

## Music Enhances Empathic Engagement with Characters in Films

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### ABSTRACT

An experiment was conducted to examine music's influence on empathy with characters in cinematic narratives. Participants viewed a series of film clips taken from unfamiliar Hollywood films that showed characters in distressing situations. A first phase of the experiment involved identifying a set of film clips for which participants failed to empathize with those distressed characters. The second phase compared these clips against a set in which emotionally congruent background music was added to each clip. The results showed that the addition of background music to the clips increased participants' empathy for the characters, compared to the original clips without music. These results provide evidence that music can influence not just viewers' emotions per se, but their empathic engagement with unfamiliar fictional characters in films.

### KEYWORDS

Character; emotion; empathy; film; music

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## INTRODUCTION

The dramatic arts would scarcely exist in human societies were it not for the fact that people feel a strong sense of empathy for characters, despite the fact that the presented scenarios are completely fictitious and that the characters are portrayed by professional actors. Through this empathic process, viewers of theatre and cinema come to experience the emotions of the portrayed characters – most typically the protagonist – in a vicarious manner. Aristotle, in *Poetics* (335 BCE/1996), argued that a major function of this empathic engagement with characters in theatre viewing is the experience of catharsis, especially when watching tragedies. For him, the social function of catharsis was to support emotion regulation in audience members. He proposed that tragedy promotes “through pity and fear the purification of such emotions” (Aristotle, 335 BCE/1996, p. 10). In fact, the word catharsis in ancient Greek implies actions related to purifying and purging (Hall, 2017).

Empathy is the automatic and contagious process of sharing in the (presumed) emotions of another person (de Waal, 2008; Hatfield et al., 2009). It is the process of vicariously experiencing the emotions of another person, resulting in a shared affective experience (Paulus et al., 2013). The psychology literature makes a distinction between, on the one hand, merely having a cognitive *awareness* of the emotions of another person without feeling their emotions (i.e., cognitive empathy, cold empathy) and, on the other, the contagious process of actually *feeling* the emotions imputed to another person (i.e., affective empathy, hot empathy) (Davis et al., 1987; Shamay-Tsoory, 2011). The current study focuses exclusively on the latter phenomenon of feeling another person’s emotions. Empathy has been described as a process of interpersonal mirroring or mimicry (van der Schyff and Krueger, in press), and is thought to capitalize on the overt behavioral cues presented by another person, such as their posture, gestures, facial expressions, and tone of voice (Hatfield et al., 2009). Through mechanisms of perception-to-motor coupling, the perception of another person’s emotional expressions is able to automatically trigger parallel emotional responses in viewers.

However, this mechanism is modulated by many factors, not least the relationship that one has with the other person. We typically only empathize with people who we like, feel close to, and thus sympathize with (de Waal, 2008; Ickes, 1993). Seeing someone we despise in a state of distress generally leads to *schadenfreude*, rather than empathy (Smith et al. 2009). Therefore, the literary and dramatic arts are crafted in such a manner that protagonists often bear a strong psychological resemblance to the self, and therefore serve as self-proxies (Storm, 2016). As a result, we can relate to protagonists as we do ourselves, leading us to sympathize and empathize with them, as occurs routinely when viewers watch fictional films (Coplan, 2006; Davis et al., 1987). If characters weren’t similar to us, then the narrative arts would not be able to serve their primary cultural function as tools for behavioral modeling and social learning (Mar, 2018; Mar & Oatley, 2008). As Storm (2016) pointed out: “It is not only that authors invent characters in order to tell a story, but that the figures they create become vehicles for our own experience as observers or as readers. Characters in drama and in fiction are made to look and be like us (a basic feature of the “real person” concern) and as such they represent us and, in effect, stand in for us....Characters can, in short, be our experiential surrogates, just like we want them to be.” (p. 95). This similarity between protagonists and ourselves strongly fosters our ability – and even need, according to Aristotle – to empathize with characters in drama, film, and fiction.

A ubiquitous device that is used to shape emotional experiences during film viewing is background music, whose presence dates back to the very origin of cinema (Wierzbicki, 2009). The vast majority of the music that is played in films is “non-diegetic”, meaning that the music does not exist within the storyworld of the characters, but is instead external to it (Cohen, 2010; Gorbman, 1987; Penner, 2017; Tan et al., 2017). As a result, the characters do not hear the music. The actors do not hear it either, and so the music does not function to make actors more expressive in their performances. The music, instead, is directed towards the film viewers, although diegetic musical forms – such as Sam singing *As Time Goes By* in *Casablanca* – are indeed directed towards characters within their narrative world. Compared to music-based narrative forms like opera, where the music is tightly coupled to each word uttered by the characters, underscore in film involves a far looser coupling to the narrative, modifying instead the overall emotional tone or kinetic properties of a scene and its characters. According to Chion (1994:8), music takes on a scene’s “rhythm, tone, and phrasing”. Exceptions to this loose coupling include the Mickey Mousing technique of tightly associating music to movement in children’s cartoons, where there are far more synchronization points between the music and the action than are typically found in feature films (Jones, 1946; Stevens, 2009).

A guiding principle for the creation of cinematic underscore is that the music should be *congruent* with the emotions of the scene’s narrative, with regard to both valence and intensity (Stevens, 2009). Cohen’s congruence-association model (2010, 2013, 2015) is the standard cognitive account of the cross-modal relationship between visual and acoustic elements in film. This model covers the full-spectrum of processes from low-level multisensory binding (potentially across six channels of information processing, Cohen, 2013) to higher levels of emotional congruence between music and the working narrative. Regarding the latter, a scene of sadness for the protagonist should ideally be accompanied by music that, on its own, sounds sad to listeners. This allows the music to amplify the emotions of the scene beyond what would be possible without the music. There is much empirical evidence that music does just that, and that the so-called commutation technique of pairing different musical samples to a single film scene (Tagg, 2006) can strongly change the perceived emotional tone and narrative meaning of the scene for viewers (Boltz, 2001, 2004; Bullerjahn and Gldenring, 1994; Cohen 1993; Thompson et al., 1994). At the other extreme, playing music of the opposite emotional tone to the scene (e.g., playing happy music during a scene of sadness) can create an impression of irony or parody (Ireland, 2017), as seen in Carol Reed’s film *The Third Man*. These two formats can be skilfully combined: a horror film taking place in an amusement park can combine fearful non-diegetic underscore with happy diegetic music coming from the merry-go-round.

While there is an abundant literature about music and emotion in cinema (e.g., Boltz, 2001, 2004; Chion, 1994; Cohen, 2010; Tan et al., 2007), relatively few studies have looked at the relationship between music and empathy in this domain. In fact, the topic of music and empathy is typically described outside of the context of narrative and cinema (see King and Waddington, 2017). Most studies are oriented toward either interpersonal interactions or the musical object itself. For example, performing music together with other people can enhance empathy for one’s co-performers (Rabinowitch et al., 2012, 2015). Likewise, some theorists have argued that people’s emotional attunement to music while listening to it is a type of empathic engagement not just with the performers of the music (Wllner, 2017), but with the music itself (Molnar-Szakacs, 2017), in other words with the

“persona” of the music (Levinson, 2011). Chion (1994) classified musical underscore that is congruent with the narrative of a scene as being “empathetic music”.

We are aware of few, if any, experimental studies that have looked at music’s ability to influence empathy with fictional characters in film narratives, despite the fact that film viewing without music can clearly engender empathy for characters (Davis et al., 1987). The closest example is the study of Hoeckner et al. (2011), which did not look at empathy itself, but instead analyzed music’s ability to modulate the “likability” of film characters, where likeability was considered by the authors as an “antecedent” to an empathic response. In that study, participants saw short film clips, each of which ended with an emotionally neutral reaction-shot of a character. The clips were shown with either melodramatic or thriller background music, or with no music. After each clip, participants had to provide a rating for the question “How unlikeable or likeable is this character?”. Melodramatic background music increased character likability compared to no music, whereas thriller music decreased it. Hence, the two musical styles manipulated viewers’ affinity for the characters in opposing directions.

The aim of the present study was to gauge what effect musical underscore has on people’s empathic engagement with fictional characters in cinematic narratives. To the best of our knowledge, it is the first study to do so. While it would have been possible for us to give participants an empathy questionnaire and directly ask them “How much do you care about the character?” after each film clip, we took a different and less loaded approach. While watching a set of film clips, two different groups of participants provided ratings on either 1) the emotions of the *protagonist* in the film clip, or 2) *their own* felt emotions while viewing the clip (i.e., self-ratings). If the emotional difference between character and self is high, this indicates that viewers fail to empathize with the character’s perceived emotional state. If the difference is low, it suggests that viewers are indeed empathizing with the character. In other words, viewers’ empathy is measured here by gauging the extent to which they vicariously experience the emotions of the character in the scene. Hence, our approach offers an unbiased method of estimating viewers’ empathy with characters that does not rely on participants making an empathy assessment for characters. In order to address the question of interest, we applied this method to a set of unfamiliar Hollywood film clips with no underscore in their original form and then created a second set of the same clips by adding emotionally-congruent underscore specific to each clip. The major psychological issue that we wanted to address was whether adding musical underscore to the film clips would increase viewers’ empathy with the characters, compared to the original version of the clips that lacked music. Based on literature showing that music can increase empathy outside of the audio-visual media, for example during interpersonal interactions (e.g., Rabinowitch et al., 2012, 2015), we predicted the music would do so with fictional characters as well.

## METHODS

### PARTICIPANTS

A total of 71 participants (mean age 19.0, age range 17-42, 44 females and 27 males) took part in the study in exchange for partial course credit in an introductory psychology class. The study occurred in two phases, with 33 participants taking part in the first phase, and 38 in the second phase. The study was approved by the

McMaster University Research Ethics Board. All participants gave their informed consent prior to participation in the study. They also completed questionnaires regarding their language proficiency and their music-listening and film-viewing habits and preferences.

## STIMULI

Stimuli consisted of thirty-second, single-scene film clips taken from mainstream Hollywood films that appeared from the late 1960's through the early 2000's, with the majority being from the 1970's and 1980's. All of them were in color. None of the clips contained either musical underscore or diegetic music. They were selected so as to be unfamiliar to the demographic of undergraduate participants taking part in the experiment. Clips were extracted from the full-length films using iMovie (Apple, Cupertino, CA). Every attempt was made to normalize the perceived sound-volume across the group of clips. The clips varied in terms of their settings, narrative content, and emotional intensity, the latter ranging from neutral scenes to highly intense scenes of violence. The number of characters in each clip varied, but most of the clips contained a dyadic interaction between two central characters. These characters varied in their age, gender, and ethnicity so as to present a wide diversity of characters. Due to the constraints of the short clip length (thirty seconds) and our aim to stimulate emotional responses in the viewers, some of the clips were chosen to maximize emotional intensity. In general, the most intense clips were of negative valence and displayed scenes of violence. Hence, the valence of almost all of the stimuli was either negative or neutral, with very few clips being positive. Many clips showed characters in distressing situations.

## PROCEDURE

The experiment was carried out in two phases. In both phases, participants were tested in groups in a large lecture hall, with stimuli presented via an LCD projector onto a large screen. In the first phase of the experiment, 33 participants viewed fifty-six film clips, each one lasting thirty seconds. All stimuli were presented via a laptop computer using Presentation (NeuroBehavioral Systems, Albany, CA). Each trial began with a still image of a "focus character" for four seconds. Participants were told to pay attention to the focus character when watching the clip. For emotional scenes that showed conflict, the focus character was, as a rule, the protagonist in the scene. Next, participants viewed a thirty-second film clip containing the focus character. After that, they had sixteen seconds to answer a series of four questions using a pen on a response sheet. 1) "Do you recognize the clip?", answered as either Yes or No. 2) "Was the clip positive or negative?", answered as either Positive, Neutral, or Negative. 3) "How intense was the clip?", answered on a Likert scale from 1 to 9, with 1 being least intense, 5 being neutral, and 9 being most intense. For the final question, half of the participants answered 4a) "How does the character feel?", answered on a Likert scale from -4 to +4, where -4 is most negative, 0 is neutral, and +4 is most positive. The other half answered 4b) "How do you feel?", answered using the same Likert scale as question 4a.

Based on a comparison between participants' responses to questions 4a and 4b, we generated a *difference score* (i.e., character – self) for each clip in the first phase of the study. A clip with a low difference score was one in which participants' self-ratings from question 4b matched, on average, the character ratings from question 4a, as based on our between-subject approach. For emotional clips, this represented a situation in which participants empathized with the character. By contrast, a clip with a high difference score was generally one in which the character ratings were very negative, while participants' self-ratings were in the vicinity of neutral. This

represented a situation in which participants failed to empathize with a highly distressed character. We call these stimuli “mismatch” clips because of the mismatch between the emotions of the character and those of the viewer. Other clips were neutral in that both the character and the self lacked a strong emotional response. Our interest in the current experiment was to focus on the “mismatch” clips in which character ratings were highly negative, but in which self-ratings were neutral. This mismatch provided a baseline against which we could examine the potential ability of music to “close the emotional gap” between character and self.

Based on the results of this first phase of the experiment, we selected the sixteen clips with the highest difference scores (i.e., those in which participants empathized the least with distressed protagonists) and added emotionally-congruent background music to them in order to see if music could reduce the difference between character and self, and hence increase participants’ empathic engagement with characters in the clips. The source films for the sixteen mismatch clips are listed in the Appendix. The musical segments were taken from a large number of pre-recorded, freely-available movie soundtracks from the internet, where the sources were typically anonymous. The music was added to the clips and the sound was edited using iMovie (Apple, 2011). Musical excerpts were selected on the basis of their emotional valence, intensity, and style. An excerpt was selected to reflect the general tone of the scene and the emotional state of the central character(s) in the clip. Most excerpts employed the standard orchestral style of Hollywood film music. In other words, they had harmonically-complex structural features along with dense orchestral textures typical of the underscore of Hollywood films. Although the process of adding music to clips was a subjective one, overall subjectivity was reduced by preparing no fewer than two musical excerpts for each clip and then deciding, from this subset, which of these candidates was most appropriate for the particular scene. This selection was done in a joint fashion by the first and second authors – both of whom are lifetime musicians – as based on a mutual agreement regarding the congruence of the music to the scene. Every attempt was made to optimize the emotional congruence of the music to the film across the thirty seconds of the clip.

In the second phase of the experiment, a new group of 38 participants performed the same procedure as the first group, but with sixteen of the original fifty-six clips now containing congruent background music. As before, half of the participants answered question 4a and half answered question 4b, and the difference scores for the music-containing clips were measured. Note that participants in the first phase only saw the mismatch clips in their original form, and that participants in the second phase only saw them in their modified musical form. Because of this between-subject approach, no participant saw the mismatch clips in both their original and musical forms.

## **ANALYSIS**

For each of the sixteen mismatch clips, a mean difference score was calculated for both the no-music and music-containing versions of the clips. Linear mixed models were generated to test the hypothesis that participants’ ratings were predicted by two between-subject factors: musical underscore (absence vs. presence) and target of the emotion ratings (character vs. self), or by an interaction between these two factors. Film clip was included as a random intercept in order to model clip-to-clip variation. Models were created using the lme4 package (Bates, Bolker, and Walker, 2015) in R (v. 3.4.1, <https://www.R-project.org>). Statistical significance was

determined by means of a permutation test with 1000 iterations in order to compute exact p-values.

### RESULTS

Figure 1 shows the mean emotion ratings (including 95% confidence intervals) for 1) the focus character and 2) the participant (i.e., self-rating) for the sixteen mismatch clips in their original form without music (top row) and the same set of clips with congruent background music added to them (bottom row). Only the negative half of the nine-point Likert scale is shown (i.e., the values of +1 to +4 are not shown), since the mismatch clips were all negative in emotional tone. The mean difference score between character and self for the clips without music was 2.06 (SD = 0.34). Adding background music to the clips resulted in a significant reduction in the difference score ( $F = 625.3, p < 0.05$ ) to a mean value of 1.52 (SD = 0.44). The emotion ratings were overall more negative in the presence of music than in its absence ( $F = 7.7, p < 0.05$ ).

The critical question for the study is how this reduction in emotional difference between character and self came about with the addition of music to the mismatch clips. As can be seen in the figure, there was no change in the character score with the addition of music ( $F = 0.86, p = 0.22$ ). However, *there was a significant change in self-related emotions in the direction of the characters' emotions* ( $F = 19.9, p < 0.05$ ), resulting as well in a significant interaction between music and emotion ratings ( $F = 13.8, p < 0.05$ ). In other words, viewers rated their own emotions as being more similar to the ratings of the characters' emotions when background music was present, compared to when it was absent. This indicates that music increased participants' empathy for the unfamiliar fictional characters in the film clips.



**Figure 1. Emotion ratings for Character and Self while viewing film clips:** the x-axis shows the emotion ratings for either the film character or the self while viewing sixteen “mismatch” film clips. The true rating scale runs from -4 to +4, but

only the region of -3.5 to 0 is shown, since the film clips were all of negative valence, hence leading to negative emotion ratings. The top line shows the results for the mismatch clips in their original form without music, while the bottom line shows the results when congruent underscore was added to each of the clips. Each value is the mean rating. The horizontal lines represent 95% confidence intervals.

## DISCUSSION

There is a large literature devoted to the topic of music and emotion, both inside and outside of a cinema context. However, few, if any, studies have addressed the issue of music's effect on empathic engagement with fictional characters during film viewing. We demonstrated here that the addition of congruent background music to clips of Hollywood films that had no underscore in their original version increased people's empathy for the main protagonist of the scene, compared to the original version of the clip with no music. Importantly, we showed that music's effect on enhancing empathy resulted from a change in *self* ratings, and not from a change in character ratings. While music has a multitude of functions and effects in cinema viewing (Cohen, 1999, 2010; Gorbman, 1987), its capacity to modulate empathic engagement with characters is an important function that has been highly understudied in the cognitive psychology literature, not least in the literature on music and empathy (King and Waddington, 2017).

A methodological novelty of the study is the manner in which we measured empathy. While we could have used a direct measurement – asking people to rate how much they cared about the character in each clip – this might have introduced a bias by making the participants focus their attention on empathy-related processes. We eliminated this bias by having distinct groups of participants make the emotion ratings for the character and for the self, thereby precluding any cognitive processing related to empathy. In other words, we measured empathy in a between-subject, rather than a within-subject, manner. This is different from previous approaches that have used the “imagine him” method of relating to a film protagonist (e.g., Davis et al. 1987), in which participants are explicitly instructed to take on the perspective of the character.

The study that most closely matches ours is that of Hoeckner et al. (2011). Their study showed that melodramatic music increased the likeability of characters in film clips, whereas thriller music had the opposite effect. The major goal of their study was to test two contrastive musical styles with a single set of clips, rather than to attempt to achieve a congruence between the music and the narrative, since the authors did not provide information about the genre properties of the film clips. In our case, we selected a different musical sample for each clip so as to optimize the emotional congruence with the narrative of each of the sixteen mismatch clips. In doing so, we were able to obtain a result whereby the music enhanced viewers' empathic engagement with the characters in the clips. Future work could compare incongruent with congruent musical samples in order to see if incongruent samples either function the same way as no-music stimuli or if they even increase the distance between character and self (see Limitations section below).

One of the central issues in the study of empathy and the arts is how the arts can be used to enhance people's social-cognition skills through a stimulation of their abilities for mentalizing and empathy. For example, Kidd and Castano (2013) provided evidence that reading literary fiction enhanced theory-of-mind functioning compared to reading non-fiction, popular fiction, or not reading

anything. This was done as a short-term reading task, but Mar (2018) suggested that long-term engagement with literature can enhance social cognition over a long time scale. He proposed a “social processes and content entrained by narrative” framework that argues that exposure to stories enhances social cognition both by stimulating processes of mental inferencing with characters (including empathic engagement) and by enhancing knowledge of the social world, for example about social norms or the personality traits of characters. Shapiro and Rucker (2004) argued that watching films can enhance empathy and altruism among medical students and residents. This is especially so for films that show people suffering, where the interactions among characters in the film can permit demonstrations of empathy, compassion, kindness, and caring. Outside of the realm of stories and cinema, playing music together with others has been proposed to increase empathy among co-performers (Molnar-Szakacs, 2017; Rabinowitch et al., 2012, 2015; Wöllner, 2017). The same is suggested to occur by simply listening to music and attuning to the emotions of the music, which can increase emotional awareness, and thereby carry over to one’s interactions with people. Rabinowitch et al. (2012) discussed music’s potential role in “empathy education”, which they defined as “working with children on social and emotional communication for gaining confidence in their ability to experience another person’s emotional state and produce a relevant and supportive emotional response” (p. 494).

But what about empathy for fictional characters? As was mentioned in the Introduction, Aristotle (335 BCE/1996) proposed that empathizing with fictional characters serves a function related to emotion regulation by allowing viewers to purge negative emotions through catharsis. There is no question that people actively seek out distressing dramas and sad pieces of music because it allows them to experience a cathartic release of negative emotions. In addition, the cognitive narratology of the last few decades has made it clear that it is the character that is the principal vehicle for the vicarious experience of emotions in theatre and literature (Caracciolo, 2012/2014; Fludernik, 1996; Herman 2013, Hogan, 2011; Palmer, 2002; Ryan, 1980; Zunshine, 2006), and that stories are first and foremost about the experientiality of characters in storyworlds. Hence, devices like background music that can enhance viewers’ emotional engagement with characters can increase the cathartic power of the narrative.

## LIMITATIONS

The study had a number of limitations. Since the experiment was predicated on the use of “mismatch” clips in which characters were very emotional but where participants did not share in these emotions, the clips in the final stimulus set were exclusively negative in emotional valence. In looking through a large number of classic Hollywood films from the period that we used in this study, we found it difficult to identify comedic clips having the dyadic arrangement of characters that we were striving for in our film clips. We can imagine a positive-valence counterpart to the present study in which the mismatch is that between very happy characters and emotionally neutral viewers, and in which the addition of happy-sounding background music changes people’s self-ratings from neutral to more-positive ratings. However, it is important to point out that many comedic films – and much comedy in general – show people in distressing situations, rather than joyous ones. The humor of such situations comes about from observing how people respond to uncomfortable (but typically benign) situations (McGraw et al., 2012), such as slipping on a banana peel. Thus, many comedic scenes do not show

characters in a happy state, but often times the opposite. Therefore, we can imagine a different type of follow-up to the current study involving the use of comedic scenes in which protagonists are *distressed* – but where viewers are neutral to this distress – and then seeing if happy-sounding background music can alter viewers' felt emotions away from neutral in the positive direction. This would be more akin to a schadenfreude effect than an empathy effect, but it would demonstrate that music can shift viewers' emotions away from the neutral baseline of a no-music version. We suspect that such a study is closer to the true nature of comedy than a study of happy characters.

Next, compared to even the briefest short films, our stimulus clips were short – only thirty seconds in duration – and were shown without any narrative context, except for directing viewers' attention to a “focus character”, who was generally the film's protagonist. It would be interesting to do a follow-up study that looked at longer clips than the ones we used. That being said, the character ratings for our clips were close to -3 out of a maximal negative rating of -4 on the Likert scale. So, even a brief exposure to these scenarios led people to identify the protagonist as being in a state of high negative emotion. Television commercials are predicated on shaping viewers' emotional responses to a commercial product or social/political message in the shortest amount of time, and take full advantage of subliminal stimulus presentation (Bullerjahn, 2006). In psychology experiments, brief exposure to even static items, such as photographs of faces, can elicit strong emotions in viewers (Phelps et al., 2000).

We only looked at congruent underscore in this study. It would be interesting to look at a comparison between incongruent and congruent background music (Ireland, 2017), something that has been well explored in the case of the music used in commercial advertising (Bullerjahn 2006; Shevy and Hung, 2013). The expectation would be that incongruent underscore should be much less efficient at eliciting empathic engagement with film characters than congruent underscore, since empathy is, at root, about creating a match to the emotions of another person. To the extent that incongruent music might detract from this, it should reduce the tendency to empathize with film characters. Along similar lines, we did not carry out a control experiment to examine the emotional properties of the music alone separate from the music's presence in the film clips in the second experiment. Such a control experiment should be done in future studies.

Because each experiment was done in large groups in a single setting, we were not able to vary the clip order between viewers. While each experiment had a different randomized clip order, that order was the same for all of the participants in a given experiment, hence creating the potential for unforeseen order effects, although we suspect that this potential was quite small.

Finally, the study was limited by an exclusive focus on the films and musical styles of a single culture, as well as its use of a culturally homogeneous North American cohort of participants. This impacts many aspects of the study. Cultures differ in their use of musical scales and in the conventionalized emotional interpretations of those scales. For example, India, which has the largest film industry in the world, has a much greater diversity of scale types (*raga*'s) than Western culture, and each scale has a well-defined emotional connotation (Massey & Massey, 1993). Therefore, even within the single musical context of cinematic underscore, the music can have different structural features and different emotional meanings to people in different cultures. Thus far, cognitive work on film music has given

virtually no attention to cross-cultural issues, not least to people's experiences of emotion in response to musical underscore.

## CONCLUSIONS

We have shown that the addition of congruent background music to clips from classic Hollywood films showing distressed protagonists – but in which viewers had neutral emotional responses to such scenes of distress when there was no music – led to an increase in viewers' empathic engagement with the characters. This effect of music came about not through a change in how viewers perceived the emotions of the characters, but rather by a change in viewers' own felt emotions during film viewing, a change that moved them in the direction of the characters' distress. This result looks beyond studies showing that music can enhance empathy with co-performers during social interactions by demonstrating that it can also do so with unfamiliar fictional characters in cinematic narratives. Such an effect of film narratives can be harnessed for interactions in real life, such as in the education of healthcare professionals or in sensitivity training courses that aim to reduce discrimination in the workplace.

## APPENDIX

The following is a listing of the films that served as the sources for the “mismatch” clips in the present study. Note that two separate clips were taken from *Kramer vs. Kramer* (#12 on this list). Hence, sixteen clips were derived from fifteen films.

1. Hooper, T. (Director), (1974), *The Texas Chainsaw Massacre*. United States: Bryanston Distributing Company.
2. Neame, R. (Director), (1972), *The Poseidon Adventure*. United States: 20<sup>th</sup> Century Fox.
3. Schlesinger, J. (Director), (1969), *Midnight Cowboy*. United States: United Artists.
4. Nichols, M. (Director), (1967), *The Graduate*. United States: Embassy Pictures/United Artists.
5. Kramer, S. (Director), (1967), *Guess Who's Coming to Dinner*. United States: Columbia Pictures.
6. Penn, A. (Director), (1967), *Bonnie and Clyde*. United States: Warner Bros.
7. Lumet, S. (Director), (1973), *Serpico*. United States: Paramount Pictures.
8. Scott, R. (Director), (1979), *Alien*. United States: 20<sup>th</sup> Century Fox.
9. Redford, R. (Director), (1980), *Ordinary People*. United States: Paramount Pictures.
10. Polanski, R. (Director), (1974), *Chinatown*. United States: Paramount Pictures.
11. McNaughton, J. (Director), (1986), *Henry: Portrait of a Serial Killer*. United States: Greycat Films.
12. Benton, R. (Director), (1979), *Kramer vs. Kramer*. United States: Columbia Pictures.
13. Boorman, J. (Director), (1972), *Deliverance*. United States: Warner Bros.
14. Schaffner, F. (Director), (1970), *Patton*. United States: 20<sup>th</sup> Century Fox.
15. Kubrick, S. (Director), (1971), *A Clockwork Orange*. United States: Warner Bros.

## REFERENCES

- Aristotle (335 BCE/1996). *Poetics*. London: Penguin Books.
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed Effects Models Using lme4. *Journal of Statistical Software*, 67, 1–48.
- Boltz, M. G. (2001). Musical Soundtracks as a Schematic Influence on the Cognitive Processing of Filmed Events. *Music Perception*, 18(4), 427–454.
- Boltz, M. G. (2004). The Cognitive Processing of Film and Musical Soundtracks. *Memory & Cognition*, 32(7), 1194–1205.
- Bullerjahn, C. (2006). The Effectiveness of Music in Television Commercials: A Comparison of Theoretical Approaches. In S. Brown and U. Volgsten (eds.), *Music and Manipulation: On the Social Uses and Social Control of Music*. New York: Berghahn Books, pp. 207–235.
- Bullerjahn, C., & Güldenring, M. (1994). An Empirical Investigation of Effects of Film Music Using Qualitative Content Analysis. *Psychomusicology*, 13, 99–118.
- Caracciolo, M. (2012). Fictional Consciousnesses: A Reader's Manual. *Style*, 46(1), 42–65.
- Caracciolo, M. (2014). Tell-tale Rhythms: Embodiment and Narrative Discourse. *Storyworlds*, 6(2), 49–73.
- Chion, M. (1994). *Audio-Vision: Sound on Screen*. New York: Columbia University Press.
- Cohen, A. J. (1993). Associationism and Musical Soundtrack Phenomena. *Contemporary Music Review*, 9(1-2), 163–178.
- Cohen, A. J. (1999). Functions of Music in Multimedia: A Cognitive Approach. In S. W. Yi (ed.), *Music, Mind, and Science*. Seoul, Korea: Seoul National University Press, pp. 40–68.
- Cohen, A. J. (2010). Music as a Source of Emotion in Film. In P. N. Juslin and J. A. Sloboda (eds.), *Handbook of Music and Emotion*. Oxford: Oxford University Press, pp. 879–908.
- Cohen, A. J. (2013). Film Music. In S. D. Lipscomb, and R. A. Kendal (eds.). *The Psychology of Music in Multimedia*. Oxford: Oxford University Press, pp. 17–47.
- Cohen, A. J. (2015). Congruence-association Model and Experiments in Film Music: Toward Interdisciplinary Collaboration. *Music and the Moving Image*, 8, 5–24.
- Coplan, A. (2006). Catching Characters' Emotions: Emotional Contagion Responses to Narrative Fiction Film. *Film Studies*, 8, 26–38.
- Davis, M. H., Hull, J. G., Young, R. D., & Warren, G. G. (1987). Emotional Reactions to Dramatic Film Stimuli: The Influence of Cognitive and Emotional Empathy. *Journal of Personality and Social Psychology*, 52(1), 126–133.
- de Waal, F. B. M. (2008). Putting the Altruism Back in Altruism: The Evolution of Empathy. *Annual Review of Psychology*, 59, 279–300.
- Fludernik, M. (1996). *Towards a "Natural" Narratology*. London: Routledge.
- Gorbman, C. (1987). *Unheard Melodies: Narrative Film Music*. Bloomington, IN: Indiana University Press.
- Hall, E. (2017). Aristotle's Theory of Katharsis in its Historical and Social Contexts. In E. Fischer-Lichte and B. Wihstutz (eds.), *Transformative Aesthetics*. New York: Routledge, pp. 26–47.
- Hatfield, E., Rapson, R. L., & Le, Y.-C. L. (2009). Emotional Contagion and Empathy. In J. Decety and W. Ikes (eds.), *The Social Neuroscience of Empathy*. Cambridge, MA: MIT Press, pp. 19–30.
- Herman, D. (2013). *Storytelling and the Sciences of Mind*. Cambridge, MA: MIT Press.
- Hoekner, B., Wyatt, E. W., Decety, J., & Nusbaum, H. (2011). Film Music Influences How Viewers Relate to Movie Characters. *Psychology of Aesthetics, Creativity, and the Arts*, 5(2), 146–153.
- Hogan, P. C. (2013). *How Authors' Minds Make Stories*. Cambridge, UK: Cambridge University Press.
- Ickes, W. (1993). Empathic Accuracy. *Journal of Personality*, 61(4), 587–610.
- Ireland, D. (2017). Great Expectations? The Changing Role of Audiovisual Incongruence in Contemporary Multimedia. *Music and the Moving Image*, 10(3), 21–35.
- Jones, C. (1946). Music and the Animated Cartoon. *Hollywood Quarterly* 1(4), 364–370.
- Kidd, D. C., & Castano, E. (2013). Reading Literary Fiction Improves Theory of Mind. *Science*, 342, 377–380.
- King, E., & Waddington, C. (eds.) (2017). *Music and Empathy*. London: Routledge.
- Levinson, J. (2011). *Music, Art, and Metaphysics: Essays in Philosophical Aesthetics*. Oxford: Oxford University Press.

- Mar, R. A. (2018). Evaluating Whether Stories Can Promote Social Cognition: Introducing the Social Processes and Content Entrained by Narrative (SPaCEN) Framework. *Discourse Processes*, 55(5-6), 454–479.
- Mar, R. A., & Oatley, K. (2008). The Function of Fiction is the Abstraction and Simulation of Social Experience. *Perspectives on Psychological Science*, 3, 173–192.
- Massey, R., & Massey, J. (1993). *The Music of India*. London: Kahn & Averill.
- McGraw, A. P., Warren, C., Williams, L. E., & Leonard, B. (2012). Too Close for Comfort, or too Far to Care? Finding Humor in Distant Tragedies and Close Mishaps. *Psychological Science* 23(10), 1215–1223.
- Molnar-Szakacs, I. (2017). Music: The Language of Empathy. In E. King, and C. Waddington (eds.), *Music and Empathy*. London: Routledge, pp. 97–123.
- Palmer, A. (2002). The Construction of Fictional Minds. *Narrative*, 10, 28–46.
- Paulus, F. M., Müller-Pinzler, L., Westermann, S., & Krach, S. (2013). On the Distinction of Empathic and Vicarious Emotions. *Frontiers in Human Neuroscience*, 7, 196.
- Penner, N. (2017). Rethinking the Diegetic/Nondiegetic Distinction in the Film Musical. *Music and the Moving Image*, 10(3), 3–20.
- Phelps, E. A., O'Connor, K. J., Cunningham, W. A., Funayama, E. S., Gatenby, J. C., Gore, J. C., & Banaji, M. R. (2000). Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activation. *Journal of Cognitive Neuroscience*, 12(5), 729–738.
- Rabinowich, T.-C., Cross, I., & Burnard, P. (2012). Long-term Musical Group Interaction has a Positive Influence on Empathy in Children. *Psychology of Music*, 41(4), 484–498.
- Rabinowich, T.-C., & Knafo-Noam, A. (2015). Synchronous Rhythmic Interaction Enhances Children's Perceived Similarity and Closeness Towards Each Other. *PLoS ONE*, 10(4), e0120878.
- Ryan, M.-L. (1980). Fiction, Non-factuals, and the Principle of Minimal Departure. *Poetics*, 9, 403–422.
- Shamay-Tsoory, S. G. (2011). The Neural Bases for Empathy. *The Neuroscientist*, 17(1), 18–24.
- Shapiro, J., and Rucker, L. (2004). The Don Quixote Effect: Why Going to the Movies can Help Develop Empathy and Altruism in Medical Students and Residents. *Families, Systems, & Health*, 22(4), 445–452.
- Shevy, M., & Hung, K. (2013). Music in Television Advertising and Other Persuasive Media. In S.-L. Tan, A. J. Cohen, S. D. Lipscomb, and R. A. Kendal (eds.), *The Psychology of Music in Multimedia*. Oxford: Oxford University Press, pp. 315–338.
- Smith, R. H., Powell, C. A. J., Combs, D. J. Y., & Schurtz, D. R. (2009). Exploring the When and Why of Schadenfreude. *Social and Personality Psychology Compass*, 3/4, 530–546.
- Stevens, M. (2009). *Image in Concert: Using Images in the Instrumental Music Concert*. Sydney, Australia: Music and Media.
- Storm, W. (2016). *Dramaturgy and Dramatic Character: A Long View*. Cambridge, UK: Cambridge University Press.
- Tagg, P. (2006). Music, Moving Images, Semiotics, and the Democratic Right to Know. In S. Brown and U. Volgsten (eds.), *Music and Manipulation: On the Social Uses and Social Control of Music*. New York: Berghahn Books, 163–186.
- Tan, S.-L., Spackman, M. P., & Bezdek, M. A. (2007). Viewers' Interpretations of Film Characters' Emotions: Effects of Presenting Music Before or After a Character is Shown. *Music Perception*. 25(2), 135–152.
- Tan, S.-L., Spackman, M. P., & Wakefield, E. M. (2017). Effects of Diegetic and Non-diegetic Music on Viewers' Interpretations of a Film Scene. *Music Perception*, 34(5), 605–623.
- Thompson, W. F., Russo, F. A., & Sinclair, D. (1994). Effects of Underscoring on the Perception of Closure in Filmed Events. *Psychomusicology*, 13, 9–27.
- van der Schyff, D., & Krueger, J. (in press). Musical Empathy, From Simulation to 4E Interaction. In A. F. Corrêa (ed.), *Music, Sound, and Mind*. Rio de Janeiro: Editora da ABCM.
- Wierzbicki, J. (2009). *Film Music: A History*. New York: Routledge.
- Wöllner, C. (2017). Music and Empathy. In E. King, and C. Waddington (eds.), *Music and Empathy*. London: Routledge, pp. 139–156.
- Zunshine, L. (2006). *Why We Read Fiction: Theory of Mind and the Novel*. Columbus, OH: The Ohio State University Press.

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