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*Psychology of Music* published online 28 August 2013  
DOI: 10.1177/0305735613498132

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# The effects of background music on the evaluation of crying faces

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0(0) 1–11

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DOI: 10.1177/0305735613498132

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## Abstract

This exploratory study was designed to determine the effects of background music of different valence on the perception of tearful faces and other emotional expressions. Participants (154 men, age range 9–64 years, and 208 women, age range 9–77 years) rated photographs of crying, smiling, anger expressing and yawning unique men and women ( $N = 12$  each) on the following three dimensions: kindness, attractiveness and pleasantness, while concurrently being exposed to happy, angry, sad and calm music, or a no-music condition. Mixed models analysis revealed that observers made more favourable judgments about a crier when listening to sad and calm background music. This particularly concerned the ratings on the dimensions kindness and pleasantness, while calm music additionally increased ratings of attractiveness. Opposite effects were found for angry faces, for which lower ratings were obtained on all three dimensions with calm music. We speculate that calm background music may be helpful to boost social bonding and empathy, when people are in tears.

## Keywords

*cross-modal emotion perception, crying, music, person evaluation*

Crying is among the most powerful emotional expressions, ubiquitous and uniquely human, with major effects on the social environment. It conveys to others that one is helpless and in need of succour. Research has demonstrated that one of the main functions of crying is to reach out to others for support, empathy and to help to remove the source of this distress (Trimble, 2012; Vingerhoets, 2013). Perceiving a crying individual affects how we judge that person, how we feel ourselves, and how we behave or react towards the person in tears. Several

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studies have demonstrated that compared to crying faces with tears digitally removed, the same tearful faces are rated as more emotional and more likely to be indicative of sadness and in need of support (Balsters, Krahmer, Swerts & Vingerhoets, 2013; Cornelius & Lubliner, 2003; Cornelius, Nausbaum, Warner & Moeller, 2000; Provine, Krosnowski & Brocato, 2009; Zeifman & Brown, 2011).

Until now, it is not known how the perception of crying faces is influenced by simultaneous exposure to (non-)congruent background music. This question is interesting and relevant, because, since ancient times, music has played an important role in all sorts of rituals, for instance, during funerals, memorial ceremonies, religious activities and weddings, i.e., situations in which individuals are also prone to crying. Of further importance is that some scientists even postulate that the origins of music are linked to (auditory) crying behaviour and some consider crying to be instrumental in the promotion of social bonding (Dissanayke, 2008; Vingerhoets, 2013).

There can be little doubt that music influences our daily lives, not just in social and more intimate settings, but in work environments and more formal settings as well (e.g., North, Hargreaves & Hargreaves, 2004). It has been established that the perception of visual stimuli is influenced by simultaneous exposure to auditory information (e.g., De Gelder & Vroomen, 2000; Spreckelmeyer, Kutas, Urbach, Altenmüller, & Münte, 2006). Emotion evoked by stimulation in one modality will, in general, be experienced as more intense when associated with a concurrently presented congruent emotional stimulus in another modality. In other words, an auditory stimulus will increase or decrease the visually-induced experienced affect, depending on the valences of both stimuli (Baumgartner, Esslen, & Jäncke, 2005; Baumgartner, Lutz, Schmidt, & Jäncke, 2006; Jeong et al., 2011; Logeswaran & Bhattacharya, 2009).

Baumgartner and colleagues (2005, 2006) demonstrated that the emotions induced by happy, fearful and sad photographs taken from the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 1995) were enhanced by the concurrent presentation of congruent classical music. In a similar experiment, Logeswaran and Bhattacharya (2009) used photographs of neutral, happy and sad faces in combination with happy and sad music and demonstrated an enhanced affect for congruent music-picture combinations. In the non-congruent conditions, ratings showed an in- or decrease depending on the emotional valence of the music. The size of this effect appeared to depend on the emotional strength of the visual stimulus. The more emotionally neutral the picture was, the stronger the effect of the concurrently presented background music. Furthermore, music has been found to influence perception of emotion even when participants were specifically instructed to focus on the affect of the visual stimulus (Van den Stock, Peretz, Grézes, & De Gelder, 2009).

### *Present study*

The specific aim of the current exploratory study was to determine the effects of music of different valence on the perception of crying individuals. In previous studies investigating effects of music on the judgment of facial expressions, pictures were used portraying sadness (Baumgartner et al., 2005, 2006; Logeswaran & Bhattacharya, 2009; Jeong et al., 2011), however, it is not clear if these sad faces had visible tears. This may really make a difference since it has been shown that visible tears have a major impact on the recognition of a need for comfort and support and the willingness to satisfy those needs (Balsters et al., 2013; Provine et al., 2009).

We asked participants to rate photographs of crying persons on three dimensions: kindness, attractiveness and pleasantness, while concurrently listening to happy, angry, sad, and calm music and a no-music condition. Pictures in additional emotional categories (smiling, anger, yawning) were used to compare with possible effects of music on judgments of crying. The used rating dimensions were especially selected, since previous studies demonstrated that sad expressions increase sympathy, but decrease likeability (e.g., Clark, Pataki & Carver, 1996). Additionally, one study (May & Hamilton, 1980) reported rock music to increase attractiveness and evaluations of personality of depicted individuals compared to avant-garde music.

In line with Baumgartner et al. (2005, 2006) and Logeswaran and Bhattacharya (2009), we expected calm and happy music both to positively affect and angry music to negatively influence ratings of the crying faces on all three dependent variables, compared to a no music condition. We further hypothesized sad music especially due to matching valence to promote sympathy with criers, thus increasing judgments of kindness and pleasantness, while decreasing ratings of attractiveness. For the other three facial expressions, we expected happy and calm music to increase ratings on all three dimensions and sad and angry music to lower these ratings.

## Method

### *Participants*

Study participants were 366 visitors to science centre NEMO, Amsterdam (157 male, 209 female) who received a free drink for participation. The data of four participants were removed due to large numbers of missing values, leaving 362 participants for inclusion in the data analysis. The final group consisted of 154 men, aged 9–64 ( $M = 25.5$ ,  $SD = 17.8$ ), and 208 women, aged 9–77 ( $M = 29.1$ ,  $SD = 17.3$ ). All participants provided informed written consent. Written consent for participants younger than 18 years of age were obtained both from their parent/s and from the participants themselves.

### *Stimulus material*

Photographs of 12 unique men and 12 unique women portraying the following four facial expressions: (1) smiling, (2) anger, (3) crying and (4) yawning, served as visual stimuli. These 24 pictures were selected from two sets of photographs based on their highly recognizable emotional expressions as measured in previous studies. Pictures of crying and yawning faces originated from a set by Hendriks and Vingerhoets (2006) while smiling and angry faces were selected from a set developed at Radboud University (Langner et al., 2010). All instrumental musical stimuli were taken from previous studies and were selected for their ability to induce to induce the following emotions: (1) happiness: Beethoven Symphony No. 6 Mvt. 3, (2) calmness: Chopin Nocturne op. 9 no. 2, (3) anger: Naked City Leng T'che, and (4) sadness: Rachmaninov Vocalise op. 30 no. 14 (Baumgartner et al., 2005, 2006; Hanser, Vingerhoets, & Mark, 2007). Our design involved each participant randomly rating 24 out of 40 possible conditions (not a full within-subjects design), though all 40 possible conditions were measured in a considerable number of trials between-subjects. Participants rated eight pictures without music, eight pictures with congruent music and eight pictures with non-congruent music. Non-congruent conditions were assigned randomly so that all 40 possible conditions were rated between subjects. Each participant heard all four pieces of music and also completed the no-music condition.

## Rating scales

Participants were instructed to rate each picture on three dimensions (original Dutch terms in parentheses): (1) How kind (*aardig*) do you find the person in the picture? (2) How pleasant (*leuk*) do you find the person in the picture? and (3) How attractive (*aantrekkelijk*) do you find the person in the picture? For younger subjects, i.e., those aged between 9 and 18 ( $N = 187$ ) years, the term “attractive” was replaced by “pretty” (*mooi*). All ratings were made on a scale ranging from 1 = *not at all* to 9 = *very much*. Additionally, as a manipulation check, at the end of each series of 4 pictures every time a piece of music was heard. All participants rated the background music excerpts on the following four dimensions on 9-point Likert-scales: happy, calm, angry, sad.

## Procedure

The experiment was conducted in a sound attenuated room. Participants were tested individually, sitting in a comfortable chair, approximately 70 cm in front of a 17" CRT-screen, and were instructed to watch each photograph carefully and make their judgments as quickly as possible. Participants were given four training trials using neutral faces, not repeated in the main experiment, and no music. Each picture was viewed for 2s, and participants had 10s per each of three questions to provide their ratings. Music was played via a headset, and started 5s before the onset of the first picture in each series of four pictures and continued until after picture presentation. The next set of pictures and music started after a 30s-pause. Presentation and combinations of stimuli were counterbalanced across participants. The experiment took approximately 30 mins in total. Participants were debriefed and given the opportunity to ask questions afterwards.

## Statistical analysis

To analyze the effects of music on the rating of facial expression, we performed a mixed model analysis (random intercept model). This analysis was chosen instead of a regular repeated measures (M)ANOVA to correct for missing values originating from the design. We included the following fixed variables in the model: (1) Music (happy, calm, no-music, angry, sad) and (2) Pictures (smiling, yawning, angry, crying). We also tested the Music  $\times$  Picture interaction.

If an interaction was found to be significant, contrasts were specified to further investigate effects. Pair-wise comparisons for all significant combinations of music and photographs are discussed. Analysis of other facial expressions are discussed in terms of how the Music  $\times$  Picture interaction differs from crying pictures for these expressions. We applied a Bonferroni correction and used an alpha of  $.05/10 = .005$  for the 10 pair-wise comparisons. All analyses were carried out using Mixed Models in SPSS 17.0.2.

## Results

### Manipulation check

To ascertain that the music excerpts evoked the intended emotions, we asked all participants to rate the excerpts on four scales: (1) happy, (2) calm, (3) angry and (4) sad (See Table 1 for mean values) after having judged four pictures. All musical pieces were perceived as intended. It

**Table 1.** Mean (and SD) perceived-emotion ratings for each type of background music, collected as a manipulation check (on a scale of 1 = *not at all* to 9 = *very high*) to ascertain if excerpts evoked the intended affect.

Music played	Perceived affect			
	Happy	Calm	Angry	Sad
Happy	6.51 (1.9)	4.93 (2.2)	2.98 (2.3)	2.62 (2.0)
Anger	2.28 (2.1)	1.54 (1.6)	6.81 (3.1)	3.19 (2.7)
Sad	2.52 (1.8)	6.61 (2.6)	3.60 (2.6)	6.59 (2.6)
Calm	4.80 (2.1)	6.08 (2.5)	3.13 (2.3)	4.43 (2.2)

should be noted though, that while the calm piece of music was indeed found to be calm, it elicited moderate feelings of happiness and sadness as well.

### Kindness ratings

To evaluate our hypothesis concerning the effects of background music on crying faces, a mixed model analysis was conducted. The interaction of Music  $\times$  Picture  $F(12,8213) = 2.7, p = .001$  yielded a significant result, which indicated different types of background music to affect our categories of facial expressions differently. In a follow-up analysis, this interaction effect appeared to be limited to crying  $F(4,8197) = 4.2, p = .002$  and angry facial expressions  $F(4,8204) = 4.2, p = .002$ . No significant effects for smiling  $p = .42$  and yawning  $p = .40$  pictures were found. Subsequent simple effects were specified in additional mixed model analyses to evaluate and compare effects of each type of music on ratings of crying and angry faces, since these interactions were found to be significant (See Figure 1 for mean values). More precisely, sad and calm background music ( $B = .24, t = 2.3, p = .024$  and  $B = .27, t = 2.1, p = .039$ , respectively) both increased ratings of kindness compared to a no-music condition for crying faces, whereas angry and happy music failed to cause significant differences from a no-music condition (see Table 2 for an overview of effects of music compared to no-music conditions).

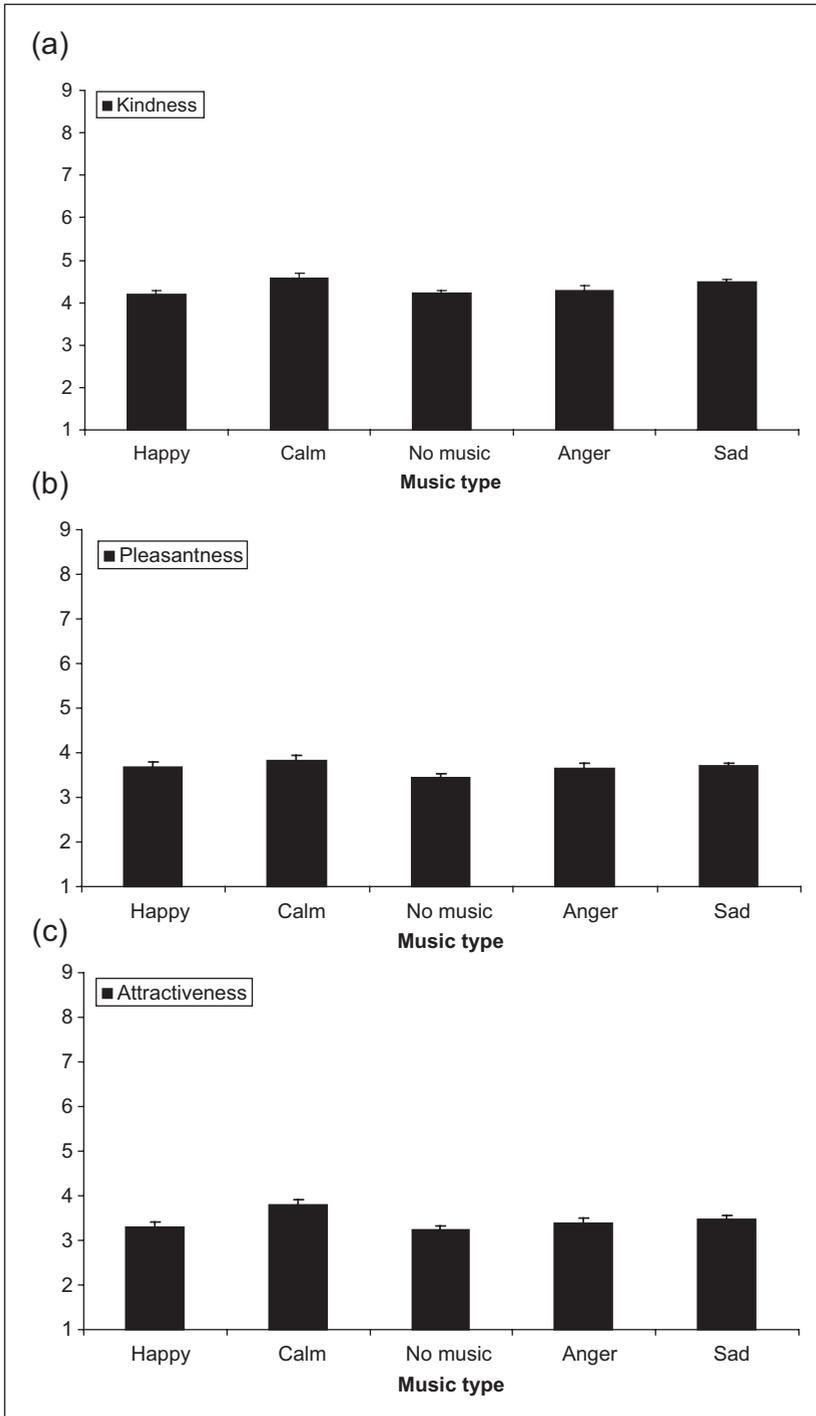
When compared to happy background music, calm  $B = .50, t = 3.2, p = .001$ , sad  $B = .47, t = 3.5, p = .001$ , and angry music  $B = .41, t = 2.5, p = .012$  all resulted in significantly higher ratings of kindness.

Angry faces were rated as less kind when concurrently listening to calm background music  $B = -.38, t = -2.9, p = .003$ , while happy music positively influenced the ratings  $B = .27, t = 2.0, p = .043$  compared to the no-music condition. Compared to calm  $B = -.65, t = -4.0, p = .001$  and angry  $B = -.36, t = -2.5, p = .011$  music, ratings of kindness of angry faces were higher with happy music, whereas sad music  $B = .41, t = 2.5, p = .013$  positively affected these ratings compared to calm music.

To summarize, crying individuals are rated especially kind when observers are simultaneously exposed to sad or calm music, whereas calm music had opposite effects for the kindness ratings of angry faces.

### Pleasantness ratings

A significant Music  $\times$  Pictures interaction was also found  $F(12,8226) = 2.2, p = .008$  (see Figure 1b for means) for the pleasantness ratings. As was the case for kindness ratings,



**Figure 1.** Mean ratings of crying faces (on a scale of 1 = not at all to 9 = very high) on dimensions kindness (1a), pleasantness (1b), and attractiveness (1c) specified for each type of background music.

**Table 2.** Schematic overview of the significant interactions of music and pictures (– = negative influence, + = positive influence, 0 = no effect) as compared to a no-music condition on all three dimensions Kindness (K), Pleasantness (P) and Attractiveness (A).

Picture type	Crying			Angry			Smiling			Yawning		
	K	P	A	K	P	A	K	P	A	K	P	A
Music												
Happy	0	0	0	+	0	0	0	0	0	0	0	0
Calm	+	+	+	–	–	–	0	0	0	0	0	0
Anger	0	+	0	0	–	0	0	0	0	0	0	0
Sad	+	+	0	0	–	0	0	0	0	0	0	0

significant effects of music on the pleasantness ratings were only for pictures depicting crying  $F(4,8210) = 4.0, p = .003$  and angry facial  $F(4,8203) = 3.0, p = .016$  expressions. No significant effects of background music on smiling  $p = .70$  and yawning  $p = .25$  pictures were established. Simple effects were explored for each type of background music and photographs of crying and angry individuals since a significant interaction was found. Compared to a no-music condition, calm  $B = .36, t = 2.8, p = .005$ , sad  $B = .30, t = 2.8, p = .005$ , and angry  $B = .39, t = 2.9, p = .004$  background music yielded significantly-increased ratings on the dimension of pleasantness, while happy music did not result in significantly different changes. Calm music produced the highest mean pleasantness ratings (see Figure 1b), but was not rated significantly higher than the other types of background music.

Pictures depicting anger were more negatively-rated while listening to calm music  $B = -.39, t = -3.0, p = .003$ , and more negative ratings were found for angry  $B = -.23, t = -2.2, p = .027$  and sad  $B = -.27, t = -2.0, p = .046$  music compared to a no-music condition. In addition, angry pictures were judged more favourably with happy  $B = .32, t = 2.0, p = .049$  than with calm background music.

To summarize, crying individuals were rated as more pleasant in the presence of calm, sad and angry background music compared to a no-music condition. When comparing the effects on ratings of crying and angry facial expressions, opposite effects were obtained for calm, angry and sad background music. More precisely, calm background music made angry faces less pleasant.

**Attractiveness ratings**

Also for attractiveness, the significant Music x Pictures interaction  $F(12,8218) = 3.6, p \leq .001$  was further explored with simple effects for each type of music (See Figure 1c for means) for crying and angry faces. No significant effect of music on smiling  $p = .27$  and yawning pictures  $p = .98$  was found. The four categories of background music affected crying faces significantly differently  $F(4,8203) = 5.7, p \leq .001$ . Only calm music  $B = .56, t = 4.2, p < .001$  significantly increased ratings compared to the no-music condition. Additionally, calm music resulted in significantly more positive judgments compared to sad  $B = .42, t = 2.9, p = .004$  and happy music  $B = .68, t = 4.2, p \leq .001$ , whereas no significant effect was found for angry music  $B = .32, t = 1.8, p = .07$ . Finally, crying individuals were rated as more attractive with angry music than with happy music  $B = .36, t = 2.1, p = .037$ .

A significant effect of background music on the ratings of angry faces was found as well  $F(4,8202) = 4.3, p = .002$ . Compared to no music, angry faces were judged significantly less

attractive with calm music  $B = -.52$ ,  $t = -3.8$ ,  $p \leq .001$ , while more positive ratings were obtained while listening to sad  $B = .47$ ,  $t = 2.7$ ,  $p = .007$ , angry  $B = .40$ ,  $t = 2.7$ ,  $p = .007$  and happy music  $B = .63$ ,  $t = 3.6$ ,  $p \leq .001$ , when compared to calm music.

In brief, calm background music thus appears to make crying individuals more attractive, while it negatively affected judgments of attractiveness of angry faces. Very similar to our findings for kindness and pleasantness ratings, calm background music had opposite effects on the attractiveness ratings for angry (less attractive) and crying (more attractive) faces.

## Discussion

This is the first study in which the effects of different kinds of background music on the perception of crying individuals are evaluated. Due to the postulated relevance of crying for social bonding in all kinds of rituals that are typically accompanied by music (Dissayanake, 2008; Vingerhoets, 2013), this study addressed not just a fundamental research issue concerning cross-modal interaction, but the findings have also relevance for a better insight into the role of music during rituals.

As expected, background music influenced the perception of faces significantly, and the results partially confirmed our hypotheses based on previous studies (Baumgartner et al., 2005, 2006; Clark et al., 1996; Logeswaran & Bhattacharya, 2009). More precisely, we found more positive ratings of crying faces on the dimensions kindness and pleasantness, in particular when the background music was sad and/or calm, compared to no music. Calm music additionally increased ratings on attractiveness compared to no music. Surprisingly, pleasantness ratings of faces against a background of angry music were also increased. It may be that tears in an environment of anger appease the rater and the (normally negative) effect of angry music is thus countered. Also contrary to expectations, calm rather than sad music yielded the most positive effect for attractiveness.

In order to interpret these findings, we first need to elaborate on what precisely background music contributes to the perception of affective pictures. Music may provide photographs with context. More specifically, the emotional valence of the background music provides additional information about a given situation (e.g., Scherer & Zentner, 2001). The combination of crying individuals and (assumed congruent) sad music prompts observers with a situation of distress or loss, while calm music might help to create a context in which tears are experienced as tears of sincerity or being touched. The music in the present study thus provided observers with a possible emotional context as to why the people in the pictures were shedding tears. Since the main functions of crying in a negative context are to reach out to others for support, to help to remove the source of any distress, and to elicit sympathy and comfort (e.g., Vingerhoets, 2013), the additional auditory cue of sad music helps observers to empathize with criers resulting in higher scores on kindness and pleasantness ratings. This might explain why, for instance, funerals and memorial services are nearly always accompanied by sad or solemn music (e.g., Dissayanake, 2008). It is tempting to speculate that these increases in ratings for kindness, pleasantness and attractiveness lower the reluctance to offer support and comfort to crying individuals if they are in distress.

Calm (like sad) music, increased ratings on kindness, pleasantness and attractiveness and this effect was even more significant for calm than for sad music. Participants also rated the sad music as calmer than the calm music perhaps suggesting that calmness and sadness are close to each other in affective space. This issue should be addressed in future experiments. The results could be interpreted to mean that with a background of sad/calm music participants

were more likely to empathize with the crying faces than with the other facial expressions. From a social perspective it could also have underpinnings for why we tend to chose calm/soothing music for both positive (e.g., weddings) and negative (e.g., funerals) ceremonies: to enhance our empathy (or sympathy) for the individuals involved and to get us into the appropriate mood for the context we are in. We should also consider the option that calm music was a better fit (more congruent with the tearful faces) than the sad music condition, which in turn bolstered ratings. However, no evidence in the ratings of the calm piece of music (see Table 1) was found for this, since observers rated it as less sad than the piece of sad music. Participants did report average levels of sadness and happiness at the same time. This particular combination may give rise to the idea that the calm piece of music acknowledges the observed sadness in the criers and is uplifting and hopeful at the same time, providing room for empathy and support. Music may therefore contribute significantly to the promotion of feelings of social connectedness.

The observed effects of calm music on angry faces is of interest here as well, since it was opposite to what we hypothesized; angry faces were rated as less kind, pleasant and attractive while listening to calm background music. These findings can be interpreted as being due to extreme incongruence between the calm music and angry expression. Similarly as in the crying condition, calm music soothes and relaxes which is a clear mismatch with the visual cue of anger, prompting a negative reaction as reflected in judgments of participants. Furthermore, the combination of calm music and angry faces might be considered as strange, a sign of maladjustment, or not in line with what people expect, resulting in a state of anger or irritation, or perhaps an emphasis on the affect of the picture, which prevents the increase of, or even decreases ratings. Some support for this notion comes from recent research by Szczurek, Monin and Gross (2011), who demonstrated that individuals displaying incongruent affect (e.g., smiling while watching sad pictures) towards emotional (IAPS) pictures are perceived as having a less attractive personality, are more likely to experience negative life events, and are less suited for jobs requiring interpersonal warmth. Observers also tended to keep a greater social distance from emotional deviants. This may also explain why we failed to find an effect of happy music on crying faces.

Lastly, contrary to expectations, we failed to find effects of music on kindness, pleasantness and attractiveness ratings for smiling and yawning photographs. Failure to replicate findings of enhanced affect (Baumgartner et al., 2005, 2006; Jeong et al., 2011; Logeswaran & Bhattacharya, 2009) may be due to design differences between our study and previous experiments. Jeong and colleagues (2011), for instance, specifically measured perceived happiness and sadness in pictures while we assessed how kind, pleasant and/or attractive participants found the pictures. In addition, it has been suggested (e.g., Marin, Gingras, & Bhattacharya, 2011) that the effect of music is stronger when it is used as a prime rather than being (as was the case in our experiment) concurrently presented with the pictures to be rated. Furthermore, smiling and yawning could be perceived as strong emotional cues that are less susceptible than other facial expressions to external influences, or the musical stimuli were not emotionally strong enough to affect these types of pictures. Previous research has shown that emotionally ambiguous/neutral stimuli are more easily affected by music (e.g., Logeswaran & Bhattacharya, 2009).

## Limitations and conclusion

There are a number of limitations in the present study. First, we did not include measures of perceived or participant experienced sadness. Future studies investigating pictures of crying

individuals in combination with (sad and calm) music should also include such mood measures to better understand our findings concerning sad and calm background music. Furthermore, information about the perceived music and picture congruency and perceived appropriateness of displayed behaviour and/or music should help us to gain insight into why background music in- or decreases observer ratings. We therefore recommend the use of films of crying people in clear contextual settings in future research. In addition, we wonder if and how music causes changes in real behaviour. Will observers actually provide criers with more support and comfort when sad and/or calm background music is present and are they indeed more inclined to keep their distance when confronted with a crier during, for instance, a (non-congruent) happy song? In addition, we do not know which mechanism might be responsible for this effect. In other words, why and how does music produce these effects? These important and interesting questions should be addressed in future studies.

In conclusion, the current study yielded provisional evidence that crying persons are more positively rated when accompanied by both emotionally congruent music (sad), and by calm music, compared to a no-music condition. To put it differently, this result suggests that the message that tears convey is reinforced by sad and/or calm music. If this finding is supported in future studies, this may contribute to a better understanding as to why, since the early years of mankind, our ancestors have used music during rituals that are typically associated with strong emotions. As pointed out by Dissayanake (2008), such rituals took place predominantly after the tribe was struck by war, drought, famine or other disasters. Although the common weeping did not really solve the problem or change the situation, its effect was that the tribe members experienced mutual support and it therefore boosted their feelings of social connectedness. As such, tears have been important for the evolution of our species. The findings in the present study may also have a practical application if we assume that enhancing empathy increases chances of treatment success in therapeutic settings. Playing calm and/or sad background music increased empathy-related ratings of photographs of crying people in our experiment. Whether such music has the same effect in a therapeutic relationship and/or on overt behaviour are worthwhile topics for future research in this field.

## Funding

This research was part of Science Live, the innovative research program of science center NEMO Amsterdam that enables scientists to carry out real, publishable, peer-reviewed research using NEMO visitors as volunteers.

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