The Relationship between Personality, Individual Differences and the Experience of Emotions Evoked by Music that Elicits Visual Mental Imagery

(Project Thesis)

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Abstract

Investigators suggest that there are at least eight possible mechanisms underlying the emotional responses that many individuals experience when listening to music. One proposed mechanism is *visual imagery*. It is thought that due to the contiguity of visual and auditory information, strong associations develop between these two modalities so that musical sounds may evoke visual mental images, which in turn may arouse certain feelings such as happiness and surprise. As individuals vary in their ability to experience visual mental imagery, it follows that these individual differences are evident when people listen to music. The aim of this project was to explore individual differences that may predict visual mental imagery while listening to music that induces a variety of emotions in the listener. One hundred and twenty first-year psychology participants completed a battery of self-report questionnaires which were designed to assess current mood and specific personality traits such as absorption and empathy and trait visual imagery. Participants also listened to four musical excerpts previously rated as representing Happy, Scary, Sad and Angry discrete emotions and recorded responses after each excerpt. Qualitative data for visual imagery experiences were collected. Regression analyses indicated that *Absorption* was predictive of *Intensity of Visual Imagery* for Happy, Scary and Angry music, while *Fantasy* (Interpersonal Reactivity Index; Davis, 1980);, *NA* (PANAS; Watson, Clark & Tellegen,1988) and *rBAS* (revised Behavioural Activation Scale; Jackson, 2009), predicted *Intensity of Emotion Felt* for these stimuli. However a different pattern emerged for Sad music as *Trait Imagery,* along with *Fantasy* and *Absorption* were predictive of the two DVs. Results for the Sad stimulus also contrasted with those for the other three stimuli in the repeated-measures ANOVAs that were conducted. Finally, the qualitative data indicated that subjective visual imagery experiences of the participants were most detailed and vivid for the Sad

music condition. Therefore the results of this study provide support for the view that sad music elicits more complex and aesthetic feelings and also provide tentative support for the hypothesis that visual imagery may be one of the psychological mechanisms involved in the musical elicitation of emotions.

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STATEMENT OF CANDIDATE

This thesis has not been submitted for a higher degree at any other university or institution.

To the best of my knowledge and belief, the thesis contains no material previously published or written by another author except where due reference is made.

An approval for the research has been obtained from the Macquarie University Ethics Committee. The protocol number is: 5201400452.

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1. Introduction

1.1 Why study Music Emotions and Individual Differences?

Fascination with the connection between music and emotions has been documented throughout history (Garrido & Davidson, 2013) and in recent years this interest has rapidly expanded in the fields of psychology, cognitive science and the neurosciences (Brattico & Pearce, 2013; Koelsch, 2010; Chanda & Levitin, 2013). Music is applied in Music Therapy (Thaut & Wheeler, 2010), Nursing and Medicine (Robb, Burns & Carpenter, 2011) to regulate mood, assist with pain relief and improve well-being. Moreover, the increasing accessibility of portable listening devices and digital downloads has led to a massive increase in money spent on music over the last ten years (Rentfrow, 2012), highlighting the popularity of this activity, part of which may be due to the fact that some people listen to music as a means of regulating their moods and emotions (Rentfrow, 2012; Rentfrow & Gosling, 2003; Juslin & Västfjäll, 2008).

However, while research documenting participants' reported experiences of strong feelings and intense physical reactions associated with music listening (Gabrielsson, 2010) provides support for the hypothesis that music can influence and arouse emotions, the situation is complicated by the variety of different definitions and theories of emotion in the literature (Moors, 2009), together with the different methodological approaches taken by researchers. In addition to this, there are still many unanswered questions as to how music induces emotions in terms of the psychological mechanisms underlying emotional responses to music listening (Juslin et al., 2008). Moreover, further complexity is raised by Scherer and Zentner's (2001) view that musical emotions are explained by an interaction between the music, the listener and the situation. This suggests that in order to come to an understanding of how music elicits emotions, the researcher must consider not only the psychological

effects of the acoustic and structural features evident in a specific piece but also, the individual differences in the listener such as personality factors, musical preferences and cultural background; as well as the listener's current mood, whether the individual is alone, at a concert or at a party with friends. The aim of this study, therefore, is to further explore how specific individual differences may interact with the psychological mechanisms generated by musical features to influence an individual's affective state.

1.1.1 What are emotions?

The emotion research field is quite extensive featuring a broad range of approaches and their associated definitions. One common definition states that an emotion is "a subjective conscious experience (the cognitive component) accompanied by bodily arousal (the physiological component) and by characteristic overt expressions (the behavioural component)", (Weiten, 2010, p.G-3). Another suggests that emotions are "multi-component responses to challenges or opportunities that are important to the individual's goals, particularly social ones" (Oatley, Keltner & Jenkins, 2006; p.29). 'Affect' is often used as a general term to refer to emotions, moods, states and preferences (Oatley, et al., 2006). Emotions are generally considered to occur in episodes that last from several minutes to hours, while other relevant affective experiences such as moods (which are emotional states or dispositions), may last for longer periods of time such as hours or days. On the other hand, traits are emotional and behavioural characteristics that tend to be relatively stable over time and in unique combinations form the basis of personality.

Moors (2009) recently organised emotion theories into eight separate categories that are differentiated by theorists' explanations for emotion causation. Of the eight categories discussed in Moors' article, three that have featured regularly in research involving music and emotions are theories of 'discrete' or 'basic emotions' developed by Ekman (1992), Izard (1993) and Panksepp (2003); Barrett's conceptual act theory (Barrett, 2006b) which features

a dimensional model approach, incorporating Russell's circumplex model (1980), and his core affect theory (2003); and Appraisal Theories of which Scherer (2001) has been one of the main proponents. Like many theorists, Russell (2003) suggests that prototypical emotional episodes are component-based, featuring an antecedent event and a number of affective, physiological and expressive changes, cognitions and actions that together form an emotional episode. Barrett's "conceptual-act model" expanded upon this view, proposing that discrete, categorical emotions arise as core affective states are conceptually analysed (Barrett, 2006). This approach is similar to views expressed by some appraisal theorists.

Therefore, to cater for the diversity of proposed emotional models and definitions, Juslin has adopted a broad definition of emotions (2011, p.114; Sloboda & Juslin, 2010; p.74) where emotions are

> relatively brief, intense, and rapidly changing reactions to potentially important events (subjective challenges or opportunities) in the external or internal environment – often of a social nature – which involve a number of subcomponents (cognitive changes, subjective feelings, expressive behaviour, and action tendencies) that are more or less 'synchronized' during an emotional episode.

Thus, having provided a brief outline of theories relevant to the research of music and emotions, a review of studies that have applied these theories follows.

1.1.2 Emotions in Music Studies

Music has been known to elicit emotions throughout history (Cook & Dibben, 2010). More recently Myer (1956) explored the effects of musical features like tempo, tonal quality, melody and structural components on human emotions suggesting that sudden unexpected events or changes in the musical structure may result in emotional arousal, while Panksepp (1995) suggested that primary-process basic emotions may be evident in listeners'

experiences of 'goosebumps' or 'chills' while listening to music, and most frequently sad music of their own choice. Other researchers have explored the subjective feelings of listeners in self-report studies, which include both questionnaire studies (Juslin & Laukka, 2004; Zentner, Grandjean & Scherer, 2008), experience-sampling methods (Juslin, Liljeström, Västfjäll, Barradas & Silva, 2008) and qualitative methodologies (DeNora, 2010).

1.1.3 What are the Underlying Psychological Mechanisms?

According to Juslin et al. (2008), a 'psychological mechanism' is any form of information processing that leads to emotion being induced by listening to music. These authors carried out a search of articles on music and emotions written between 1967 and 2007 revealing no articles that had sought to test a theory proposing how emotional induction through music occurs, although a small percentage of articles raised the issue or referred to possible mechanisms that may be involved in this process (Juslin et al., 2008). Therefore, Juslin et al. (2008) proposed a theoretical framework that presented six possible psychological mechanisms thought to be involved in the musical induction of emotions, these being: *emotional contagion, brain stem reflexes, episodic memory, musical expectancy, evaluative conditioning,* and *visual imagery*. For example, emotional contagion is thought to occur when a listener perceives an emotional expression in music and internally 'mirrors' that expression (Juslin, 2011). The capacity for music to imitate the emotional expressions heard in the voice may contribute to an emotional contagion effect (Juslin and Laukka, 2003). Recently two further potential mechanisms– *rhythmic entrainment* and *aesthetic judgment* – were added to this list and the theoretical framework was labeled '*BRECVEMA'* (Juslin, Harmat & Eerola, 2013).

While Juslin et al. (2013) found initial evidence for the first four of these 'mechanisms', they did not specifically investigate visual imagery, although one non-targeted question about visual imagery experiences revealed a significant correlation (.28) with the musical stimulus

designed to test 'contagion'. Therefore this particular stimulus characterised by cello tones and sad mood and which also received the highest mean rating for '*sadness-melancholy'*, stimulated more visual imagery than other stimuli. However, this is a slightly confusing result in that it is unclear as to which mechanism, contagion or visual imagery was involved in the elicitation of '*sadness-melancholy'* and raises further questions about the possibility that the two mechanisms may be connected in some way.

Interestingly, Vuoskoski and Eerola (2012a), also reported a strong connection between participant empathy and feelings of sadness elicited by unfamiliar sad music, suggesting that emotional contagion, being an underlying component of empathy may indeed act as a 'mechanism' of musically elicited emotions. Due to the high percentage of visual imagery reported in their study, particularly for unfamiliar, sad excerpts, Vuoskoski et al. (2012a) also speculated that visual imagery may be involved in the elicitation of sad feelings. Results from these studies raise questions about the nature of visual imagery and why more visual imagery was reported for the sad excerpt than for the other excerpts. Findings from additional studies that have explored individual differences and visual imagery may be helpful in answering this question.

1.1.4 Visual Imagery and Music

Several studies mentioned previously refer to the occurrence of visual mental imagery while listening to emotion-eliciting music. For example, in Gabrielsson's Strong Experiences with Music Study (SEM; 2010), approximately 10% of participants reported experiencing inner images evoked by music, while in Juslin et al.'s (2008) experience sampling study in which participants recorded their music listening experiences at random intervals during the day, 7% of participants reported visual imagery as being the cause of emotions they felt, although only 1% reported listening to music to experience imagery. Moreover, in Vuoskoski et al. (2012a), mentioned previously, who reported a strong association between

trait empathy and mean sadness ratings of facial expressions for an unfamiliar sad music condition, 23% of the participants who listened to unfamiliar sad music reported experiencing sad visual imagery and another 20% of participants reported experiencing other visual imagery.

In a review of mental imagery research, Kosslyn, Ganis and Thompson (2001) explained that mental imagery is formed by accessing perceptual information stored in the memory, engaging many of the same neural components as perception in that modality, and can involve "mechanisms used in memory, emotion and motor control" (p.635). Reasons for this phenomenon, according to Thompson (2009; p.137), may be due to the "contiguous occurrence" of visual and auditory information, leading to the development of strong associations between these two modalities. That is, because visual and auditory stimuli generally occur simultaneously, particular visual information will tend to be associated with specific acoustic patterns so that musical sounds such as a high-pitched melody played on a flute may evoke the visual image of a bird, or short repetitive high notes on the piano may induce images of rain. These images in turn may elicit emotions. Recently, in findings from an fMRI study, Koelsch, Skouras, Herrera, Bonhage, Küssner and Jacobs, (2013) speculated that the observed increase in activity in visual areas in response to listening to frightening music with eyes closed, may have led to intense visual imagery.

Kosslyn et al. (2001) observed two different visual imagery processes. For example, when participants mentally rotated patterns their parietal and right frontal lobes were activated, however when given a different task that involved visualizing previously memorized patterns, areas in the occipital and left association cortex were activated. Two forms of visual imagery have been identified from this research, the first being *spatial imagery* which refers to the schematic representation and transformation of spatial information and the second, *object imagery* characterised by colourful, detailed images of

objects (Blazhenkova, Kozhevnikov & Motes, 2006). Blazhenkova and Kozhevnikov (2010) found that visual artists tended to use more object imagery than scientists, while those specialised in science demonstrated more spatial imagery ability. Interestingly, in a question designed to collect qualitative data, some respondents while not specifically asked to do so, wrote about the role of emotion in imagery experiences. While visual artists tended to report that their visual images had emotional content, most scientists did not mention emotions and several even claimed that the lack of emotional content in their images made them easier to "manipulate and control" (Blazhenkova & Kozhevnikov, 2010; p.296). This raises questions as to whether visual imagery experienced while listening to emotionally-eliciting music may be more likely to be object imagery or spatial imagery. In the present study, each musical stimulus was followed by a question asking participants to describe any visual imagery experiences that occurred while listening to the excerpts, which it was thought may give some insight into whether one kind of imagery is favoured over another, when presented with emotion-inducing stimuli.

1.1.5 Music, Emotions and Individual Differences

It may also be that personality factors predict the co-occurrence of visual imagery and emotions arising from music listening. Researchers have highlighted the importance of studying individual differences in the musical elicitation of emotions (Garrido & Schubert, 2011) and have investigated the possible effects that dimensions of personality may contribute to individual subjective responses. These dimensions or traits are emotional and behavioural characteristics that tend to be relatively stable over time and in unique combinations form the basis of personality. It makes sense therefore, that different individuals with their unique emotional and behavioural attributes are likely to experience a range of emotional and behavioural outcomes when they listen to music.

1.1.5.1 Absorption, Empathy and Enjoyment of Sad Music

For example, Garrido and Schubert (2011) suggested that differentiated responses in listeners may arise from interactions between individual factors, proposing that this may explain why some participants enjoy listening to sad music that makes them feel sad. In this study (Garrido & Schubert, 2011) the results of Pearson correlations revealed strong positive correlations between participants' reported liking of sad music, and trait absorption, while positive correlations were also found between liking sad music and measures of music empathy, followed by general empathy. A further factor analysis revealed an alignment between "enjoyment of negative emotion felt" (Q01 in the questionnaire used by Garrido et al., 2011) and the factor of absorption. These findings led the authors to suggest that absorption may be a "conscious manifestation" (p. 289) of a cognitive dissociation mechanism earlier proposed by (Schubert, 1996). In terms of the present study, the implications of this finding suggest that trait absorption and empathy may predict enjoyment of sad music.

Similarly, Vuoskoski, Thompson, McIlwain and Eerola (2012b) found strong positive correlations between participants' enjoyment of sad musical stimuli and individual differences such as Openness to Experience and global Empathy. However, Vuoskoski et al.'s (2012b) findings also revealed that frightening musical stimuli, although eliciting the most intense emotional responses from participants, received significant unpleasantness ratings. It was therefore suggested that Schubert's normative dissociation theory (Garrido et al., 2011; Schubert, 1996) may not provide a full explanation for the enjoyment of sad music phenomenon; but rather that individual differences such as a strong tendency to appreciate art and beauty as indicated by Openness to Experience, and a deep awareness of others' experiences, as in the case of Empathy, may contribute to these types of responses. Conversely, Vuoskoski et al. (2012b) also acknowledged that while evidence from a previous

study (Eerola & Vuoskoski, 2011) indicating strong positive correlations between ratings of perceived sadness and perceived beauty for sad musical stimuli and strong negative correlations between fear and anger ratings and perceived beauty for frightening and angry music, it was also possible that the reverse may be true; that is, some individuals may find scary and angry music beautiful or sad music not so.

A further example of the effect of individual differences is evident in Vuoskoski and Eerola (2012a), briefly mentioned previously, in which the researchers investigated whether or not music that is perceived as being sad can actually evoke sadness in listeners. Vuoskoski et al. (2012a) tested this by randomly allocating participants to one of four conditions, these being: listening to unfamiliar sad or neutral music chosen by the researchers; listening to self-selected sad music; and writing about a sad autobiographical event. Indirect measures, namely, a word recall task and a judgement task which involved rating emotions expressed by images of faces, were used to measure affective states after the listening or writing task. Participants also filled out the Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988) to ascertain the mood of participants prior to the task and the Interpersonal Reactivity Index (IRI; Davis, 1980), a measure of global empathy.

In addition to this, participants in the first three conditions answered some questions about the music, one of which instructed them to write about any thoughts or impressions they had during the listening task. Overall the results of the study found a strong association between those who rated high in trait empathy, and mean sadness ratings of facial expressions in those participants who had listened to sad music, and in particular, unfamiliar sad music. These results provided support for one of the hypotheses, namely, "that trait empathy would contribute to the susceptibility to music-induced sadness" (p.3).

Interestingly, all of these studies observed strong correlations between individual differences such as absorption (Garrido & et al., 2011), empathy, openness to experience

(Vuoskoski et al., 2012b) and enjoyment of music that evokes sadness. Furthermore, some of the measures utilized in these studies such as the *Interpersonal Reactivity Index* (*IRI*, Davis, 1980) which measures empathy and fantasy proneness, the *Absorption, Intellectance and Liberalism Questionnaire* (*AIT*, Glisky & Kihlstrom, 1993) a measure of absorption, and the Openness to Experience Scale from the *Big Five Inventory* (BFI; John & Srivastava, 1999), contain items that enquire about visual mental imagery. This suggests that experiencing visual imagery is considered to be one of the features associated with both trait absorption and empathy. Therefore it is possible to predict that respondents who receive higher ratings in absorption, empathy or openness are more likely to experience some degree of visual imagery when faced with absorbing situations or stimuli such as listening to music.

Tellegen and Waller (2008) explained that in the process of developing the *Multidimensional Personality Questionnaire* (*MPQ*; Tellegen & Waller, 2008), absorption displayed the appearance of a major personality trait and that Tellegen et al. interpreted this trait as indicative of openness to absorbing and 'self-altering' experiences. Previously Tellegen and Atkinson (1974) suggested absorption to be a form of attention that involves placing all of one's perceptional and cognitive resources into a representation of the attentional object. Individuals rating higher in absorption, according to Butler (2006), easily create mental representations and tend to feel empathy towards that which is at the centre of that individual's attention. These people also tend to become engrossed in recreational activities such as reading novels, watching films, listening to music or work projects. Accordingly it could be predicted that people who are higher in trait absorption may be more likely to experience visual imagery when participating in these kinds of 'absorbing' activities such as listening to music.

Therefore, because there has been limited exploration of visual imagery as a mechanism potentially underlying the induction of emotions from listening to music, the purpose of this

study is to investigate possible personality factors and other predictors pertaining to individual differences that may indicate a likelihood of visual imagery occurring in combination with listening to emotion-eliciting music. In the present study, strong positive correlations are anticipated between *Absorption*, *Empathy (Fantasy and Empathic Concern)* and *Spontaneous Imagery* scales. Also, from the evidence mentioned so far, it is possible to anticipate that higher trait absorption, empathy and fantasy proneness are likely to predict a higher frequency and intensity of visual imagery experiences while listening to music.

Additionally, another prediction suggested by previous results, is that the effect of musical stimuli on intensity of emotions felt will be moderated by trait absorption and empathy and that this effect will be stronger for the sad music stimulus in comparison to the other music conditions. It is also anticipated that intensity of felt emotion elicited by the music stimuli will be predicted by the *Spontaneous use of Imagery Scale* (*SUIS;* Reisberg, Pearson & Kosslyn, 2003). Moreover, the effect of musical stimuli on degree of liking will also be moderated by absorption and this effect too will be stronger for sad music as compared to other conditions.

1.1.5.2 Reinforcement Sensitivity Theory and Music Studies

Another approach to investigating the moderating influence of individual differences on musically-elicited emotions was applied in an earlier study by Kallinen and Ravaja (2004) who implemented two psychobiological measures of personality as well as measures of electroencephalographic (EEG) and cardiovascular activity as measures of participants' responses to musical stimuli. Kallinen et al.'s (2004) rationale for using measures based on Gray's Reinforcement Sensitivity Theory (Gray, 1982) was that the dispositional behavioural inhibition system (*BIS*) and behavioural activation system (*BAS*), were considered by Gray to be the brain's primary systems of motivation that underlie behaviour and affect. The *BIS* was considered to regulate aversive motivation by increasing arousal and directing attention

toward negative stimuli and was also thought to be responsible for negative affect responses to unpleasant stimuli. Meanwhile the *BAS* was thought to be involved in the regulation of appetitive motivation leading to approach behaviour and positive affect in the presence of potentially rewarding, pleasant stimuli. Therefore Kallinen et al. (2004) suggested that *BIS* and *BAS* sensitivities might have a moderating effect on emotions elicited by music.

The authors found that participants scoring higher on both the *Dispositional Behavioural Inhibition Scales* (*BIS-FS*; Carver & White, 1994) and the *Neuroticism and Anxiety Scales* of the Alternative Five personality dimensions (*ZKPQ*; Zuckerman & Kuhlman, 1993) demonstrated increased left temporal and eyes-closed parietal activation after a music listening session. This is significant because the posterior parietal cortex, which is believed to be responsible for somatic sensation, visual stimuli and movement planning, is one area where less complex sensory information is integrated to form more complex representations (Bear, Connors & Paradiso, 2007). From their findings, Kallinen et al. (2004) hypothesized that the improvement in mood post-music, together with the increase in parietal activity in these participants may have been due to visual imagery experienced while listening to music. These results raise a number of questions as to whether there may be a relationship between those who experience emotions as a result of visual imagery when listening to music, and personality factors such as trait anxiety.

Therefore, as there have not been many studies that have applied psychobiological measures such as the Carver and White (1994) *Behavioural Inhibition* and *Behavioural Activation Scales* (*BIS* and *BAS*) and Zuckerman's alternative five dimensions of personality, in combination with EEG and cardiovascular measures, Kallinen et al.'s (2004) study provides an alternative approach to investigating the moderating effects of individual differences on emotions elicited by music. For example, if Kallinen et al.'s hypothesis is correct, it is possible to predict that participants scoring higher *BIS* and *Neuroticism-Anxiety*

(*N-Anx*) ratings may report more frequent and intense visual imagery experiences after listening to a musical stimulus than participants with lower scores of *BIS* and *N-Anx*.

However, one problem with Kallinen et al.'s study is the fact that reinforcement sensitivity theory was revised by Gray and McNaughton (2000) after the development of Carver and White's (1994) Scale. Currently, Revised Reinforcement Sensitivity Theory (Pickering & Corr, 2008) proposes a Fight-Flight-Freeze system (*FFFS*), which is thought to be responsible for mediating reactions to aversive stimuli, specifically those related to fear. *BAS* is still thought to mediate reactions to all appetitive stimuli, both conditioned and unconditioned, which, according to Pickering and Corr (2008) is connected with feelings such as the anticipation of pleasure, and hope, while related personality factors include optimism, reward orientation and impulsiveness.

Meanwhile, *BIS* is still thought to be responsible for the generation of anxiety and for inhibiting potentially conflicting behaviours through the activation of risk-assessment processes, including checking memory and environment for signs of threat. It is accompanied by subjective feelings of worry, rumination and potential danger or loss. According to the revised theory, *BIS* is now thought to be responsible for the resolution of conflicting goals which may occur between *BAS*-related approach and *FFFS*-related avoidance situations. However as *BIS* is still associated with anxiety, it is still predicted that participants scoring higher *BIS* and *Neuroticism-Anxiety* (*N-Anx*) ratings may report more frequent and intense visual imagery experiences than lower scores of *BIS* and *N-Anx*.

On the other hand, Marvin Zuckerman who became interested in the sensation seeking characteristics of individuals when he carried out research on sensory deprivation (Joireman & Kuhlman, 2004), later developed an 'alternative five' personality scale based on personality traits with a "strong biological-evolutionary basis" (Zuckerman, 2002; p.377). Comparing three of his five basic factors to other personality models such as Gray's basic

dimensions of anxiety, impulsivity and fight-flight (Zuckerman, 2002), Zuckerman noted that *sociability* features positive affect, tendencies of behavioural approach and generalized reward expectancy, *neuroticism* is associated with emotions of anxiety and depression, behavioural inhibition and generalized reward expectancy, while impulsive sensation seeking at this point was associated with behavioural disinhibition and anger. This indicates that Zuckerman independently identified very similar basic personality dimensions to the ones proposed by Gray's original reinforcement sensitivity theory.

In another study investigating the role of individual differences in the musical elicitation of emotions, Nater, Krebs and Ehlert (2005) investigated whether the construct "sensation seeking" predicted preference for arousing styles of music such as heavy metal, together with the effect of arousing musical styles on psychological and physiological parameters. However, the results indicated an overall preference for classical music in the participant sample, accompanied by an absence of deviation from normative scores for sensation seeking. Therefore despite findings from previous studies that demonstrated high sensation seeking relating strongly to a preference for hard rock (Litle & Zuckerman, 1986), Nater et al. (2005) suggested that a lack of variability in the study sample may explain why an effect was not found.

1.6 Aims

Accordingly, as there has been limited exploration of visual imagery as a mechanism potentially underlying the induction of emotions from listening to music, the purpose of this study was to investigate possible personality factors and other individual differences that may predict visual imagery occurring in combination with listening to emotion-eliciting music. Therefore participants were asked to complete a range of personality measures, which were chosen on the basis of the studies, mentioned previously, including the *IRI* (Davis, 1980), *AIT* (Glisky et al., 1993) and *ZKPQ-50-cc* (Aluja, Rossier, Angleitner et al., 2006) and listened to

four musical excerpts representing happy, frightening, sad and angry emotions, each of which were rated on a 'domain-specific scale' according to the intensity of emotions experienced. Participants then completed further questions about their emotional and visual imagery experiences while listening to the excerpts.

A number of strong correlations were anticipated between *Trait Absorption*, *Fantasy*, *Empathic Concern* and *Trait Imagery*, while further correlations were also anticipated between *BIS* and *N-Anx* and between *BAS* and *ImpSS*. It was also expected that musical stimuli would elicit the emotions that they had been 'perceived' to represent in previous studies. Furthermore, the following predictions will be investigated.

1.7 Hypotheses

H.1 From the evidence discussed, it was anticipated that *Trait Absorption*, *Fantasy*, *Empathic Concern* and *Trait Imagery* would predict *intensity of visual imagery* experiences while listening to the musical stimuli. Alternatively, if the hypothesis suggested by Kallinen and Ravaja (2004) is correct, *BIS* and *N-Anx* ratings would predict *intensity of visual imagery*.

H.2 Also, from the evidence mentioned previously, it was anticipated that the *intensity of emotions felt* would be predicted by *Trait Absorption*, *Fantasy*, *Empathic Concern* and *Trait Visual Imagery*. Furthermore it was expected that this would be stronger for the sad music.

H.3 It was also anticipated that there would be an effect of musical stimuli on degree of *liking* and that liking scores would be higher for the happy and sad music conditions than the two other conditions. Moreover, the effect of musical stimuli on degree of *liking* would also be moderated by *Absorption* and *Fantasy* this effect too would be stronger for sad music as compared to other conditions.

H.4 It was also expected that there would be an effect of musical stimuli on the *intensity of emotions felt* by participants and that this would also be moderated by *absorption* and *fantasy*.

2. Method

2.1 Participants

The participants were 120 undergraduate introductory psychology students ranging from 17 to 58 years (Mean age = 21 yrs, SD = 6.31; 64.2% females; 35.8% males) at Macquarie University, who participated for course credit. Students self-selected to participate via the Sona Psychology Participant Pool.

Materials

2.2.1 Musical Stimuli. Musical stimuli for the emotional elicitation section of this study were initially selected from a set of 110 film excerpts compiled for a study carried out by Eerola and Vuoskoski (2011) in which a comparison of emotions perceived in the musical excerpts was undertaken using both the discrete emotion model and a dimensional model of affect. An additional aim was to provide a new set of stimuli for studying music-mediated emotions. (The set of 110 film excerpts have been made available for free download from the University of Jyvaskyla Music Department website: https://www.jyu.fi/music/coe/materials/emotion/soundtracks/).

All excerpts were rated with scales designed to measure perceived emotions according to the dimensional and discrete models and demonstrated consistent reliability ratings. Two excerpts, representing one each of the 'high fear' and 'high anger' (No. 014 & 003; p.47) rated excerpts, one 'high positive valence' rated excerpt that sounded 'happy'(No. 055; p. 48) and one 'high negative tension', (No. 109; p. 49) rated, 'sad' sounding excerpt were selected from the set for the emotional elicitation phase. However, given that the stimuli are all between 15 and 20 seconds in duration, they were too short for the purpose of the current study which aimed to explore participants' individual differences in musically-elicited emotions and visual imagery responses. Therefore original copies of the film soundtracks were used. The chosen tracks were edited with "Audacity", a free music editing program

available on the internet and were each reduced to 2 minutes and 30 seconds in length, apart from the high anger excerpt which was reduced to 2 minutes and 18 seconds, as there was a dramatic change in the music at this point. The resulting four stimuli are referred to as the Happy, Scary, Sad and Angry excerpts throughout the rest of this study. The original plan to randomize the musical stimuli was not implemented due to a technical issue. Therefore all stimuli were heard in a fixed order which was at least consistent across all participants.

2.2.3 Music Questionnaire. Emotions experienced were assessed by using a 12-item adjective-pair scale based on one used by Juslin et al. (2013). Participants rated the intensity of 'felt' emotions for each of the 12 adjective pairs on a 5-point Likert-style scale ranging from 1 (Not at all) to 5 (A lot), where higher scores equal higher emotional intensity. An example is "Rate the intensity with which you *felt* happiness-elation". Degree of *liking* and *familiarity* with the musical stimuli were also assessed on a 5-point Likert-type scale, with strongest liking and greatest familiarity equal to highest scores. In addition to this, *brain-stem reflex, visual imagery* and *episodic memory* were assessed with questions requiring dichotomous responses. For example "Did the music feature an event that startled you? Yes or No?". Furthermore, "Yes" responses for visual imagery and episodic memory resulted in participants being invited to write a brief description of imagery or memories experienced while listening to the stimuli.

When the data collection was completed, the written visual imagery responses were rated by three Masters students on a scale of 0 to 4 with '0' representing 'no visual imagery reported', 1 representing 'least intense' to 4 – ' highly intense imagery'. Approximately 66% of ratings were the same across raters however for discrepant ratings the average of the three scores was used. Through this process an *Intensity of Visual Imagery* variable was formed. Examples of responses that received a 'least intense' and 'highly intense imagery' rating are demonstrated in 'Table 11' on page 42.

2.2.4 The PANAS. Mood of participants at the start of the questionnaire was obtained using the *Positive and Negative Affect Schedule* (PANAS; Watson, Clark & Tellegen, 1988), a 20-item mood scale developed to measure positive and negative affect as two distinct, orthogonal dimensions. The *Positive Affect* (PA) scale reflects the extent to which a person feels enthusiastic, active and alert so that high PA represents "a state of high energy, full concentration and pleasurable engagement", while low PA indicates sadness and lack of energy. Conversely, the Negative Affect (NA) scale encompasses negative mood states such as anger, guilt and fear, while low NA indicates a state of peacefulness and calm. The *PANAS* provides a range of seven temporal instructions enabling the administrator to assess how the participant is feeling in the present moment, today, in the past few days, up to the past year. For example the participant can be asked to "Indicate to what extent you feel *interested right now*" on a scale of 1 (very slightly or not at all) to 5 (extremely). Participants' scores may range from 10 to 50 on each subscale so that a higher score indicates a higher level of positive or negative affect.

The authors found the *PANAS* to demonstrate high internal consistency reliabilities with a Cronbach's alpha of .89 for PA and .85 for NA, when administered with the "right now, at the present moment" instructions.

2.2.5 The Jackson 5 revised Reinforcement and Sensitivity Theory (r-RST) Scales (Jackson, 2009). The *Jackson 5 revised Reinforcement and Sensitivity Theory (J5r-RST) Scales* (Jackson, 2009) were used in this study as a psychobiological measure of personality. Jackson's scale was designed to reflect revisions of the original Reinforcement Sensitivity Theory (Gray & McNaughton, 2000) and consists of five six-item scales, *r-BAS*, *r-BIS* and *r-FFFS* (comprising the *r-Fight, r-Flight and r-Freeze* scales). Extraversion and functional impulsivity were assessed using the *r-BAS* scale. For each of the six items participants were asked to rate their enjoyment of new experiences on a 5-point Likert-type scale ranging from

1 (completely disagree) to 5 (completely agree), where higher scores are equal to higher extraversion and functional impulsivity. An example of the *r-BAS* is "I actively look for new experiences".

Anxiety was assessed using the *r-BIS* scale. On the six *r-BIS* items, participants were asked to rate situations involving uncertainty and social evaluation on another 5-point Likert-type scale ranging from 1 (completely disagree) to 5 (completely agree), where higher scores indicated higher anxiety. An example from the *r-BIS* scale is "I avoid work that makes me look bad". The remaining three six-item scales, *r-Fight*, *r-Flight* and *r-Freeze* were used to assess participants' fear responses, to proximal threat (*r-Fight*) and distally threatening circumstances (*r-Freeze* and *r-Flight*). Just like the *r-BIS* and *r-BAS* scales, participants were asked to rate their typical responses in frightening situations on 5-point Likert-type scales ranging from 1 (completely disagree) to 5 (completely agree) so that higher scores indicated higher fear. An example from the *r-Fight* scale is "I would fight back if someone hit me first", while an *r-Flight* item example is "If approached by a suspicious stranger, I run away" and one from *r-Freeze*, "In a crowd my mind freezes and I never know what to say".

Jackson (2009) reports an adequate Cronbach's alpha for internal consistency of 0.70 across the five scales. The current study demonstrated Cronbach's alphas of 0.74 for *r-BAS*, 0.70 for *r-BIS*, 0.74 for *r-Fight*, 0.73 for *r-Flight* and 0.62 for *r-Freeze*.

2.2.6 The Zuckerman-Kuhlman Personality Questionnaire – *Cross-Cultural 50-item version,* (*ZKPQ-50-CC*; Aluja, Rossier, Garcia, Angleitner, Kuhlman & Zuckerman, 2006). Zuckerman's psychobiological approach to personality has led to the development of an alternative five-factor model (Zuckerman, Kuhlman, Joiremann, Teta &Kraft, 1993), that features dimensions of Impulsive Sensation Seeking (ImpSS), Neuroticism-Anxiety (N-Anx), Aggression-Hostility (Agg-Host), Activity (A) and Sociability (Sy). A shorter version of the original 99-item scale, the *ZKPQ-50-CC* (Aluja et al., 2006) was used in this study to assess

personality dimensions. Each of the *ZKPQ-50-CC* scales features 10 items that consist of statements such as "I enjoy getting into new situations where you can't predict how things will turn out", from the *ImpSS* scale, or "I frequently get emotionally upset" from the N-Anx scale. Participants were asked to rate their responses dichotomously with either "True" or "False" for each statement.

The *ZKPQ-50-CC* was developed to be used in different countries and is reported to have good psychometric properties across four languages with an equivalent five-factor structure to the original scale. In the current study Cronbach's alphas were: Activity = 0.80; Aggression–Hostility = 0.66; Sociability = 0.78; Neuroticism-Anxiety = 0.79; Impulsive Sensation Seeking = 0.75.

2.2.7 Absorption, Intellectance, and Traditionalism Questionnaire *(AIT*; Glisky and Kihlstrom, 1993). Absorption was assessed via the *Absorption, Intellectance, and Traditionalism Questionnaire* (*AIT*; Glisky and Kihlstrom, 1993), which consists of three 12-item scales that measure *absorption*, *intellectance* and *liberalism*. The 12- item subscale used to measure *absorption* features items from the Absorption Scale (*AB*) of the Multidimensional Personality Questionnaire (*MPQ*; Tellegen, 1982). The subscale includes questions such as: "It is sometimes possible for me to be completely immersed in nature or in art and to feel as if my whole state of consciousness has somehow been temporarily altered" (question 1). Participants responded to *AIT* items on a 5-point Likert-type scale ranging from 1 = "strongly disagree" to 5 = "strongly agree".

Glisky and Kihlstrom (1993) report a high reliability for the absorption subscale, presenting a 'Carmine's theta' of .84. In the current study Cronbach's alpha was 0.88 for Absorption, 0.82 for the Intellectance scale and 0.61 for Traditionalism.

2.2.8 The Interpersonal Reactivity Index *(IRI, Davis, 1980).* In this study, the *Interpersonal Reactivity Index* (*IRI*, Davis, 1980) was used to measure trait empathy. The

IRI is a 28-item measure with four subscales that each has 7 items. The four subscales which each correspond to four discrete factors, are: 1. a *Fantasy Scale* denoting an individual's capacity to identify strongly with characters in films, books or plays – for example, "When I watch a good movie, I can very easily put myself in the place of a leading character"; 2. *Perspective-Taking* reflecting an individual's ability or tendency to adopt the perspective of another person – for instance, "I believe that there are two sides to every question and try to look at them both"; 3. *Empathic Concern* assessing an individual's tendency to experience warmth and compassion for those experiencing difficulty or pain – for example, "When I see someone being taken advantage of, I feel kind of protective toward them"; and 4. *Personal Distress* signifying the anxiety or emotional discomfort that an individual may experience when they encounter another person in a distressing or difficult situation – an example being, "Being in a tense emotional situation scares me". Participants rated how closely each statement described them on a scale of 0 ("does not describe me well") to 4 ("describes me very well").

Due to the fact that women score significantly higher than men on each of the subscales, a result that is consistent with findings from other measures of empathy, Davis has reported internal and test-retest reliability data separately for males and females. Standardized alpha coefficients are as follows: *Fantasy* = .78 for Males and .75 for Females; *Perspective-Taking* = .75, Males and .78 Females; *Empathic Concern* = .72, Males and .70 Females; and *Personal Distress* = .78 for both Males and Females. Correlations between test-retest scores ranged from .61 to .79 for Males and .62 to .81 for Females. In the current study Cronbach's alphas were: 0.78 for *Fantasy*; 0.81 for *Empathic Concern*; 0.79 for *Perspective Taking*; and 0.81 for the *Personal Distress* scale.

2.2.9 The Spontaneous Use of Imagery Scale *(SUIS; Reisberg, Pearson & Kosslyn, 2003).* In this study, trait visual imagery was measured with the *Spontaneous Use of Imagery*

Scale (*SUIS*; Reisberg et al., 2003) which is a 12-item scale measuring an individual's general tendency to experience visual imagery and features items such as; "If I am looking for new furniture in a store, I always visualize what the furniture would look like in different places in my home". Participants' responses were recorded on a 5-point Likert-type scale ranging from 1 ("never appropriate") to 5 ("always completely appropriate"). Total scores for the scale range between 12 and 60 so that a higher score indicates a higher degree of spontaneous imagery. Reisberg, Pearson and Kosslyn (2003) reported a high degree of internal consistency, with a Cronbach's alpha of 0.98. These authors also found a small convergent validity with the *VVIQ* (*Vividness of Visual Imagery Questionnaire*; Marks, 1977). In the current study the Cronbach's alpha was 0.74.

2.2.10 Demographic Questions In this section, participants typed their age and sex. Participants also answered questions about musical instruments played and years of musical tuition received. Finally, they were asked to list their favourite musical styles and favourite pieces or songs.

2.3 Procedure

All materials including the musical stimuli and questionnaire, the battery of psychometric measures and the demographic questions outlined above were loaded into 'Qualtrics', a software program designed for the online delivery of surveys and questionnaires. Participants attended sessions in a laboratory in either individually or in groups of up to four. Each session lasted approximately 40 minutes.

Each participant was seated at a desk with a PC and the researcher introduced the study, explaining that the questionnaire would last between 35 to 40 minutes, that one-third of the way through the questionnaire there would be an instruction to put headphones on to listen to the musical items and that participants were able to adjust sound volume according to their own preferences. The order of measures and stimuli proceeded as follows: the *PANAS*, the

Jackson 5 Revised Reinforcement Sensitivity Scales and the *ZKPQ – CC – 50*; participants were then instructed to put headphones on and press the play button to begin the first musical excerpt and to shut their eyes for the duration of the excerpt. Following each musical stimulus, participants answered the *Music Questionnaire* items. Musical stimuli were heard in the order of happy, frightening, sad and angry excerpts. Finally participants completed the *AIT, IRI* and *SUIS* items and finished with the *Demographic Questions*. Participants were debriefed and thanked for participating and were then free to leave the session.

3. Results

3.1 Descriptive Statistics

Initially variables were examined to determine whether assumptions of normality, homogeneity of variance and independence were met. All variables met these assumptions with the exception of the "*Intensity of Visual Imagery"* dependent variable (see Appendix E). Descriptive statistics for all variables are presented in Table 1.

Table 1

Descriptive Statistics for Variables of Interest

	Variable	Total	(*N*=120)
		M	*SD*
AIT	*Absorption*	46.52	7.95
Empathy	*Fantasy*	26.09	5.57
Empathy	*Emp. Con.*	28.90	4.51
SUIS	*T. Imagery*	40.43	7.03
rRST	*BAS*	22.76	3.12
rRST	*BIS*	21.94	3.44
rRST	*FFFS*	51.94	8.39
ZKPQ	*NAnx*	14.65	0.25
ZKPQ	*ImpSS*	15.04	0.25
PANAS	*PA*	27.59	7.19
PANAS	*NA*	12.99	3.69

Note: AIT = Absorption, Intellectance, Traditionalism Scale; Empathy = Davis' Empathy Scale; SUIS = Spontaneous Imagery Scale; rRST = Jackson 5 Revised Reinforcement Sensitivity Scale; ZKPQ = Zuckerman-Kuhlman-50-CC; PANAS = Positive Affect Negative Affect Scale.

3.2 Correlations between Variables of Interest

Intercorrelations between all variables of interest can be seen in Table 2.

As anticipated, there were strong positive relationships between *Absorption*, *Fantasy Empathy*, *Empathic Concern* and *Trait Imagery* variables. The relationship between *Absorption* and *Fantasy* revealed a correlation of r (118) = 0.57, $p < 0.001$. *Absorption* and *Empathic Concern* indicated a correlation of r (118) = 0.44, $p < 0.001$, while for *Absorption* and *Trait Imagery*, r (118) = 0.43, $p < 0.001$. Further relationships were found between *Fantasy* and *Empathic Concern*, r (118) = 0.47, $p < 0.001$ and *Fantasy* and *Trait Imagery*, r (118) = 0.46, $p < 0.001$ and between *Empathic Concern* and *Trait Imagery*, r (118) = 0.31, $p < 0.001$.

Table 2

Correlations between Variables of Interest

Variables	2	3	4	5	6	7	8	9	10	11
1.Absorption	.57**	.44**	.43**	.27**	.08	.42**	.12	.09	.15	.35**
2. Fantasy		.47**	.46**	.23*	.09	.39**	.19*	.15	.14	.34**
3. Empathic Concern.			.31**	.20*	-.03	.22*	.22**	.05	-.07	.33**
4. Trait Imagery				.11	-.08	.21*	-.00	.17	.00	.19*
5. PA					.11	.40**	.10	-.09	.19*	-.06
6. NA						.02	.19*	.15	.12	-.16
7. BAS							.05	-.12	.60**	-.09
8. BIS								.35**	-.06	.22**
9. FFFS									-.17	.34**
10. ImpSS										-.16
11. N-Anx										

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Table 2 also indicates two additional positive correlations that were anticipated between *BIS* and *N-Anx*, r (118) = 0.21, $p < 0.05$ and between BAS and ImpSS, r (118) = 0.60, $p < 0.001$, while several other positive, statistically significant correlations were also evident. For example, *Absorption* and *BAS* r (118) = 0.42, $p < 0.001$; *Absorption* and *N-Anx*, r (118) = *BAS* and *Fantasy*, r (118) = 0.39, $p < 0.001$; *BAS* and *PA*, r (118) = 0.40, $p < 0.001$.

3.3 Regression Analyses

3.3.1. (**H.1**) To test the first hypothesis, all variables of interest listed in 'Table 2' were entered into multiple stepwise regression analyses with *Intensity of Visual Imagery* scores for each of the music conditions as the Dependent Variable.

3.3.2 For the Happy music condition, the hypothesis was partially supported with both *Absorption* and *N-Anx* found to be statistically significant predictors of *intensity of visual imagery* F (2, 117) = 25.26, $p < 0.001$. The adjusted R^2 indicated that 29% of the variance in *intensity of visual imagery* can be explained by variances in the predictor variables. The analysis suggested that *Absorption* ($\beta = 0.38$) was the most influential predictor, followed by *N-Anx* ($\beta = -0.29$) and that both *Absorption* ($t = 4.58$, $p < 0.001$) and *N-Anx* ($t = -3.46$, $p = 0.001$) were statistically significant predictors of *intensity of visual imagery*.

Table 3

Regression Model with Intensity of Visual Imagery as the Criterion Variable – Happy Music Condition

	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	2.89			
Absorption	0.13	0.38	4.58	< 0.001
N-Anx	-0.29	-0.29	-3.46	< 0.001

Adjusted R^2=29 per cent; F (2,117) = 25.26; $p < 0.001$.

3.3.3 In terms of the Scary music condition the hypothesis was again partially supported with *Absorption* and *ImpSS* found to be significant predictors, F (2, 117) = 4.41, $p < 0.05$.

An adjusted R^2 indicated that 5% of the variance can be explained by the variances of the two predictors. Once again, *Absorption* was the most influential (β = 0.22), while *ImpSS* was less influential (β = -0.19). *Absorption* (t = 2.41, $p < 0.05$) and *ImpSS* (t = -2.08, $p < 0.05$) were shown to be statistically significant predictors of visual imagery intensity.

Table 4

Regression Model with Intensity of Visual Imagery as the Criterion Variable – Scary Music Condition

	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	4.14			
Absorption	0.08	0.22	2.41	< 0.05
ImpSS	-0.20	-0.19	-2.08	< 0.05

Adjusted R^2=5 per cent; F (2,117) = 4.41; p < 0.05.

3.3.4 In the case of the Sad music excerpt, the hypothesis was again only partially supported this time with *Trait Imagery*, $F(1, 118) = 5.70$, $p < 0.05$ found to be a predictor of intensity of visual imagery. However, the adjusted R^2 indicated that *Trait Imagery* explained only 4% of the variance in the intensity of visual imagery experienced, although this predictor (β = 0.22) was found to be statistically significant, $t = 2.39$, $p < 0.05$.

3.3.5 Once more, the Angry music excerpt provided partial support for the hypothesis with *Absorption*, $F(1, 118) = 7.02$, $p < 0.01$ again found to be a predictor of intensity of visual imagery. The adjusted R^2 in this case was 0.048, indicating that again only approximately 5% of the variance was explained by this predictor (β = 0.24, $t = 2.65$, $p < 0.01$).

3.3.6 (**H.2**) To test Hypothesis 2, all predictor variables of interest were entered into stepwise multiple regression analyses with *Intensity of Felt Emotion* scores for each of the music conditions as the Independent Variable.

3.3.7 For the Happy music condition, the hypothesis was partially supported with *Fantasy*, *NA* and *BAS* all found to be statistically significant predictors of the *intensity of emotions felt*, $F(3, 116) = 9.47$, $p < 0.001$. The adjusted R^2 indicated that these three variables accounted for 18% of the variance. The analysis revealed that *Fantasy* (β = 0.28) was the most

influential predictor, followed by *NA* (β = 0.17) and *BAS* (β = 0.19) and that *Fantasy* (*t* = 3.13, *p* < 0.01), *NA* (*t* = 2.05, *p* = 0.05) and *BAS* (*t* = 2.08, *p* < 0.05) were all statistically significant predictors of *Intensity of Emotions Felt*.

Table 5

Regression Model with Intensity of Felt Emotion as the Criterion Variable – Happy Music Condition				
	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	11.85			
Fantasy	0.28	0.28	3.13	< 0.05
NA	0.26	0.17	2.05	< 0.05
BAS	0.33	0.19	2.08	<0.05

Adjusted R^2=18 per cent; F(3,116) = 9.47; p < 0.001.

3.3.8 In the scary music condition, *Fantasy, NA* and *BAS* were again found to be significant predictors, *F* (3, 116) = 14.47, *p* < 0.001 of *intensity of emotions felt*. An adjusted R^2 indicated that 25% of the variance was explained by the variances of the three predictors. Once again, *Fantasy* was the most influential (β = 0.36), while *NA* (β = 0.23) and *BAS* (β = 0.16) were less influential. *Fantasy* (*t* = 4.21, *p* < 0.001) and *NA* (*t* = 2.91, *p* < 0.01) were shown to be statistically significant predictors of *intensity of emotions felt*, however *BAS* (*t* = 1.85, *p* = 0.07) did not reach significance in this model.

Table 6

Regression Model with Intensity of Emotion Felt as the Criterion Variable – Scary Music Condition				
	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	6.22			
Fantasy	0.33	0.36	4.21	< 0.001
NA	0.32	0.23	2.91	< 0.01
BAS	0.26	0.16	1.85	= 0.07

Adjusted R^2=25 per cent; F (3, 116) =14.47; p < 0.001.

3.3.9 Results for the Sad music condition were slightly different to the first two conditions, although once again partial support for the hypothesis was found with *Fantasy*, *NA* and *Absorption* found to be significant predictors. This model indicated that all three variables

were statistically significant predictors of intensity of emotions felt in the Sad music condition, F (3, 116) = 9.61, $p < 0.001$. The adjusted R^2 again indicated that 18% of the variance in intensity of emotions felt can be explained by these variables, with *Fantasy* (β = 0.24) found to be the most influential predictor, followed by *NA* (β = 0.18) and *Absorption* (β = 0.20). *Fantasy* (t = 2.37, $p < 0.05$), *NA* (t = 2.14, p = 0.05) and *Absorption* (t = 2.00, $p <$ 0.05) were all statistically significant predictors of *intensity of emotions felt*.

Table 7

Regression Model with Intensity of Emotion Felt as the Criterion Variable – Sad Music Condition

	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	11.38			
Fantasy	0.27	0.24	2.37	< 0.05
NA	0.31	0.18	2.14	< 0.05
Absorption	0.16	0.20	2.00	< 0.05

Adjusted R^2=18 per cent; F (3, 116) =9.61; p < 0.001.

3.3.10 Finally, the Angry stimulus revealed similar results to the Happy and Scary conditions with *Fantasy, NA* and *BAS* indicating significant results, F(3, 116) = 11.30, $p <$ 0.001, demonstrating partial support for the hypothesis. An adjusted R^2 indicated that 21% of the variance can be explained by the variances of the three predictors. Once again, *Fantasy* was the most influential (β = 0.31), while *NA* (β = 0.17) and *BAS* (β = 0.21) were less influential. *Fantasy* (t = 3.45, p = 0.001) and *NA* (t = 2.03, $p < 0.05$) and *BAS* (t = 2.36, p = 0.02) were all shown to be statistically significant predictors of *intensity of emotions felt*.

Table 8

Regression Model with Intensity of Emotion Felt as the Criterion Variable – Angry Music Condition

	Unstandardized Coefficients	*Standardized Coefficients*	*t*	*Sig.*
Constant	4.44			
Fantasy	0.32	0.31	3.45	< 0.001
NA	0.26	0.17	2.03	< 0.05
BAS	0.39	0.21	2.36	< 0.05

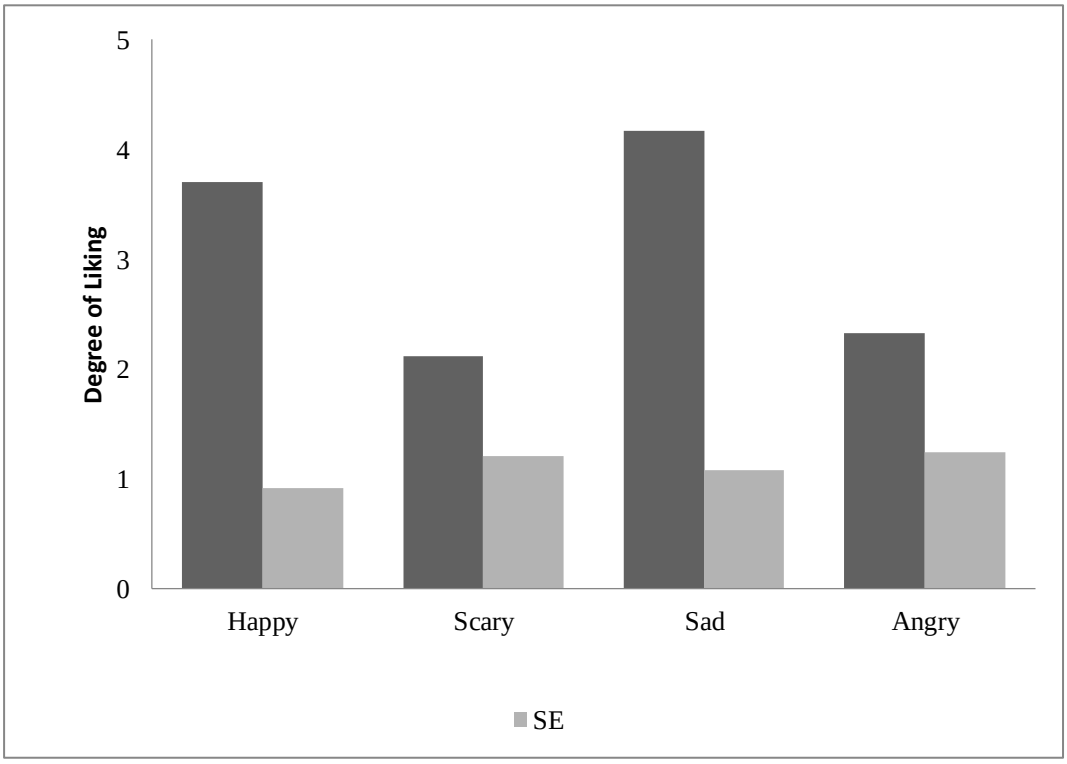
Adjusted R^2=21 per cent; F (3, 116) =11.30; p < 0.001.

3.4 Repeated Measures ANOVAs

3.4.1 (**H.3**) To test Hypothesis 3, which was to determine the effect of the four musical stimuli on *degree of liking*, a one-way repeated measures ANOVA was conducted using the GLM procedure, with *degree of liking* scores for each of the four musical conditions entered as within-subjects variables. The results (Figure 1) demonstrated a significant main effect of musical condition, F (2.35, 281.60) = 142.41, $p < .001$. Mauchly's test indicated that the assumption of sphericity had been violated, χ^2 (5) = 47.44, $p < .001$, therefore the Greenhouse-Geisser estimates of sphericity were used to correct the degrees of freedom.

Figure 1

Group Mean Scores for Degree of 'Liking' Scale



Post hoc tests adjusted according to Bonferroni's correction, indicated that the 'Happy' music stimulus (M = 3.70, SD = 0.92) had a significantly higher 'liking' rating ($p < .001$) than both the 'Scary' (M = 2.12, SD = 1.21) and the 'Angry' (M = 2.33, SD = 1.24) stimuli. Furthermore, the Sad stimulus (M = 4.17, SD = 1.08) was significantly more liked than the

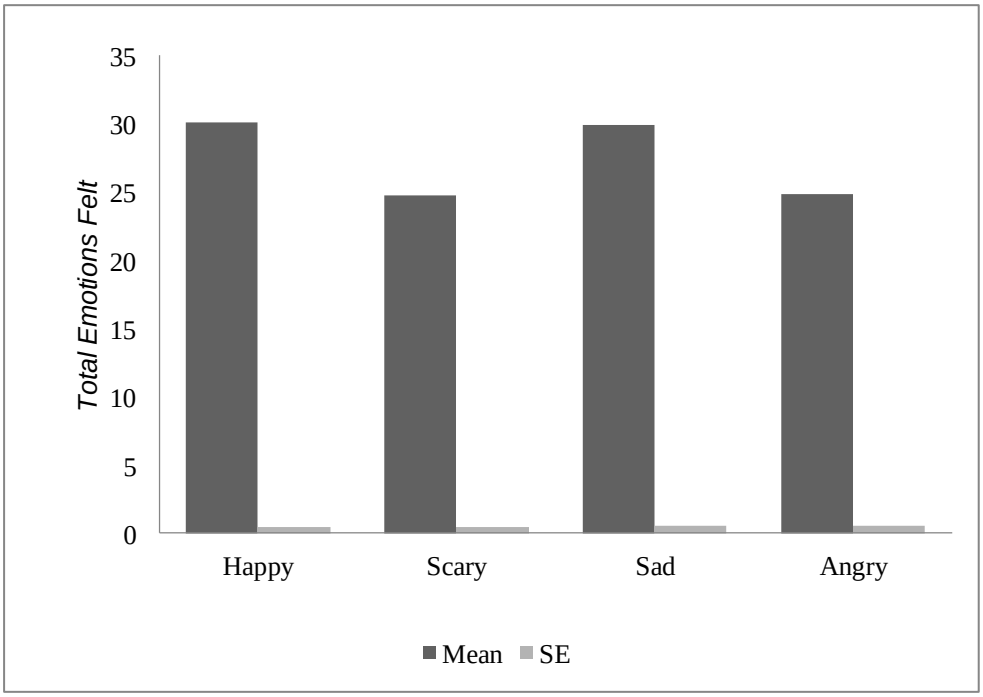
'Happy' music stimulus ($p < .001$). However the difference between liking ratings for the 'Scary' and 'Angry' stimuli did not reach significance ($p = 0.96$).

Fantasy and *Absorption* were also tested for moderation in order to investigate H.3, however no moderating effect was found for either variable when they were placed into the analysis as cofactors.

3.4.2 (**H.4**) Hypothesis 4 was tested with a further, one-way, repeated measures ANOVA in which *Intensity of Felt Emotion* scores for each of the four musical conditions. The results indicated that there was a significant difference between the intensity of emotions reported for the musical stimuli, $F\ (2.65, 315.84) = 76.56$, $p < 0.001$. Again Mauchly's test indicated a violation of the assumption of sphericity, $\chi^2\ (5) = 28.05$, $p < 0.001$, therefore Greenhouse-Geisser estimates of sphericity have been reported.

Figure 2

Group Mean Scores for *Intensity of Emotions Felt*



Post hoc tests in the form of pairwise comparisons revealed that there were significant differences between the reported intensity of emotions for the Happy and Scary stimuli and for the Happy and Angry stimuli but not between the Happy and Sad, and the Scary and Angry excerpts. Therefore paired sample *t*-tests were carried out which indicated that participants experienced greater emotional intensity for Happy (M = 30.07, SE = 0.50) compared to Scary (M = 24.75, SE = 0.46) stimuli t (119) = 11.35, $p < 0.001$; for the Happy versus Angry (M = 24.83, SE = 0.52) music, t (119) = 10.72, $p < 0.001$; and for Sad (M = 29.93, SE = 0.58) compared to Scary music, t (119) = 10.87, $p < 0.001$.

However Happy music was not significantly different to Sad music (M = 29.93, SE = 0.58) in the effect of emotional intensity experienced by participants, t (119) = 0.25, p = 0.80, nor was Scary versus Angry music, t (119) = 9.12, p = 0.82, (Bonferroni corrected).

Although *Fantasy* and *Absorption* were tested for moderation in order to investigate H.4, no moderating effect was found for either variable when they were placed into the analysis as cofactors.

3.5 Means for *familiarity* ratings.

Table 9

Means for familiarity ratings

Musical stimuli	Mean	SD	N
Happy	1.98	1.12	120
Scary	2.08	1.11	120
Sad	2.37	1.37	120
Angry	1.85	1.07	120

Table 9 shows the mean ratings for *familiarity* of the four musical stimuli. The results indicate that the Sad music was rated as most familiar (M = 2.37, SD = 1.37), with 10.8% of participants rating Sad music with the highest available score of '5' for familiarity. Next was

the Scary stimulus (M = 2.08, SD = 1.11) with 2.5% of participants giving this music the highest familiarity rating. This was followed by the Happy (M = 1.98, SD = 1.12) and finally the Angry (M = 1.85, SD = 1.07) music which received ratings of '5' from 4% and 3% of participants, respectively.

3.6 Means for the 'domain specific' emotion-paired ratings.

Table 10

Means for the 'domain specific' emotion-pair ratings

Musical Stimuli	*Happy(**N**=120)*		*Scary(**N**=120)*		*Sad(**N**=120)*		*Angry(**N**=120)*	
Emotion Pairs	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
1.*Happiness-Elation*	**3.71**	.98	1.26	.57	2.84	1.28	1.31	.55
2.*Sadness-Melancholy*	1.28	.52	1.70	.84	3.12	1.29	1.58	.79
3.*Surprise-Astonishment*	2.26	1.06	3.28	1.09	1.52	.78	2.86	1.20
4.*Calm-Contentment*	3.01	1.13	1.12	.40	**3.58**	1.19	1.15	.50
5.*Anger-Irritation*	1.03	.16	1.99	1.06	1.06	.33	2.52	1.33
6.*Nostalgia-Longing*	2.63	1.22	1.36	.75	**3.69**	1.30	1.32	.75
7.*Interest-Expectancy*	3.47	1.09	2.69	1.20	2.56	1.28	2.78	1.27
8.*Anxiety-Nervousness*	1.21	.63	**3.61**	1.25	1.46	.84	2.97	1.30
9.*Love-Tenderness*	2.52	1.08	1.07	.34	**3.77**	1.20	1.05	.22
10.*Admiration-Awe*	**3.83**	1.09	1.43	.82	3.09	1.37	1.82	1.02
11.*Fear-Apprehension*	1.09	.10	**3.89**	1.24	1.19	.57	3.22	1.30
12.*Pride-Confidence*	**4.03**	1.15	1.34	.70	2.06	1.15	2.28	1.28

*Means above 3.50 in **bold.***

Table 10 shows the means of each of the domain specific adjective pairs for the four music conditions. These results demonstrate that for the Happy music, although 'Happiness-Elation' was represented, mean ratings for 'Admiration-Awe' and 'Pride-Confidence' were

higher than ‘Happiness-Elation’. For the Scary excerpt, ‘Fear-Apprehension’ received the highest mean, followed by ‘Anxiety-Nervousness’. The Sad music received higher mean ratings for ‘Love-Tenderness’, followed by ‘Nostalgia-Longing’ and ‘Calm-Contentment’, while ‘Sadness-Melancholy’ only received the fourth highest mean rating, closely followed by ‘Admiration-Awe’. The lowest mean ratings were demonstrated for the Angry excerpt with ‘Fear-Apprehension’, ‘Anxiety-Nervousness’, ‘Surprise-Astonishment’ and ‘Interest-Expectancy’ receiving higher mean ratings than ‘Anger-Irritation’.

3. 7 Qualitative Data

Frequencies of qualitative responses for each of the four musical stimuli were higher than anticipated. For the Happy music stimulus, 96 (80%) participants checked ‘Yes’ they had experienced visual imagery and provided a written description of their experience, while for the Scary excerpt, 93 (77.5%) participants checked ‘Yes’ and for the Sad and Angry excerpts responses were 95 (79%) and 91 (75.8%) respectively. For each of the four stimuli a number of themes emerged from the written responses and representative examples are presented in Table 11. For example themes evoked by the Happy stimulus included descriptions of scenes from nature such as mountains, valleys, fields and ocean sunsets, or movement through nature in the form of sailing ships and flying over clouds. Desert scenes from Western America, some including people riding horses, were described in six responses, while soldiers marching to or returning from war and being victorious featured in 13 responses. Another popular theme was represented by images of kings and queens, princes, knights and castles (6 responses).

Some more literal descriptions included imagery of people performing music in orchestras or bands (8 responses) or actual images of scenes from films such as Star Wars or Harry Potter, while other responses described sitting in a concert hall or cinema watching the

performance or film. However some responses were less specific in terms of imagery and mentioned more abstract ideas, such as thoughts of heroism, achieving goals and winning. Furthermore, several responses mentioned feelings as well as images. For example, one response described "big open spaces, filled with people happy – sense of winning and freedom but also longing".

The Scary music stimulus evoked images of haunted houses and being chased (22 responses) in places such as dark alleyways, hallways and tunnels or dark forests. Fourteen responses described images of animated films or cartoons, while another nine responses featured images of old black and white, horror or Hitchcock movies. Some responses described eerie dance or ballet scenes (4), orchestras playing (2) and spiders, rats or mice (8). Some more abstract responses described feelings of eeriness, darkness, distress or falling.

Imagery responses for the Sad excerpt again featured descriptions of scenes from nature including sunrise and sunsets (4), mountains (4), meadows (6), lakes (5), rain (4) and waterfalls. There were descriptions of flowers, plants and gardens as well as butterflies and breezes. Images of orchestras and people playing pianos (9) including the participants, themselves recurred as well as ballet scenes (7). However there were some images depicting separation, grief and loss with descriptions of churches and funerals but also images of reunion and time spent with family and loved ones. There were also responses describing romantic scenes, scenes from the regency period, Jane Austen's novels and for several participants who knew the music and film for which it was composed, descriptions of scenes from the film.

Angry music imagery responses were overwhelmingly characterised by images of war and battle (35), together with various forms of fighting such as sword fights (3), hand-to-hand combat (4) and fights or action imagery from familiar movies such as Indiana Jones, Star Wars and Lord of the Rings and Wizard of Oz. One participant specifically identified the

film franchise for which the music was composed and described imagery reminiscent of those films. There were also images describing various chase scenarios. Other recurring images included ships on a stormy sea, images of orchestras, bands or trumpets and drums and colours (red 2). Deforestation and industrial imagery were also reported.

Table 11

Examples of Qualitative Visual Imagery Responses

Most & Least Intense	Happy Excerpt	Scary Excerpt	Sad Excerpt	Angry Excerpt
	The music sounded quite epic. It made me visualize the frontier, a western. I pictured wagons, horses, hopeful people, wide open planes	There was someone being chased in an old mansion. A large, run-down building. Lots of cobwebs, very dark, big stair cases, long hallways. A blizzard outside –no escape.	I visualised images of discovery and wandering through a beautiful, lush, green forest with colourful flowers and plants – along with wildlife. Then as the music picked up, I visualised images of flying and soaring over the land and then over a large body of water.	I saw images of war. I saw the preparation, the weapons, the chain mail. Then it moved to the battle, to the charge and the clash of warriors. It zoned in on one man and he finally got stabbed at the climactic moment at the end of the slow fall to the ground.
	Not specifically defined images but more ideas of heroism, hope and completion.	Eeriness and just darkness.	A scene from a romance movie.	Random dramatic events.

4. Discussion

The aim of this study was to explore the relationship between individual differences, the musical elicitation of emotions and experiencing visual imagery. Participants completed a battery of personality measures, a mood scale and listened to four musical excerpts that had previously been found to be perceived as representing happy, scary, sad and angry discrete emotions. They answered questions about their subjective feelings and provided written reports of visual imagery experienced while listening to the musical stimuli.

4.1 Regression Analyses

To test Hypotheses 1 and 2, all variables of interest listed in 'Table 2' were entered into multiple stepwise regression analyses with *Intensity of Visual Imagery* scores and *Intensity of Emotions Felt* for each of the music conditions as the Dependent Variables, respectively. It must be emphasized that with 11 predictor variables a larger sample size was needed and this is one of the limitations of this study. Nevertheless, for each analysis a statistically significant solution was indicated.

4.1.1 Hypothesis 1 Partial support for Hypothesis 1 was evident from the regression analyses conducted for each of the four musical conditions. *Trait Absorption* but not *Fantasy, Empathic Concern* or *Trait Imagery* was found to be predictive of the *intensity of visual imagery* experienced as a result of the Happy excerpt. On the other hand, *N-Anx* but not *BIS* was found to negatively predict visual imagery, accounting for some variance in the model. While *Absorption* was also found to be predictive of visual imagery intensity for the Scary music condition, with *ImpSS* accounting for some variance, together the two variables accounted for only 5% of the variance. Although the adjusted R^2 values here and elsewhere represent relatively small effect sizes, this is not uncommon in personality research. A similar trend in terms of the small amounts of variance predicted was also evident for the Sad and Angry music conditions. However in the case of Sad music, *Trait Imagery* and not *Absorption* was found to predict visual imagery intensity, while for Angry music *Absorption* was the sole predictor.

In light of the literature discussed previously, *Absorption* was anticipated to be one of the predictors of visual imagery, as individuals scoring higher in this trait have been found to easily create mental representations when participating in activities such as listening to music. However, this raises questions as why *Absorption* and not *Fantasy* or *Trait Imagery* was evident in the models produced for Happy, Scary and Angry excerpts but not the Sad

excerpt, as all of these variables enquire about visual imagery experiences. Previous studies may provide a possible explanation. For example, several of the studies discussed in the introduction such as those by Garrido et al. (2011) and Vuoskoski et al. (2012a & 2012b) found trait empathy to be an important factor in the musical elicitation of sad emotions.

This together with the current findings suggest that there is something different about the way that individuals and particularly more empathic individuals experience music classified as Sad as opposed to Happy, Scary and Angry sounding music. Therefore, the fact that *Absorption* was found to be a predictor of *Intensity of Visual Imagery* for the Happy, Scary and Angry excerpts may suggest that the visual imagery experienced during these excerpts may somehow be more 'impersonal' or 'objective' in nature. However, this does not explain why *Trait Imagery* rather than *Fantasy* was found to predict *Intensity of Visual Imagery* for the Sad excerpt.

In the case of the Happy music condition, *N-Anx* negatively predicted visual imagery. This makes sense in terms of the fact that the Happy excerpt was less likely to induce anxiety and may, as the negative value in the regression results (Table 3) suggests, even alleviate anxiety compared with the Scary or Angry excerpts, however in terms of the alternative hypothesis, it raises questions as to why *N-Anx* but not *BIS* was found to predict visual imagery. These findings only partially support those reported by Kallinen et al. (2004) who found that individuals with higher *BIS* and *N-Anx* demonstrated improved mood and increased parietal activity post-music listening. This may be due to the revisions that were made to Reinforcement Sensitivity Theory (Gray et al., 2000) and consequentially the changes that were required to bring the psychometric measure into line with the revised dimensions. Therefore, a possible reason for the present result may be the fact that a different scale was used to measure *BIS* than in Kallinen et al.'s study.

Although the findings for the Scary excerpt also partially supported the hypothesis, they are more difficult to explain. In addition to *Absorption* positively predicting *intensity of visual imagery, Impulsive Sensation-Seeking* (*ImpSS*) was found to negatively predict visual imagery experienced, indicating that as *ImpSS* scores increased, the intensity of visual imagery decreased. Considering the nature of the stimulus, which was harsh, unpredictable and fast-paced, it was thought that this excerpt would be stimulating for participants demonstrating higher *Impulsivity* and *Sensation Seeking* due to its 'arousing' qualities. However it may be that individuals who are higher in *ImpSS* experience less visual imagery when experiencing more arousing stimuli as, compared with lower *ImpSS* individuals, they are less aroused. The Angry excerpt, like the Happy and Scary conditions, was also found to be predicted by *Absorption*, although again it was only able to explain approximately 5% of the variance in the model.

In contrast to the other conditions, the Sad excerpt revealed *Trait Imagery* rather than *Absorption*, *Fantasy* or *Empathic concern*, to be a significant predictor of *intensity of visual imagery*. While, it is unclear as to why *Trait Imagery* was a better predictor than *Absorption* or any of the other variables for this condition, the qualitative data from which the *Intensity of Visual Imagery* dependent variables were formed, indicated more 'high intensity'- rated responses for the Sad excerpt than for any of the other excerpts, resulting in a higher mean for this variable. That is, the written responses describing participants' visual imagery experiences for the Sad excerpt were more detailed, expressive and contained more descriptive language than for the other excerpts. Consequently, this greater 'vividness' may explain why the regression analysis resulted in *Trait Imagery* being found to be predictive of *Intensity of Visual Imagery* for the Sad excerpt. Moreover, in Juslin et al. (2013), the 'contagion', sad music stimulus resulted in a strong correlation with visual imagery experiences, while Vuoskoski et al. (2012) also reported visual imagery experiences in

participants who listened to unfamiliar sad music so these results support the current findings, although, as mentioned previously, it is possible that the 'contagion' mechanism may also be involved in this process.

4.2 Hypothesis 2 In order to test Hypothesis 2, further regression analyses were conducted with *intensity of emotions felt* as the Dependent Variable. While it was anticipated that *Trait Absorption*, *Fantasy*, *Empathic Concern* and *Trait Imagery* would be found to be predictors of *intensity of emotions felt*, this hypothesis was again only partially supported. In this case *Fantasy* was revealed as the dominant predictor for each excerpt, followed by *NA* and *BAS* for the Happy, Scary and Angry conditions but by *NA* and *Absorption* in the Sad condition. Interestingly, the pattern that emerged for the *intensity of emotions felt* was similar to that for *intensity of visual imagery* in that a different combination of predictors was found for the Sad music excerpt.

4.2.1 Finding *Fantasy* to be a predictor of emotional intensity experienced was supported by previous literature (Garrido et al., 2011; Vuoskoski et al., 2012a; 2012b). Davis describes this subscale from his global empathy scale (*IRI*; Davis, 1980) as measuring the tendency to identify with characters in fictional situations such as movies and novels, and several of the studies discussed previously have found that this tendency extends to listening to music. However there is no clear explanation as to why *negative affect* (*NA*) which is also included in this model, would lead to a greater intensity of emotional experience. Nor is it entirely clear why *BAS* which is indicative of orientation toward rewarding stimuli was found to be predictive of *Intensity of Emotions Felt* for the Happy, Scary and Angry excerpts.

However if it were to be argued that in the case of the Sad excerpt, *BAS* may have been excluded due to the greater complexity of the music, then it might follow that the Happy, Scary & Angry stimuli were more straight forward and perhaps more instantly 'rewarding' than the Sad music. This interpretation is purely speculative and requires further

investigation. It is also worth emphasising here, that for both Hypotheses, the regression analyses revealed different predictors for the Sad excerpt compared with the other excerpts.

4.3 Repeated Measures ANOVAs

4.3.1 Hypothesis 3 As anticipated, results of the one-way repeated measures ANOVA for *degree of liking*, indicated that the Sad and Happy excerpts were significantly more liked than the Scary and Angry excerpts; however the Sad music was also significantly more liked than the Happy music. Meanwhile, no significant difference was found for degree of liking between the Scary and Angry music. What this indicates is that something about the quality of the music in combination with the individuals who participated in the study meant that the sad excerpt was liked more than the other three. While these findings are partially supported by previous studies (Vuoskoski et al., 2012b), it was surprising to find that the Sad music was 'liked' so much more than the Happy music. One possible explanation for this difference according to suggestions made by Scherer (2004) may have been that the complexity of the emotions and the aesthetic quality of the music together resulted in the higher liking score. Scherer's view is supported by the findings of the qualitative responses soon to be discussed. Yet another explanation for the Sad stimulus being the most liked may be the fact that this music was rated as the most familiar of the four stimuli (see Section 4.4), which is supported by previous studies that have found familiarity to be a factor in musical preference (Schubert, 2007).

Fantasy and *Absorption* were tested for moderation in order to investigate H.3, however no moderating effect was found for either variable when they were placed into the analysis as cofactors.

4.3.2 Hypothesis 4 Results of a second, one-way, repeated measures ANOVA indicated that as expected, there was an effect of musical excerpt on *Intensity of Emotions Felt*. Pairwise comparisons showed that Happy and Sad excerpts received higher ratings of emotional

intensity than the Scary and Angry music. Although these results support the hypothesis in that an effect was evident, the direction of the results is contrary to previous findings. For example in Vuoskoski et al. (2012b), the authors found that scary music was rated as more emotionally intense than sad, tender or happy excerpts. One possible reason for this difference can be explained by the methodology used in the present study compared to the previous study. In the present study, participants were asked to rate the intensity with which they felt each of the emotions represented by the 12 emotion pairs. The score for *Intensity of Emotions Felt* was then constructed by adding the score (1-5) for each of the 12 emotion pairs, which could result in a score of between 12 and 60. Therefore, due to the more ambiguous nature of the 'Sad' excerpt which received higher ratings in more emotion-pair categories than the other excerpts (as is indicated in Table 9), the Sad music received a higher score. An alternative method would have been to simply ask participants to rate the intensity of their emotional experience for each musical item on a scale of 1 to 5, as was the case in Vuoskoski et al. (2012b), or to use both methods as in Liljeström, et al. (2012).

Another possible reason for differences between felt emotion ratings in the current study and previous studies, is due to the fact that longer excerpts were used in the current study, in which the musical stimuli were 2′30″ long, in comparison to the stimuli used in Vuoskoski et al. (2012b), which were intentionally selected as short excerpts of approximately 45-80″, to avoid the inclusion of familiar or emotionally ambiguous musical material. For example in the present study the Happy excerpt included some thematic material which may have been identified by participants, although this was not the case. However the inclusion of a strong melody in the longer excerpt may have lead to a more intense emotional response. This could also be true for the Sad music excerpt which contained slightly more melodic material as a result of extending the excerpt.

Conversely, the melodic material in the Scary and Angry excerpts was more fragmented even after extending the excerpts. Other musical features such as differences in tonal quality, loudness or tempo may have also had an effect on the intensity ratings. Therefore one area for future research may be to undertake a thorough analysis of all musical components in order to investigate whether these variables have any influence or not. Alternatively, and possibly the most interesting explanation for the higher emotional intensity experienced in the Happy and Sad conditions may have been due to the quality of the visual imagery experienced for these excerpts and this will be discussed in the 'Qualitative Data' section.

It was also anticipated in the second part of H.4 that *Absorption* and *Fantasy* would have a moderating effect on the *Intensity of Emotions Felt* however no moderating effect was found for either variable when they were placed into the analysis as cofactors.

4.4 Familiarity ratings

The results of the mean ratings for *familiarity* of musical stimuli indicated that the Sad musical stimulus was more familiar than the other stimuli. To a small extent, this effect is also evident in the Qualitative Visual Imagery responses in that 4 participants stated that they recognized the music as being from the soundtrack of the most recent "Pride and Prejudice" movie. The Sad excerpt was followed by the Scary music as being most familiar however none of the Qualitative responses indicated that the participants recognized the specific film soundtrack from which this stimulus came. The Happy stimulus was rated as the third most familiar and the Angry stimulus as the least familiar, although interestingly one participant recognized the Angry stimulus as coming from the "Aliens" soundtracks but did not indicate that they recognized the Scary music which came from the same film franchise.

Although only four participants named the exact film soundtrack from which the Sad stimulus came, some responses suggested that the music may have come from a romantic

scene or film. Therefore the Sad stimulus may have been rated as most familiar partly due to musical 'schemas'.

4.5 'Domain-specific' emotion-paired ratings

On one hand, the fact that only Scary music received a highest mean rating for the discrete emotion pair, namely, 'Fear-Apprehension', while the other three excerpts were rated highest for emotion pairs other than the discrete emotions, provides some support for Zentner, et al.'s (2008) view that discrete emotions are inadequate measures of emotions elicited by music. This is especially true for the Sad excerpt for which the discrete emotion received the fourth highest rating. On the other hand, it is not clear as to whether participants actually felt these emotional feelings, or simply perceived emotions expressed by the music and ticked the emotion pairs that best described each excerpt. However, the qualitative data provide support for the possibility that some participants may have felt the emotions that were reported.

4.6 Qualitative Data

One of the most surprising aspects of this study was the large number of 'Yes' responses indicating that participants had experienced visual imagery for a particular excerpt. In comparison to figures mentioned in previous studies such as the 10% reported in Gabrielsson's SEM study (2010) and the 23% of participants who reported sad visual imagery, or 20% who reported other imagery in Vuoskoski et al. (2012a), the percentages in the current study are considerably higher. For example, for the Happy and Sad excerpts, 80% and 79% of participants, respectively, reported that they had experienced visual imagery. There are several possible explanations for this, the first being that participants were asked to respond with 'Yes' or 'No' as to whether they had experienced visual imagery during the excerpt, and following this they were asked to write about any visual imagery they experienced. It is possible that participants chose to write about their imagery in order to make a good impression to the researcher, however, considering the detail provided in many

of the imagery descriptions another possible explanation for the volume of responses was the fact that many participants seemed to enjoy the process of writing about their personal experience.

Alternatively, another explanation for the quantity of visual imagery responses may have been due to the nature of the musical excerpts. In Eerola and Vuoskoski (2011) the authors explained that they chose film music for their comparison of discrete and dimensional emotion models because it is specifically composed to mediate "powerful emotional cues" (p.23). Therefore it is possible that more visual imagery was experienced both as a response to the highly emotional nature of the music and because as Eerola et al. (2011) predicted in their study, it evoked schematic memories of the experience of watching movies. In fact, many of the written responses confirmed that the music reminded participants of a particular film (often Star Wars, Lord of the Rings or Alfred Hitchcock's films).

A further point of interest, evident from the qualitative responses, is that the images themselves provide a further indication of emotions felt by the participants. For example the Happy excerpt evoked mostly pleasant images of scenes from nature and positive experiences, while the Scary music resulted in mostly unpleasant scenes of conflict, unrest, dark and eerie places and being chased by ominous figures. The Angry music also evoked images of conflict, however for this excerpt there were more responses describing various forms of combat, battle scenes and action themes. However the Sad music imagery provided a more complex collection of responses with a recurring theme of loss balanced by images of reunions; and like the Happy music imagery there were also a large number of responses describing scenes from nature, but in the Sad condition the natural scene descriptions were more aesthetically beautiful. Therefore imagery responses for the sad excerpt support previous views expressed by Scherer (2004) and findings from Vuoskoski et al. (2012b), suggesting that sad music elicits more complex and aesthetically orientated emotions than

Happy, Scary or Angry music, although other possible explanations for these findings may include structural components of the music including its greater complexity.

4.7 Strengths and Limitations

The main strength of this study is the inclusion of a specific qualitative assessment of visual imagery, which has provided further insight into the subjective experience of individuals in response to emotionally-eliciting film music. In particular, the visual imagery data reinforce the view that previous researchers have emphasised, which is the fact that sad music elicits more complex emotions that may signify a deeper, more reflective and aesthetically beautiful experience. In addition to this, the current study also provides a novel approach to obtaining a dependent variable, by rating the intensity of visual imagery in the qualitative responses to create a numerical scale. A further strength of this study, was the introduction of a relatively new psychobiological measure of personality, namely the Jackson Five scale of Revised Reinforcement Sensitivity (2009), from which the *BAS* scale was found to predict intensity of emotions experienced for the Happy, Scary and Angry stimuli but not the Sad stimulus.

Some of the limitations of this study have been discussed in previous sections. For example some of the methodological differences in this study have made it difficult to compare the data from this study with other studies. This is one of the reasons that Juslin et al., (2010) have given for the slow progress in the development of a theory of musical emotions. However, despite these differences, the current study still provides some support for previous findings about experiences with sad music.

Further limitations include the use of only four experimenter-chosen film excerpts, rather than including a wider range of music in terms of genre and the option for participant chosen stimuli, which may have provided a means of contrasting visual imagery experiences across different musical categories. Four excerpts, three of 2′30″ and one of 2′18″, were chosen, in

order to provide a range of emotional stimuli but also to keep the full procedure as short as possible for the participants. Additionally the fact that the data-collection process outlined in the methods section was not counterbalanced may have also lead to order effects, however the process was organised to provide a balance between questionnaires, listening experiences and typed responses. Furthermore, a larger sample size was needed to test the 11 predictor variables that were entered into the regression analyses.

4.8 Implications

The current findings provide tentative support for the possibility that visual imagery may be involved in the process of emotional elicitation that is reported to be experienced by some individuals when they listen to music. Additionally, it is suggested that these findings also tentatively support the view that visual imagery may be one of the mechanisms that are thought to be involved in the musical elicitation of emotions (Juslin et al., 2008). Future research in this area should consider investigating how musically-elicited visual imagery contributes to emotional experiences by conducting experimental research that may involve neuroimaging techniques such as fMRI or MEG in combination with cognitive tasks and self-report measures. Extensive neurobiological research including some of the studies conducted by Kosslyn and colleagues mentioned previously, has already been conducted into the underlying neural processes involved in visual imagery and there are also a large number of neuroimaging studies that have explored music and emotions (Koelsch, Siebel & Fritz, 2010).

Recently, Koelsch and colleagues (Koelsch et al., 2013) conducted an fMRI study in which participants listened to music that induced joyful or fearful feelings as well as neutral music. An increase in activity in some visual areas during the scary music stimulus suggested to the researchers that participants may have experienced visual imagery during this music. Therefore, these kinds of techniques in combination with self-report measures like the ones used in the present study may be applied to future studies. Furthermore, the

current findings provide support for music and visual imagery in therapy which is already widely used in various forms of Music Therapy, the most prolific of these being Guided Imagery and Music (GIM; Grocke, 2010).

4.9 Conclusions

The purpose of this study was to investigate possible personality factors and other individual differences that may predict visual imagery occurring in combination with listening to emotion-eliciting music. A series of regression analyses revealed that Absorption was predictive of *Intensity of Visual Imagery* for Happy, Scary and Angry music, while *Fantasy, NA and BAS* predicted *Intensity of Emotion Felt* for these stimuli. However a different pattern emerged for Sad music as *Trait Imagery,* along with *Fantasy* and *Absorption* were predictors of the two DVs. Results for the Sad stimuli also contrasted with those for the other three stimuli in the repeated-measures ANOVAs that were conducted. Finally, the qualitative data indicated that the subjective visual imagery experiences of the participants were most detailed and descriptive for the Sad music condition. Therefore the results of this study provide support for the view that sad music elicits more complex and aesthetic feelings, although other possible explanations such as a greater musical complexity of the Sad music used in this study may have contributed to these findings. Furthermore these findings provide tentative support for the hypothesis that visual imagery may be one of the psychological mechanisms involved in the musical elicitation of emotions.

5. References

Aluja, A., Rossier, J., Garcia, L. F., Angleitner, A., Kuhlman, M., & Zuckerman, M. (2006). A cross-cultural shortened form of the ZKPQ (ZKPQ-50-cc) adapted to English, French, German, and Spanish languages. *Personality and Individual Differences, 41,* 619-628.

Barrett, L. F. (2006). Are emotions natural kinds? *Perspectives in Psychological Science, 1*, 25-28.

Bear, M. F., Connors, B. W., & Paradiso, M. A. (2007). *Neuroscience: Exploring the Brain.* (p.407) Baltimore, USA: Lippincott Williams & Wilkins.

Blajenkova, O., Kozhevnikov, M., & Motes, M. A. (2006). Object-Spatial Imagery: A New Self-Report Imagery Questionnaire. *Applied Cognitive Psychology, 20,* 239-263.

Blajenkova, O., Kozhevnikov, M. (2010) Visual-object ability: A new dimension of non-verbal intelligence. *Cognition, 117*, 276-301.

Brattico, E., & Pearce, M. (2013). The neuroaesthetics of music. *Psychology of Aesthetics, Creativity and the Arts, 7,* 1, 48-61.

Butler, L. D. (2006). Normative dissociation. *Psychiatric Clinics of North America*, 29, 45-62.

Carver, C. S. & White, T. (1994). Behavioural inhibition, behavioural activation, and Affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67,* 319-333.

Chanda, M. L., & Levitin, D. J. (2013). The neurochemistry of music. *Trends in the Cognitive Sciences, 17,* 4, 179-193.

Cook, N. & Dibben, N. (2010). Emotion in culture and history: Perspectives from Musicology. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.45-72). Oxford, UK: Oxford University Press.

Davis, M. H. (1980). A multidimensional approach to individual differences in Empathy. *SSAS Catalog of Selected Documents in Psychology,* 10, 1-17.

DeNora, T. (2010). Emotion as social emergence: perspectives from social psychology. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.159-183). Oxford, UK: Oxford University Press.

Eerola, T., & Vuoskoski, J. K. (2011). A comparison of the discrete and dimensional models of emotion in music. *Psychology of Music, 39,* 1, 18-49.

Eerola, T., & Vuoskoski, J. K. (2013). A review of music and emotion studies: Approaches, emotion models, and stimuli. *Music Perception, 30, 3,* 307-340.

Ekman, P., & Cordaro, D. (2011). What is meant by calling emotions basic. *Emotion Review, 3,* 4, 364-370.

Gabrielsson, A., (2002). Emotion perceived and emotion felt. *Musicae Scientiae, Special Issue 2001-2002,* 123-147.

Gabrielsson, A. (2010). Strong experiences with music. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.159-183). Oxford, UK: Oxford University Press.

Garrido S., & Davidson, J. (2013). Music and mood regulation: A historical enquiry into individual differences and musical prescriptions through the ages. *Australian Journal of Music Therapy, 24,* 89-109.

Garrido, S., & Schubert, E. (2011). Individual differences in the enjoyment of negative emotion in music: A literature review and experiment. *Music perception, 28,* 279-296.

Glisky, M. L., & Kihlstrom, J. F. (1993). Hypnotizability and facets of openness. *International Journal of Clinical and Experimental Hypnosis, 41,* 112-123.

Gray, J. A. (1982). *The Neuropsychology of Anxiety: An Enquiry into the Functions of The Septo-hippocampal system*. New York: Oxford University Press.

Gray, J. A., & McNaughton, N. (2000). *The Neuropsychology of Anxiety: An Enquiry into The Functions of The Septo-hippocampal system*. New York: Oxford University Press.

Grocke, D. (2005). The role of the therapist in the Bonny Method of Guided Imagery and Music (BMGIM). *Music Therapy Perspectives, 23, 1*, 45-52.

Izard, C. E. (2011). Forms and functions of emotions: Matters of emotion-cognition Interactions. *Emotion Review, 3,* 4, 371-378.

Jackson, C. J. (2009). Jackson-5 scales if revised Reinforcement Sensitivity Theory (r-RST) and their application to dysfunctional real world outcomes. *Journal of Research in Personality, 43*, 556-569.

Joireman, J., & Kuhlman, D. M. (2004). The Zuckerman–Kuhlman personality questionnaire: origin, development, and validity of a measure to assess an alternative five-factor model of personality. In R. M. Stelmack (Ed.), On the psychobiology of personality: essays in honor of Marvin Zuckerman (pp. 49–64). New York: Elsevier.

Juslin, P. N. & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin, 129*, 5, 770-814.

Juslin, P. N. & Laukka, P., (2004). Expression, perception and induction of musical emotions: A review and a questionnaire study of everyday listening. *Journal of New Music Research, 33*, 217-238.

Juslin, P. N., Liljeström, S., Västfjäll, D., Barradas, G., & Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music and situation. *Emotion, 8*, 668-683.

Juslin, P. N., & Västfjäll, D. (2008). Emotional response to music: The need to consider underlying mechanisms. *Behavioural and Brain Sciences, 31*, 559-621.

Juslin, P. N., Liljeström, S., Västfjäll, D., Barradas, G., Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music and situation. *Emotion, 8,* 668-683.

Juslin, P. N., Liljeström, S., Västfjäll, D., & Lundqvist, L.-O. (2010). How does music evoke emotions? Exploring the underlying mechanisms. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.159-183). Oxford, UK: Oxford University Press.

Juslin, P. N., (2011). Music and emotion: seven questions, seven answers. In I. Deliège & J. W. Davidson (Eds.), *Music and the Mind: Essays in Honour of John Sloboda* (p.114 –115). Oxford: Oxford University Press.

Juslin, P. N., Harmat, L., & Eerola, T., (2013). What makes music emotionally significant? Exploring the underlying mechanisms. *Psychology of Music, 0,* 0, 1-25.

Kallinen, K., & Ravaja, N. (2004). The Role of Personality in Emotional Responses to Music: Verbal, Electrocortical and Cardiovascular Measures. *Journal of New Music Research, 33,* 399-409.

Koelsch, S. (2010). Towards a neural basis of music-evoked emotions. *Trends in the Cognitive Sciences, 14,* 131-137.

Koelsch, S., Skouras, S., Fritz, T., Herrera, P., Bonhage, C., Küssner, M. B., & Jacobs, A. M. (2013). The roles of superficial amygdala and auditory cortex in music -evoked fear and joy. *NeuroImage, 81,* 49-60.

Kosslyn, S. M., Ganis, G. & Thompson, W. L. (2001). Neural foundations of Imagery. *Nature Reviews: Neuroscience, 2,* 634-642.

Liljeström, S., Juslin, P. N., & Västfjäll, D. (2012). Experimental evidence of music choice, social context, and listener personality in emotional reactions to music. *Psychology of Music, 41, 5,* 579-599.

Meyer, L. B. (1956). *Emotion and meaning in music*. Chicago, IL: Chicago University Press.

Moors, A. (2009). Theories of emotion causation: A review. *Cognition and Emotion, 23,* 625-662.

Nater, U. M., Krebs, M., & Ehlert, U. (2003). Sensation seeking, music preference, and Psychophysiological Reactivity. *Proceedings of the 5th Triennial ESCOM Conference (8-13 September 2003, Hanover University Of Music and Drama, Germany),* 163-165.

Oatley, K., Keltner, D., & Jenkins, K. (2006). *Understanding emotions* (2nd ed.) Oxford, UK: Blackwell.

Panksepp, J. (1995). The emotional sources of "chills" induced by music. *Music Perception, 13,* 2, 171-207.

Panksepp, J. (2003). At the interface of affective, behavioural, and cognitive neurosciences: Decoding the emotional feelings of the brain. *Brain and Cognition, 52,* 4-14.

Panksepp, K., & Watt, D. (2011). What is basic about basic emotions? Lasting Lessons from affective neuroscience. *Emotion Review, 3,* 4, 387-396.

Pickering, A. J., & Corr, P. J. (2008). J. A. Gray's Reinforcement Sensitivity Theory (RST) of Personality. In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.) *The SAGE Handbook of Personality Theory and Assessment: Personality Measurement and Testing*. (pp.261-292). London; Thousand Oaks, California, USA: Sage Publications.

Reisberg, D., Pearson, D. G., & Kosslyn, S. M. (2003). Intuitions and Introspections about Imagery: The Role of Imagery in Shaping an Investigator's Theoretical Views. *Applied Cognitive Psychology, 17,* 147-160.

Rentfrow, P. J., (2012). The Role of Music in Everyday Life: Current Directions in the Social Psychology of Music. *Social and Personality Psychology Compass, 6,* 5, 402-416

Rentfrow, P. J., & Gosling, S. D., (2003). The Do Re Mi's of Everyday Life: The Structure and Personality Correlates of Music Preferences. *Journal of Personality and Social Psychology, 84,* 6, 1236-1256.

Robb, S. L., Burns, D. S., & Carpenter, J. S. (2011). Reporting Guidelines for Music-based interventions. *Music Medicine, 3, 4*, 271-279.

Russell, J. A., (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39,* 1161-1178.

Salimpoor, V.N., & Zatorre, R.J., (2013). Neural Interactions that Give Rise to Musical Pleasure. *Psychology of Aesthetics, Creativity, and the Arts,* 7(1), 62-75. DOI: 10.1037/a0031819

Scherer, K. R. (2004). Which Emotions Can be Induced by Music? What Are the Underlying Mechanisms? And How Can We Measure Them? *Journal of New Music Research, 33*, 3, 239-251.

Scherer, K. R., & Zentner, M. R. (2001). Emotional effects of music: Production rules. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp.361-392). Oxford, UK: Oxford University Press.

Schubert, E. (1996). Enjoyment of negative emotions in music: An associative network problem. *Psychology of Music, 24,* 18-28.

Schubert, E. (1999). Measuring emotion continuously: Validity and reliability of the two-dimensional emotion-space. *Australian Journal of Psychology, 31,* 3, 154-165.

Schubert, E. (2007). The influence of emotion, locus of emotion and familiarity upon preference in music. *Psychology of Music, 35, 3*, 499-515. DOI: 10.1177/0305735607072657

Sloboda, J. A., & Juslin, P. N. (2010). At the interface between the inner and outer world: Psychological Perspectives. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion:*

Theory and research (pp.73-97). Oxford, UK: Oxford University Press.

Tellegen, A. & Atkinson, G. (1974). Openness to Absorbing and Self-Altering Experiences ("Absorption"), a Trait Related to Hypnotic Susceptibility. *Journal of Abnormal Psychology, 83*, 3, 268-277.

Tellegen, A., & Waller, N. G. (2008). Exploring Personality Through Test Construction: The Development of the Multidimensional Personality Questionnaire. In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.) *The SAGE Handbook of Personality Theory and Assessment: Personality Measurement and Testing.* (pp.261-292). London; Thousand Oaks, California, USA: Sage Publications.

Thaut, M. H., & Wheeler, B. L. (2010). Music Therapy. In Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.819-848). Oxford, UK: Oxford University Press.

Thompson, W. F., (2009). *Music, Thought, and Feeling: Understanding the Psychology of Music*. Oxford, UK: Oxford University Press.

Vuoskoski, J. K., & Eerola, T., (2012a). Can Sad Music Really Make You Sad? Indirect Measures of Affective States Induced by Music and Autobiographical Memories. *Psychology of Aesthetics, Creativity, and the Arts*, 1-10. DOI: 10.1037/a0026937

Vuoskoski, J. K., Thompson, W. F., McIlwain, D., Eerola, T. (2012b). Who Enjoys Listening to Sad Music and Why? *Music Perception: An Interdisciplinary Journal, 29*, 3, 311-317. DOI: 10.1525/MP.2012.29.3.311

Watson, D., Clark, L., A., Tellegen, A., (1988). Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales. *Journal of personality* and Social Psychology, 54, 6, 1063-1070.

Weiten, W. (2010). *Psychology: Themes and Variations* (8th Ed.). Las Vegas; Wadsworth: Cengage Learning.

Zentner, M. R., Grandjean, D., & Scherer, K. R. (2008). Emotions evoked by the sound of Music: Characterization, classification, and measurement. *Emotion, 8,* 494-521.

Zentner, M. R. & Eerola, T., (2010). Self-report measures and models. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications.* (pp.159-183). Oxford, UK: Oxford University Press.

Zuckerman, M., Kuhlman, D. M., Joireman, J., Teta, P., & Kraft, (1993). A Comparison of three Structural Models for Personality: The Big Three, the Big Five, and the alternative Five. *Journal of Personality and Social Psychology, 65*, 4, 757-768.

Zuckerman, M. (2002). Zuckerman-Kuhlman Personality Questionnaire (ZKPQ): An alternative five-factorial model. In B. De Raad & M. Perugini (Eds.) *Big Five Assessment*. (pp.377-396). Hogrefe & Huber Publishers.

Appendices

Appendix A

MACQUARIE UNIVERSITY

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22 May 2014

Dr Simon Boag
Department of Psychology
Faculty Human Sciences
Macquarie University
NSW 2109

Dear Dr Boag

Re: The Relationship Between Personality, Individual Differences and the Experience of Emotions Evoked by Music

Thank you for your recent correspondence. Your response was reviewed by the Executive of the Human Research Ethics Committee (HREC) (Human Sciences and Humanities).

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007) and your application has been approved.

Details of this approval are as follows:

Reference No: 5201400452

Approval Date: 22 May 2014

This letter constitutes ethical approval only.

The following documentation have been reviewed and approved by the HREC (Human Sciences and Humanities):

Documents reviewed	Version no.	Date
Macquarie University Human Research Ethics Application	2.3	Jul 2013
Correspondence from Ms Robina Day addressing the HREC's feedback		19 May 2014
Participant information and consent form	2	19 May 2014
Study advertisement		
Questionnaires, Questions and Musical Stimuli		

Please ensure that all documentation has a version number and date in future correspondence with the Committee.

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement,* which is available at the following website:

http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

2. Approval is for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval of this protocol.

3. All adverse events must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Please do not hesitate to contact the Ethics Secretariat should you have any questions regarding your ethics application.

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White
Director, Research Ethics & Integrity
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) (the National Statement) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

Appendix B

MACQUARIE UNIVERSITY

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MACQUARIE UNIVERSITY NSW 2109

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Participant Information and Consent Form

A Study of Individual Differences and Emotional Responses to Music

You are invited to participate in a study examining the different ways in which individuals experience music and emotions. The purpose of the study is to investigate how individual differences and personality factors affect a person's emotional experience of music that may be encountered in day-to-day life.

The study is being conducted by Ms Robina Day (robina.day@students.mq.edu.au) to meet the requirements of the Master of Research (MRes) in Psychology under the supervision of Dr Simon Boag (ph: 9850 8024; email: simon.boag@mq.edu.au) of the Department of Psychology.

What will be involved should you decide to participate?

If you decide to participate you will be asked to complete 6 short questionnaires, listen to 4 short musical pieces and answer some questions after each piece. This will take approximately 45 minutes for which you will receive 1.5 credits for your involvement.

Are there any risks involved?

There are no risks expected as a result of participating in this study. However should you feel uncomfortable at any time during the process you are free to inform the researcher and the study will be terminated immediately.

Confidentiality

Information and personal details collected in the course of this study will remain confidential and no individuals will be identified in any publication results. Only the researchers mentioned above will have access to the data which will be coded and stored on password-protected computers.

MACQUARIE UNIVERSITY

Obtaining feedback on the results of the study

Participants will be able to view a summary of the aims and findings of the study, which will be displayed on the Psychology First Year notice board after the study's conclusion in mid-October.

Participation is Voluntary

Participation in the study is entirely voluntary. Should you decide to participate, you are free to withdraw from the study at any time without having to give a reason, without consequence and without forfeiting the course credit that you have received.

If you would like to participate in this study, please complete the consent form below. Please retain your copy of the information and signed consent form and the researcher will keep the second copy.

I, _____, have read and understand the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Participant's Name: _____
(Block letters)

Participant's Signature: _____ Date: _____

Researcher's Name: _____

Researcher's Signature: _____ Date: _____

The ethical aspects of this study have been approved by Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics and Integrity (telephone (02) 9850 7854;
email ethics@mq.edu.au). *Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.*

Appendix C

Questions answered after each musical excerpt; adapted from Juslin, Harmat and Eerola (2013).

Response sheet for self-reported feelings

1. Rate the intensity with which you *felt* each of the following feelings by circling a number from 0 to 4.

	Not at all				*A lot*
1. happiness-elation	1	2	3	4	5
2. sadness-melancholy	1	2	3	4	5
3. surprise-astonishment	1	2	3	4	5
4. calm-contentment	1	2	3	4	5
5. anger-irritation	1	2	3	4	5
6. nostalgia-longing	1	2	3	4	5
7. interest-expectancy	1	2	3	4	5
8. anxiety-nervousness	1	2	3	4	5
9. love-tenderness	1	2	3	4	5
10. admiration-awe	1	2	3	4	5
11. fear-apprehension	1	2	3	4	5
12. pride-confidence	1	2	3	4	5

1. How much did you like the music? (Circle a number)
   Not at all 1 2 3 4 5 *A lot*

2. How familiar were you with the music? (Circle a number)
   Not at all 1 2 3 4 5 *A lot*

3. Did the music feature an event that startled you? Y/N

4. Did the music evoke an event from your life? Y/N
   If Yes, please briefly describe the images

5. Did the music evoke images while you were listening? Y/N
   If Yes, please briefly describe the images.

Appendix D

Musical Stimuli

Excerpts			
Happy	Dances with Wolves	Tr. 10	full track
Scary	Alien Trilogy	Tr. 5	00:00 – 02.30
Sad	Pride and Prejudice	Tr. 13	01:02 – 03:31
Angry	Alien Trilogy	Tr. 9	00:00 – 02:17

Appendix E

Variables	Min	Max	M	SD	Skew. (SE)	Kurt. (SE)	N
Absorption	15	60	46.53	7.95	-.78 (.22)	1.22 (.44)	120
Fantasy	9	35	26.10	5.57	-.55 (.22)	0.13 (.44)	
Emp. Con.	17	35	28.90	4.51	-.61 (.22)	-.58 (.44)	
Trait Image.	13	54	40.43	7.03	-.62 (.22)	1.42 (.44)	
PA	10	48	27.59	7.19	.06 (.22)	-.02 (.44)	
NA	10	32	12.99	3.69	2.49 (.22)	8.46 (.44)	
rBAS	13	29	22.76	3.12	-.40 (.22)	.07 (.44)	
rBIS	13	29	21.94	3.44	-.32 (.22)	-.61 (.44)	
rFFFS	29	75	51.94	8.39	.17 (.22)	-.99 (.44)	
ImpSS	10	20	15.04	2.69	-.13 (.22)	-.99 (.44)	
N-Anx	10	20	14.65	2.78	.01 (.22)	-1.05 (.44)	
Int. Vis Im.							
Happy	0	8	4.68	2.81	-.60 (.22)	-.97 (.44)	
Scary	0	8	4.75	2.89	-.66 (.22)	-.95 (.44)	
Sad	0	8	5.24	3.05	-.86 (.22)	-.81 (.44)	
Angry	0	8	4.49	2.93	-.56 (.22)	-1.19(.44)	
Int. Emo. Fe							
Happy	12	43	30.07	5.52	-.52 (.22)	.41 (.44)	
Scary	12	40	24.75	5.04	.01 (.22)	.77 (.44)	
Sad	16	49	29.93	6.31	.30 (.22)	.28 (.44)	
Angry	12	39	24.83	5.75	.12 (.22)	-.31 (.44)	
Liking							
Happy	1	5	3.70	0.92	-.54 (.22)	.11 (.44)	
Scary	1	5	2.12	1.21	.99 (.22)	.06 (.44)	
Sad	1	5	4.17	1.08	-1.28 (.22)	.78 (.44)	
Angry	1	5	2.33	1.24	.74 (.22)	-.37 (.44)	
Familiarity							
Happy	1	5	1.98	1.12	.97 (.22)	.08 (.44)	
Scary	1	5	2.08	1.09	.87 (.22)	-.10 (.44)	
Sad	1	5	2.37	1.37	.62 (.22)	-.84 (.44)	
Angry	1	5	1.85	1.07	1.24 (.22)	.76 (.44)	