

# **Listen to the Music: The Emotive Strength of Music on Musicians and Non-Musicians**

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### **Abstract**

The aim of this study is to consider the role of music theory and performance proficiency in eliciting emotions by listening to music. A related aim is to consider how age, personality, musical preference and mood predicts the level of musical emotion felt by the listener. Ninety-three participants listened to 8 film excerpts and rated the emotional response elicited by the music excerpts. Linear regression tests revealed that music theory and performance proficiency, as separate variables, predict the level of emotion felt by the listener. Further multiple regression tests indicate that music theory proficiency is a stronger predictor of musical emotion than musical performance proficiency. Linear regression tests also suggested that participants with introverted personalities have a musical preference for music of an intense nature, like heavy metal and punk.

## **Introduction**

Music is a product of human processing mechanisms and has evolved to make use of these mechanisms (Deutsch, 1984) to allow individuals to enjoy and make music. In the Western World, the majority of people listen to music every day and this arouses emotions sometimes on a profound level (Juslin, 2013). Although Western music theory is an established and old tradition but the examination of music in a psychological setting is very new (Deutsch, 1984). There is also little examination of the processes that come from musical stimulus to experience emotion even though this is a time honoured tradition (M. Zentner, Grandjean, & Scherer, 2008). Gurney (as cited in M. Zentner, Grandjean, & Scherer, 2008) stated “the prime characteristic of music, the alpha and omega of its essential effect [is] its perpetual production in us of an excitement of a very intense kind, which yet cannot be defined under any known head of emotion”.

The ability for music to induce and express emotions is one of its most powerful motifs. Both common experiences and scientific research suggests that various emotions are attached to music from sorrow to overwhelming joy. From an ecological perspective, an individual’s ability to perceive music suggests that our ancestors depended on being able to detect patterns in sounds in order to adjust their behaviour accordingly (Juslin, 2013). The examination of music as an object of emotion is still a unknown area of research however, the power of music to induce and express emotions are the reasons why musical activities exist (Kallinen & Ravaja, 2015).

The majority of researchers agree that emotions are evoked in listeners of music. Gomez & Danuse (2007) who looked at the physiological response to music as well as examining the activation of the sub cortical and cortical brain areas. Zajonc, (1980) suggested that reactions can be elicited from virtually no cognitive processing and minimal stimulus however, other research suggests that the role of cognitive processing in the context musically

induced emotions is not clear (Kallinen & Ravaja, 2015). Other research conducted with regard to music and emotion includes physiological reactions like heart and breathing rate (Grewe, Nagel, Kopiez, & Altenmüller, 2007). As well as elevating arousal levels, music listening can also loosen arousal levels in the presence of stressors. The effects of music and the affective reactions to music can be seen in infants from 4 months of age (M. R. Zentner & Kagan, 1996). Furthermore, 6 month old infants showed an increase in salivary cortisol levels when their mother sang (Nakata & Trehub, 2004). This suggests that music has an important role in the formation of emotions from a young age.

Although psychological attributes of sound can be measured, it is more difficult to measure the perception of sound. In 1860, Gustav Fechner (as cited in Oxenham, 2013) attempted to create a way to establish the quantitative relationship between sensations and physical attributes allowing for techniques to be developed to examine sensations and perceptions created by music. Perceptions and sensations like vision, touch, taste and hearing are divided into two categories of measures, objective and subjective. For example, if an individual was to describe the loudness of music, they would be asked to give a description of the loudness by giving a ratio of measurement. This is a subjective measure. An objective measure, however, is the actual measurement of loudness by using scientific means (Oxenham, 2013).

Previous research suggests that music evokes complex emotions, some of which are deemed as sad and these types of music may be appealing to certain individuals with specific personality traits. For example, according to McCrae & Sutin (2009), individuals who have an openness to experience trait can be more sensitive to art and beauty. Furthermore, individuals who have a strong empathy trait are more likely to enjoy sad films (de Wied, Zillmann, & Ordman, 1995) and sad music (Vuoskoski & Thompson, 2012). Individuals who have a high score on the openness to experience personality dimension, they are more likely to respond to

music and feel the actual emotions when listening to music, especially positive ones (Liljeström, Juslin, & Västfjäll, 2013). An individual who associates positively with their emotional responding to music are more likely to be become absorbed in the music (Kreutz, Ott, Teichmann, Osawa, & Vaitl, 2007), whereas others feel no pleasure or little pleasure when listening to music (Mas-Herrero, Zatorre, Rodriguez-Fornells, & Marco-Pallarés, 2014).

To understand how music can evoke emotions in individuals, a closer examination of the interplay between music and the listener is required. This is important as an individual's response to music may depend on the function of the music in the specific situations (Sloboda, O'Neill, & Ivaldi, 2001). There are many factors that may attribute themselves to an individual's emotional response to music like musical training, personality and music preference (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008) .

### ***Emotion***

To examine sphere of study, emotion must be examined. Music uses different mechanisms to affect emotion; visual imagery, brain stem reflexes, episodic memory, evaluative conditioning, musical expectancy, cognitive appraisal and emotional contagion. According to an increasing consensus in the affective science, emotions are regarded as intense but brief responses to changes in the environment which have various sub-components from cognitive appraisal, like recognising that a situation is dangerous, subjective feelings like feeling afraid and regulation, where the individual regulates their heartbeat to calm themselves (Davidson, Scherer, & Goldsmith, 2003 as cited in Juslin et al., 2008). Most studies have used instrumental music to date presumably to minimise the influence of affective lyrics. There has been research, however, conducted using music containing lyrics (Västfjäll, 2001). In order to attest to the affect lyrics have on the induction of mood, Stratton & Zalanowski (1994) presented three

variants of Hammerstein and Kern's ballad 'Why Was I Born'. Participants were presented with the music, the lyrics or the music and lyrics together. They then rated the depressive and positive effect of the music by using the Multiple Affect Adjective Check List-Revised(MAACL-R). Between the three conditions, significant differences were found. For example, participants who listened to solely lyrics reported a depressive state as did participants who listened to both lyrics and music. Participants who listened to only music became less depressed and slightly more positive. The study suggests that lyrics provide cognitive priming and music can help intensify the mood (Västfjäll, 2001).

### *Personality*

Extensive research has been conducted into the underlying structure of personality with focus on extraversion and neuroticism, as well as negative and positive emotionality at both trait and state levels. According to Costa & McCrae (1980), neuroticism relative to extraversion is strongly associated with negative emotion whereas extraversion relative to neuroticism has a strong association with positive emotionality (Barrett et al., 2010b). Individuals who enjoy sad sounding music are open to experience whereas introverts have a high measure of empathy (Ladinig & Schellenberg, 2012) or absorption (Garrido & Schubert, 2011).

Further research has also been conducted examining the relationship between personality and musical preference. Results were most consistent for extraversion and openness-to-experience. Individuals with a high score in openness listen to a wider range of genres and individuals who are extraverted prefer upbeat, conventional, energetic or high-arousal genres like hard rock, pop and dance music (Dollinger, 1993).

### ***Mood***

Mood is sometimes measured before and after manipulation in order for a change score to be calculated (Lenton & Martin, 1991). It has been argued that as measurements of this kind are sensitive to different biases and therefore may not be completely accurate (Västfjäll, 2001). Research by Wildschut, Sedikides, Arndt, & Routledge, (2006) suggests that nostalgia can serve to counteract a negative mood as participants identified negative mood as a trigger of nostalgia. Therefore, this study suggests that individuals who initially have a negative mood may be more likely to experience nostalgia that has been evoked by music (Barrett et al., 2010b). As per research conducted by Friedman, Gordis, & Förster (2012), individuals who are in a sad mood are less likely to choose to listen to happy sounding music than individuals with a neutral or happy mood. In contrast, individuals who listens to various pieces of happy sounding pieces consecutively may then have a preference for sad sounding music (Schellenberg, Corrigall, Ladinig, & Huron, 2012).

### ***Music Preference***

Music preferences reflect basic avoidance responses and represent an individual liking for specific genres of individual pieces of music. Adult listeners generally prefer happy music more so than sad music (Husain, Thompson, & Schellenberg, 2002; Ladinig & Schellenberg, 2012). There are associated emotional benefits to listening to a preferred genre of music. It has also been suggested that individuals who are induced to feel anxious can reduce the level of anxiety felt if they listen to preferred music instead of sitting in silence (Walworth, 2003).

There have been issues with MMIP (musical mood induction studies) studies, as the music played in the study does not affect all participants in the same way. Some remain unaffected by listening to the music however, the manipulation highly affected some individuals. To counteract this, some researchers created different MMIP for different music tastes (Terezis,

1993) or allowed individuals to self-select from a prescribed list of music (Sutherland et al., 1982). In a study conducted Terezis, 12 different musical programs were created for six different music tastes: Class Rock, Country, Classical, Jazz, Progressive and Popular-Soul (Västfjäll, 2001). As this research suggests, if an individual experiences a sad mood in laboratory setting, their mood can improve by listening to self-selected happy sounding music. In addition, an effective way to change mood from negative to positive is by allowing the individual to self-select ""depressing"" music and this is believed to be more effective than other manipulations (Swaminathan & Schellenberg, 2015). When listening to music, older individuals experience more intense emotions when listening to happy music than younger adults. They also have a higher level of zygomatic EMG from listening to music that is deemed scary (Vieillard & Gilet, 2013).

### *Current Debate*

Current debate has examined music in many different areas of life, however, current debate focuses on music in everyday life. North, and Hargreaves (2004), conducted a study of 346 participants who were sent a text every day for 14 days. Upon receipt of the text, the participants completed a questionnaire about the music that they had heard since the last survey or music that was playing at that time. They found that participants generally listened to music while they were alone. Furthermore, the participant's music preference depended on whether the music was self-selected.

In other research conducted by Sloboda (1991), in which he investigated the formation of the feeling of chills when listening to music, results suggested that chills tend to appear when new or unprepared harmonies appear in music as well as textural or dynamic changes. Krumhansl (1997), asked 10 Cornell students to listen to music and to rate how sad the music made them feel on a sliding scale. The same experiment was conducted with 3 groups of 10

people, who were asked to respond via a sliding scale if the piece of music made them feel happy, fearful or tense, with each group being assigned a different emotion. Other research, conducted by Juslin & Laukka, (2004), examined the musical emotions felt in everyday life by 141 participants. Results suggested that participants listened to music in combination with other activities and listened to music several times a day. No one particular style of music dominated the emotional reactions which included relaxation, happiness, pleasure and sadness.

There are several key findings that suggest that there are emotional universal cues in music. Some cues are acoustic cues that are not specific to music or a genre of music but contribute to the way emotions are expressed in music. These cues can be heard in everyday expressive speech (Juslin & Laukka, 2003). According to Stalinski & Schellenberg (2012), emotions like fear and happiness, which are high arousal emotions, are easier for young children to recognise than peacefulness or sadness. However, by the age of 11 year old, children are able to recognise emotions in music as well as adults. Although older adults are able to identify positive emotions like younger adults (Laukka, 2007) they tend to lose their ability to recognise negative emotions around middle age. Their ability to recognise positive emotions, however, is stable across their life (Lima & Castro, 2011).

There has been debate as to whether music evokes utilitarian emotions like anger, happiness or surprise or if it evokes aesthetic emotions like awe and wonder (Swaminathan & Schellenberg, 2015). According to Scherer (2004), utilitarian emotions are cognitive appraisals that motivate adaptive action tendencies. Aesthetic emotions are not goal relevant and are feelings of subjective pleasure when presented with the structural characteristics of the stimulus (Swaminathan & Schellenberg, 2015). Eerola & Vuoskoski's (2011) study of 116 participants evaluated 110 film music excerpts and results suggested that sadness ratings correlated with beauty rating but not with happiness ratings. This suggests that beauty and aesthetic appreciation may be significant in the enjoyment of sad music (Vuoskoski & Thompson, 2012).

There has been much debate as to whether emotional responses to music are a result of something that is intrinsic to the music or if the resulting emotion is a result of cognitive appraisals (Ellsworth, P. C., & Scherer, Ellsworth, & Scherer, 2003). Some theorists, like Molnar-Szakacs & Overy (2006), suggest that emotions are induced with the need for cognitive function. They also suggest that emotions induced by music are a result of automatic mirroring of the listener to the motor movements of the musicians to communicate emotion. Other theorists like Rizzolatti & Sinigaglia (2010), suggest that automatic mirroring is served by the mirror-neuron system, which is seen across the cortical parieto-frontal motor regions. However, it must be reiterated that the emotions perceived by the listener may not be the emotion experienced by the listener and therefore, mirroring cannot be the only mechanism at work (Swaminathan & Schellenberg, 2015).

Positive and intense emotional responses to music are expected when the listener is listening to music with a friend or when the music is self-selected (Liljeström et al., 2013). Therefore, if the music is familiar to the listener, this will elicit a strong emotional response (Schellenberg & Peretz, 2008). Even though individuals generally avoid situations that may have a negative effect, many people like listening to sad music and therefore makes the concept puzzling. One argument is that although a piece of music may sound sad, it is the music's aesthetics that make the experience pleasurable (Garrison & Schubert, 2011 as cited in Swaminathan & Schellenberg, 2015). As per Eerola & Vuoskoski, (2011), sad music can sound beautiful and can improve sad mood states.

In addition to musical preference and self-selected music, an individual's current mood can influence the level of emotion felt. Konečni et al. (2008), was arguably the first study to examine the link between the participant's current mood and their perceived emotion to music. Participants were asked how they felt at the time of a certain event. Music was played and they were asked how they felt about the life event.

Familiarity with a piece of music can also be an influencing factor. According to Schubert, Hargreaves, & North (2014), before pleasure can be experienced when listening to music, the listener must be familiar with the music and must have a prior mental representation. Furthermore, an individual's preference for certain pieces or genres of music typically increases as a function of exposure (ZAJONC, 1968). Familiarity has been associated with elevated EDA (van den Bosch, Salimpoor, & Zatorre, 2013) with paralimbic, limbic and reward circuits of the brain activated (Pereira et al., 2011). Hofel (as cited in Juslin, 2013), suggests that for individuals to consider music as art or for music to elicit an emotional reaction, the music must surpass an aesthetic threshold. For example, a piece of music may be pleasing to the ear but if the music surpasses the aesthetic threshold, it may evoke an emotional response.

There is also an evident link between personality and musically evoked emotions. Research regarding personality and music is very slim. Dillinger (as cited in Kallinen & Ravaja, 2015) suggests that extroversion could be related to music with high arousal properties, like jazz. Ravaja (2004), also suggests that heightened arousal is elicited in extroverts when listening to high arousal stimuli, like rising background music, than individuals who have a lower score on the personality dimension related to extroversion. Furthermore, Ravaja & Kallinen (2004) found that there was an increase in pleasure and positive activation in participants who were prone to anxiety and neuroticism. They also found that background music had either beneficial or adverse effects on individuals dependent on the disposition although BAS sensitivity of the individual (Kallinen & Ravaja, 2015). In an experiment conducted by Vuoskoski & Eerola (2012), 16 excerpts of music were presented to 48 participants who then rated their emotional responses to the music. Sadness was the most salient emotion experience by the participants as well as wonder, peacefulness and nostalgia.

Furthermore, individuals who possessed personality traits like empathy and openness to experience preferred sad music, therefore suggesting that empathetic engagement and

aesthetic appreciation play a role in the enjoyment of sad music. Furthermore, individuals who prefer sad music have a heightened responsiveness to experiences of others and have an enhanced sensitivity to beauty and art and experience intense emotions when listening to sad music. Another point to note is that while individuals may feel sad when listening to sad music, it can also elicit a range of positive emotions with their foundations in aesthetic emotions (Vuoskoski & Thompson, 2012). According to Matthews and Gillian's, 1999, extroverts are more likely to seek stimulation to raise arousal to hedonic optimal levels. Rusting, 1988, also suggested that individuals process emotional stimuli in agreement with the emotional tone of their personality and are also attracted to stimuli or people that are similar to their own personality (Nass and Lee, 2001).

### ***Rationale***

Juslin suggests that current research only considers the emotion felt by an individual after they have listened to music. Therefore, previous studies have relied on aggregated and retrospective reports. However, this research will allow the participants to record their emotion in real time and therefore, will give more accurate description of musically induced emotion.

Higher order concepts which are found in cognitive inputs are more knowledge based than perceptual. This knowledge is organised into schemata, which store specific knowledge about music. Therefore, it can be surmised that the extent and nature of the cognitive input will vary depending of the expertise and the level of the expertise of the listener (Juslin, 2013). Juslin and Isaksson conducted research examining non-musician and musicians and the importance of different criteria when considering music as art. The research suggests that there was no one criterion that created the listeners aesthetic judgment to the music. Furthermore, certain criteria, like originality, skills, beauty were more important to the listener and the music

was judged under this criteria instead of other criteria, therefore different listeners focused on different criteria (Juslin, 2013).

Juslin (2013), suggested that musicians will base their musical preferences on music that they perceive as aesthetically pleasing. In contrast, individuals who are not musicians judge music as aesthetically pleasing based on their current musical preferences (Juslin, 2013). This indicates that a musician's training as an influence on the type of emotion they feel when listening to music. Although previous studies consider the predictive nature of music on perceived emotions, an individual's past musical training has not been taken into consideration. Examination of this subject has the potential to be interesting and important as it could give rise to more informed training techniques for musicians and non-musicians as well as elaborate on current music and emotion research.

Therefore, this study will attempt to examine individuals who have training in music performance, music theory, both or neither. Participants will be asked to rate the way they feel when listening to prescribed music. Therefore this study will examine if music training, both in theory and performance will be predictive of strong emotional response to music.

Further examinations will be conducted into the role of current mood, age, personality and musical preference and their predictive effect on the level of emotion felt by the listener.

### ***Hypotheses***

Hypotheses 1(a): Participants who are proficient in musical theory will have a stronger emotional reaction to music than participants who are not proficient in music theory.

Hypotheses 1(b): Participants who are proficient in musical performance will have a stronger emotional reaction to music than participants who are not proficient in music performance.

Hypotheses 1(c): Participants who are proficient in both musical theory and performance will have a stronger emotional reaction to music than participants who are proficient in either music theory or performance, or not proficient in either

Hypotheses 2(a): Participants with a high positive current mood will have a stronger emotional reaction to happy music than participants with a high negative current mood.

Hypotheses 2(b): Participants with a high negative current mood will have a stronger emotional reaction to sad music than participants with a high positive current mood

Hypotheses 3(a): Participants who are extroverted will experience a higher level of emotion when listening to happy songs.

Hypotheses 3(b): Participants who are introverted will experience a higher level of emotion when listening to sad songs.

Hypotheses 4(a): Personality will have an effect of musical preference

Hypotheses 5(a): Older participants will have a stronger emotional response to happy music than younger participants.

Hypotheses 5(b): Younger participants will have a stronger emotional response to nostalgic music than older participants.

## **Method**

To proceed with the study, ethical approval was sought and by Dublin Business School Ethical Board with regards to participants and methodology.

### ***Participants***

93 participants aged 18-67 years (mean = 28.89, standard deviation 10.77, 46 male and 47 female) took part in the experiment. An online survey shared on social media sites and participants were recruited via snowball sample. Participants were not selected according to previous musical training or background. The participants received no compensation for their participation.

### ***Measures***

Before stimuli was presented to the participants, participants were asked about their proficiency in music performance and music theory separately. Items on the scale were rated on a 10-point Likert scale (0=No Proficiency, 10=Highly Proficient. The participant's personality traits were then assessed by using "The Big Five Inventory" (John, O. P., & Srivastava, 1999)(see Appendix 1). The test was reduced to 8 questions to examine Extraversion and Introversion traits. Items on the scale were rated on a 5-point Likert scale (1=disagree strongly, 5=agree strongly). A Short Test of Music Preference (STOMP; Rentfrow & Gosling, 2003)(see Appendix 2) was conducted to assess the participants musical preferences. The test included 23 genres of music. These items were rated on a 5-point Likert scale (1=disagree strongly, 5=agree strongly).

In addition, the participant's current mood was assessed by using the Brief Mood Introspection Scale (Mayer & Gaschke, 2001) (see Appendix 3). 16 items were rated on a 5-point Likert scale (1=definitely do not feel, 5=definitely feel) with an additional item assessing overall current mood rated on a 10-point Likert scale (1=Very Unpleasant, 10=Very Pleasant).

In response to stimuli, the emotional response of each participant was assessed after each music excerpt by using The Geneva Emotional Music Scale (GEMS; (Zentner, Grandjean, & Scherer, 2008) (See Appendix 5). Each item was rated on a 5-point Likert scale (1=Not at All, 5=Very Much).

### ***Stimuli***

The stimulus material consisted of 8 film music excerpts representing transcendence, tenderness, sadness and tension (for excerpts, see Appendix 7). Film music was used as it is created to create powerful emotional cues. The excerpts were selected from film excerpts used selected by a panel of musicologists (see, Eerola & Vuoskoski, 2011).

### ***Procedure***

As the survey was conducted online, instructions were given to participants to wear earphones during the survey. Participants were required to consent to participation of survey and were unable to take part if consent was not given (see Appendix 6). Participants were also required to provide their age to continue with the survey to ensure that all participants were 18 and over.

Once demographic questions were answered, participants were required to confirm if they could play an instrument and then confirm their level of proficiency and asked to confirm their level of musical theory training. Participants were instructed to listen to each piece of music and then rate the emotion they experience immediately after the music stopped. The emotion ratings were collected by using The Geneva Emotional Music Scale (GEMS; (Zentner, Grandjean, & Scherer, 2008).

The following ethical considerations were made; all responses to the survey were anonymous and participants were advised of this before the survey began; participants were given the right to withdraw from the survey at any time; informed consent was obtained at the

start of the survey; and all data collected is relevant to the study and will be deleted once thesis has been submitted.

### *Apparatus*

The listening experiments were conducted in a location selected by the participant. This location was not disclosed by the participant. Stimuli were presented in the same order for each participant.

### *Design*

A correlational design was used for each of the hypotheses. The independent variables were age, musical theory proficiency, musical performance proficiency and current mood. The dependant variables were musical preference and emotional response. All variables were examined between subjects.

## Results

### *Descriptive analysis*

The survey questionnaire included questions assessing the participants age, gender, level of music theory and performance proficiency and overall mood.

**Table 1: Demographical variable descriptive**

Variable	N	Mean	SD	Min	Max
<b>Gender</b>					
<i>Male</i>	47	-	-	-	-
<i>Female</i>	46	-	-	-	-
Total	93				
<b>Age</b>					
	91	28.89	10.77	18	67
<i>Missing</i>	2	-	-	-	-
Total	93				
<b>Music Theory Proficiency</b>					
	93	4.01	2.67	1	10
<b>Music Performance Proficiency</b>					
	76	5.11	2.97	1	10
<i>Missing</i>	17	-	-	-	-
Total	93				
<b>Overall Mood</b>					
	93	6.76	10	3	1.51

Demographic descriptives below (see Table 1), show that the sample (N=93) consisted of 47 Males and 46 Females with no missing entries. Participants ages ranged from 18 to 67 ( $m = 28.89$ ,  $SD = 10.77$ ). Regarding music theory proficiency ( $m = 4.01$ ,  $SD = 2.67$ ) and music performance proficiency ( $m = 5.11$ ,  $SD = 2.97$ ), participants had a wide range of self-reported ability in each variable.

### *Inferential Analysis*

Hypotheses 1(a): Participants who are proficient in musical theory will have a stronger emotional reaction to music than participants who are not proficient in music theory.

A linear regression test was used to determine if music theory proficiency predicted a higher level of emotional reaction to music than participant who had no music theory proficiency. The result of the analysis found that music theory significantly predicted an emotional response to music ( $F(1,31) = 499.526$ ,  $p < 0.01$ ,  $R^2 = .942$ ) (Music Theory,  $\beta = .970$ ,  $p < .001$ , CI (95%) 1.023 -> 1.228). Therefore, the null hypothesis can be rejected.

In figure 1, it is clear that there results are in line with expected results.

Hypotheses 1(b): Participants who are proficient in musical performance will have a stronger emotional reaction to music than participants who are not proficient in music performance.

A linear regression test was conducted to assess if music performance theory predicted a higher level of emotion when listening to music than a participant who had no music performance proficiency. Analyses concluded that music performance significantly predicted musically evoked emotions ( $F(1,29) = 9.920$ ,  $p = 0.004$ ,  $R^2 = .255$ ) (Music Performance,  $\beta = .505$ ,  $p = .004$ , CI (95%) 0.149 -> 0.701). Therefore, the null hypothesis can be rejected (see figure 2).

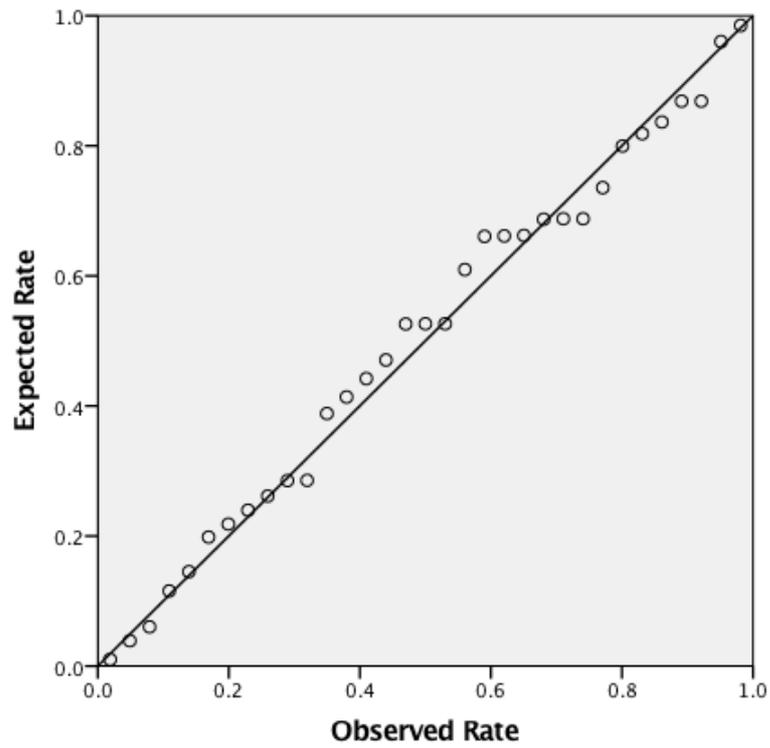


Figure 1: H1 (a) P-P Plot of Linear Regression. Dependant Variable – GEMS Overall Score

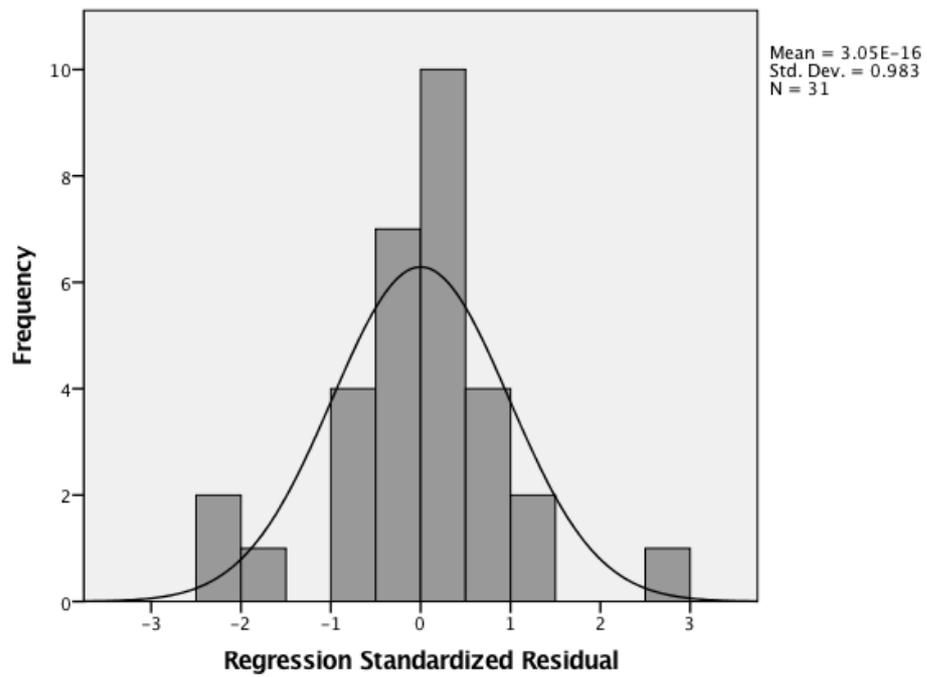


Figure 2: H1 (b) Histogram showing musical performance as a predictor for emotional response

Hypotheses 1(c): Participants who are proficient in both musical theory and performance will have a stronger emotional reaction to music than participants who are proficient in either music theory or performance, or not proficient in either

Multiple regression was used to test whether music theory proficiency and music performance proficiency were predictors of musically evoked emotions. The results of the regression indicated that two predictors explained 94% of the variance ( $R^2 = .94$ ,  $F(2, 28) = 240.247$ ,  $p < .001$ ). It was found that musical theory proficiency significantly predicted musically evoked emotions ( $\beta = 1.007$ ,  $p < .001$ , 95% CI = 1.046, 1.303) however musical performance proficiency is not predict musically evoked emotions ( $\beta = -.064$ ,  $p = .241$ , 95% CI =  $-.147, .038$ ). Therefore, the null can be rejected (see figure 3).

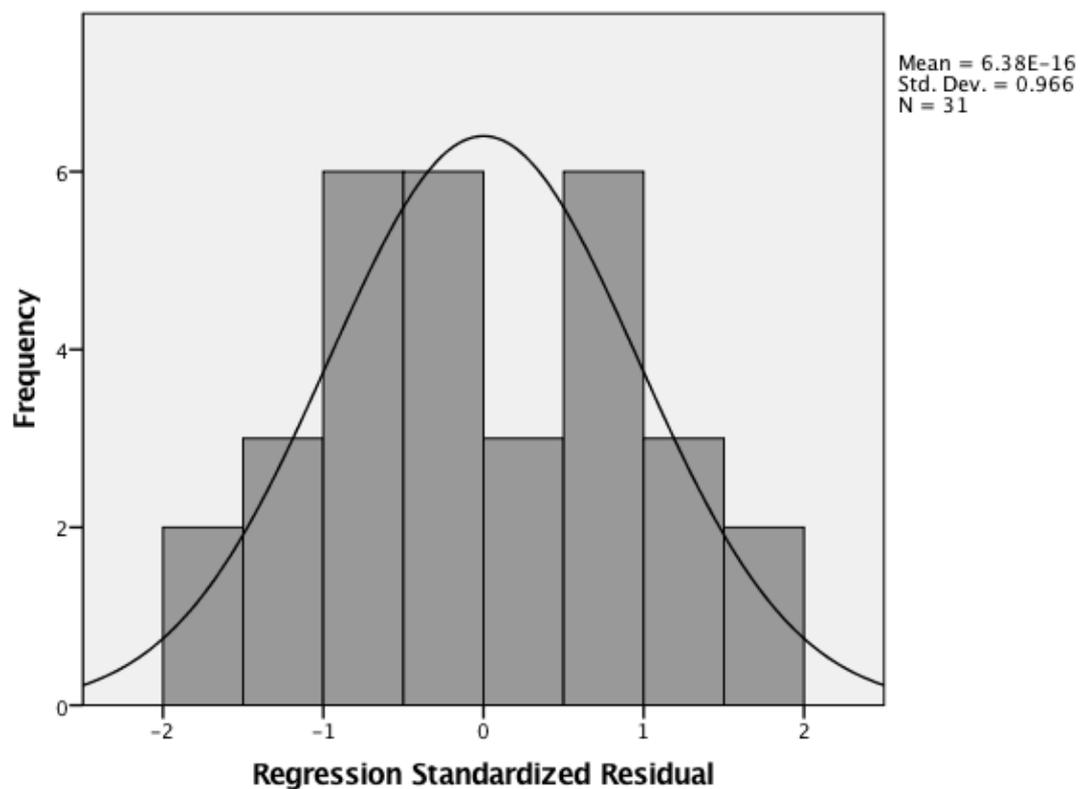


Figure 3: H1(c) Histogram showing music theory and proficiency predicting overall GEMS score.

Hypotheses 2(a): Participants with a high positive current mood will have a stronger emotional reaction to happy music than participants with a high negative current mood.

A Mann-Whitney U test revealed that the Positive Mood (mean rank = 34.2) condition and the Negative mood (mean rank = 25) condition did not differ significantly ( $z = -1.55$ ,  $p = .122$ ) when predicting an individual's feeling of happiness or transcendence when listening to music. Therefore, the null can be accepted.

Hypotheses 2(b): Participants with a high negative current mood will have a stronger emotional reaction to sad music than participants with a high positive current mood

A Mann-Whitney U test revealed that the Positive Mood (mean rank = 39.9) condition and the Negative mood (mean rank = 29.12) condition did not differ significantly ( $z = -1.62$ ,  $p = .106$ ) when predicting an individual's feeling of happiness or transcendence when listening to music. Therefore the null can be accepted.

Hypotheses 3(a): Participants who are extroverted will experience a higher level of emotion when listening to happy songs.

A linear regression test found that participants with a higher level of extroversion did not significantly predict the level of emotion felt while listening to happy song ( $F(1,61) = 9.45$ ,  $p = .523$ ,  $R^2 = 0.01$ ) (BFI Total,  $\beta = .92$ ,  $p = .472$ ,  $CI(95\%) = -.882 \rightarrow 1.883$ ). Therefore the null can be accepted.

Hypotheses 3(b): Participants who are introverted will experience a higher level of emotion when listening to sad songs.

A linear regression test was conducted found that participants with a higher level of introversion did not significantly predict the level of emotion felt while listening to sad music

( $F(1,72) = .065$ ,  $p = .799$ ,  $R^2 = 0.01$ ) (BFI Total,  $\beta = .030$ ,  $p = .799$ , CI(95%) - .352 -> .455).

Therefore the null can be accepted.

#### Hypotheses 4 - Personality will have an effect of musical preference

To test whether a participant's personality as a predictor of musical preference, five genres of music were examined; Intense, Sophisticated, Unpretentious, Mellow and Contemporary music. All five genres were tested separately by using a linear regression test.

It was found that personality significantly predicted preference towards Intense Music ( $F(1,88) = 4.306$ ,  $p = 0.041$ ,  $R^2 = .47$ ) (BFI Total,  $\beta = -.216$ ,  $p < .041$ , CI (95%) -0.609 -> 0.13).

Therefore, participants who are deemed introverted are more likely to prefer music like Punk, Rock and Heavy Metal (see Table 2).

Furthermore, it was found that there is no significant relationship between personality and sophisticated music ( $F(1,89) = .209$ ,  $p = 0.591$ ,  $R^2 = .003$ ) (BFI Total,  $\beta = -0.057$ ,  $p = 0.591$ , CI (95%) -0.378 -> 0.217).

A linear regression also found that there is no significant relationship between personality and unpretentious music ( $F(1,90) = 2.813$ ,  $p = .097$ ,  $R^2 = .030$ ) (BFI Total,  $\beta = .174$ ,  $p = 0.097$ , CI (95%) -0.41 -> 0.482).

There is also no significant relationship between BFI Total and Mellow music ( $F(1,89) = .191$ ,  $p = .663$ ,  $R^2 = .002$ ) (BFI Total,  $\beta = -0.46$ ,  $p = .663$ , CI (95%) -0.298 -> 0.191) or between personality and contemporary music ( $F(1,90) = .433$ ,  $p = .512$ ,  $R^2 = .005$ ) (BFI Total,  $\beta = -0.69$ ,  $p = .512$ , CI (95%) -0.190 -> 0.377).

**Table 2: Linear Regression showing regression for personality and intense musical preference**

Model	Unstandardised B	Standardised Coefficients Beta	t	Sig.	95% Confidence Interval for B	
					Lower Bound	Upper Bound
Constant	5.218	.478	10.923	.000	4.269	6.168
BFI Total	-.311	.150	-2.075	.041	-.609	-.013

Hypotheses 5(a) - Older participants will have a stronger emotional response to happy music than younger participants

And

Hypotheses 5(b) - Younger participants will have a stronger emotional response to nostalgic music than older participants.

Separate linear regression tests were conducted, which found that there is no significant relationship between age and feelings of transcendence ( $F(1,60) = .568, p = .454, R^2 = .009$ ) (Age, beta = 0.97,  $p = .454$ , CI (95%) -0.066 -> 0.145) or between age and feelings of sadness ( $F(1,71) = .116, p = .734, R^2 = .002$ ) (Age, beta = -0.40,  $p = .734$ , CI (95%) -0.038 -> 0.027) or between age and feelings of sadness ( $F(1,71) = .116, p = .734, R^2 = .002$ ) (Age, beta = -0.40,  $p = .734$ , CI (95%) -0.038 -> 0.027). Therefore, the null is accepted.

**Discussion**

The aim of this study was to examine the predictive effects of personality on musical preference and age, personality, current mood and musical preference on musical emotion. This study suggests that although age, personality and current mood do not predict musical emotion, the level of musical theory and performance proficiency may be predictors of musically evoked emotion. In terms of musical preference, despite indications from previous research that personality can predict musical emotion, it seems that personality cannot predict musical preference even when closely linked with the emotion felt by the listener. Therefore, critiques of this study must be made.

Music may not be the only force at work when trying to elicit emotions. For example, musically-evoked emotions may arise when an individual listens to the music and remembers an event in their past. As discussed in previous literature (Barrett et al., 2010a), the felt or perceived emotion may be based on the memory more-so than the music itself. To ensure that the emotions created are based on the music alone, a more robust questionnaire should be created asking if the individual had heard it before and then asked if it the music provoked a memory. Furthermore, specially created music should be used to ensure that the participant has never heard the music before. The possibility that the music-evoked emotion is a result of musical attributes in particular songs cannot be ruled out (Barrett et al., 2010a).

***Strengths***

As discussed, previous research examined the demographical and personality variables and their role in musically evoked emotion. However, no other study has considered the role of previous musical theory or performance training and possible role these variables may have in emotion.

### *Limitations*

Limitations of the study are varied and have strong connections to the nature of sound. The ability to characterise a psychical stimulus is inhibited by theories currently being developed as to how stimulus is processed. There are also no criteria to distinguish between bad or good music, or music and non-music. Furthermore, according to Deutsch (1984), past experiences have an influence on how music is perceived. Therefore, in order to conduct thorough and robust examination of the psychology of music, a careful definition is required to examine the relevance of psychological experimentation to music theory (Deutsch, 1984).

Research pertaining to mood has taken many shapes from examinations of mood before and after the experiment (Lenton & Martin, 1991) to research that sampled mood at different intervals across the experiment (Albersnagel, 1988). Mood measurements are, however, sensitive to a number of biases (Västfjäll, 2001). There has been support in using multiple scales to measure mood induction. For example, Izard (1992), suggested that other moods may arise that attenuates, interacted or amplifies the original mood state (Västfjäll, 2001).

An individual's nostalgic experience may be influenced by their familiarity with a given song. In a study by Janata, (2009) 3% of unfamiliar songs evoked an autobiographical memory. Autobiographical memories are inherently linked with nostalgia (Wildschut et al., 2006) and therefore nostalgia may be indirectly linked to song familiarity (Barrett et al., 2010b).

Another limitation of the study is that the labels given to describe emotion felt are dependent on the views of participants in other studies (Scherer, 2004) and therefore the emotion label is not specific to each participant. It may be worth examining to effectiveness of qualitative examination to ensure that emotion labels stated by the participant are most suitable for each participant (M. Zentner et al., 2008). Furthermore, specific questions about the type of emotion felt i.e. felt or perceived, should have been asked during the survey allowing the results to be deciphered by examining felt and perceived emotions.

As this study examines the role of music in an individual vacuum, it does not engage with previous research like Grewe, Katur, Kopiez, & Altenmüller (2011) and Panksepp, (1995) where the importance of familiarity is examined. Grewe et al., found that there was a lower occurrence of chills when playing the piece ("Making Love out of Nothing at All" by Air Supply). In contrast, Panksepp's research, participants have a high familiarity and preference for the piece of music at that time. Conflicting testing environments may account for the change in results as participants in Panksepp's experiment tested participants are part of a group whereas Grewe et. al tested participants on an individual basis and therefore, did not consider the role of social surroundings in the reporting of familiarity to music (Egermann et al., 2011).

### ***Further Research***

Further research could examine the musical structures within music and identify the characteristics of music that is deemed sad, pleasurable or happy. Musical structures like timbre, pitch, range and volume could be examined along with the effect of certain musical instruments in music-evoked emotion (Deutsch, 1984). According to Oxenham (2013), pitch is an important structure of music. Melody is created by sequences of pitches whereas simultaneous combinations of pitches create harmony. This could be another variable to consider in further research (Oxenham, 2013). Music theorist Kraehenbuehl & Meyer (1957) argued that musical structure should be "viewed in terms of implications generated by pitch events that are realised by further pitch events". Again, this could be considered as another area of further research and could link in with musical structures (Deutsch, 1984). Other physiological measurements that could be taken is sound intensity measured at the eardrum however, this could be influenced by the duration for the piece as well as the context in which it is presented (Oxenham, 2013).

The role of culture in music could also affect music evoked emotion. According to Juslin (2013), specific styles of music are created by learned schemata which in turn creates musical expectancy. Musical expectancy can differ from culture to culture and therefore a reaction to one piece of music may be different across different cultures (Juslin, 2013) 244. As suggested by Barrett et al., (2010), autobiographical salience can create a stronger emotional effect in individuals who are prone to nostalgia. This study should be reconnected with a higher level of examination directed towards the personality of the individual. Furthermore, according to Juslin & Västfjäll (2008), events which are urgent, novel, compatible with the norm, coping potential and goal congruence, can elicit emotions from cognitive evaluation. Social influence effects the evaluation process as social acceptance is important to humans and norms are social determined (Aronson, Wilson, & Akert, 2010).

Support for EDA measuring of responses can be taken from Hunter et al. (2010 as cited in (Swaminathan & Schellenberg, 2015), which suggested that self-reports can be contaminated by confusions between experienced emotions and perceived emotions. By using self-reporting, participants sometime confuse felt and perceived emotions, therefore further research may consider the use of EDA, electro-dermal activity, to measure respiration and heart rate as previously used in studies by Rickard (2004) and Gomez & Danuser (2004). In research conducted by Anne J. Blood, Zatorre, Bermudez, & Evans (1999) and A. J. Blood & Zatorre (2001) patterns of activation were revealed via brain imaging which is associated with emotional arousal of the limbic system (Swaminathan & Schellenberg, 2015). As suggested by Evans & Schubert, (2008), emotions are more strongly perceived than experienced and therefore it could be argued that perceived and felt emotions, may also differ qualitatively (Swaminathan & Schellenberg, 2015). Therefore the most glaring opportunity for further research is to decipher between emotions perceived and emotions felt (Deutsch, 1984).

### ***Implications***

The results of this study have implications in the field of music training as an individual's performance of a piece may be influenced by the level of emotion felt when playing or when attempting to play for the first time after listening to a certain piece of music. Furthermore, as the study suggests, individuals with music theory also experience a higher level of emotion when listening to music indicating that a knowledge of music theory may be enough to consider music in different forms, from performance to notation.

### ***Conclusion***

In conclusion, this study considers the implications of personality on musical preference and age, personality, current mood and musical preference on musical emotion. Despite results suggesting that musical theory and performance proficiency are clear predictors of musical emotion, further study is required to reduce influencing factors.

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## Appendix

### Appendix 1

#### The BIG Five Inventory (BFI)

#### How I am in general

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement.**

1	2	3	4	5
Disagree	Disagree	Neither agree	Agree	Agree
Strongly	a little	nor disagree	a little	strongly

#### I am someone who...

- \_\_\_\_\_ Is talkative
- \_\_\_\_\_ Tends to find fault with others
- \_\_\_\_\_ Does a thorough job
- \_\_\_\_\_ Is depressed, blue
- \_\_\_\_\_ Is original, comes up with new ideas
- \_\_\_\_\_ Is reserved
- \_\_\_\_\_ Is helpful and unselfish with others
- \_\_\_\_\_ Can be somewhat careless
- \_\_\_\_\_ Is relaxed, handles stress well.

- \_\_\_\_\_ Is curious about many different things
- \_\_\_\_\_ Is full of energy
- \_\_\_\_\_ Starts quarrels with others
- \_\_\_\_\_ Is a reliable worker
- \_\_\_\_\_ Can be tense
- \_\_\_\_\_ Is ingenious, a deep thinker
- \_\_\_\_\_ Generates a lot of enthusiasm
- \_\_\_\_\_ Has a forgiving nature
- \_\_\_\_\_ Tends to be disorganized
- \_\_\_\_\_ Worries a lot
- \_\_\_\_\_ Has an active imagination
- \_\_\_\_\_ Tends to be quiet
- \_\_\_\_\_ Is generally trusting
- \_\_\_\_\_ Tends to be lazy
- \_\_\_\_\_ Is emotionally stable, not easily upset
- \_\_\_\_\_ Is inventive
- \_\_\_\_\_ Has an assertive personality
- \_\_\_\_\_ Can be cold and aloof
- \_\_\_\_\_ Perseveres until the task is finished
- \_\_\_\_\_ Can be moody
- \_\_\_\_\_ Values artistic, aesthetic experiences
- \_\_\_\_\_ Is sometimes shy, inhibited
- \_\_\_\_\_ Is considerate and kind to almost everyone
- \_\_\_\_\_ Does things efficiently
- \_\_\_\_\_ Remains calm in tense situations

- \_\_\_\_\_ Prefers work that is routine
- \_\_\_\_\_ Is outgoing, sociable
- \_\_\_\_\_ Is sometimes rude to others
- \_\_\_\_\_ Makes plans and follows through with them
- \_\_\_\_\_ Gets nervous easily
- \_\_\_\_\_ Likes to reflect, play with ideas
- \_\_\_\_\_ Has few artistic interests
- \_\_\_\_\_ Likes to cooperate with others
- \_\_\_\_\_ Is easily distracted
- \_\_\_\_\_ Is sophisticated in art, music, or literature

## SCORING INSTRUCTIONS

To score the BFI, you'll first need to **reverse-score** all negatively-keyed items:

Extraversion: 6, 21, 31  
 Agreeableness: 2, 12, 27, 37  
 Conscientiousness: 8, 18, 23, 43  
 Neuroticism: 9, 24, 34  
 Openness: 35, 41

To recode these items, you should subtract your score for all reverse-scored items from 6. For example, if you gave yourself a 5, compute 6 minus 5 and your recoded score is 1. That is, a score of 1 becomes 5, 2 becomes 4, 3 remains 3, 4 becomes 2, and 5 becomes 1.

Next, you will create scale scores by **averaging** the following items for each B5 domain (where R indicates using the reverse-scored item).

Extraversion: 1, 6R 11, 16, 21R, 26, 31R, 36

Agreeableness: 2R, 7, 12R, 17, 22, 27R, 32, 37R, 42

Conscientiousness: 3, 8R, 13, 18R, 23R, 28, 33, 38, 43R

Neuroticism: 4, 9R, 14, 19, 24R, 29, 34R, 39

Openness: 5, 10, 15, 20, 25, 30, 35R, 40, 41R, 44

## Appendix 2

### Short Test of Musical Preferences (STOMP)

Please indicate your basic preference for each of the following genres using the scale provided.

1-----	2-----	3-----	4-----	5-----	6-----	7
Dislike	Dislike	Dislike a	Neither like	Like a	Like	Like
Strongly	Moderately	Little	nor dislike	Little	Moderately	Strongly

- \_\_\_\_\_ Alternative
  - \_\_\_\_\_ Bluegrass
  - \_\_\_\_\_ Blues
  - \_\_\_\_\_ Classical
  - \_\_\_\_\_ Country
  - \_\_\_\_\_ Electronica/Dance
  - \_\_\_\_\_ Folk
  - \_\_\_\_\_ Funk
  - \_\_\_\_\_ Gospel
  - \_\_\_\_\_ Heavy Metal
  - \_\_\_\_\_ World/International
  - \_\_\_\_\_ Jazz
  - \_\_\_\_\_ New Age
  - \_\_\_\_\_ Oldies
  - \_\_\_\_\_ Opera
  - \_\_\_\_\_ Pop
  - \_\_\_\_\_ Punk
  - \_\_\_\_\_ Rap
  - \_\_\_\_\_ Reggae
  - \_\_\_\_\_ Religious
  - \_\_\_\_\_ Rock
  - \_\_\_\_\_ Soul/R&B
  - \_\_\_\_\_ Soundtracks/themesong
-

Music preference dimensions scoring:

Mellow: 6, 11, 13

Unpretentious: 5, 16, 20

Sophisticated: 2, 3, 4, 7, 9, 12, 15

Intense: 1, 10, 17, 21

Contemporary: 8, 18, 19, 22

To calculate score on each dimension, total scores for each item listed above and divide by number of items (take the mean).

**\*\*NOTE:** “Oldies” and “Soundtracks/Theme Songs” genres are often excluded from data analyses as they may include many genres of music.

**Appendix 3**

## Brief Mood Introspection Scale (BMIS)

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INSTRUCTIONS: Circle the response on the scale below that indicates how well each adjective or phrase describes your present mood.

(definitely do not feel) (do not feel) (slightly feel) (definitely feel)

XX X V VV

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Lively XX X V VV Drowsy XX X V VV

Happy XX X V VV Grouchy XX X V VV

Sad XX X V VV Peppy XX X V VV

Tired XX X V VV Nervous XX X V VV

Caring XX X V VV Calm XX X V VV

Content XX X V VV Loving XX X V VV

Gloomy XX X V VV Fed up XX X V VV

Jittery XX X V VV Active XX X V VV

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Overall, my mood is:

Very Unpleasant

Very Pleasant

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

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## Appendix 4

### The Geneva Emotional Music Scale (GEMS)

#### Instructions

When providing your ratings, please describe how the music you listen to makes you feel (e.g., this music makes me feel sad). Do not describe the music (e.g., this music is sad) or what the music may be expressive of (e.g. this music expresses sadness). Keep in mind that sometimes a piece of music can be sad or can sound sad without making you feel sad. Please rate the intensity with which you felt each of the following feelings on a scale ranging from 1 (not at all) to

5 (very much). If you should find that one or more important labels are missing from the list to describe what you feel, please add those at the end and give it a rating (NN).

1 - Not at all

2 - Somewhat

3 - Moderately

4 - Quite a lot

5 - Very Much

1. \_\_\_\_\_ Moved

2. \_\_\_\_\_ Fascinated

3. \_\_\_\_\_ Strong

4. \_\_\_\_\_ Tender

5. \_\_\_\_\_ Nostalgic

6. \_\_\_\_\_ Serene

7. \_\_\_\_\_ Animated

8. \_\_\_\_\_ Sad

9. \_\_\_\_\_ Tense
10. \_\_\_\_\_ Bouncy
11. \_\_\_\_\_ Filled with Wonder
12. \_\_\_\_\_ Sentimental
13. \_\_\_\_\_ Affectionate
14. \_\_\_\_\_ Overwhelmed
15. \_\_\_\_\_ Agitated
16. \_\_\_\_\_ Feeling of Transcendence
17. \_\_\_\_\_ Calm
18. \_\_\_\_\_ Joyful
19. \_\_\_\_\_ Tearful
20. \_\_\_\_\_ Soothed
21. \_\_\_\_\_ Energetic
22. \_\_\_\_\_ Dreamy
23. \_\_\_\_\_ Mellowed (Softened-up)
24. \_\_\_\_\_ Allured
25. \_\_\_\_\_ Triumphant
26. \_\_\_\_\_ Happy
27. \_\_\_\_\_ Inspired
28. \_\_\_\_\_ In love
29. \_\_\_\_\_ Melancholic
30. \_\_\_\_\_ Fiery
31. \_\_\_\_\_ Meditative
32. \_\_\_\_\_ Feel like dancing
33. \_\_\_\_\_ Dazzled

34. \_\_\_\_\_ Sorrowful
35. \_\_\_\_\_ Chills (shivers & goose bumps)
36. \_\_\_\_\_ Irritated
37. \_\_\_\_\_ Amused
38. \_\_\_\_\_ Heroic
39. \_\_\_\_\_ Relaxed
40. \_\_\_\_\_ Feeling of Spirituality
41. \_\_\_\_\_ Sensual
42. \_\_\_\_\_ Stimulated
43. \_\_\_\_\_ Nervous
44. \_\_\_\_\_ Admiring
45. \_\_\_\_\_ Impatient
- (X.) \_\_\_\_\_ Blue
- (Y.) \_\_\_\_\_ Amazed
- (Z.) \_\_\_\_\_ In awe
- NN \_\_\_\_\_

#### Scoring Instructions for GEMS-45

Items belonging to each musical emotion category are as follows:

Wonder: 1, 11, 24, 26, 33, 44 (Y & Z are optional items created for the English version)

Transcendence: 2, 14, 16, 27, 35, 40

Power: 3, 21, 25, 30, 38

Tenderness: 4, 13, 23, 28, 41

Nostalgia: 5, 12, 22, 29

Peacefulness: 6, 17, 20, 31, 39

Joyful Activation: 7, 10, 18, 32, 37, 42

Sadness: 8, 19, 34, (X, optional item)

Tension: 9, 15, 36, 43, 45

## Appendix 5

Thank you for taking time to participate in this study examining music and it's effect on emotion.

The aim of this study is to test the effects of music on emotions. The survey is split into 2 parts. The first part asks basic demographic questions along with questions about personality type, emotional cognition and musical preferences. The second part of the survey is all about music and the emotions felt when listening to this music. The tests are designed to measure your emotional response to music and should be taken consecutively with no break in between.

Participation in this survey is completely voluntary and you are able to leave and withdraw your participation at any time. All information given is anonymous and kept in the strictest confidence.

The survey should take no longer than 15 minutes. Please ensure that all music is listen through earphones. If you wish to be included in this survey, you will be asked to sign and date a consent form. Please note participants should be aged 18 or over.

If necessary, here are some helpful resources that you can use for support. Samaritans: [www.samaritans.org/](http://www.samaritans.org/) 01116 123

If you have any questions, or would like to find out what the results of this study, please contact Rebecca Hammond at xxxxxx@mydbs.ie.

## Appendix 6

I have read the information with regards to the following survey and confirm that any questions I may have had have been answered. I therefore give my consent to participate in this study.

I confirm that my participation is entirely voluntary and I can withdraw at any time during the survey without penalty.

Selecting the 'agree' option below indicates that: • You have read the above information •

You voluntarily agree to participate • You are at least 18 years of age

**If you do not wish to participate in the research study, please decline participation by selecting the "disagree" option.(Please select your choice below by clicking the appropriate tick box) \***

*Tick all that apply.*

I agree

I disagree

## Appendix 7

### List of Excerpts Used

Excerpt	Emotion	Soundtrack Name	Track	Time	Duration
F1	Scary	The Alien Trilogy	9	00:00 – 00:56	56s
T1	Tender	The Godfather III	5	01:13 – 02:19	66s
H1	Happy	Dances with Wolves	10	00:00 – 00:46	46s
S1	Sad	Running Scared	15	01:45 – 02:40	55s
T2	Tender	Pride & Prejudice	1	00:10 – 00:49 L*	77s
F2	Scary	Batman Returns	5	00:00 – 00:46	46s
S2	Sad	The Portrait of a Lady	9	00:00 – 00:23 L*	45s
H2	Happy	The Untouchables	6	01:26 – 02:06 L*	72s

\*L = Looped