

# Personality & Emotional States: Understanding Users' Music Listening Needs

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**Abstract.** Music plays an important part in people's lives to regulate their emotions throughout the day. We conducted an online user study to investigate how the emotional state relates to the use of emotionally laden music. We found among 359 participants that they in general prefer emotionally laden music that correspond with their emotional state. However, when looking at personality traits, different patterns emerged. We found that when in a negative emotional state, those who scored high on openness, extraversion, and agreeableness tend to cheer themselves up with happy music, while those who scored high on neuroticism tend to increase their worry with sad music. With our results we show general patterns of music usage, but also individual differences. Our results contribute to the improvement of applications such as recommender systems in order to provide tailored recommendations based on users' personality and emotional state.

**Keywords:** Personality; Emotions; Music.

## 1 Introduction

We experience emotions in every facet of our life (e.g., during decision making, thinking, creativity), and our behavior is influenced by the emotional state we are in [16]. To regulate our emotional states, we rely on 162 different methods where listening to music is the second most used method [9].

Within an emotion regulation method, we can adopt different strategies, such as, changing, enhancing, or maintaining our emotional states. Previous research has found that the preferred strategy is based on individual differences (e.g., [11]). For example, some people prefer to be cheered up when feeling sad, while others would like to stay in this emotional state a bit longer. Research has shown that composers are able to effectively express the intended emotion of their song to their audience [13], and that music is able to induce bona fide emotions [16]. The ability of music to express and induce different kind of emotions makes it well suited to support emotion regulation.

Current music applications that feature the ability for users to listen to music that fits their emotional state, assume that they want to listen to music in line with how they feel. However, since people adopt different emotion regulation

strategies, they may not always desire music which is similar with their emotional state. Hence, in order to recommend the most appropriate music for users and their current emotional state, understanding music listening needs on a general as well as on an individual level is needed.

With this work we seek to expand the understanding of how one’s emotional state relates to the preferred (emotionally laden) music. Music is known to regulate emotions, but it is not known *how* emotional states relate to different types of emotionally laden music preferences, nor how preference differences breakdown on an individual level by looking at personality traits.

This leads us to the following research questions:

1. How do emotional states relate to emotionally laden music preferences?
2. How do personality traits relate to emotionally laden music preferences?

An online user study was conducted where participants were asked to rate different emotionally laden music pieces on the listening likelihood based on their current emotional state. Among 359 participants we found that the emotional state is related to the use of emotionally laden music. Furthermore, individual differences were identified based on personality traits.

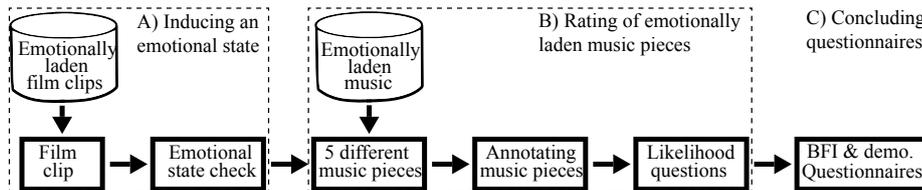
We continue with the related work, method, findings, and discussion.

## 2 Related work

Ample research has investigated the effects of music and the importance of it in everyday life. For example, Thompson and Robitaille found that composers are effective in transferring the intended emotion of the music pieces to their audience [13], indicating that people perform well at interpreting music emotions. People are not only good at recognizing emotions in music, but music is also able to induce emotions in such a way that it is used as experimental stimuli (e.g., [16]). Others have investigated how people use music. Parkinson and Totterdell surveyed affect-regulation strategies, and found that music is used as a common means [9]. Although the effects and usages of music has been extensively investigated, it is striking that to our knowledge, no research has focused on *how* emotionally laden music is used to regulate which emotion and *how* differences exist on an individual level. With this work we try to answer these questions.

## 3 Method

**Procedure.** We developed an online experiment to get insights into the relationship between emotional states and emotionally laden music (Figure 1). In this experiment, participants were put in an emotional state and were asked to rate different emotionally laden music pieces on the listening likelihood, based on their emotional state. Participants were recruited ( $N=382$ ) through Amazon Mechanical Turk. Participation was restricted to those located in the United States, and with a very good reputation. Several comprehension-testing questions were



**Fig. 1.** User study work flow. A) We induced and checked participants' emotional state, then B) let them annotate emotionally laden music and asked the likelihood of listening to it, and C) asked to fill in the personality (BFI) questionnaire and demographics.

used to filter out fake and careless entries. This left us with 359 completed and valid responses. Gender (174 men and 185 women) and age (range 19-68, median 31) information indicated an adequate distribution.

Participants were informed that an emotional state is going to be induced and were given a consent form. The study started with an example to familiarize participants with the study. To induce an emotion, we used the film clips presented in Table 1. The film clip of *Hannah and her Sisters* was always shown in the example to provide a constant (neutral) baseline stimulus [5]. For the actual study, we randomly assigned the remaining film clips. A short synopsis was provided before playback to increase involvement, and improve understanding of the film clips' content [15]. In line with the procedure of Hewig et al., we asked participants at the end of the film clip to indicate how *they were feeling* (by selecting an emotion from the set as seen in Table 1), and not what they thought the film clip was suppose to express [7]. In the next step, five emotionally laden music pieces, from within and between the emotion categories (Table 2), were randomly presented. Participants were asked to annotate the emotion they thought the music piece was trying to express (by selecting an emotion from the set as seen in Table 2), and the likelihood (5-point Likert scale; never-always) of listening to such emotionally laden music, considering their (reported) emotional state. The study ended with the personality questionnaire and demographics.

**Materials.** For our stimuli we relied on existing materials that have been tested in prior studies. To induce an emotional state, we used film clips as they are the most powerful emotion elicitation technique in a controlled environment [10]. Hewig et al. designed film clips to induce an emotional state *without sound*, and categorized them based on Ekman's emotion categorization (anger, fear, happy, surprise, disgust, and sad; Table 1) [7]. Using muted stimuli allowed us to control for conflicts with our music pieces in the annotation step of the study.<sup>1</sup>

We used the emotionally laden music pieces created by Eerola and Vuoskoski. They defined music pieces based on the emotional value they bear, based on Ekman's emotion categorization. Film soundtracks were used as they are created with the purpose to mediate powerful emotional cues. Additionally, as they are

<sup>1</sup> As the surprise emotion only lasts seconds [2], we decided not to include this.

**Table 1.** The film clips with their length, and emotion.

Film Clip	Length (s)	Emotion
Hannah and her Sisters	92	Neutral
Crimes and Misdemeanors	63	Neutral
All the President’s Men	65	Neutral
An Officer and a Gentleman	111	Happy
When Harry met Sally	149	Happy
Witness	91	Anger
My Bodyguard	236	Anger
Silence of the Lambs	202	Fear
Halloween	208	Fear
An Officer and a Gentlemen	101	Sad
The Champ	171	Sad
Maria’s Lovers	58	Disgust
Pink Flamingos	29	Disgust

**Table 2.** The albums with the track number, length, and emotion.

Album (track number)	Length (s)	Emotion
The Rainmaker (3)	18	Happy
Batman (18)	20	Happy
Lethal Weapon 3 (8)	14	Anger
The Rainmaker (7)	15	Anger
Batman Returns (5)	16	Fear
JFK (8)	14	Fear
The English Patient (18)	25	Sad
Running Scared (15)	19	Sad
Shine (10)	20	Tender
Pride & Prejudice (1)	16	Tender

instrumental, they are relatively neutral in terms of musical preferences and (artist) familiarity (Table 2) [1].<sup>2</sup>

We assessed personality traits with the widely used 44-item Big Five Inventory (BFI; 5-point Likert scale; disagree strongly - agree strongly [8]), which describes personality in terms of openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism.

## 4 Findings

The analyses were done based on participants’ reported emotional state after the film clip was shown, not on the intended induced emotion by the film clip. The distribution of the reported emotional states were as follows: happy ( $n=55$ ), neutral ( $n=82$ ), anger ( $n=62$ ), disgust ( $n=56$ ), fear ( $n=79$ ), and sad ( $n=61$ ).

An initial one-way multivariate analysis of variance (MANOVA) was conducted to test the relationship between emotionally laden music pieces and emotional states. A significant MANOVA effect was obtained (Wilks’ Lambda = .523,  $F(25, 1164.24) = 8.89$ ,  $p < .001$ ) with a moderate effect size ( $\eta^2 = .13$ ). The homogeneity of variance assumption was tested for all the emotionally laden music pieces. Levene’s F test showed that the music pieces depicting the emotional states *happy* and *tender* do not meet the requirement of  $p > .05$ . None of the largest standard deviations of the two pieces were more than four times the size of the corresponding smallest, suggesting that follow-up ANOVAs are robust.

Post-hoc tests (Tukey HSD) were performed to examine individual mean difference comparisons across the six emotional states and the five emotionally laden music pieces. The results reported here were compared against a neutral emotional state and were all statistically significant ( $p < .05$ ). Results revealed that in general, participants preferred *happy* and *tender music* when in a *neutral emotional state*. However, in a *angry* or *disgusted state*, participants preferred

<sup>2</sup> Eerola and Vuoskoski [1] replaced disgust with tender, as disgust is rarely expressed by music. Music depicting surprise was omitted due to lack of statistical significance.

*angry* or *fearful music*. They also preferred *sad music* when they were feeling *sad*. Additionally, participants indicated a dislike of *happy* and *tender music* when they felt *angry*, *fearful*, or *disgusted*.

Follow-up ANOVAs were conducted to test for individual differences. Results revealed that in a neutral emotional state, participants who scored high on agreeableness tend to listen more to happy ( $F(1, 19.27) = 16.12, p < .001$ ) and tender ( $F(1, 11.89) = 11.40, p < .005$ ) music. When participants felt happy, the ones who scored high on openness tend to listen more to happy music ( $F(1, 9.02) = 8.85, p < .05$ ). Participants who scored high on neuroticism and felt disgusted tend to listen more to sad music ( $F(1, 12.73) = 8.47, p < .005$ ). Lastly when participants felt sad, and scored high on extraversion ( $F(1, 16.95) = 9.96, p < .005$ ), agreeableness ( $F(1, 13.29) = 7.81, p < .05$ ), or openness ( $F(1, 16.29) = 9.57, p < .005$ ), they tend to listen more to happy music.

## 5 Discussion

Our data show that the emotional state influences the (emotionally laden) music people listen to. In a neutral emotional state, happy and tender music is consumed more frequently. Additionally, findings indicate that people in general prefer emotionally laden music that is in line with their emotional state. Angry and fearful music is preferred when feeling angry or disgusted, whereas preference for happy and tender music decreases for these emotional states. Additionally, we found an increase of sad music in a sad state.

Taking personality traits into account, individual differences emerged. One of our findings showed that those who scored high on openness, extraversion, and agreeableness are more inclined to listen to happy music when they are feeling sad. In other words; they are trying to cheer themselves up with happy music. On the other hand, we found that those who are neurotic try to maintain their negative emotional state by listening to more sad songs.

In order to provide personalized music recommendations, we identified important individual differences that deviate from the notion that users desire to listen to music which is in line with their emotional state. By using personality to identify individual differences, we join the emergent interest of personality-based personalized systems. Several solutions have already been proposed to incorporate personality (e.g., [3, 4, 14]). For example, adaptation of the user interface of music recommender systems based on personality traits [4]. Also the extraction of emotion from social media is starting to establish (e.g., Twitter feeds [6]). Given our results there are several implications to consider. Music systems could anticipate the next song in the queue, or provide a list of recommendations, based on the user's current emotional state. This allows the system to better serve the user's music listening needs, and support their emotion regulation strategy.

Although we relied on self-report measures to assess emotions (emotion induction as well as music annotations) through an online platform, over 85% of the responses were in line with the original classifications that have been extensively tested priorly [1, 7]. This suggests that the used methods were effective.

Our results focused on individual differences of music preferences based on general emotional states. However, as Tamir and Ford [12] noted, emotion regulation strategies depend not only on individual differences, but also on the context that people are situated in. They found that people want to experience unpleasant emotions to attain certain instrumental benefits. That is, people want to feel bad when they expect it to give them benefits. For example, in confronting situations. We will address the influence of context in future work.

## 6 Acknowledgments

This research is supported by the Austrian Science Fund: P25655, and the EU FP7/2013-2016 through the PHENICX project under grant agreement 601166.

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