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The social side of music listening: Empathy and contagion in music-induced emotions

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Abstract

Process theories have identified empathy and contagion as mechanisms by which music may induce emotions and recent studies in psychology and cognitive neuroscience have started to examine these hypotheses. After showing how music listening may tap into social cognition, and distinguishing between empathy and emotional contagion at the psychological and neural levels, this chapter reviews the theoretical and empirical support for the involvement of these two processes in music-induced emotions. Several implications for future research on music-induced emotions are discussed: (1) drawing from current efforts to reduce conceptual confusion in mainstream research on empathy and contagion, these concepts should be clearly distinguished and consistently used; (2) most current evidence focuses on empathy, but the involvement of contagion remains theoretically appealing and cannot be discarded; therefore, theories should consider both of these mechanisms; (3) a major challenge for future research is to disentangle the contributions of empathy and contagion, and their interplay with other psychological mechanisms such as visual imagery and memory; and (4) in order to support the causal roles of empathy and contagion, research should move from correlational to experimental approaches.

Introduction

Music has the ability to evoke powerful emotional responses in listeners. In fact, it has been estimated that we respond emotionally to music more than half of the time we spend listening to it (e.g., Juslin & Laukka, 2004; Juslin, Liljestrom, Vastfjall, Barradas, & Silva, 2008). Why should instrumental music, without explicit semantic meaning, be capable of moving us to tears? Although it is likely that there are multiple mechanisms through which music can induce affective responses in listeners, one compelling account suggests that we might respond to music as we would to the observed experiences of another person – with empathy. In its broadest sense, empathy can be defined as a process by which we can understand and feel what another person is experiencing.

It has been widely documented that music can effectively communicate emotional meaning – through emulating the expressive qualities of human vocal communication and movement (Jackendoff & Lerdahl, 2006; Juslin & Laukka, 2003), as well as through culturally learned cues such as mode (e.g., Dalla Bella, Peretz, Rousseau, & Gosselin, 2001) and extramusical associations (i.e., evaluative conditioning; Juslin & Vastfjall, 2008). Some researchers have even proposed that we might hear music as the emotional expressions of a virtual person (Levinson, 2006), or as the expressive acts of the performer and/or the composer (Scherer & Zentner, 2001). Thus, as music is imbued with connotations of human emotional expression on multiple levels, it is plausible that listeners might – at least in some occasions – respond to it with empathy.

Recent empirical studies have accumulated compelling evidence to suggest that empathy might actually be more fundamental to our engagement with music than previously thought. Just as people differ in terms of the intensity and type of responses they experience while listening to music, they also differ in terms of how readily they tend to experience empathy in their daily lives. This "dispositional empathy" can be defined as an individual's

general responsiveness to the observed experiences of others, involving both perspective-taking capabilities and tendencies, and emotional reactivity (e.g., Davis, 1980). Although a variety of factors contribute to whether or not we experience empathy in a given situation, those with high dispositional empathy tend to experience empathy more readily across different situations. This inter-individual variability in empathic responsiveness can offer insights into individual differences in emotional responses to music, as a number of studies on music-induced emotions have observed associations between dispositional empathy and emotional responses to music (Baltes & Miu, 2014; Vuoskoski & Eerola, 2011; Vuoskoski & Eerola, 2012).

In this chapter, we will first outline the concepts of empathy and contagion as psychological processes, and discuss current directions in mainstream literature. Next, we will introduce a selection of theories that have proposed some form of empathy as a mechanism of music-induced emotions, and review empirical findings in the light of these theories. We have restricted the empirical studies under consideration to those that have either investigated the contribution of dispositional empathy to individual differences in music-induced emotional responses, or explicitly manipulated empathy in the context of music listening. Finally, we will identify a number of gaps in the current literature on empathy and music-induced emotions, and suggest future directions for empirical explorations.

Empathy and emotional contagion

Imaginatively projecting oneself into another's situation, like artists do when creating their characters, is the process originally referred to as "Einfühlung" by Theodore Lipps (Lipps, 1903) and later coined "empathy" by Edward B. Titchener (Titchener, 1909). Due to its fundamental role in social cognition and behavior, empathy has been a popular topic of

investigation in philosophy, psychology and cognitive neuroscience. The diversity of theoretical approaches helped uncover many facets and functions of empathy, but also contributed to terminological redundancy and confusion regarding the boundaries of this concept (Batson, 2009; Cuff, Brown, Taylor, & Howat, 2014).

Broad definitions of empathy include processes from perception to behavior (Decety & Jackson, 2004; Preston & de Waal, 2002), such as taking another's perspective, coming to share his/her state of mind and developing motivation to improve his/her situation (Zaki & Ochsner, 2012). These approaches have been criticized for cancelling the distinction between empathy and related concepts such as theory of mind, defined as the ability to infer what others think or feel (Gallagher & Frith, 2003). Keeping this distinction is important considering that there are situations in which one seeks to understand another's feelings without actually coming to develop those feelings. Such situations have been viewed either as a cognitive facet of empathy (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009) or an affective facet of theory of mind (Shamay-Tsoory & Aharon-Peretz, 2007). Clearly, empathy and theory of mind are closely related concepts (McCall & Singer, 2013) considering that from an empathy point of view, understanding others' feelings is crucial to coming to feel the same, and from a theory of mind point of view, inferring how others think comes hand in hand with understanding what they feel.

Recent approaches from psychology (Eisenberg, 2000; Hoffman, 2000) and social neuroscience (de Vignemont & Singer, 2006; Hein & Singer, 2008; Singer & Klimecki, 2014) argue that empathy should be defined more narrowly in order to differentiate it from closely related processes. According to one such working definition (de Vignemont & Singer, 2006; Hein & Singer, 2008; Singer & Klimecki, 2014), empathy has three main characteristics. First, empathy involves experiencing an affective state as reaction to another's feelings. By emphasizing experience sharing as the specific component of empathy,

this approach avoids confusion with theory of mind, which refers to understanding another's state of mind, without necessarily adopting the same thoughts and feelings.

A second characteristic of empathy is the "isomorphism" between the affective states of protagonists (de Vignemont & Singer, 2006), which means that one reacts with the same emotion as the one perceived or assumed in another (e.g., being sad with another who is sad). This characteristic helps distinguish empathy from other forms of emotional responses to others, such as compassion or sympathy in which emotion can differ between protagonists (e.g., feeling pity for someone who is sad). Empathy involves affect coupling or "feeling with the other", whereas compassion refers to caring for another without actually sharing his or her affective state ("feeling for the other") (de Vignemont & Singer, 2006; Singer & Klimecki, 2014). In addition, compassion may also imply motivation to improve others' situation, as illustrated by those in helping professions, such as physicians or psychotherapists, who cannot afford to share the distress of their patients, but often report feelings of warmth, concern or care for them (de Vignemont & Singer, 2006; Singer & Klimecki, 2014).

The third characteristic specifies that in empathy, one is consciously aware that his/her current emotion is related to another's emotion (Decety & Meyer, 2008). This characteristic differentiates empathy from emotional contagion, which refers to processes by which one may "catch" the affective state of another outside awareness (Hatfield, Cacioppo, & Rapson, 1994). Unlike empathy, emotional contagion does not involve the self-other differentiation or knowing that another person is the source of one's emotion (de Vignemont & Singer, 2006; Decety & Meyer, 2008). Therefore, empathy and contagion both involve affect coupling between protagonists, but through either consciously controlled or automatic mechanisms. While empathy is thought to rely on theory of mind, two mechanisms

hypothesized to support contagion are motor mimicry and premotor neural mirroring of emotional expressions.

According to Hatfield et al. (1994), one way by which one may "catch" another's emotion is through reflex mimicry of emotional expressions (e.g., facial, vocal, postural) and afferent feedback from activated muscles, which may in turn serve as priming mechanism in emotion generation. A recent critical appraisal of empirical evidence (Hess & Fischer, 2013) suggested that emotional mimicry is selective, and its specificity and role in emotion recognition are more limited than originally thought. There is evidence that automatic mimicry of emotional expressions depends on affiliative intentions, which means that the observer seeks to reinforce a bond with the target (Hess & Fischer, 2013). For instance, people display more emotional mimicry toward friends compared to strangers (Fischer, Becker, & Veenstra, 2012), and positive compared to negative fictional characters (Likowski, Muehlberger, Seibt, Pauli, & Weyers, 2008). These findings are in line with evolutionary thinking which argues that in social species, selection may have favored responses to conspecifics on which one would rely for help (Preston & de Waal, 2002).

In addition, there is also evidence that automatic facial mimicry may not reflect the specific emotions expressed by others, but only the valence (i.e., positive/negative) of emotional expressions. For instance, people display automatic frowning when observing facial expressions of several different negative emotions, including fear, anger and sadness (Hess & Fischer, 2013). Moreover, it was found that automatic facial mimicry contributes to emotion recognition mostly when expressions are ambiguous, such as in distinguishing true from fake smiles (Maringer, Krumhuber, Fischer, & Niedenthal, 2011). Therefore, it was suggested that: "emotional mimicry is related to the understanding of emotion in context and is involved in regulating one's relation with the other person, rather than being the

synchronization of meaningless individual muscle actions" (Hess & Fischer, 2013, pp. 144, 146).

Recent studies have uncovered a neural mechanism that may contribute to imitation, by matching actions observed in others with one's own actions (Gallese, 2001; Iacoboni, 2009). In other words, observing another's action recruits part of the neural circuits involved in preparing to execute the same action. Therefore, understanding another's action may occur through the internal simulation of those actions in premotor areas of the brain (i.e., responsible for action planning), rather than motor imitation. Studies in primates identified neurons that discharge both when the animal performs an action (e.g., grasping an object), and when it observes somebody else performing a similar action (di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolatti, 1992; Gallese, Fadiga, Fogassi, & Rizzolatti, 1996) These were called "mirror neurons" because their properties suggest that observing others' actions is, at the neural level, like observing one's own actions in a mirror. Mirror neurons were found in the frontal premotor and posterior parietal cortex of macaque monkeys, but there is evidence that neural circuits with "mirroring" functions (i.e., mirror neuron system) also exist in similar regions of the human brain (Iacoboni et al., 1999). They seem to code action intention, as the observation of the same action triggers the discharge of different mirror neurons depending on its intention. When monkeys observed a human experimenter grasping for food and intention was cued by the presence of a container (i.e., food was put in the container when it was present, or eaten when it was absent), the neurons that discharged were those active when the monkey performed that action with the same intention (Fogassi et al., 2005). Moreover, two thirds of mirror neurons fire for observed and executed actions that are not even the same, but achieve the same goal or are related (di Pellegrino et al., 1992; Gallese et al., 1996). Another important finding indicated that mirror neurons are multimodal, which means that they can match one's own actions with others' similar actions both when seeing

what others do and hearing the sounds of their actions (Kohler et al., 2002). Therefore, neural matching between actions observed in others and one's own actions may provide a mechanism for understanding others' intentions, based on visual or auditory observation.

In the case of facial movements, the intention is often to communicate emotion. Therefore, it has been hypothesized that the mirror neuron system may contribute to recognizing emotional expressions (i.e., by matching them to one's own expressions) and to developing the corresponding emotion though contagion and empathy (Gallese, 2001; Iacoboni, 2009). There is evidence that activity in frontal premotor areas, which may be part of the human mirror neuron system, is correlated with facial emotion discrimination (Enticott, Johnston, Herring, Hoy, & Fitzgerald, 2008). Although further studies are necessary, the potential role of the mirror neuron system in emotion recognition suggests that this system may also contribute to contagion and empathy. The ability to empathize with others may rely on the interaction between the mirror neuron system involved in the recognition of emotional expressions and the limbic system involved in emotion generation, with the insula playing the mediator role (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003). Several studies reported overlapping activity in frontal premotor areas, insula and limbic structures such as the amygdala, during both observation and imitation of facial expressions of emotion (Carr et al., 2003; Pfeifer, Iacoboni, Mazziotta, & Dapretto, 2008). Moreover, activity in this network correlates with dispositional empathy and social skills (Pfeifer et al., 2008). Trait empathy has also been linked to parietal and temporal regions that might be part of the auditory mirror neuron system, being active both during action execution and hearing the sounds of a similar action (Gazzola, Aziz-Zadeh, & Keysers, 2006).

In summary, both empathy and contagion involve affect coupling or developing an affective state seen or assumed in others. This characteristic distinguishes them from theory of mind which involves understanding another's state of mind without necessarily sharing it.

While empathy occurs through consciously controlled processes such as theory of mind, contagion may be supported by automatic processes such as motor mimicry or premotor neural mirroring of emotional expressions. Available evidence shows that affiliative contexts enhance motor mimicry, reflecting the emotional valence of the observed emotional expression and playing a role in emotion recognition when expressions are ambiguous. The mirror neuron system may also contribute to contagion and empathy, by matching emotional expressions observed in others with one's own expressions and spreading activation to the insula and the limbic system.

Empathy, contagion and music-induced emotions

Several theories of music-induced emotions feature empathy and contagion as potential mechanisms through which music might induce emotions in listeners (e.g., Davies, 2011, 2013; Juslin & Vastfjall, 2008; Livingstone & Thompson, 2009; Molnar-Szakacs & Overy, 2006; Scherer & Zentner, 2001). The theoretical accounts range from pre-conscious motor simulation (involving the mirror neuron system; Livingstone & Thompson, 2009; Molnar-Szakacs & Overy, 2006) and emotional contagion (Davies, 2011, 2013; Juslin & Vastfjall, 2008; Scherer & Zentner, 2001) to empathizing with the imagined emotional experiences of the performer/composer (Scherer & Zentner, 2001) or the music as a 'virtual person' (Levinson, 2006; Watt & Ash, 1998). In this section we will outline some of the main theories that have proposed some form of empathy as a mechanism of music-induced emotions, and review the current empirical evidence in the context of these theories.

Theoretical accounts

Several authors (e.g., Davies, 2011; Juslin & Vastfjall, 2008; Scherer & Zentner, 2001) have proposed that emotional contagion might occur between music and the listener. Some of the

fundamental ways in which music is able to effectively communicate emotional information include utilizing the acoustic code for human vocal expression of emotions (for a review, see Juslin & Laukka, 2003), and emulating the speed, trajectory, and smoothness/jerkiness of human movement and gestures (Jackendoff & Lerdahl, 2006). Thus, it is possible that human listeners may respond to emotionally expressive music as they would to the perceived emotional state of a conspecific (e.g., Juslin & Vastfjall, 2008; Livingstone & Thompson, 2009). Some authors have argued that the human mirror neuron system might offer a neural mechanism for emotional contagion from music (Livingstone & Thompson, 2009; Molnar-Szakacs & Overy, 2006; Overy & Molnar-Szakacs, 2009). In essence, a listener would engage in a form of pre-conscious 'motor simulation' of those auditory and gestural features that resemble human vocal and motor expression of emotion (Juslin & Vastfjall, 2008; Livingstone & Thompson, 2009; Molnar-Szakacs & Overy, 2006), and/or the intentional motor acts that are carried out to produce the sounds (Overy & Molnar-Szakacs, 2009).

Beyond emotional contagion, it has been postulated that music-induced emotional responses might involve empathy, with underlying theory of mind abilities and awareness that one's emotional responses are related to the observed object. Scherer and Zentner (2001) have proposed that "there may also be a kind of empathy with the emotion presumed to be felt by the performer that may be construed in our imagination through an underlying 'idea' that is seen as responsible for the emotional state that is expressed (for example, the longing of the composer for his homeland, as in Dvoràk's 'New World Symphony')" (Scherer & Zentner, 2001, p. 371). In other words, it is possible that listeners experience empathy for the performer and/or composer by utilizing their imagination and theory of mind abilities. Some authors have even suggested that listeners might experience music as a narrative about a virtual person that they 'hear' as inhabiting it (Lavy, 2001; Levinson, 2006). According to Lavy's (2001) account, this 'narrative' is an emergent property of the listening process rather

than an object or a property of the music itself, and involves the merging of cues from both sound and context into one, coherent narrative structure. Thus, the listener may – in some instances – experience empathy for the imagined experiences of a virtual person that the music personifies (cf. Levinson, 2006). This tendency to adopt a 'narrative mode of listening' may stem from the frequent pairing of music with narrative content (e.g., films, operas, lyrics), and the innate human tendency to make sense of the world and our experiences through the construction of narratives (Lavy, 2001).

Empirical evidence

Brain-imaging studies have shown that music listening is able to activate premotor areas related to vocal sound production (Koelsch, Fritz, v. Cramon, Muller, & Friederici, 2006) as well as larger-scale motor circuits (Alluri et al., 2012) in the absence of overt singing or movement. Furthermore, studies that have investigated music-induced emotions using facial electromyography have discovered that emotionally expressive music is able to evoke facial muscle activation that is consistent with the emotional expression of the music (Lundqvist, Carlsson, Hilmersson, & Juslin, 2009; Witvliet & Vrana, 1996). Although these findings are consistent with the theoretical predictions related to the role of the mirror neuron system and emotional contagion in music-induced emotions, they do not offer unequivocal evidence. It may be that the activation of motor areas during music listening is related to rhythm and beat perception (cf. Grahn & Brett, 2007) rather than mirroring responses, and that zygomatic (cheek) and corrugator (brow) muscle activations reflect liking and disliking responses rather than emotional contagion, for example. It is also unclear whether emotional contagion in musical contexts might involve actual motor simulation of emotionally expressive acts, or whether the process would be more accurately described as the mirroring of contextualized emotions (cf. Hess & Fischer, 2013). The fact that listening to emotionally expressive music

is able to evoke facial muscle activation that is congruent with the emotional expression of the music (e.g., Lundqvist et al., 2009; Witvliet & Vrana, 1996) is more consistent with the view that people enact mental representations of emotions (rather than mirroring specific facial muscle activations, for example).

In an experience-sampling study of 32 Swedish college students, Juslin and colleagues (2008) found that "emotional contagion" was the most frequently mentioned mechanism of music-induced emotions, occurring in 32% of the episodes. However, the wording that they used in their questionnaire ("the music's emotional expression [caused the feeling]"; Juslin et al., 2008, p. 683) implies that participants must have been consciously aware of their emotional state being a response to the emotional expression observed in the music; a process more consistent with empathy than emotional contagion. Indeed, distinguishing between emotional contagion and empathy has been a serious challenge for empirical investigations of music-induced emotions, and the fact that some researchers have used these terms in a rather inclusive (or even interchangeable) manner has not helped to clarify the potential roles of these two hypothesized mechanisms. However, a rare exception is provided by Egermann and McAdams (2013), who attempted to distinguish between the contributions of empathy and emotional contagion to music-induced emotions (valence and arousal, to be specific). They discovered that empathy felt for the musicians performing the music was associated with emotional responses that were congruent with the emotions expressed in the music. Interestingly, they also found an independent effect of emotional expression on felt emotions (i.e., an effect that was not associated with reported levels of empathy), which they interpreted as evidence of emotional contagion. Although there is a possibility that participants may have utilized music's emotionally expressive cues in their responses (especially in the absence of actual felt emotions), this likelihood is rendered small

by the fact that participants were very carefully instructed to differentiate between felt and perceived emotions.

One possible approach to gain insight into the potential role of empathy in music-induced emotions is to look at individual differences in empathy, as this might provide indirect evidence for the involvement of empathy in emotional responses to music. Individuals who have a tendency to experience empathy more readily across a range of situations (i.e., high dispositional empathy) tend to be more susceptible to emotional contagion, for example (e.g., Doherty, 1997). Neuroimaging studies have shown that individuals who score highly on dispositional empathy measures exhibit stronger mirroring responses to speech prosody and action sounds (Aziz-Zadeh, Sheng, & Gheytanchi, 2010; Gazzola et al., 2006). It might be expected that – if music indeed evoked emotional responses through empathy and emotional contagion – individuals with high dispositional empathy would be more susceptible to the emotional effects of music listening. Indeed, previous studies have found positive associations between dispositional empathy and self-reported responses to music, including the intensity of emotions evoked by sad and tender music (Vuoskoski & Eerola, 2011), music-induced sadness, wonder, and transcendence (Miu & Baltes, 2012), and the degree of motor and 'visceral' entrainment experienced while listening to classical music (Labbé & Grandjean, 2014). However, one cannot exclude the possibility that this association only exists on the level of self-report, reflecting participants' response styles rather than their actual reactions.

Vuoskoski and Eerola (2012) set out to clarify this issue by using more objective, indirect measures of experienced emotion, namely emotional judgment and memory biases. They discovered that dispositional empathy was positively associated with a judgment bias towards sadness after listening to unfamiliar sad music, but not after listening to neutral music, and not after sad autobiographical recall. In other words, empathy was associated with

the degree of experienced sadness only in the sad music condition. This suggests that dispositional empathy can indeed contribute to emotional responses evoked by unfamiliar sad music. In addition to facilitating emotion induction, dispositional empathy has also been associated with enhanced emotion recognition in the context of musical performance. Another study found that listeners with high dispositional empathy were more accurate at perceiving the expressive intentions of a string quartet, suggesting that listeners may also utilize their affective theory of mind abilities when evaluating musical performances (Wöllner, 2012).

To the best of our knowledge, only one study to date has explicitly manipulated the use of empathy in a musical context. Miu and Balteş (2012) investigated emotional responses to a recorded opera performance by giving two groups of participants differing instructions: one group was instructed to "imagine as vividly as possible how the performer feels about what is described in the music, and try to feel those emotions themselves", while the other group was instructed to "take an objective perspective toward what is described in the music, and try not to get caught up in how the performer might feel" (Miu & Baltes, 2012, p. 3). These high and low empathy instructions lead to differing psychophysiological responses, and differing ratings of experienced emotion. Specifically, the emotional responses in the high empathy condition were more in line with the emotional expression of the opera performances – a finding consistent with those of Egermann and McAdams (2013). The findings of Miu and Balteş provide the first evidence that adopting an empathic point of view can affect music-induced emotions even at the level of psychophysiology.

Finally, investigations that have collected free descriptions of listeners' thoughts and impressions during music listening have shown that listeners often construct narratives and experience vivid imagery when engaging in focused listening (Vuoskoski & Eerola, 2012; Vuoskoski & Eerola, 2013), but it is still unclear whether these processes could be

characterized as forms of empathy, or whether music-induced imagery and empathy are two distinct phenomena. Nevertheless, one study (Vuoskoski & Eerola, 2013) attempted to manipulate music-induced visual and/or narrative imagery by giving two groups of participants differing information regarding the original context of a melancholic-sounding piece of film music. One group received a short, empathy-inducing description of a concentration camp scene, while the other group received a neutral description of a nature documentary. Both descriptions evoked vivid visual and/or narrative imagery (related to their contents) during the music listening, and the empathy-inducing description lead to stronger experienced sadness after the music listening (measured indirectly using a word recall task). These findings are consistent with the view that cues from both sound and context get merged into one, coherent narrative structure in the listener's imagination (cf. Lavy, 2001). Furthermore, the emotions that the listeners experienced were congruent with those cues, as would be expected if empathic processes were involved.

In summary, the empirical studies that have investigated the role of empathy in music-induced emotions have revealed that individuals with high dispositional empathy tend to be more susceptible to the emotional effects of music listening, and that empathy manipulations can intensify the emotional responses evoked by music. Furthermore, when listeners report experiencing empathy, their felt emotions are congruent with the emotional expression of the music. However, the evidence regarding the specific underlying mechanisms and their relative contributions – were it emotional contagion or actual empathy – is far from definitive, as it possible or even likely that multiple different emotion induction mechanisms are at play simultaneously in a given episode of music-induced emotions (e.g., Juslin & Vastfjall, 2008).

Conclusions and implications

Stimulated by process theories, which have identified psychological mechanisms underlying emotional responses to music (e.g., Juslin & Vastfjall, 2008; Molnar-Szakacs & Overy, 2006; Scherer & Zentner, 2001), a growing number of studies have recently focused on empathy and emotional contagion. The main aim of this chapter has been to put theories and empirical evidence related to music in the context of mainstream research on empathy and emotional contagion, and to derive implications for future research on music.

Drawing from current efforts to reduce conceptual confusion in psychological research on empathy and emotional contagion (e.g., de Vignemont & Singer, 2006; Eisenberg, 2000; Hoffman, 2000), this chapter has argued for the need to consistently define these constructs in the music literature. Based on recent work from social neuroscience, empathy and emotional contagion are defined as the processes by which one may consciously or automatically come to share the feelings of another (de Vignemont & Singer, 2006; Singer & Klimecki, 2014). In this framework, theory of mind is distinct from, but crucially supports empathy. Mechanisms such as automatic motor mimicry (Hatfield et al., 1994) or premotor neural mirroring of emotional expressions (Iacoboni, 2009) are thought to underlie emotional contagion. Understanding that empathy and emotional contagion rely on different mechanisms should limit the use of these concepts as interchangeable in the music literature.

Theories of music-induced emotions have mainly focused on either emotional contagion (Juslin & Vastfjall, 2008; Molnar-Szakacs & Overy, 2006), or empathy (Scherer & Zentner, 2001). The former theories are related to a line of research which argues that music induces emotions based on its similarity with vocal and motor expression of emotion, through automatic mechanisms such as premotor neural mirroring (Juslin & Laukka, 2003). The theories that emphasize the role of empathy in music-induced emotions are based on a different perspective arguing that music listeners seek to understand and share the emotions that the composer or performer strives to express through music (Scherer & Zentner, 2001),

or according to another line of argument, empathize with fictional characters evoked by music (Levinson, 2006). It is important to note that while their emphasis is on empathy, Scherer and Zentner (2001) also consider the involvement of contagion. These different perspectives are not mutually exclusive and they allow for an integrative theoretical account of both contagion and empathy. Based on current empirical evidence, theories cannot discard the involvement of either contagion or empathy in emotional responses to music.

By comparing evidence on contagion and empathy in relation to music-induced emotions, it seems that there is less evidence on the former mechanism. This is not surprising considering that automatic processes are not accessible through self-report and can only be assessed through objective measures of automatic motor mimicry (e.g., behavioral observation, electromyography) and neural measures of mirror neuron system activity during music listening. However, the role of contagion remains theoretically appealing for several reasons. Not only that emotional responses to music have short latency and are non-effortful, but they emerge early in development (Trehub & Nakata, 2002) and precede the appearance of the self-other distinction (Roth-Hanania, Davidov, & Zahn-Waxler, 2011). Contagion does not involve the self-other distinction and is viewed as a developmental precursor of empathy (Batson, 2009), so it may support emotional processing of music in infants and perhaps continue to play this role in adults, in interaction with complementary mechanisms such as empathy.

The mechanisms underlying emotional contagion are not clear considering that automatic facial mimicry is more limited than once thought (Hess & Fischer, 2013); and there is only correlational evidence on the involvement of premotor neural mirroring in the ability to share others' emotions, particularly in the form of self-reported dispositional empathy rather than active contagion (Carr et al., 2003; Pfeifer et al., 2008). As far as the first mechanism in concerned, an interesting possibility is that music listening may enhance

automatic motor mimicry by offering an affiliative context, in which one seeks to share the state of mind that another person expresses through music. Future studies may investigate this hypothesis, as well as provide new evidence linking premotor neural mirroring to music-induced emotions in the absence of empathy. The major challenge of future studies is to disentangle the effects of contagion and empathy. One approach is to focus on affect sharing in early development, before the emergence of empathy. Another ingenious approach illustrated in music research (Egermann & McAdams, 2013) is to use self-report to support the absence of empathy efforts and attribute "by exclusion" whatever emotions are caught from music to contagion. Furthermore, observing affect coupling under cognitive load, which leaves little resources for empathy, offers another approach to studying contagion. Such approaches to controlling for the effects of empathy could also be used in cognitive neuroscience studies focused on the mirror neuron system and music-induced emotions.

Evidence for the involvement of empathy is currently more compelling and this may be explained by the accessibility of self-report measures focused on dispositional aspects of empathy and the active use of empathy during music listening. Current studies support the view that music is appraised as social stimulus, based on the understanding that it has been created by other people in order to express a state of mind or a situation. Moreover, music listening occurs in social contexts, with other people present with whom one may want to share an emotional bond. Future studies may compare these forms of empathy by distinguishing conditions when the target is absent (e.g., the composer, a fictional character) or present (e.g., performer, other music listeners). The former type of empathy underscores the interplay between empathy and other psychological mechanisms, including semantic memory for information about the composer or the music, and visual imagery and autobiographical memory as mechanisms by which music may evoke fictional characters or people from one's past. The latter type of empathy draws attention to potential differences

between listening music in the form of audio recordings and watching the performer live or on video. It also suggests that empathy might mediate the social facilitation of music-induced emotions under conditions where one listens to music with others (Baltes & Miu, 2014). As a general perspective on current studies on empathy and music, most of the evidence is correlational and refers to dispositional facets of empathy. The causal link between empathy and music-induced emotions (Miu & Baltes, 2012) should be further supported in the future, especially considering that multiple approaches to empathy manipulations are available in the psychological literature.

In conclusion, both contagion and empathy may be involved in the generation of emotional responses to music. Until their effects are disentangled, both processes should be considered in theories on music-induced emotions. In order to support the mediator roles of contagion and empathy, music research should gradually move from correlational to experimental studies in which these psychological mechanisms are manipulated. Future work on music-induced emotions should be synchronized with advances in the general field of contagion and empathy in order to avoid conceptual confusion and draw methodological inspiration. In turn, this work might contribute to uncovering new and fundamental aspects of contagion and empathy considering that music is a socially rich form of emotional expression.

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