduction, which in the sixteenth century had the primary purpose of directing sacred and profane music to the use of harmonies appropriate to the desired purpose, and in some French treatises, specifically by Guillaume-Gabriel Nivers and Jean Rousseau among the modes are mentioned majeure and mineure, in a sense not too different from the current one. The introduction of the tonal structure is due to Jean-Philippe Rameau (1722), with the theory of generating chords from the base tone, with two main blocks: the triad, composed of the perfect fifth and the third (minor or major), and the seventh chord. From these all other harmonies are derived. Rameau's conviction in finding a natural explanation for the entire corps sonore wavered precisely in the face of the minor third, which he had vainly strove to find a generating formula compatible with the rest of his plan. We need to wait for Hugo Riemann (1898) for a complete theory of major and minor modes, which can be generated in an identical manner, the succession of two tones, a semitone, three tones and another semitone, moving symmetrically, descending for the minor and ascending for the major with respect to the fundamental triad.

Riemann's tonal theory is purely descriptive, a first important contribution to a foundation in physical terms of tonality is due to Hermann von Helmholtz (1863), based on the phenomena of resonance and beating. For example in the perfect fifth, because of its 3:2 ratio to the tonic, the main harmonic coincides with the third harmonic of the tonic, just as its fourth coincides with the sixth of the tonic. Therefore, when the two notes are heard in agreement, they facilitate the task of the same group of discriminative cells of the auditory apparatus, with a pleasant sensation. When instead two sound waves have a close frequency, their interference produces the beat, a periodic oscillation of the overall amplitude, not discriminable by the acoustic organ, as well as the discrimination between the two frequencies, and this difficulty is perceived as unpleasant. Contemporary neuroscience has fully confirmed von

Helmholtz's intuitions, through the analysis of InterSpike Interval in the auditory cortex, which demonstrate regularity of neural activation during the listening of consonant chords, in contrast with dissonant intervals, during which the activity becomes irregular, with neural fatigue (Tramo et al. 2003). These evidences provide a good explanation for the liking of consonant chords, and the unpleasant sensation for dissonances, but they don't say anything about the variation between joy and pain going from the major third to the minor one.

The standard frequency that corresponds to the fourth A in the scale is 440 Hz. Starting from this note, the major third has a frequency of 550 Hz and the minor third 527 Hz, a minimal difference. As taught by von Helmholtz, the question concerns the harmonics. In the major case, there is perfect resonance between the 5th harmonic of the fundamental and the 4th harmonic of the third. On the other hand, in the minor case, the perfect resonance is between the 6th harmonic of the fundamental and the 5th harmonic of the third. Here, one must stop, unlike phenomena that cause a distinct psychophysical reaction between consonance and dissonance, there is nothing known in the neurophysiology of the auditory system that differentiates the two ratios of 5:4 and 6:5 of the resonating harmonics.

However, even though an explanation cannot be provided, various neuroscientific evidence seems to confirm a regular pairing between major chords with positive emotions, and minor chords with negative emotions, starting from the already cited work by Pallesen et al. (2005), and that by (Mitterschiffthaler et al. 2007), to which additional confirmations are added. For example, subsequent studies by Brattico et al. (2011) have reiterated the contrast of brain activations between happy music in major mode, and sad music in minor mode, further differentiated in cases where the music is accompanied or not by lyrics. A study of the same year (Fujisawa and Cook 2011) used musical stimuli made of harmonic triads of three classes: minor, major and amodal. A 2D cortical map has been found, that distinguish between the dimensions of resolved/unresolved harmonies in a medial-lateral

direction, and the dimension of positive/negative emotion orthogonally in a ventrocaudal-dorsorostral direction.

Equally important as neurological evidence, are some psychological experiments that sought to verify to what extent the universality of the pairing between major third with happiness and minor third with sadness extends. The work by Virtala et al. (2013) has detected, through EEG, different reactions to major, minor, and dissonant chords in newborns with only a few days of life. Clearly, this study cannot detect whether there are distinct emotional associations to the three categories of chords from birth, but the mere discrimination of a subtle variation in terms of frequency, such as that between minor and major, suggests its specific processing at the auditory level. Equally surprising is the cross-cultural study by Fritz et al. (2009) among the Mafa population in Cameroon, where three possible emotions related to listening to music: joyful (major mode), sad (minor mode) and scary (dissonances), with judgments by the Mafa subjects consistent with those of Western listeners. The most recent study by Fang, Shang, and Chen (2017) compared Western participants with Chinese subjects, finding once again similar emotional responses to music in major or minor mode. Even with all the caution due to the methodology of the studies, and their still limited number, it would seem that the divergent emotions that emerge from those anonymous harmonic ratios of 5:4 for the major third, and 6:5 for the minor third, trigger something unknown but rather universal, in the neural network between the auditory system and the limbic system.

4. Desire for sadness

Having established that music has a decisive power in inducing emotions, at least in their neuroscientific sense, and that negative emotions appear, inexplicably, associated with the minor mode, it is time to address the key question of this work. Why do people want to experience negative emotions, in fact, it seems that the more they are passionate about music, the more inclined they are to indulge in the sadness it can infuse.

Notoriously, the biological purpose of emotions is to be able to attribute values to environmental states, so clues that elicit negative emotions trigger actions to avoid what is happening, vice versa positive emotions lead to seeking the situation that provoked them. Therefore, seeking listening situations that are known to cause negative emotions a priori is a blatant biological paradox. Nothing serious per se, the human species coexists with many biological paradoxes, for example, people who enjoy greater wellbeing tend to reproduce less, however paradoxes lead to seeking explanations.

And that's what, in fact, several philosophers tried during the entire history, starting with Aristotle and continuing with Hume and Kant. It is not a paradox unique to music, it is common to other forms of art: literature, theater, cinema. However, for these art forms, explanations are quite shared that invoke portrayal of human perseverance, insights into human plight and existence, and re-appraisal of one's experience from different perspectives. These are motivations that cannot be transferred to music, being based on the propositional content of the tragic narratives of novels, plays, or films.

The case of music is therefore more problematic, and has collected a large number of different hypotheses, in the following of this section, extensive use will be made of the review curated by Eerola et al. (2018), and of the book by Garrido (2017). Both these works begin by giving credit to one of the most famous philosophical theories on seeking negative emotions in art, the catharsis first proposed by Aristotle. The idea is that going through strong negative emotions, at their end leads to a beneficial sensation of relaxation, liberation, as if the tragic and sad conditions reproduced in the artistic work had really been overcome. Despite finding a certain philosophical following, catharsis seems a process ill-suited to explain the appreciation for sad music, first of all, it is enjoyed by people who are not at all in a negative state of mind. Moreover, the beneficial turn of catharsis typically occurs when tragic and painful events are resolved in some "happy ending". In music, it is not like that, the pleasure of listening takes place during the sad musical piece, and often its final resolution is the culmination of the tragedy.

Several variants and deviations from the basic idea of catharsis, more suited to music, such as the so-called conversionary, have been proposed, for which the aesthetic capacity of music is to transform an experience of suffering per se, into something pleasant (Levinson 1996). This is made possible by the listener's full awareness of not being in any real danger, of having full control of the situation, even though they are experiencing negative emotions.

The search for explanations about the appreciation of sadness in music is not much different from the research on the relationship between music and emotions, as seen in Section 2. For a long time, the only two feasible paths were speculation and introspection, from which the above-mentioned philosophical theories sprung. The key turning point in the case of emotions was the transition to empirical science methods, and particularly neuroscience. A similar shift has occurred in the last few decades in the issue of deriving pleasure from sad music, but this is especially true in terms of psychological empirical studies, as setting up neuroscientific experiments in this case is decidedly more challenging.

One of the first—and still influential—psychological hypotheses based on empirical investigations is credited to Emery Schubert (1996, 2007, 2012). (Garrido 2017) has collectively labeled the set of insights and empirical evidence collected by Schubert, as well as in further joint studies (Garrido and Schubert 2012), as the Dissociation Theory of Emotion in Aesthetic Contexts (DTEAC). DTEAC proposes that when negative emotions are activated in aesthetic situations in which the stimulus is cognitively discounted as unreal, a "dissociation node" is triggered which inhibits the displeasure and pain units of the mind. When dissociation occurs and displeasure is deactivated, the remaining cognitive activation that is occurring as a result of the emotional arousal is inherently pleasurable. Dissociation in this context borders on the common meaning in clinical psychology, which in its most extreme manifestations—typically following traumatic events—leads to a pathological distancing from reality. Usually, lingering to listen to

sad music does not imply anything of the sort, but these are two extremes of a continuum of the same underlying process.

Another psychological concept has been identified as a potential pivot around which the pleasantness of sad music revolves: empathy. In the proper sense, it is the mechanism that humans (and other animals) possess that allows them to understand and even experience what another person is feeling. An instance of empathy can involve automatic, non-conscious processes such as emotional contagion, as well as more conscious, reflective processes such as mentalizing and perspective-taking.

There have been several studies that have tested whether empathy and appreciation of sad music go hand in hand. In Miu and Balteş (2012), the level of empathy of the subjects was deliberately manipulated before exposing them to videos of opera music, which featured close-ups of the singers. In a neutral condition, there were no specific instructions, while in the induced empathy condition, subjects were asked to carefully observe the performer's face and facial expressions, trying to understand what they were feeling while singing the opera piece. In Eerola, Vuoskoski, and Kautiainen (2018), empathy was not manipulated, but a correlation was sought between the subjects' subjective predisposition to empathy, measured according to a standard protocol (IRI, Interpersonal Reactivity Index), and the liking of sad music. Both of these studies, as well as similar others, actually show some relationship between empathy and enjoyment of sadness in music.

The array of psychological concepts that have been investigated as a possible pivot around which the attraction of sad music revolves doesn't stop there. Nostalgia, rumination, grief, and love addiction can all be added. All of them include some empirical study that has attempted to verify some correlation. The phenomenon of empathy discussed earlier is indeed a cornerstone of social psychology, and it is also in this field that further explanations have been hypothesized. Several revolve around a consolatory effect that sad music would have, in transmitting the idea of no longer being alone, but of belonging to a community, specifically the community of all

those who know how to appreciate the sadness of a certain music (ter Bogt et al., 2018). This would constitute a kind of social surrogacy, granting the listener the gratifying sensation of a virtual presence, constituted by the music itself. It's an idea very close to the concept of emotional communion described by Levinson (1996). Even more inherently social is the idea of cultural ratcheting, in the framework that sees music as part of the cultural transmission of knowledge. Music can then take the form of narratives that meaningfully situate entities of human experience into their environment, allowing for understanding of experienced events at both personal and larger sociocultural levels. In particular, musical traditions that express sadness, from this perspective, have the merit of providing codes of behavior for dealing with moments of sadness.

It is evident that the more we slide on the social and cultural plane, the more difficult it becomes to ensure scientific foundations for the various hypotheses. An anomalous case should be mentioned that seeks to move in the completely opposite direction. This is David Huron (2011), who has pointed out a precise neurophysiological counterpart of the pleasure derived from sad music. It is prolactin, a peptide hormone released primarily by the pituitary, but also synthesized within the central nervous system. As suggested by the name, prolactin is associated with the production of milk, but it also has important mood effects, producing feelings of well-being, calmness, consolation. Moreover, prolactin contributes to crying, a comforting effect by reducing the threshold for crying onset. According to Huron, the acoustic features of sad music emulate the acoustic properties characteristic of sad speech, bootstrapping feelings of sadness which in turn cause a release of prolactin with its consoling effect.

This is an interesting conjecture, with the great scientific merit of exposing itself to empirical refutation (Popper, 1963), if it were possible to measure prolactin under rigorous experimental conditions. Indeed, this happened in a study (EversSuhr) of which Huron was obviously unaware, which unfortunately seems to refute the conjecture: while systematic variations of

serotonin were measured during the listening of musical pieces, no production of prolactin was reported. Certainly, a single study is not able to give a definitive answer, but it raises strong doubt about this hypothesis. It should be added that one of his premises was the similarity between sad music and characteristic aspects of a lamenting voice. These characteristics would be the slowed rhythm of vocal production, and the shift towards lower frequencies. As discussed at length here, the dominant characteristic of sadness in music is the minor mode, which has nothing to do with either low frequencies or rhythm. There are empirical studies showing the irrelevance of rhythm in differentiating between happy and sad music (Khalifa et al., 2008). However, Huron's attempt remains admirable, and it is to be hoped that it will be followed by other attempts to identify neurophysiological mechanisms that can open the doors to scientifically well-founded explanations.

5. Conclusions

The arguments presented in this article, especially in the last section, suggest that nearly every possible feature of a person's psychological or psychosocial structure could be implicated in trying to explain the paradox of the desire to experience sadness by immersing oneself in music. Probably each such hypothesis has some truth to it, but it contributes little to trying to provide a unified model of this phenomenon. The decidedly positive aspect of the current research landscape is that empirical methodology is increasingly taking precedence over speculation, replaced by introspection of the subjective sensations evoked by sad music. The negative aspect is that the path of neuroscientific experimentation is currently underexplored, which has been crucial in demonstrating the strong link between music listening and the activation of emotional brain circuits. This has been possible thanks to an increasingly deep understanding of the brain centers associated with different emotional valences, regardless of music. However, when it comes to accounting for how neural activations intrinsically linked to negative

sensations lead to a sort of enjoyment, identifying the mechanisms obviously becomes much more difficult.

References

- BERNSTEIN, L., *The Unanswered Question*, Cambridge (MA), Harvard University Press, 1976.
- BRATTICO, E., ALLURI, V., BOGERT, B., JACOBSEN, T., VARTIAINEN, N., NIEMINEN, S., TERVANIEMI, M., “A Functional MRI Study of Happy and Sad Emotions in Music with and Without Lyrics”, *Frontiers in Psychology*, 2, 2011, p. 308.
- EEROLA, T., VUOSKOSKI, J. K., KAUTIAINEN, H., “Being Moved by Unfamiliar Sad Music Is Associated with High Empathy”, *Frontiers in Psychology*, 7, 2018, p. 1176.
- EEROLA, T., VUOSKOSKI, J. K., PELTOLA, H.-R., PUTKINEN, V., SCHÄFER, K., “An Integrative Review of the Enjoyment of Sadness Associated with Music”, *Music Perception*, 30, 2018, pp. 307-340.
- FANG, L., SHANG, J., CHEN, N., “Perception of Western Musical Modes: A Chinese Study”, *Frontiers in Psychology*, 8, 2017, p. 1905.
- FRITZ, T., JENTSCHKE, S., GOSSELIN, N., SAMMLER, D., PERETZ, I., TURNER, R., FRIEDERICI, A. D., KOELSCH, S., “Universal Recognition of Three Basic Emotions in Music”, *Current Biology*, 19, 2009, pp. 573-576.
- FUJISAWA, T. X., COOK, N. D., “The Perception of Harmonic Triads: An fMRI Study”, *Brain Imaging and Behavior*, 5, 2011, pp. 109-125.
- GABRIELSSON, A., LINDSTRÖM, S., “Strong Experiences of and with Music”, in GREER, D. (ed.), *Musicology and Sister Disciplines: Past, Present, Future*, Oxford, Oxford University Press, 1997, pp. 118-139.
- GARRIDO, S., *Why Are We Attracted to Sad Music?*, London, Palgrave MacMillan, 2017.
- GARRIDO, S., SCHUBERT, E., “Adaptive and Maladaptive Attraction to Negative Emotions in Music”, *Musicae Scientiae*, 17, 2012, pp. 147-166.

- HANSLICK, E., *Vom Musikalisch-Schönen – Ein Beitrag zur Revision der Ästhetik der Tonkunst*, Leipzig, Breitkopf & Härtel, 1854.
- HEVNER, K., “The Affective Character of the Major and Minor Modes in Music”, *The American Journal of Psychology*, 47, 1935, pp. 103-118.
- HURON, D., “Why Is Sad Music Pleasurable? A Possible Role for Prolactin”, *Musicae Scientiae*, 15, 2011, pp. 146-158.
- KHALFA, S., ROY, M., RAINVILLE, P., DALLA BELLA, S., PERETZ, I., “Role of Tempo Entrainment in Psychophysiological Differentiation of Happy and Sad Music?”, *International Journal of Psychophysiology*, 78, 2008, pp. 17-26.
- KIVY, P., *Sound Sentiment: An Essay on the Musical Emotions*, Philadelphia (PA), Temple University Press, 1989.
- LEVINSON, J., *The Pleasures of Aesthetics: Philosophical Essays*, Ithaca (NY), Cornell University Press, 1996.
- MEYER, L., *Emotion and Meaning in Music*, Chicago (IL), University of Chicago Press, 1956.
- MITTERSCHIFFTHALER, M. T., FU, C. H. Y., DALTON, J. A., ANDREW, C. M., WILLIAMS, S. C. R., “A Functional MRI Study of Happy and Sad Affective States Induced by Classical Music”, *Human Brain Mapping*, 28, 2007, pp. 1150-1162.
- MIU, A. C., BALTEŞ, F. R., “Empathy Manipulation Impacts Music-Induced Emotions: A Psychophysiological Study on Opera”, *PLoS ONE*, 7, 2012, p. e30618.
- PALLESEN, K. J., BRATTICO, E., BAILEY, C., KORVENOJA, A., KOIVISTO, J., GJEDDE, A., CARLSON, S., “Emotion Processing of Major, Minor, and Dissonant Chords”, *Annals of the New York Academy of Sciences*, 1060, 2005, pp. 450-453.
- PATEL, A., *Music, Language, and the Brain*, Oxford, Oxford University Press, 2008.
- PERETZ, I., ZATORRE, R. (eds.), *The Cognitive Neuroscience of Music*, Oxford, Oxford University Press, 2003.

- PLEBE, A., “La spiegazione mancante”, in RUGGIERO, G., BRUNI, D. (eds.), *Il ritmo della mente - La musica tra scienza cognitiva e psicoterapia*, Sesto San Giovanni, Mimesis, 2015, pp. 73-92.
- POPPER, K., *Conjectures and Refutations: The Growth of Scientific Knowledge*, London, Routledge, 1963.
- RAMEAU, J.-P., *Traité de l'harmonie*, Paris, Ballard, 1722.
- RESNICOW, J. E., SALOVEY, P., REPP, B. H., “Is Recognition of Emotion in Music Performance an Aspect of Emotional Intelligence?”, *Music Perception: An Interdisciplinary Journal*, 22, 2005, pp. 145-158.
- RIEMANN, H., *Handbuch der Harmonielehre*, Leipzig, Breitkopf & Härtel, 1898.
- SCHUBERT, E., “Enjoyment of Negative Emotions in Music: An Associative Network Explanation”, *Psychology of Music*, 24, 1996, pp. 18-28.
- , “The Influence of Emotion, Locus of Emotion and Familiarity Upon Preference in Music”, *Psychology of Music*, 35, 2007, pp. 499-515.
- , “Loved Music Can Make a Listener Feel Negative Emotions”, *Musicae Scientiae*, 35, 2012, pp. 499-515.
- TER BOGT, T. F. M., VIENO, A., DOORNWAARD, S. M., PASTORE, M., VAN DEN EIJDEN, R. J. J. M., “‘You’re Not Alone’: Music as a Source of Consolation Among Adolescents and Young Adults”, *Psychology of Music*, 45, 2018, pp. 155-171.
- TRAMO, M. J., CARIANI, P. A., DELGUTTE, B., BRAIDA, L. D., “Neurobiology of Harmony Perception”, in PERETZ, I., ZATORRE, R. (eds.), *The Cognitive Neuroscience of Music*, Oxford, Oxford University Press, 2003, pp. 127-151.
- VIRTALA, P., HUOTILAINEN, M., PARTANEN, E., FELLMAN, V., TERVANIEMI, M., “Newborn Infants' Auditory System Is Sensitive to Western Music Chord Categories”, *Frontiers in Psychology*, 4, 2013, p. 492.

VON HELMHOLTZ, H., *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik*, Braunschweig, Friedrich Vieweg und Sohn, 1863.

VUOSKOSKI, J. K., THOMPSON, W. F., MCILWAIN, D., EEROLA, T., “Who Enjoys Listening to Sad Music and Why?”, *Music Perception: An Interdisciplinary Journal*, 29, 2012, pp. 311-317.