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AMBIVALENT EMOTIONS IN MUSIC: WE LIKE SAD MUSIC WHEN IT MAKES US HAPPY

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Abstract

We often react ambivalently to a piece of music, simultaneously experiencing both sadness and happiness, and attributing both emotions to the musical content. Two experiments were conducted (1) to empirically test for ambivalent emotions and (2) to investigate the amount of musical information necessary to elicit such emotions. In experiment 1, synthesized musical excerpts were manipulated in tempo (fast/slow) and mode (major/minor). By using unipolar scales, listeners could independently rate how (1) happy and (2) sad the music made them feel, as well as the (3) happiness and (4) sadness perceived in the music. Regarding perceived emotion, happiness was higher in major-fast excerpts, sadness was higher in minor-slow excerpts, and mixed emotions were reported (raised happiness and sadness ratings) for ambivalent music (major-slow and minor-fast). Ratings of felt emotions were similar, except that sad music (minor-slow) was experienced as ambivalent, happiness often nearly equalling the amount of sadness. Furthermore, the liking of sad excerpts positively correlated (r=.59) with the experienced happiness in the same excerpts. The results help to understand the enjoyment of sad music by suggesting that feelings of happiness are a desired emotional outcome. In experiment 2, the main results of experiment 1 were replicated with shorter musical excerpts (0.5-1.5s), suggesting that ambivalence is an immediate and effortless emotional response.

Keywords: ambivalent emotions, sad music, emotion perception/induction

1. Introduction

Studying the relationship between specific musical characteristics and the emotions they convey and elicit has a long tradition in music psychology. To date, these associations have been well established in more than 100 studies on the topic (Gabrielsson & Lindström, 2010). Among these characteristics, most researchers would agree that tempo and mode play a crucial role. Especially when it comes to happiness and sadness, different modes and tempi have clear emotional associations in Western music: Major mode and fast tempo are usually cues for happiness, whereas minor mode and slow tempo imply sadness (Juslin & Laukka, 2004). Although these associations have been repeatedly substantiated, one has to consider that in "real" musical compositions, the use of musical cues is often more dynamic than in scientific musical stimuli, i.e. it is common to change the mode within a piece, or to incorporate conflicting cues (e.g. major mode with slow tempo) at the same time, consequently carrying more complex or ambivalent emotional material. Hardly any studies have explicitly dealt with the listener's emotional reaction to music with such conflicting cues. This lack is partly due to the underlying emotion theories: One of the predominant approaches organizes emotions in bipolar *dimensions* (Russell, 1980). In this context, happiness and sadness are considered as mutually exclusive, since their posi-

tive and negative quality represent the two ends of the *valence* dimension. Thus, studies based on dimensional models and their respective response formats do not allow listeners to rate happiness and sadness independently, and thereby neglect the existence of ambivalent emotions. The other predominant approach, the *categorial* one (Ekman, 1992), allows listeners to respond ambivalently in principal. Yet, studies based on this theoretical framework often did not record ambivalent emotions, simply because response formats were not designed to do so. However, new findings by Hunter, Schellenberg, & Schimmack (2010) have showed how listeners react to music with such conflicting cues (in this case multiple MIDI-versions of excerpts of J. S. Bach), if given the opportunity to independently evaluate happiness and sadness: In contrast to music with clear emotional cues for happiness or sadness, in most cases music with conflicting cues was both perceived and experienced ambivalently, i.e. the listeners perceived/experienced happiness and sadness simultaneously.

The question arises how common such ambivalent emotions are, and whether they are a more elaborate and time-consuming reaction than unambiguous emotions. In order to answer this question, one would have to compare the immediacy with which both types of reactions occur. For pure emotions, Vieillard et al. (2008) showed that listeners accurately identify happy or sad music after merely 3 musical events, which corresponds to 0.5-2 seconds, according to the original tempo of the piece. As mentioned above, "real" music often provides conflicting or more subtle emotional cues than scientific musical stimuli. Thus, listeners should have experience in decoding complex and ambivalent emotional material as they are exposed to music in daily life. Consequently, if the experience (or perception) of simultaneous happiness and sadness is a common and effortless reaction to music, as is proposed here, listeners should accordingly be able to identify ambivalent musical material correctly after 3 musical events.

Special interest was furthermore aimed at sad music, and a possible role of ambivalent emotions. To date, several studies have shown that sad music elicits sad emotions in listeners. Such findings resulted from different measurement techniques, such as self-reports (e.g. (Bigand, Vieillard, Madurell, Marozeau, & Dacquet, 2005) indirect measures (Thompson, Schellenberg, & Husain, 2001), or neuroimaging techniques (Mitterschiffthaler, Fu, Dalton, Andrew & Williams, 2007). Yet, the situation seems to be more complex. Newer research suggests that in many cases, listeners do not react to sad music with exclusively negative, but rather ambivalent emotions of positive and negative valence, and also other positive emotions such as wonder or peacefulness (Vuoskoski, Thompson, McIlwain & Eerola, 2012). Hunter et al. (2010) similarly found evidence for ambivalent emotions of happiness and sadness in reaction to sad music. It seems that mixed emotions might be a thoroughly important response to examine the motivational outcome of why people listen to sad music, especially as such mixed reactions usually do not occur with happy music. The liking of sad musical pieces might also be affected as a function of the listener's perceived and experienced emotions. Vuoskoski et al. (2012) found that the liking of sad music correlates with the overall intensity of felt emotion, regardless of its quality. In the present study, a more distinguished proposal is tested, namely how liking of sad music is affected by the magnitude of perceived and felt happiness.

2. Aims

The aim of the present study was to (1) represent and elicit ambivalent emotions of happiness and sadness through music by mixing musical cues for happiness and sadness in musical excerpts, and (2) examine the relationship of such ambivalent emotions with the liking of sad music. In a second experiment, it was (3) tested if a minimal exposure to the musical stimuli is sufficient to decode ambivalent emotions. Here, it was hypothesized that 3 musical events comprise enough musical information for the listener to decode such ambivalent emotions.

3. Methods

In Experiment 1, 50 students of the University of Salzburg (25 male, 25 female) between 18-26 years of age (M = 22.68, SD = 2.14) rated their felt and perceived emotions related to 16 synthesized musical excerpts of approx. 40 seconds length. In order to avoid preferences for popular genres (which could bias ratings), the musical stimuli were composed to be best described as film music, which many listeners do not consume actively, yet it's main objective is to transport emotions. The 16 excerpts resulted from 4 versions of 4 original compositions, each of which was manipulated in the dimensions mode (major/minor) and tempo (fast/slow). The 4 resulting versions of each excerpt represented individual conditions in a 2 x 2 field, which were expected to represent happiness (major-fast), sadness (minor-slow) and ambivalent emotions of happiness and sadness (major-slow and minor-fast). In order to allow for ambivalent responses, subjects independently rated (1) perceived and (2) experienced happiness, as well as (3) perceived and (4) experienced sadness on unipolar VAS-scales of 100mm length (coded from 1-100). Liking and disliking ratings were also measured independently on identical scales. Subjects were tested separately in a laboratory setting. The questionnaire was presented on a laptop, while the musical stimuli were heard with studio-quality headphones. A session lasted 30-40 minutes.

In Experiment 2, 47 students of the University of Vienna (20 female, 27 male) between 18-28 years (M = 23.13, SD = 2.58) ran through an identical version of Experiment 1, except that the musical stimuli were severely shortened. The stimuli were not trimmed to a certain amount of time (e.g. 1 second), as this would result in stimuli of unequal musical (and thus emotional) information. In other words, a piece of music with 60 bpm trimmed to 1s will contain far less musical information than a piece with 120 bpm. Instead, the unit of choice was musical events. Vieillard et al. (2008) proposed that fewer than 3 musical events suffice to accurately label happy and sad music. Acting on that assumption, each of the 16 musical stimuli was shortened to 3 musical events. As a function of the respective stimuli's tempo, the shortened versions were 0.5 - 3.0 seconds.

4. Results

In order to evaluate the occurrence of ambivalent emotions, the main dependant variable of interest was the absolute difference between each participant's rating of happiness and sadness on scales from 0-100 (perceived or felt, respectively) for every musical piece. A higher difference between happiness and sadness represents a clearer preference for either happiness or sadness, whereas a small difference is a marker for a more ambivalent response. For example, if a subject rates a musical piece's amount of happiness as 75, and its sadness as 5, the difference of 70 points to a clear preference for one emotion, in this case happiness. Ratings of 60 (happiness) and 55 (sadness) would result in a difference of 5, proposing an ambivalent response. Hence, in the consistent conditions (major-fast / minor-slow), a higher overall difference was expected than in the ambivalent conditions (major-slow / minor-fast).

To test these hypotheses in experiment 1, two separate two-way repeated-measures ANOVAs were conducted to evaluate perceived and felt emotion, with tempo (fast/slow) and mode (major/minor) as independent variables, and the above mentioned difference value as target variable. Regarding perceived emotions, significant main effects were found for both mode and tempo, $F(1, 49) = 6.79$; $p < .05$, $\eta_p^2 = .12$, and $F(1, 49) = 8.72$; $p < .01$, $\eta_p^2 = .15$. In detail, pieces in minor were perceived more ambivalently than the pieces in major. The same applies to slow tempo, which listeners perceived as more ambivalent than fast tempo. Most importantly, a highly significant interaction was found between mode and tempo, $F(1, 49) = 166.47$; $p < .001$, $\eta_p^2 = .77$. As expected, the mean differences in the consistent conditions major-fast (54.82, SD = 16.29) and minor-slow (41.51, SD = 22.7) were significantly higher than in the ambivalent conditions major-slow (19.56, SD = 14.23) and minor-fast (18.5, SD = 15.03). All post-hoc simple effects comparisons were significant at the .001 level. These results reveal that the

inconsistent musical pieces were perceived as more ambivalent than the consistent ones. However, they do not give evidence about the composition of happiness and sadness in the respective conditions, i.e. the high difference value in the happy excerpts (major-fast) could theoretically result from a high amount of sadness and a low amount of happiness. In order to check for this, the absolute means of the perceived happiness and sadness ratings for each condition have to be examined. As evident in Figure 1 (upper figure), all conditions were rated as expected, i.e. high happiness ratings in major-fast excerpts, high sadness ratings in minor-slow excerpts, and ambivalent ratings in the major-slow and minor-fast excerpts.

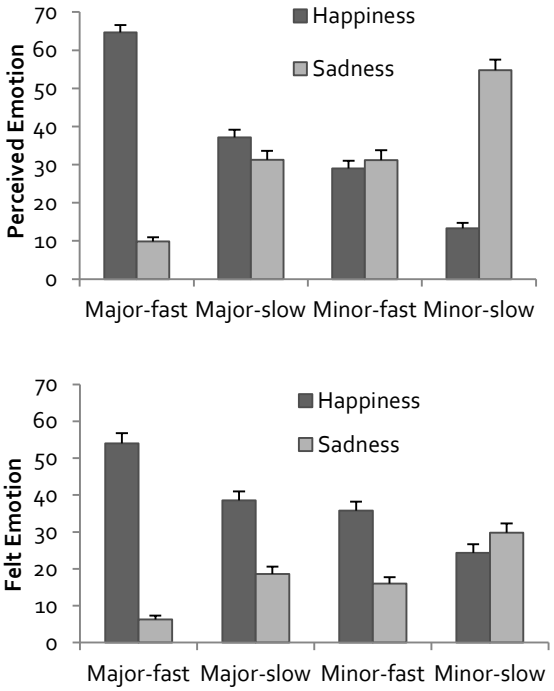

Figure 1. Absolute mean ratings of perceived (upper figure) and felt (lower figure) happiness and sadness in the individual conditions. Error bars are Standard errors.

Regarding felt emotions, both factors showed significant main effects: Again, pieces in minor mode were experienced more ambivalently compared to major mode pieces, $F(1, 49) = 86.13$; $p < .001$, $\eta_p^2 = .53$. Similarly, slow tempo was experienced as more ambivalent than fast tempo, $F(1, 49) = 56.2$; $p < .001$, $\eta_p^2 = .64$. Furthermore, a significant interaction was found between mode and tempo, $F(1, 49) = 24.22$; $p < .001$, $\eta_p^2 = .33$. As expected, participants rated the major-fast excerpts highest (47.71, SD = 17.65), i.e. as the most unambiguous. The two inconsistent conditions major-slow (24.23, SD = 14.68) and minor-fast (21.39, SD = 15.05) were experienced as significantly more ambivalent, represented by the smaller difference, as revealed by the simple effects analysis ($p < .001$). Interestingly, the sad pieces in minor-slow elicited the most ambivalent reactions of all conditions (17.3, SD = 14.68). The corresponding difference value was lower than in the so-called inconsistent conditions, even reaching significance compared to major-slow ($p < .05$). Again, a look at the absolute means of the participants' initial ratings (see Figure 1, lower figure) is necessary to confirm the expected distribution of happy and sad ratings in the individual conditions.

In order to better understand the ambivalent responses regarding felt emotions in the sad condition, the relationship between liking/disliking and perceived/felt emotions was analysed with Pearson correlations (see Table 1). The results showed that the listeners liked the sad excerpts, the more happiness they perceived and above all, felt, in reaction to the sad excerpts. Disliking ratings showed complementary results: Listeners disliked sad music, the more sadness they felt and perceived.

Table 1. Sad music: Pearson correlations between liking/disliking ratings and perceived/felt happiness and sadness.

	Liking	**Disliking**
Felt happiness	**.59****	-.21
Perceived happiness	**.34***	.14
Felt sadness	.13	**.31***
Perceived sadness	.17	**.30***

*p<.05; **p<.01

Experiment 2 aimed to evaluate if a minimal stimulus exposure time influenced the emotional ratings. For that purpose, the datasets of Exp. 1 were compared with Exp. 2, since both were identical except for the stimulus length. Thus, mixed three-way ANOVAs were conducted, both for perceived and felt

emotions. The within-subject factors were mode (major/minor) and tempo (fast/slow), whereas the group factor was stimulus length (long/short, corresponding to Exp. 1/Exp.2). The previously used absolute difference between the happiness and sadness rating functioned as the target measure.

The results of the ANOVA regarding perceived emotions are presented in Table 1. To test the hypothesis if listeners similarly perceive ambivalent emotions in short musical excerpts, a non-significant three-way interaction was desired. Indeed, this was the case, showing that the two-way interaction was independent of the stimulus length, i.e. the ratings ambivalence in the individual conditions are the same between the long and short musical pieces. Further results are depicted in Table 1 , but will not be discussed as they are not fundamental for the hypothesis.

Table 2. Results of the mixed three-way ANOVA for perceived emotions.

	F	p	η_p^2
Within-subjects			
Mode	3.18	ns	.03
Tempo	9.17	< .01	.09
Mode x Tempo	227.46	< .001	.71
Between-groups			
Stim. Length	12.05	< .001	.11
Mode x Stim. Length	5.35	< .05	.05
Tempo x Stim. Length	1.89	ns	.02
Mode x Tempo x Stim. Length	2.91	ns	.03

ns = not significant; N = 97; df (1,95)

In terms of felt emotions, the findings were similar (see Table 2). Again, the three-way interaction of all within-subjects and between-groups factors was not significant. The results propose that the listeners' experience of ambivalent emotions was comparable in response to the short and long musical excerpts. Table 2 provides the complete results of the ANOVA.

Table 3. Results of the mixed three-way ANOVA for felt emotions.

	F	p	η_p^2
Within-subjects			
Mode	90.65	< .001	.49
Tempo	52.89	< .001	.36
Mode x Tempo	38.65	< .001	.29
Between-groups			
Stim. Length	14.8	< .001	.14
Mode x Stim. Length	16.75	< .001	.15
Tempo x Stim. Length	14.05	> .001	.13
Mode x Tempo x Stim. Length	1.69	ns	.02

ns = not significant; N = 97; df (1,95)

4. Discussion

The present study aimed to elicit ambivalent emotions of happiness and sadness by mixing emotional cues (mode and tempo) for happiness and sadness in short musical excerpts. 8 of 16 excerpts had unambiguous cues for happiness (major mode/fast tempo) or sadness (minor mode/slow tempo), whereas the other 8 excerpts featured conflicting cues for both emotions (major mode/slow tempo, and minor mode/fast tempo). As expected, listeners perceived nearly equal levels of happiness *and* sadness for excerpts with conflicting cues, as compared to excerpts with consistent cues, which were perceived as predominantly happy or sad. These findings substantiate the concept of ambivalent emotions, which were previously demonstrated with both pre-selected "real" music of different genres (Hunter, Schellenberg, & Schimmack, 2008), and highly controlled MIDI-versions of Bach pieces (Hunter et al., 2010). The present study adds comparable results with a new set of musical stimuli, namely controlled MIDI-based film music.

The listeners also evaluated the same excerpts in terms of actual felt emotions: Here, happy excerpts clearly induced happiness. In the ambivalent excerpts, listeners again reacted with higher levels of happiness *and* sadness. Yet, compared to the perception of the same excerpts (which were equally happy and sad), the amount of felt happiness exceeded the perception of happiness. Finally, the sad ex-

cerpts were experienced as the most ambivalent of all, i.e. happiness nearly equalled the amount of sadness. This finding is particularly interesting when considering the discrepancy between perception and experience: Listeners perceived sad excerpts as predominantly sad, yet they experienced a far lesser amount of sadness, which was accompanied by a nearly equal amount of happiness. Thus, sad music elicited an amount of happiness, which exceeded the amount of perceived happiness. In this context, liking ratings were analysed and showed a strong relationship with felt happiness. In other words, the more happiness participants felt when listening to sad music, the more they liked it. Although a causal relationship cannot be concluded from these results, it could be hypothesized that the tendency of liking music that elicits happiness (Ladinig & Schellenberg, 2012) is also applicable to sad music. Experiencing positive emotions such as happiness in response to music might resemble an implicit goal, which becomes particularly relevant when listening to sad music, since obvious cues for positive emotions are absent. Regardless of influencing factors such as mood (Hunter, Schellenberg & Griffith, 2011) or personality (Vuoskoski et al., 2012), in all cases the goal might remain the same: experiencing positive emotions. Huron's (2011) thoughts on the enjoyment of sad music and the role of the hormone Prolactin take up a similar stance. He proposes that some people choose to listen to sad music because of the positive emotional outcome, resulting from the release of the hormone Prolactin, which provides the organism with a feeling of comfort.

In Experiment 2, it was tested if participants are able to perceive and experience ambivalent emotions in musical excerpts consisting of merely 3 musical events. For that purpose, the ratings were compared to those of the long excerpts (Experiment 1). The data revealed that listeners perceived and experienced the short excerpts in a comparable way to the long ones, regarding the relationship between happiness and sadness. In other words, the participants' ratings of ambivalence remained the same, no matter if long or short excerpts were presented. It has to be noted that this measure does not allow conclusions about the absolute extent of perceived/experienced emotion. In terms of absolute magnitude of emotion, throughout all conditions, a lower amount of happiness/sadness was observed. This finding seems obvious, as the long excerpts carry more emotional information than the short ones, which in turn allows a stronger emotional reaction to enfold. On the one hand, the results of Experiment 2 are consistent with Vieillard et al. (2008) in terms of listeners identifying happy and sad musical excerpts after 3 events, on the other hand they are extended by the listeners' ability to react similarly to ambivalent pieces. Turning to applied fields, these findings might be particularly interesting for the use of music in advertisement or sound branding, in which music or jingles are often presented for a very short duration of time.

The fact that listeners could perceive and experience the interplay of happiness and sadness after the short period of 3 musical events raises the assumption that such ambivalent emotions are an effortless response. It likely is the case that such ambivalent reactions are actually a popular response to music. Firstly, this claim is supported by the fact that even musical pieces with seemingly explicit cues for happiness were rated as somewhat sad, even though to a marginal extent. Comparably, the perception of sad music was accompanied by a small extent of happiness, and the experience of sad music being even highly ambivalent. Furthermore, examples from the GEMS (Geneva Emotional Music Scale) by Zentner, Grandjean, & Scherer (2008) which consists of the 9 most common emotional responses to music, likewise offers some emotions with seemingly ambivalent characters. For example, the emotion *nostalgia* could be described as a state in which an individual reminisces about past events, both feeling positive about having experienced them, and negative about them having past. Similarly, the emotions *tension*, *wonder* or *power* could be regarded as ambivalent, or at least unclear regarding their valence.

The results as a whole support previous findings regarding ambivalent emotions and further extend them. Future studies should further differentiate the concept of ambivalence, and especially highlight the role of ambivalent emotions in sad music.

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