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Music and emotions

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Abstract

This paper discusses contemporary empirical approaches to the topic of music and emotions that are conducted at the intersection of psychology, neuroscience and musicology. I show that within this interdisciplinary programme a number of general issues were posed that are not that distant from the questions asked by the classical authors such as Stravinsky and Hanslick. The main purpose of the paper is to show that there are three areas of cognitive and behavioural activity of the listener and the respective types of musical emotions: embodied emotions, cognitive emotions, as well as associative and contextual emotions.

Keywords: music and emotion; emotional response to music; absolutist vs. referentialist views of musical meaning; psychology of music; Stravinsky.

Introduction

The aim of the present article is to take a look at contemporary research on music and emotions that is conducted at the intersection of psychology, neuroscience and musicology. This kind of research assumes that there exists a close relationship between music and the sphere of emotions, and that the range of body's affective and emotional responses to a musical stimulus stretches from physiological and behavioural reactions to subtle aesthetic feelings. Unfortunately, the nature of this relationship, the various functions thereof (e.g. the role of musical emotions in the evolution of the species), as well as the neuronal basis and mechanisms thereof remain far from recognised and conclusively explained. Nonetheless, for the time being it is still possible to point towards the main areas of human cognitive and behavioural activity in which musical emotions become apparent. For this reason, in the present paper I try to differentiate between various types of musical emotions, e.g. affects connected with the excitation of the body, cognitive emotions and

emotions connected with the context of listening to the music. Obviously, a further step should be to point out to specific mechanisms that are responsible for the appearance of musical emotions in the aforementioned areas.

The article is comprised of four parts. In the first part I reconstruct critical arguments against emotionalism in music as formulated by Igor Stravinsky. I believe that they constitute a good starting point for considering the relationship between music and the emotional spheres, especially in the context of differentiating between “everyday emotions” and “aesthetic emotions”. In the second part I show that within the programme of empirical interdisciplinary research into musical emotions a number of general issues were posed, pertaining e.g. to whether musical emotions are utilitarian, everyday emotions, or whether they have an aesthetic character; whether we experience them, or only perceive the emotional content of a piece, and whether the music itself or the extra-musical context are the reason behind emotions - issues that are not that distant from the questions asked by the classical authors such as Stravinsky and Hanslick. In the third part I refer to the results of psychological, physiological and neuroscientific research which show that musical emotions are not merely illusions, but real phenomena, which can be studied effectively with the use of empirical methods. Finally, in the fourth part I suggest differentiating between three areas of cognitive and behavioural activity of the listener and the respective types of musical emotions: embodied emotions, cognitive emotions, as well as associative and contextual emotions.

1. The essence of music and its emotive functions. Stravinsky on emotions induced by music

Reflections on emotions expressed and induced by music occupy an important place in the European musical culture. It is mainly due to the unremitting disputes between the authors who perceived music as a closed formal structure and those for whom the meaning of music was identical with stirring an emotional response (cf. Dahlhaus & Eggebrecht 1992: 35-43)²³². The critics of music being strongly associated with emotions referred, among others, to the specificity of the musical piece itself - an orderly structure of sounds that refer only to other elements of the same structure. The task of music understood in this manner is not to invoke nice and pleasant feelings, but to prompt the listener to follow the course of the music with the senses and intellect, and hence to experience it aesthetically.

²³² According to Hans Eggebrecht, European music is permeated by tension - revealing itself with historically changing intensity - between two opposite, although, at the same time, constitutive notions: “emotion” and *mathesis*, cf. Dahlhaus & Eggebrecht (1992: 42)

Thus, the postulate not to connect music with emotions results directly from the philosophical view on the nature (essence) of music. Due to the fact that music - mostly instrumental music – is something fleeting, abstract and non-visual, the most basic problem of the theory and philosophy of music has become the question whether at all it can “designate, depict, or otherwise communicate referential concepts, images, experiences, and emotional states” (Meyer 1956: 32-33). According to Leonard Meyer, in response to this question there emerged two opposing positions: absolutism (resp. formalism – e.g. Hanslick, Stravinsky) according to which a musical piece is an autonomic piece that refers to itself and defined as a system of intra-musical references²³³, and referentialism, according to which music refers to a broadly understood extra-musical sphere, e.g. events in the world, notions or emotions (cf. Meyer 1956: 1).

According to absolutists, the beauty of music “is not contingent upon, or in need of any subject introduced from without, but that it consists wholly of sounds artistically combined” (Hanslick 1891: 66). There is also a *negative* version of the absolutist approach, the gist of whose criticism is directed against the search for beauty and meaning (designation) of music in the extra-musical sphere, among others, among emotions, moods and feelings that music arouses. In his classical work *The Beautiful in Music* Eduard Hanslick argued that beauty is a basic category of aesthetics in music, while a feeling (an emotion) is only an auxiliary, secondary category. He treats these two categories as separate ones: (a) the aim of beauty is not to arouse feelings, (b) beauty is not influenced by whether someone experiences pleasant feelings, (c) an item may be beautiful even if it does not arouse any feelings in anyone (cf. Hanslick 1891: 18-19)²³⁴.

Autonomy, specificity and the untranslatable character of musical experience were also emphasised by Igor Stravinsky, who has sometimes been, for this very reason, counted as one of the absolutists²³⁵. In his aesthetical reflections and comments on his own body of work there appear theses consistent with

²³³ What is the most characteristic for the approach of the absolutists is defining music through referring to an ideal type of a musical piece understood as “pure” instrumental music, “absolute music”. Eduard Hanslick (1903: 47ff) wrote about the exceptional place of instrumental music (as “art alone”) in research on musical meaning). A philosophical and cognitive characteristic of the phenomenon of music alone, unaccompanied by “text, title, subject, program, or plot”, was suggested by Peter Kivy (1990).

²³⁴ Despite this, Hanslick sees the possibility of indirect arousing feelings by beauty (via sensations and imagination), (cf. Hanslick 1891: 19-23, 69).

²³⁵ As it seems, quite rightly so. Stravinsky wrote about people seeking meaning outside music in this way: “They never seem to understand that music as an entity of its own apart from anything that it may suggest to them. In other words, music interests them in so far as it touches on elements outside it while evoking sensations with which they are familiar” (Stravinsky 1936: 256).

the negative version of the absolutist approach that are aimed at excessive emotionality, sentimentalism or expressionism of music:

For I consider that music is, by its very nature, essentially powerless to express anything at all, whether a feeling, an attitude of mind, a psychological mood, a phenomenon of nature, etc. . . . Expression has never been an inherent property of music. That is by no means the purpose of its existence. If, as is nearly always the case, music appears to express something, this is only an illusion and not a reality (Stravinsky 1936: 83-84).

Stravinsky's attitude towards the relationship between music and emotions is, however, much more complex and multilayered, as it also involves, e.g., the criticism of making use of music in order to arouse everyday life-related emotions and the criticism of treating it as an easy escape route from the everyday life:

Most people like music because it gives them certain emotions, such as joy, grief, sadness, an image of nature, a subject for daydreams, or still better oblivion from "everyday life." They want a drug, "dope." It matters little whether this way of thinking of music is expressed directly or is wrapped up in a veil of artificial circumlocutions. Music would not be worth much if it were reduced to such an end (Stravinsky 1936: 256).

Thus, it seems that in order to grasp the complexity of the absolutist critique of emotionalism in music, several constitutive elements have to be distinguished. Therefore, I propose the distinction between: (i) musical anti-expressivism (music is not capable of expressing or rendering individual feelings or the creator's mood); (ii) musical anti-representationalism (music is not capable of presenting or imitating adequately extra-musical phenomena, such as the essence of an emotion or a mood); and (iii) musical anti-emotivism (the task of music is not to arouse in its listeners natural emotions and everyday feelings).

I believe that Stravinsky's (and Hanslick's) approaches to emotions in music are a mixture of thus understood anti-expressivism, anti-representationalism and anti-emotivism, but it is a mixture of uneven proportions that never achieves an ideally fitting shape. While Stravinsky's absolutism makes him reject the excessive role of emotions in music, it is never an absolute rejection. Firstly, resistance towards connecting music and emotions is, in Stravinsky, postulative in character and does not consist in questioning the fact that in real situations music does, after all, express and arouse emotions in people. Stravinsky notices that, but he treats it as an auxiliary, insignificant function of music:

It is simply an additional attribute which, by tacit and inveterate agreement, we have lent it, thrust upon it, as a label, a convention in short, an aspect which, unconsciously or by force of habit, we have come to confuse with its essential being (Stravinsky 1936: 84).

Secondly, he is annoyed by it and does not like it when music arouses trivial, everyday feelings and emotions - which are auxiliary from the point of view of the music. However, he allows for and accepts a situation in which music arouses in the audience *unique feelings*. Should these “unique emotions” be treated – as I postulate – as a kind of aesthetic emotions, it will turn out that Stravinsky’s anti-emotivism is not as radical as it may seem. It is aimed at trivial, everyday feelings and emotions, but not at aesthetic emotions. For instance, Stravinsky connects the phenomenon of music with the listener organising sounds in time on an ongoing basis and, thus, experiencing the present in a unique manner. It is an entirely unique experience, as due to cognitive limitations, in normal situations humans are only able to grasp time in the shape of the past or the future (cf. Stravinsky 1936: 84; Stravinsky 1974: 27-37). And it is precisely constructing order and contemplating the order of sounds in time that arouses unique experiences and feelings in a listener.

It is precisely this construction, this achieved order, which produces in us a unique emotion having nothing in common with our ordinary sensations and our responses to the impressions of daily life. One could not better define the sensation produced by music than by saying that it is identical with that evoked by contemplation of the interplay of architectural forms. Goethe thoroughly understood that when he called architecture petrified music (Stravinsky 1936: 84-85).

In his subsequent words, the author of the *Symphony of Psalms* leaves no further doubts that he allows for and proposes that music arouses “higher” aesthetic pleasure in the listeners:

When people have learned to love music for itself, when they listen with other ears, their enjoyment will be of a far higher and more potent order, and they will be able to judge it on a higher plane and realize its intrinsic value (Stravinsky 1936: 256-257).

To summarise, firstly, the criticism of the role of the presence of emotions in music results directly from Stravinsky’s philosophical absolutist attitude towards the essence of a musical piece. I believe that this shows that for the absolutists the way music is perceived was dependent on the nature (structure) of the musical stimulus. Additionally, they were slightly arbitrary in trying to sharply separate the emotional perception of music from sensual and intellectual cognition thereof. Secondly, the anti-expressivism and anti-representationalism of the author of *The Rite of Spring* does not consist in a radical banishing of emotions out of music, but, rather, it only constitutes a

postulate not to mistake the essence of the musical piece with its auxiliary function that is expressing and representing feelings, moods and other mental states. Thirdly, as it seems, Stravinsky does not entirely reject the postulate that music should arouse feelings in its listener, on the condition, however, that these are pleasures experienced as a result of admiring the internal form of music, e.g. following the musical course, noticing melodic or harmonic tensions between the piece's elements, etc. This suggests that he divides the sphere of musical emotions into two parts - everyday emotions (which are natural) and aesthetic emotions - and he only ascribes the authentic experiencing of beauty in music to the latter.

As we will see further, the echoes of the dilemmas which the musical absolutists faced can be found even in contemporary research on emotions in music, conducted from the perspective of biological science. This suggests, on the one hand, that discussions around the approach of the absolutists are not at all separate from real problems with understanding music, and, on the other, that the field of empiric research on music is not free from profound theoretical problems and philosophical tensions.

2. Empirical research on musical emotions – general problems and debatable issues

In contemporary research on musical emotions conducted at the intersection of cognitive psychology, neuroscience of music and musicology there dominates an empirical and experimental approach. It partly results from rejecting a normative approach that tries to establish by philosophical means what the essence and the main role of music is²³⁶, and partly from being based on the tradition of biological research on expressing emotions in humans and animals (Darwin 1902, 1988; Ekman 2012), dimensional approach to emotion (Russell 1980) and empirical aesthetics (Berlyne 1971). The classic cognitive approach to musical emotions in musicology is represented in this trend mainly through the strong and unquestioned position of Meyer's work therein (Meyer 1956; cf. Huron 2006).

The researchers are convinced that music fulfils multiple roles and functions - for instance a cognitive, social, therapeutic or aesthetic role - and that these need to be taken into account when answering the question about the affective effect of music on the listener (cf. the articles collected in Juslin & Sloboda 2001 and Juslin & Sloboda 2010). At the same time, the aesthetic function is treated not as a unique one, but as one equal to the others. The commonness

²³⁶ Philosophical research and reflection on the nature of music and its emotional resonance (mainly in the cognitive and aesthetic dimension) are still being carried out and developed, c.f. e.g. Kivy (1989), Madel (2002), Davies (2003), Scruton (2009), Levinson (2011).

of music and its interference into human life on almost every level forces the researchers to take into account as many musical genres as possible (classical and popular music, instrumental music and singing, film music, etc.) and to take into account a wide array of musical phenomena (e.g. convivial music-making, music that accompanies everyday activities, cf. Sloboda & O'Neil 2001; Sloboda 2010).

One of the aims of such research is an empirical study on how particular elements and features of music (e.g. loudness, high and low pitch, tempo, regular or irregular rhythm, ascending or descending melody, tonality, etc.) and combinations thereof can cause an emotional effect in a listener. They also seek to explain the way in which affective arousal can be modulated by the listener's perceptual and cognitive activity, how the kind and strength of the experienced emotions are influenced by the quality and manner the piece is performed and how the appearance of an affect is influenced by various circumstances that accompany listening to music. It is assumed that the affective influence of a musical stimulus on the recipient's perceiving and emotional system is multi-level and can take place in the layer of physiological, brain, behavioural or psychological arousal (cf. articles collected in Peretz & Zatore 2003, Koelsch 2012).

Closely related to the above is the issue of acquisition of ability to react emotionally to music in children and the influence of brain injuries on affective response to musical stimulus (cf. e.g. Peretz 2001; Trehub 2003). Similarities and differences in reacting to music and related sound phenomena, such as speech, arouse much interest (Patel 2010). The central questions in this research area concern whether music and the emotions it generates are evolutionary adaptations, and if they have a survival value (cf. e.g. Cross 2003).

A research programme ranging so broadly necessarily results in a strong fragmentation of the conducted studies and forces the researchers to utilise various research methods (cf. e.g. Juslin, Liljeström et al. 2010), which, in turn, creates the need to coordinate, integrate and discuss the entirety of results achieved in such diverse fields (cf. Juslin & Sloboda 2010; Arbib 2013). On this occasion, there are revealed problems of a more general nature, which usually remain invisible from the perspective of the experimental researchers. Many of these problems and question marks pertain to issues similar to those that the absolutists would earlier discuss. Below I focus on three such key issues pertaining to the connection between music and emotions.

2.1. *Does music evoke natural basic emotions?* – Are emotions aroused by music similar to basic affects, such as fear, sadness, disgust or joy? And does music and the emotions specific to it perform an adaptive function and somehow aid humans in survival? Or do they perhaps constitute a separate, autonomous category of aesthetic emotions whose importance for survival is likely smaller?

This problem was noticed already by Charles Darwin, who believed that “Music arouses in us various emotions, but not the more terrible ones of horror, fear, rage, etc. It awakens the gentler feelings of tenderness and love, which readily pass into devotion” (Darwin 1902: 735). Does that mean that emotions of this type have nothing to do with experiences that accompany the biological struggle for survival? Darwin himself suggested another solution - he ascribed aesthetic pleasures and emotions with a role in sexual selection. He traced them to the rituals of courtship, competing for a partner and triumph over the adversary (Darwin 1902: 733-737; cf. e.g. Miller 2000). It is also possible that musical emotions fulfil a functional role in social life. Emotions that accompany singsongs, dancing or rites may strengthen social bonds, consolidate a group of people in achieving common goals and thus contribute to its survival and success.

Another possibility is that emotions aroused by listening to music possess a primarily aesthetic value and are not fully authentic, natural life emotions. Accordingly, the publications by Scherer (2004), as well as Zentner, Grandjean and Scherer (2008) distinguish between *utilitarian emotions*, connected to interest and well-being of an individual, and *musical aesthetic emotions*, which have no direct effect on the wellbeing of an individual. These researchers work on the assumption that the standard approach to researching the affective influence of music, consisting in looking for natural basic emotions, is unreliable. In the experiments they conducted Zentner and Scherer aimed to point out those characteristics of emotional and aesthetic experience of music which differentiate this type of experience from the remaining affects. To this effect they used a questionnaire containing a broad selection of emotional descriptors associated with music, including aesthetic ones²³⁷. In their research, they registered that feelings evoked by music were described with the use of positive adjectives by a vast majority of listeners (they used such words as *relaxed, happy, joyful, dreamy*) and only marginally negative (aggressive, anxious, sorrowful, depressed, angry). Negative emotions such as sadness or fear were more frequently recognised in music, although they did not spread to and “infect” listeners. This may probably be accounted for by the fact that in a typical situation a listener of music experiences relaxation and “getting lost” in the music allows him or her to temporarily separate from worries and

²³⁷ The so-called Geneva Emotional Musical Scale (GEMS), cf. Zentner, Grandjean & Scherer (2008).

problems of everyday life. Even if the listener experiences, say, sadness, it is not the same sadness as that caused by everyday experiences. It may take on the form of a paradoxical sadness, where the feeling of sadness is combined with admiration for the musical piece, or it may manifest in the form of one of the sadness-like aesthetic emotional categories, such as melancholia. In both cases the feeling of aesthetic sadness ceases to fulfil a role of a typically negative emotion of an aversive character, as evidence by the fact that typically we do not avoid or flee from music that expresses sadness. According to researchers, the terms used by the subjects to describe emotions that accompany listening to music correspond to the nine aesthetic musical emotions: wonder, transcendence, tenderness, nostalgia, peacefulness, power, joyful activation, tension and sadness (Zentner, Grandjean & Scherer 2008: 507; Zentner 2010: 106).

2.2. Feeling vs. perceiving musical emotions? – Another controversial issue concerns whether in a given instance music evokes emotions in the listeners, or whether they merely perceive and recognise the emotion expressed in the piece. The answer to this question differentiates between the emotivist and cognitivist approach. According to the former, a musical piece one hears is treated as a stimulus that causes the listener to experience certain emotions. It activates a chain of affective reactions of psychological, physiological or motoric character: the feeling of happiness, relaxation, it eliminates muscle tension or causes the tendency to tap rhythmically. A different aspect of the relation between music and emotions is emphasised if we consider a musical piece to be the expression of the composer's or performer's emotions. The emotions contained by the piece may spread to the listener, but they do not always do so (Konečni 1993: 701-702). Sometimes the listener merely engages in recognising them without succumbing to them. In such a situation, we do not encounter an emotive but a cognitive relation. For instance rather than feeling joy and happiness any time I listen to *Ode to Joy*, I can merely recognise the emotion in it and differentiate between it and other emotions, such as sadness.

According to K. Scherer and V. Konečni, the imprecise distinction between the two aspects of the emotional impact of music leads one to overinterpreting the results of various experiments testing the emotional sensitivity of the listeners. This concerns most of all psychological questionnaire-based research. Only a carefully thought-out and precise construction of such a questionnaire allows for final conclusions to be drawn regarding whether the participants reported their own emotional experiences or the emotions they perceived in the piece of music (cf. Scherer 2004: 239; Konečni 2008: 118ff).

2.3. *What arouses musical emotions: the music itself or the extra-musical context?* – The next difficult question concerns whether it is the course and form of the music that arouses emotions or is it rather occasioned by the circumstances that accompany the listening? This is particularly relevant in all those situations where music constitutes background for other parallel extra-musical events (for instance a mass in church, dancing, marching music, etc.) or when music constitutes the impulse that triggers the intellectual activity of the listener (for instance memory or imagination) directed at the extra-musical sphere. It also shows that the referentialist view broadly linking music to the external world is not without a point.

It can be related to the place in which I listen to music, for instance during a funeral, where “the structure of the musical piece is irrelevant and I feel sadness regardless of the piece’s structure” (Sloboda 1999: 42²³⁸). Group singing used by football fans at the stadium has an essential goal - to create the feeling of unity with one’s team and demonstrate one’s strength to the opponent. Stadium music is therefore intrinsically directed towards causing emotions related to mobilisation, towards readying one’s organism for action and towards lowering the threshold of aggression. In a situation at the stadium, just as during a funeral or a wedding, the complex structure of a piece of music loses importance and it is ideally reducible to a few simple and widely recognisable musical schemata. In such situations the music is supposed to uphold, stabilise and sometimes reinforce the emotional reaction which is appropriate to a given place and social context. Therefore, it is difficult to describe such emotions as purely musical.

Emotions generated by traces of memory have a similarly context-dependent character. For emotions initiated by traces of memory, what matters is with whom and in what circumstances we heard a musical piece in the past - subsequently, “every time you hear this piece, it touches your hearts because it is music associated with a loved one” (Sloboda 1999: 43²³⁹). Some feelings, such as nostalgia, are based on a similar contextual-temporal relationship with the past. This feeling may be caused by hearing a song remembered from one’s youth and evoking a chain of memories related to the good days of old.

²³⁸ Translation EB & NS.

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3. Psychological, physiological and neuronal indicators of emotional reactions to music

Assuming that music is only “vibrations moving through the air” may prompt one to scepticism when it comes to ascribing music with the ability to arouse authentic emotions. However, a strong argument for the realness of musical emotions is that their manifestations can be observed and registered in the same spheres in which basic emotions manifest:

- in the sphere of subjective feelings and experiences (e.g. the feeling of sadness resulting from listening to sad music),
- in the sphere of physiological and behavioural arousal (e.g. changes in pulse, blood pressure, skin conductivity, growth or decline in muscle tension accompanying the experience of emotion, involuntary propensity to tap out the rhythm), and
- in the sphere of neuronal activity (among others, the subcortical centres belonging to the limbic system and the reward system, the paths of dopaminergic activity)

Developmental research on perception and feeling musical emotions have shown that this ability appears quite early in a child’s development and that the ability to discriminate emotions is based on increasingly complex musical indicators grows gradually as the child ages. It is already between the second and the fourth month of their lives that children prefer and connect pleasant feelings with consonant sounds, and unpleasant with dissonant sounds (cf. Trainor, Tsang et al. 2002). Presumably it is around the third and the fourth year of their lives that children master the ability to recognise joyful music, while slightly later - around the sixth year – they are capable of recognising a wider set of emotions possible to express through music, such as sadness, fear or anger (Cunningham & Sterling 1988). The child first masters the ability to identify basic musical emotions, joy or sadness, based on recognising tempo differences (fast, slow), and only later – based on other criteria (e.g. grasping the difference between major vs. minor modes) (cf. Dalla Bella & Peretz et al. 2001).

The abilities developed in childhood decide whether the adults, both those who received musical education and those without it, can quickly and aptly sense and recognise in music the majority of basic emotions and moods, e.g. joy, sadness, peace or threat (cf. e.g. Viellard, Peretz et al. 2008; Mohn, Argstatter et al. 2011). In experimental circumstances recognising musical emotions is possible both in a categorical approach to emotion, when the research subjects are to determine which of the words denoting emotions (“sad”, “happy”, etc.) are most relevant to the given musical fragment, and in a dimensional approach to emotion, when the task would be to assess a musical stimulus on

appropriate scales, e.g. when it comes to the level of arousal it causes and the valence (positive /negative emotions) (cf. Viellard, Peretz et al. 2008; Eerola & Vuoskoski 2011).

There is a certain problem that researchers face in this kinds of studies (that is, ones based on verbal reports), namely the decision whether a given person experienced a given emotion or only recognised it in the musical material. The conducted studies suggest that in the majority of cases when the subjects of the study recognise a given musical emotion, at the same time they share it to some degree (cf. e.g. Juslin & Laukka 2004). It is, however, obvious that there appear situations in which feeling and experiencing an emotion do not coincide. If a person in a joyful mood is presented with a fragment of a sad piece, it is likely that this person will be able to recognise these emotions, but will not experience them (cf. Gabrielson 2002).

According to P. Juslin, music is fundamentally capable of causing the same emotions as other life events; however, there exists a statistically noticeable difference that characterises this way of emotional perception. In a study conducted by Juslin, Liljestrom, Västfjäll, Barradas and Silva it was discovered that positive emotional states, such as happiness-elation and nostalgia-longing more frequently accompany episodes of listening to music than everyday life situation in which there is no musical background. Conversely, anger-irritation, boredom-indifference or anxiety-fear were encountered more frequently among everyday emotions than when listening to music (Juslin, Liljestrom et al. 2008). Similar conclusions were reached by M. Zentner, D. Grandjean and K. Scherer, who, in a series of studies, showed that music causes positive reactions (relaxation, joy, amusement, dreaming) in people decidedly more frequently than negative ones (aggression, anxiety, regret, depression, anger) (Zentner, Grandjean & Scherer 2008).

On the other hand, in studies conducted by Carol Krumhansl (1997) with the use of apparatuses that registered physiological reactions of the body (e.g. respiration, blood pressure or skin conductance) it was shown that when listening to fragments of musical pieces expressing sadness (e.g. Barber's *Adagio for Strings*), fear and anxiety (e.g. Mussorgsky's *Night on Bald Mountain*) and joy (e.g. *Spring* from Vivaldi's *Four Seasons*), the level of the body's physiological arousal changes. During the study the sad musical fragments influenced the most such features as changes in the heartbeat frequency, blood pressure and skin conductance (SCR – cf. also Khalifa, Peretz et al 2002) and body temperature in the listeners. Music expressing fear and anxiety caused, most of all, circulation effects such as changes in pulse parameters. Finally, happy music resulted mainly in changes in breathing parameters of the study subjects.

Various behavioural reactions with an emotional background were also studied by J. Sloboda (1991) and J. Panksepp (1995). In Sloboda's questionnaire-based study, the subjects reported that listening to music causes a whole range of behavioural reactions in them, such as shivers down the spine, laughter, a lump in the throat, tears, goose bumps, sweating, increased heart rate, yawning, sexual arousal and others. Shivers turned out to be the most frequent reaction, with 90% of respondents admitting to them. The aim of Sloboda's experiment was also to correlate the body's behavioural response with specific musical forms. The results achieved showed that for example tears were most often elicited by melodic appoggiaturas, while sudden changes in harmony caused shivers in the listeners. Chills that appear while listening to the music were also the subject of Panksepp's study. It demonstrated that a reaction of this kind appears more frequently in the case of listening to sad, rather than happy, musical fragments and that women experience those more often than men do.

The results of neuroimaging experiments showed, in turn, that emotions experienced while listening to the music are frequently accompanied by activation of similar brain areas as it happens in the case of natural emotions. For instance, Anne Blood and Robert Zatorre (2001), as well as Vinod Menon and Daniel Levitin (2005) demonstrated – respectively – with the use of positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) that emotions experienced while listening to music are accompanied by activation of the so-called reward system in the brain and dopaminergic neural activity, analogously as it takes place in cases of natural euphoria caused by erotic stimuli, eating chocolate or using other stimulants.

Similar conclusions, based on his own research and a review of neuroimaging studies and lesion studies, were reached by Stefan Koelsch (2010, 2012 – chapter 12.6). In his opinion, based on the experiments conducted so far, one can draw the conclusion that musical emotions are accompanied by activation of subcortical structures, especially limbic and paralimbic areas: of the amygdala, hippocampus, the parahippocampal gyrus, the nucleus accumbens, the ventral tegmental area, the insula, the anterior cingulate cortex and the orbitofrontal cortex. This may evidence the fact that at least some of musical emotions are associated with the activity of structures important for survival, which manage basic affective mechanisms formed in the process of evolution. This constitutes the best proof that emotions of this kind are not an illusion, but something real (Koelsch 2010: 133).

4. Areas of a listener's behavioural and cognitive activity. A preliminary typology of musical emotions

Numerous factors, which are, on the one hand, connected with the music itself (e.g. the elements of structure of the musical piece), and, on the other hand, with the situation in which music is perceived (the quality and manner of performance, individual features of the listener, outside circumstances amounting to the context of the listening experience) significantly complicate the possibility of coming up with a homogenous process or singular mechanism through which music can induce emotions. For example, Patrik Juslin and Daniel Västfjäll, relying mainly on the existing empirical and theoretical findings, mention as many as six various mechanisms with the aid of which, they believe, music influences emotionally the listening person. These are: (1) brain stem reflexes (2) evaluative conditioning, (3) emotional contagion, (4) visual imagination, (5) episodic memory and (6) musical expectations (cf. Juslin & Västfjäll 2008).²⁴⁰

Conversely, within the perspective I assume, a more promising starting point for determining key mechanisms and processes whereby musical emotions are induced is to point towards basic areas of the listener's behavioural and cognitive activity in which emotional reactions to music appear. I therefore propose a distinction between three such basic areas in which musical emotions appear. Emotional reactions to music can be:

- generated directly as perceptual and behavioural reactions of the listeners, that is as their bodily reactions (*embodied musical emotions*)
- mediated through the recipients' cognitive activity directed towards analysis of the musical structure and form (*epistemic musical emotions*);
- a result of directing the subject's cognitive activity towards extra-musical outside factors (*associative and contextual musical emotions*).

4.1. *The field of embodied musical emotions* – Embodied musical emotions appear independently from cognitive factors, most frequently as reactions of the autonomic nervous system that is perceptually aroused by the elements of the sonic structure of a musical piece. Perceiving music can cause increase in heartbeat rate, sweating, shivers or tears, as well as other physiological and

²⁴⁰ The authors considered (and even tested experimentally) the possibility of adding additional mechanisms of arousing musical emotions to the list, that is the mechanisms of (7) cognitive appraisal and (8) rhythmic entrainment (cf. Juslin, Liljeström et al. 2010: 616, 621).

bodily reactions of this type (cf. e.g. Sloboda 1981; Krumhansl 1997). The reactions that are raised then should be connected, among others, with the activation of the subcortical areas: the brainstem, elements of the limbic system, such as the amygdala and the hypothalamus, which control the behavioural, hormonal and vegetative reactions of the body (cf. Berlyne 1971: chapter 8).

The elementary stimuli capable of initiating such bodily reactions in a listener bottom-up are, above all, such features of the musical stimulus as, for instance: a sudden sound, its loudness, rhythm, dissonance, etc. (cf. Juslin & Västfjäll 2008: 564, Johnstone & Scherer 2000: 294-296). However, the reasons behind bodily reactions to music can also lie in slightly more complex mechanisms, such as, e.g. emotional contagion. What causes is that, for example, happy or sad music can mechanically infect the listener with the emotion inside it and cause corresponding emotional arousal, that is the feeling of happiness or sadness, increase or decrease in muscle tension or secretion of appropriate hormones in blood (prolactin, endorphins) (cf. e.g. Juslin & Västfjäll 2008: 564-566; Huron 2011). Human voice and musical expressions based thereon have unique capabilities of emotional contagion. For example, the capabilities that singing has in this respect are much higher than the possibilities of instrumental music, which derives from the fact that physiological changes characteristic for particular kinds of emotion – e.g. breath rate when experiencing fear – are more closely connected with changes in parameters of voice emission (cf. Gorzelańczyk & Podlipniak 2011: 80). It is also interesting that emotional contagion by the means of vocal resources is more effective in the case of emotions such as fear or anxiety than in the case of the emotion of disgust, which is probably connected with adaptive functions of voice as a means of communication over distance, such as using it in a group in order to signal the approaching danger, and thus eliciting fear of this danger (while it is difficult to communicate disgust with the use of voice [cf. Johnston & Scherer 2000: 223; Gorzelańczyk & Podlipiniak 2011: 81]). Emotional contagion with the use of vocal resources also works efficiently in the case of other emotions, such as the emotion of sadness, which may also be caused by the acoustic voice parameters characteristic for this emotion – a decreased rate of articulation, a decrease in the intensity of the voice, attenuation of voice frequency energy – and their emotional influence on the listener (cf. Johnston & Scherer 2000: 227).

4.2. The field of epistemic musical emotions – The factor that makes it possible for musical emotions to appear may lie in the listener's cognitive activity, e.g. in the shape of his/her expectations, imaginings, an increased engagement of working memory directed at the analysis of the musical piece. The key cognitive activity that takes part in the initiating of emotion are the anticipations that appear while listening to the music. When listening to a given piece, the

recipient – consciously or unconsciously – harbours in advance specified expectations regarding its further course. They may pertain to e.g. the appearance of an accord at a specified time, the continuation of a melodic line, repetition or complementation of a specific phrase or motif.

The influential conception of musical emotions as proposed by Leonard Meyer in the mid-1950s asymmetrically represents precisely such an approach. The general definition of emotions provided by Meyer connects the appearance of emotions with the stopping of some important life function or practice: “Emotion or affect is aroused when a tendency to respond is arrested or inhibited (Meyer 1956: 14, see also 31). The example he references is the case of a heavy smoker who may react emotionally upon reaching to his pocket for cigarettes and not finding them (Meyer 1956: 25, 39). This example shows that emotions may arise as the result of broken expectations. A similar thing happens when listening to music. By intervening in the listener’s musical expectations, a composer or a performer of a piece may arouse the emotion of surprise in the listener. The composer may cause that a sequence in the musical material “need not be the one which was specifically expected” (Meyer 1956: 26). The anticipation may also be fulfilled, but after a delay. The initial musical stimulus may allow for various developments with equal probability, that is create an impression of indecision and uncertainty in the listener. Other than the composer, also the performer of the musical piece can aesthetically and creatively manipulate the listener’s expectations through the so-called “performance deviations” within tonality, chromatics, ornamentation or the level of the expressiveness of a given performance (see Meyer 1956: chapter 6).

4.3. The field of associative and contextual musical emotions – Listening to music can arouse the listener emotionally through outside associations that the given piece evokes. Thanks to music, the recipient turns in his/her imagination or episodic (or semantic) memory towards items, people, events and ideas from the extra-musical sphere (cf. Sloboda 1985). For example, in the listener’s mind there appear images pertaining to e.g. past events, places or people whom he/she encountered, and which/who cause emotional arousal. It is also the place in which the listener is at the moment (a church, a concert) and the people who accompany him/her while listening that can contribute to generating specific emotions. Music can also make the recipient consider his/her own life in a more abstract manner, or even to think about the sense of being, which, in certain situations, may put him/her into a specific affective state - cause sorrow, sadness or even fear.

There probably exists a whole range of mechanisms - differing in the level of cognitive control, consciousness level, the influence of individual factors and the speed of emotional reaction to a musical stimulus - that manage this kind of “redirecting” attention towards the extra-musical context which takes place

in memory or imagination when listening to the music. For example, one of such mechanisms worth mentioning in this context has the shape of the – learned, culturally automatised and habitual – process of initiating associations common for a large number of people by music. Such *culturally organised associations* (which Meyer calls “connotations”) connect elements and ways of musical organisation, and even the sound or the images of the instruments with the extra-musical world: “The organ, for example, is associated for Western listeners with the church and through this with piety and religious beliefs and attitudes, The gong is linked by contiguity to the Orient and often connotes the mysterious and the exotic” (Meyer 1956: 259). Associations created on this basis contribute to a specific directing of an emotion or a mood, e.g. associations caused when listening to Christmas carols may lead to the appearance of Christmas mood and emotional feelings connected with family, tenderness and the sense of closeness.

Conclusion

The phenomenon of arousing emotions through music constitutes an important aspect of everyday and aesthetic human experience. It is, in fact, one of the aims of the contemporary interdisciplinary research into musical experience conducted at the intersection between cognitive psychology, neurocognitive science and musicology to show that musical emotions constitute a phenomenon that can be explained, and thus made more understandable, with the use of scientific methods. However, this goal, among other things – due to the intangible and mysterious character of musical emotions – is very difficult to realise and controversial as such.

In the present article I have tried to demonstrate that, in spite of the difficulties that the programme of interdisciplinary research into musical emotions must face, it has led, as it may seem, to a certain change in the way of looking at this phenomenon. Firstly, it was demonstrated that musical emotions are not an illusion, but a phenomenon that exists where psychology, physiology and brain function are concerned. Secondly, it was demonstrated that emotional experiences related to music are not limited to aesthetic experiences and can be variously connected to cognitive and behavioural activity of the listener. Thirdly, it is known that feeling musical emotions depends on the work of many different mechanisms – brain, cognitive and behavioural ones – which determine the quality and intensity of the experienced emotions.

The essence of the proposal posed in the present text lies in the conviction that there are three types of musical emotions, defined by the different spheres of behavioural and cognitive reactions to music: embodied reactions, reactions that are elicited cognitively and directed at the musical work, and reactions

that result from the combination of mental associations and the interaction with extra-musical context of the listener.

At the same time, I attempted to emphasise the fact that empirical research into musical emotions is not and will never be exempt from the need to pose general questions and from the need to philosophically highlight the problems it discusses. An example of this type of general problems may be for instance the question whether musical emotions are utilitarian or aesthetic in nature, whether we experience or merely perceive the emotional content of the piece, or the question whether it is music itself or extra-musical context that is the source of emotions. I believe that these questions do not differ that much from the lofty philosophical questions posed by classical authors such as E. Hanslick and I. Stravinsky.

There are obviously numerous issues on which the proposed solutions contradict the classical proposals of Hanslick and Stravinsky. The most important point of controversy is probably the fact of considering aesthetic experiences to be on par with other kinds of affective musical experiences. In spite of the fact that this accusation is partly justified, I do not believe it to be fully so (cf. Juslin 2013). In contemporary empirical research into musical experience, the trend which emphasises the exceptionality of musical aesthetic experiences marks its presence very strongly (cf. e.g. Konečni 2005; Zentner & Scherer 2008; Zentner 2010; Trost, Ethofer et al. 2012). The research programme of the neuroaesthetics of music may serve to increase the chances of finding an explanation for the aesthetic aspects of the impact music has on brain functions (cf. Brattico & Pearce 2013; Przybysz 2013). In light of these facts, the thesis about the exceptional character of aesthetic musical experience remains, in my view, an inspiring hypothesis, and will remain the subject of empirical research in years to come.

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