FILM, MUSIC AND INDUCED MIXED-EMOTION

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Tiivistelmä – Abstract

This Master's Thesis examines the relationship between film, music and induced mixed-emotion with particular focus on the effect of semantic congruency and musical background on emotion ratings. This study provides further understanding of which emotions are felt during film watching and provide an answer to whether or not there is a difference between musicians' and non-musicians' emotional reactions.

A brief overview of emotion research conducted with audio and visual stimuli, as well as in film, is provided. The discussion includes the following topics: visual primacy, semantic congruency and cognitivst/emotivist theory. The difference between musicians and non-musicians as supported by various research is also covered. The various models used to measure induced emotion in music studies are discussed and adaptations for new techniques are suggested.

This study reports the details of the experiment conducted with 24 university students. Participants were asked to rate how they felt in response to a variety of 30 second film excerpts (expressing either happiness or sadness) presented simultaneously with a film music excerpt chosen to express either happiness or sadness in two conditions: congruent (eg., happy visuals with happy music) and non-congruent (eg. happy visuals with sad music). Participants responded using a Likert-type scale to rate emotions listed in an extended GEMS-9 model. The analysis focused on the correlation between semantic congruency and emotion ratings as well as how, if at all, the musical background of participants affected their emotion ratings. Informal interviews conducted with participants also provided insight into some of the problems associated with emotion models dependent on verbal labels.

Results show that while semantic congruency does have a significant effect on certain emotions, musical background has little to no effect on the emotional responses of participants. Results suggest that other traits such as music/film preference and familiarity with the material, cognitive styles and even nationality may prove to have a greater effect on induced mixed-emotion ratings.

Although not conclusive, this study provides numerous avenues for further empirical research in the field of film and music. This study also suggests new and, or improved methods of measurement for future studies.

Asiasanat – Keywords induced mixed-emotion, semantic congruency, musical background

Säilytyspaikka - Depository

Muita tietoja – Additional information

CONTENTS

1. INTRODUCTION

This thesis investigates the effect of film music on the range of mixed-emotions induced during film watching with a given soundtrack. In this study, induced emotion may also be referred to as evoked or felt emotion. Previous research into film, film music and emotion has tended to focus on perceived emotions experienced due to film music and the effect this may have on the film narrative. The research has centred on the theory of visual primacy, that film music alters and controls the emotional reaction of viewers to the visual content in film. This study moves away from traditional studies of visual primacy to investigate the induced mixed-emotions participants experienced whilst watching emotionally intense film clips accompanied by either emotionally congruent or non-congruent film music. Furthermore, this study will investigate the difference between musicians and non-musicians and how a participant's emotion ratings might depend on musical background. How are a participant's emotion ratings effected by formal music tuition and active participation in musical activities? Will the musicians' ratings reflect the emotional content of the music rather than the film clip given the emotionally non-congruent condition? As Bigand and his colleagues have noted, "There is no doubt that emotion is the core of musical experience. It is of crucial importance to investigate how emotional experience may change with musical expertise." (Bigand, Filipic & Lalitte. 2005:430). This study endeavours to answer these questions by addressing the possible effect of musical expertise on emotional experience during film watching.

Film watching for most people is a relaxing past time, a source of enjoyment, much like music listening. The film industry is not only the glitz and glamour associated with actors and actresses but also involves the lucrative and creative sub-industry of film music. The current trend in film seems to be focused on the 'epic', with studios competing in terms of visual effects, CGI integration and now 3D compatibility. Consider *Avatar*, *Tron: Legacy* and *Thor*. The film score, however, remains an integral part in the creation of an epic film. Award-winning film scores for the likes of *Gladiator* and *The Lord of the Rings* bear testament to this fact while films like *Avatar,* relying heavily on computer effects, still require a grand music score to accompany the outstanding visuals so as to connect with the audience on an emotional level, completing the dramatic creation.

Music in film is used for various reasons and in various ways. Not least of all, music is used to evoke

powerful emotions in the film watcher and to convey meaning, often adding to the visual storyline by providing more subtle nuances to the plot (Boggs & Petrie 2008). Why people have such strong emotional reactions during film watching and why they remain emotionally connected to or invested in the film long after the credits roll are questions pertinent to music psychologists particularly in the field of music and emotion. By studying the induced emotions experienced during film watching, researchers may better understand the complexity of human emotion and how or why certain emotions are triggered, specifically considering the powerful effect of music on felt emotion.

The study of music and emotion in the context of film encompasses various areas of scholarship including film theory, theories of music and induced emotion including emotion models, music and mixed-emotion, the methods for measuring a mixed-emotion state, and the effects of musicianship on induced mixed-emotion .

Section 2.1 of the literature review discusses the research conducted in the field of film music with specific focus on the narratological relationship between music and film, the effect of congruency and the way in which one's understanding of film narrative may be manipulated by accompanying film music with specific focus on musically induced emotion. The theory of visual primacy will be explored with a brief overview of the classic study by Marshall and Cohen conducted in 1989. This section examines the cognitivist and emotivist frameworks and discusses the ability of film and to evoke strong emotions separately and in combination with each other.

Section 2.2 presents the theory of mixed-emotion. An overview of the concept and the GEMS model will be discussed. The method of measuring mixed-emotion and the implications of these measuring systems on the current study will also be discussed. **Section 2.3** explores the differences between musicians and non-musicians and how these assessed differences might effect the current study.

Part 3 contains the empirical portion of the thesis and the hypotheses upon which this study is based. Methodology and analytical procedures are explained. The analysis is dealt with in sections. The section on congruency will cite the most relevant results dealing with the effect of emotional congruency on the participants' mixed-emotion ratings while the section on musicianship will address the difference in mixed-emotion ratings based on an individual's musical background.

Part 4 concludes this study with a discussion of caveats and the possible future research to be conducted in this field.

2 FILM, MUSIC AND MIXED-EMOTION RESEARCH

2.1 FILM AND MUSIC

Cohen (2001) defines film as any narrative drama characteristic of cinema theatres, television and video/DVD releases. For the purpose of this study, the term 'film' refers specifically to dramatic cinema motion pictures from which excerpts were taken (see Appendix B).

Boggs and Petrie (2008) state that to regard film music as background music is to underestimate and misjudge the contribution music makes to the overall effect of the film. The film score is an integral and complimentary part of the visual-scape. A clear distinction should be made between the two types of musical scores: *The Mickey Mousing* and the *Generalized score*. Unlike the Mickey Mousing score, the Generalized or Implicit score does not aim to match the action of the film with the music. Instead, the emphasis of this score lies in creating an emotional atmosphere and conveying an emotion that parallels the action of the film (Boggs & Petrie, 2008). It is the latter score-type upon which music psychology and emotion research tends to focus and of which this thesis makes use.

Despite the generally accepted notion that the film score should be subordinate to the visual action (that is that the visual stimulus takes primacy over the auditory stimuli), the integration of visual, dramatic and rhythmic features are essential for making the film a whole. That the visual and audio content of a film should be balanced in order to have the greatest effect on the viewer, is in direct contrast to the theory of visual primacy (Boggs & Petrie, 2008).

Music is responsible for bringing the imaginary world of the film (diegesis) and the real world of the audience (non-diegesis) together. Music transcends the diegetic and non-diegetic worlds in that it imparts emotional content and meaning to the audience without the audience being overly aware of the presence of the music (Cohen, 2001). The synchronization of music and film structures relegates the music to one's subconscious making it almost inaudible while still giving music the ability to affect the meaning of the film without disrupting the narrative (Gorbman, 1987).

Music is a complex tool for communication between the mind of the film-director and the mind of the audience members. "Music is 'the most efficient code' for emotional expression in film", (Kalinak,

1992) providing one of the strongest sources of emotion in film.

2.1.1 Visual Primacy

The theory of visual primacy can be understood as this: that when one is presented with simultaneous visual and audio stimuli, one automatically pays active attention to the visual stimulus and does not analyse the audio stimulus in terms of acoustic features even though one is aware that music is playing (Noad, 2007), that it is not essential for the audience to analyse the acoustical features of the music in order to attain emotional understanding or influence from the film music; the subconscious effect of the 'background' music is enough to alter the emotional meaning of the film (Cohen, 2001).

The concept of multi-sensory information integration states that film relies on both the audio and visual content for meaning (Lipscomb & Kendall, 1994). Cohen's (2005) study aimed to quantify the mental effects of music in film and describe the effect of auditory and visual stimuli on predictive models. In the study, film music and film excerpts were quantified independently and combined to provide a point of comparison. After rating the emotional meaning (either happy or sad) of music and film independently (unimodal) and then rating the emotional meaning of the music and film together (bimodal), Cohen (2005) concluded that the auditory and visual meanings combine systematically to produce an overall meaning and that certain individuals place greater meaning in either the music or the visual images, therefore one stimulus tends to take primacy over the other. Given these results Cohen developed the Congruence-Associationist framework. This framework is based on two ideas: first that meaning is developed through music particularly in the film context, for setting the mood and scene, and second that structural congruence focuses the attention of a viewer on specific visual information. The Congruence-Associationist framework functions on the assumption that visual stimuli generally take primacy over auditory. But does the theory of visual primacy hold true for both musicians and non-musicians within the context of film watching? As previous studies supporting the theory of visual primacy have deliberately excluded musicians from the participant sample (Ellis & Simons, 2005) this thesis hopes to provide some answers by comparing musicians and non-musicians in terms of the effect of visual primacy on emotion ratings.

In the 1988 study by Marshall and Cohen the effect of musical soundtracks on the attitude of viewers towards shapes in a short animated film is investigated (Marshall & Cohen, 1988). The preliminary

hypothesis was that two musical extracts having significantly different meaning will, when combined with a film sequence, alter the meaning of the film. A short animated film using geometric shapes by Heider and Simmel made in 1994 was combined with two minutes of either the Adagio or Allegro Marcato movements of Prokofiev's Symphony No. 5. Marshall and Cohen (1988) used five test conditions: Adagio & film, Allegro & film, Film only, Adagio only, Allegro only.

Twenty-five students were randomly assigned to each condition. A retrospective self-report questionnaire method was used to describe what happened in the film. The results from this study show a significant difference in meaning and emotions attributed to the shapes according to the music. Thus, the results support the hypothesis; however, Marshall and Cohen (1988) did not take into account the participants' preference for the musical excerpts or their musical background, which may have had an effect on the positive and negative emotion ratings.

Based on the pilot study, Marshall and Cohen (1988) continued the study with a second hypothesis that two soundtracks differing on a particular dimension will influence the perceived meaning of a film on that dimension. The dimensions used were Evaluative (good/bad), Potency (weak/strong) and Activity (calm/agitated). Scores were specifically composed for this experiment so that musical features could be manipulated to categorise the music according to the three dimensions. The results suggested that the Activity dimension of the film is the most susceptible to the influences of music. However, the changes in musical dimension do not predictably translate to changes in dimension of the film. The results also showed that participants tended to favour those musical soundtracks which seemed most appropriate for the action of the film; this they termed 'cognitive' congruency (In this thesis, the term semantic congruency is used). The change in meaning seemed to depend heavily on the perceived congruency between visual and auditory stimulus.

Marshall and Cohen (1988) conclude that "congruence between internal structure of film and music alters the attentional strategy to and subsequent encoding of information in the film" (1988, p. 110) meaning that the pattern of a viewer's attention can be altered using music.

2.1.2 Semantic Congruency

Semantic congruency can be understood as two mediums, in this case music and film visuals, having

the same meaning or, specifically, that the same emotional meaning can be clearly identified in both the music and visual stimulus.

Semantic congruency is a point of interest, investigated by numerous researchers. This research states that emotionally congruent scenes containing both visual and audio stimuli produce a stronger reaction in viewers and are preferred to non-congruent scenes where the visual and audio stimuli have different and or opposite emotional meaning or content. (Bolivar et al, 1994; Lipscomb & Kendall, 1994). A problem with semantic non-congruency however, within the film context, is knowing precisely when a visual and audio stimulus are semantically non-congruent and when the music is serving the film by providing subtext. Many war movies make use of this technique where instead of having the soundtrack of war (firing guns, screaming etc) a profoundly sad or moving piece of music is used instead, illustrating perhaps the misery inherent in war. This type of scene might not necessarily be considered semantically non-congruent although the perceived meaning of the visual and audio stimuli could be considered different. (Petrie & Boggs, 2008).

The 1994 study by Lipscomb and Kendall, investigated the relationship between music and visual images within a film in an attempt to explain the idea of semantic congruency between pictures and music. In conclusion, the composer-intended music for the film was perceived as the most congruent strongly supporting the theory that music perceived as congruent with the film has a more powerful effect on emotion ratings. However, music can alter the perceived meaning of the visual content even when the visual and audio are considered semantically non-congruent (Bolivar et al., 1994), which implies a greater interrelatedness between the visual and auditory stimuli and the syntactical information within a film. Thus, the modern film can be considered a composite of visual and auditory stimuli, which interact to create a whole aesthetic experience.

2.1.3 Cognitivism vs Emotivism

There are two main approaches to emotion studies be they with music or film. As Filipic and Bigand (2003) state, cognitivists think a listener perceives emotion expressed in music, and emotivists think a listener feels the emotion expressed in music. This polarity in theoretical assumption has resulted in most researchers adopting an either or approach to musically induced emotion (Juslin & Sloboda, 2010); a problem this thesis endeavours to circumvent.

Cognitivist theory, in the context of music listening, states that when one experiences an emotion it is a conscious process of inference, that is, a listener identifies the emotion expressed by the music thereby arousing that particular emotion within themselves. This stems from music's resemblance to the human voice which is why cognitivists believe 'sad' music tends to be slow, soft and low in pitch – as the human voice would be when communicating sadness. Similarly 'angry' music would be higher-pitched, loud with unpredictable deviations in tempo as well as sharp breaks within the melodic contour. (Ushedo, 2006; Juslin & Sloboda, 2010). This is applied similarly to film in that a watcher identifies the emotion portrayed on screen by the actor and thus feels that emotion themselves.

One of the leading cognitivists, Peter Kivy, states that one does not experience an emotion when listening to music but rather recognises its expression, meaning that when a listener characterises a piece of music as sad or angry, they are not sad or angry *at* the music but rather identify certain acoustic qualities which in turn moves them to feel that identified emotion The ability to identify the emotion expressed by a certain piece of music comes from listening experience and cultural conditioning. It may be a learnt custom to associate certain kinds of music with certain emotions, such as heavy metal (loud, fast, bass heavy) with feelings of aggression and anger. (Ushedo, 2006; Winters, 2007).

Emotivist theory states that “music is both a cause and an effect of sentiment” (Ushedo, 2006:1). This theory relies on an idea of 'make-believe,' that a listener imagines their experience of an emotion whilst listening to a piece of music expressing that emotion. In this way, Ushedo (2006) states that the emotion is induced in the listener.

Both of these approaches are limited by their attempt to establish a reductive, all-encompassing theory, which would fully account for the dynamic relationship between music and emotion as well as film and emotion. Cognitivst theory suggests emotion is a distraction from the intellectual process of understanding music (or film) correctly while emotivists tend to undermine the analytic process of music listening by assuming it is a completely emotional activity. (Ushedo, 2006; Juslin & Sloboda, 2010).

This thesis considers both theories valid but does not favour one or the other, believing that it is only through a combined process of intellectual analysis and emotional reaction that an audience member can digest the simultaneous audio-visual stimuli and experience genuine emotion. It is important for an audience member to identify the emotion being expressed in a film scene and expressed in the accompanying music before they are able to have a personal, emotional reaction to the stimuli.

2.1.4 Music and Induced Emotion

There is a significant amount of research supporting the ability of music to induce or evoke strong emotion in listeners (Gabrielsson, 2001; Scherer, 2004; Juslin & Laukka, 2004; Evans & Schubert, 2006; Juslin & Västfjäll, 2008; Lunqvist et al., 2009). Juslin and Laukka (2004) define an emotion as an intense, brief reaction to goal-relevant changes in the environment. An emotional reaction consists of various components. The most critical components to this thesis are: Cognitive Appraisal (you study and judge the situation as possibly 'dangerous') and Subjective Feeling (you feel afraid, experience fear).

That music expresses basic emotion is attributed to an evolutionary origin of communication by verbal sounds. Emotions are therefore perceived and decoded according to fundamental life issues. Emotions typically expressed in music with their correlating life issue are as follows: fear (danger), anger (competition), sadness (loss), happiness (co-operation) and tenderness (care-giving), (Juslin & Laukka, 2004). The emotions induced by music, however, are determined more by the cognitive appraisal of the musical event and the reasons for engaging in that event, for example enjoyment or mood regulation. This has a significant effect on the range of emotions experienced due to subjective feeling.

Evans and Schubert (2006) support the emotivist approach by stating that “the importance of the musical experience is music’s ability to move the listener” (p. 447) suggesting that the power of music lies not in what it makes a listener think but in how it makes a listener feel. The ability of music to evoke strong emotion in listeners is explored in a 2001 study by Garbielsson. Gabrielsson's research into Strong Experiences in Music, particularly focusing on the peak experiences reported by listeners accompanied by physiological symptoms of strong emotional experience such as chills, concluded that music can indeed evoke particularly strong emotional experiences (Gabrielsson, 2001). A conclusion confirmed by Trainor and Schmit (2003), who state that music elicits emotion directly. This evoked

emotion is clearly visible through neurological indicators such as changes in heart rate, respiration rate, blood flow and skin conductance, indicating that music stimulates subconscious, neurological activity. This in turn manifests as physical symptoms of emotion. Trainor and Schmit (2003) also conclude that happiness and sadness are more easily expressed in musical structure than emotions such as anger.

Although happiness and sadness may be the most easily expressed emotions in terms of musical structure, Juslin and Västfjäll (2008) posit that music evokes a wide range of basic and complex emotions. These can range from arousal and pleasantness via discrete emotions to more complex emotions such as nostalgia, transcendence and wonder, resulting in chills or what Gabrielsson (2001) termed peak experiences. This does not imply, however, that a piece of music, which expresses a certain emotion will necessarily induce the same emotion in a listener. According to Juslin & Västfjäll (2008) 'emotional contagion[1]' will, per definition, evoke the same emotion in the listener as expressed by the music. In the case of episodic memory, a piece of music perceived as happy may actually evoke a sad episodic memory, or result in a range of emotions such as nostalgia and tenderness. It is also possible for a listener to perceive the emotion of the music without feeling any emotion themselves, or at least not an emotion evoked by the music. (Juslin & Västfjäll, 2008).

Evans & Scherer (2006) describe the relationship between induced and perceived emotion as positive when the listener feels the same emotion expressed by the music. Gabrielsson (2002) argues that although the positive relationship seems the most logical, and is most dominant, occurring, on average in 70% of cases, this assumption is too simplistic and a variety of other relationships are possible.

- Negative relationship: the listener reacts with the opposite emotion from that which is expressed in the music. In this case a positive emotion in the music may elicit a negative emotion in the listener or vice versa.
- No systematic relationship: this occurs when a listener remains emotionally neutral, feeling no particular emotion regardless of what the music is expressing.
- No relationship: this occurs when there is no potential relationship. The listener feels emotion that cannot be expressed by the music (consider disgust).

1 Emotional contagion is the underlying mechanism, which represents a tendency to automatically mimic and synchronise facial expressions, vocalisations, postures, and movements with those of another person (actors in film) or music (strong rhythmic figures, melodic motives) resulting in a similar emotional state.

Lunqvist et al. (2009) investigated whether music evokes a genuine emotional response in listeners (emotivist stance) or whether listeners only perceive emotions in music (cognitivist stance). To test this, participants' facial muscle activity and autonomic responses were measured while listening to popular music composed to express either happiness or sadness. The study supports the emotivist stance as results showed a "coherent manifestation in the experiential, expressive, and physiological components of the emotional response system" (p. 61). Results also showed that happy music generated more zygomatic facial muscle activity (smiles), greater skin conductance, lower finger temperature, and an emotional state of greater happiness and less sadness compared to participant reactions to the sad music condition. That there was a positive relationship between perceived and evoked emotion is consistent with the process of emotional contagion. (Lundqvist et al., 2009). The **Figure 1** below illustrates the mechanism of emotional contagion for both music listeners and a film audience. The process of identifying expressed emotion in music or a film scene and feeling the same, different or range of evoked emotion is similar for both media.

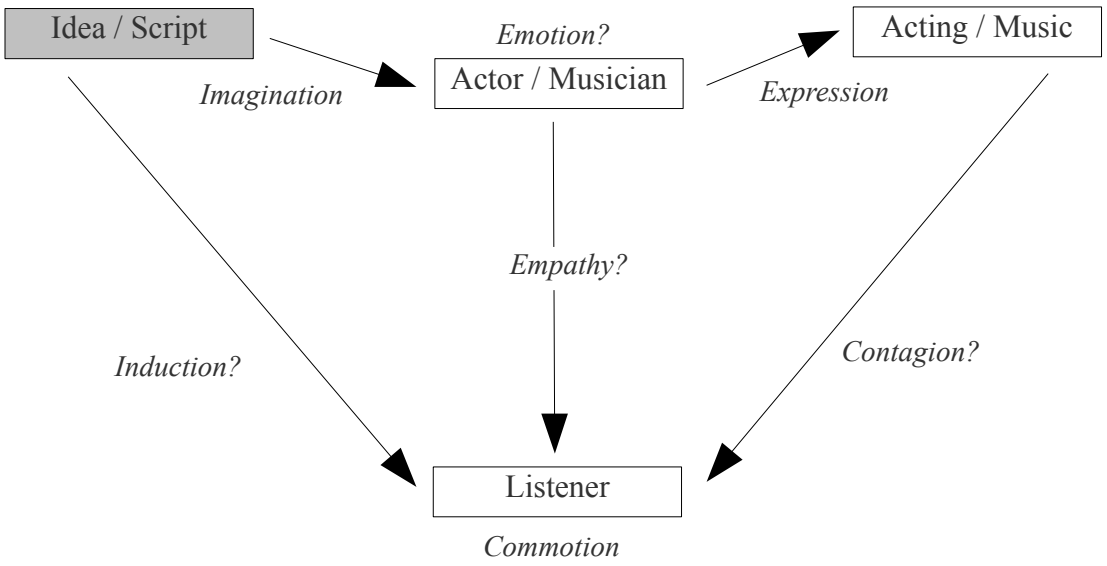


Figure 1. *Adaptation of the commotion model (Scherer & Zentner, 2001) illustrating relationships between music/ actors in film and listeners/audience members. Grey shading indicates the source of emotion or aspect responsible for the emotional state.*

Kreutz et al. (2008) investigated the induction of emotion during music listening based on the categorical and dimensional frameworks of emotion. Although this study did not specifically focus on film music, it provides further empirical evidence supporting the theory of emotion induction by music listening. The study focused on self report methods judging the pleasantness and arousal aspects of each classical, instrumental music excerpt. The classical, instrumental music used in this study closely resembles film music in terms of acoustic features. Kreutz et al. (2008) hypothesized that those individuals with musical training and a more musical background would experience emotional effects with greater intensity, supporting the hypothesis of this thesis. The study concludes that music can induce strong emotions in listeners but that the musical background and preference of individuals make it highly subjective.

Figure 1 shows that the mechanism of processing and subsequently feeling emotion while watching a film is similar to that of listening to music. When the conditions are combined, that is actors using facial expression and body language to communicate emotion in combination with music using acoustic features to express, and subsequently evoke, emotion in a listener, the induced emotion in an audience member may be more intense. In the book *Music and Emotion: Theory and Research,* (2001), Cohen takes a psychological perspective when discussing the role of music in film and the importance of music for conveying emotion. Cohen (2001) makes a distinction between mood and emotion in that moods do not have an object, emotions do. In film, the object for emotion is the music and the film content controls the definition of the object as is expected considering the theory of visual primacy. The combination of visual and audio stimuli, especially when considered emotionally congruent, can result in the induction of very strong emotion.

“Film music is a highly coded form of emotional message; its tones and cadences seem to appeal to something 'wired' in us, triggering the appropriate emotional response at the appropriate moment” (Lack, 1997, p. 174). The emotive power of film music is perhaps best illustrated in the horror film. The music in horror films seems to engender a state of suspense or even fear. This ability is well known to audience members. In order to alleviate the tension and fear of a scene in a horror film, turn down the volume of the music or block one's ears. Without the music, the film loses its ability to convey dread and terror, and can at times result in the event on screen seeming more comical than terrifying. Blocking one's ears is a more effective method than blocking one's eyes as, despite not seeing what is

happening on screen, the music still communicates that sense of foreboding. (Consider the soundtrack for *Jaws* and the 'impending doom' rhythmic and melodic riff). (Winters, 2007).

That the music in film conveys the more powerful emotional content, is a theory supported in the study by Nikki (2004.) The study compared emotionally powerful film (EPF) and emotionally powerful music (EPM). Participants were subjected to numerous physiological tests measuring responses to emotion, such as skin temperature, pulse, skin conductance and muscle tension. Participants also used an event recorder to record their experience of chills. Saliva samples were also obtained in order to measure cortisol levels. The music examples and EPF scene were presented to each participant separately, that is there was no combined film/music condition. The results revealed that listeners subjected to the EPM condition produced a considerably greater increase in skin conductance tests, illustrating a physical manifestation of a strong emotional state. The EPM was also rated as having significantly greater emotional impact on participants than the EPF scene.

2.1.5 Film and Induced Emotion

The emotive power of film is well known and well documented. (Winters, 2007). If film did not elicit such powerful emotional responses in an audience then it would not be the booming industry that it is today. How and why film evokes these strong emotions and, more specifically, which emotions film is able to evoke is a hot topic amongst researchers.

How film evokes strong emotion in an audience was tackled in 1956 by Dutch psychologist Nico Frijda. Frijda distinguishes a number of attitudes of observation, two of which are considered relevant to this study. *Attitude en-face,* this attitude involves attentive observation of the actor's behaviour (not only body language but physical movement, such as pacing, slamming doors etc.) for its own sake. Melodramas, in particular, focus extensively on the character's reaction to events. Here, the cause of the specific behaviour is already known to the audience (a reaction scene following the death of a loved one, a heist gone wrong) and a prolonged view of the character's reaction enables the audience to empathise with the character, by imagining what the character is feeling from the inside. The *attitude en-profil* involves observing the actor's (or actress') facial expressions and behaviour or body language in order to find out what causes it, to identify the underlying emotional reason for the action of the actor. The first attitude described above requires knowledge of the plot in order to understand the

actor's reaction within the context of the story. The *attitude en-profil,* however, is less dependent on context as an audience can identify the emotion felt by the character (sorrow, elation) in a given scene from the actor's posturing without having to know why (loss of a loved one, winning the lottery). (Tan, 1998).

Tan (1998) proposed that 'interest' is the central emotion in film viewing and defines interest as the "urge to watch and actively anticipate further developments in the expectation of a reward" (1998:7). Sympathy is considered the primary empathic emotion allowing an audience to engage with the characters on screen. Tan argues that in order for an audience response to be considered empathetic, an understanding of the significance of events for the given character is required, this implies a relation to the plot and or context of the film as a whole. Tan argues that "understanding of the significance of the situation is crucial for empathic viewer emotion" (2007:19). Non-empathetic emotion, according to Tan, is what an audience feels in reaction to a scene without having to sympathise with the character. For example an audience member can enjoy and feel aroused when watching an explicit sex scene without sympathising with the character's desire. This occurs when a scene is used as spectacle. Regardless of whether an emotion is defined as empathetic or non-empathetic, film has the power to evoke strong emotions in an audience (Nikki, 2004).

As to which emotions are evoked by film, Gross addressed this issue in his 1995 study. The study made use of a dimensional model (valence/pleasantness and arousal/intensity), similar to the one employed in music and emotion studies. The 8 emotional states used in gauging a participant's emotional response to film were: amusement, anger, contentment, disgust, fear, neutral, sadness and surprise. Though there are some labels similar to the GEMS model (Zentner, Grandjean, & Scherer, 2008) employed in music studies, it is important to note the differences. Neutrality is not considered an emotional state in music models, perhaps because it seems redundant to include a state which reflects no emotion in a study designed to evoke strong emotion. Disgust, fear, anger, amusement and surprise are also absent in the GEMS model though fear might considered synonymous with tension, anger might be reflected in ratings of power and tension as would fear, amusement may be reflected in the ratings for joy, and surprise in the ratings for wonder. Disgust, however, seems more difficult to place in the music model as the elicitation of disgust through music may prove more difficult without an object upon which to focus this emotion. In film, disgust is more easily evoked, consider images of war and abuse. It is

interesting to note that in Gross' study, disgust elicited the strongest reaction in viewers. A result possibly skewed by unbalanced film scenes as the 'disgust' condition featured a human eating dog faeces, a scene likely to elicit stronger feelings of disgust than the animated scene of a dying deer may elicit sadness (scene used from *Bambi*). Taking this into consideration, all scenes selected for the present thesis study used human characters on screen to depict the desired emotion.

As with music studies, Gross (1995) considered the restriction of predetermined labels a possible hindrance in accurately gauging what people felt. Gross' study illustrated mixed-emotion as the target emotion (surprise for a scene considered to depict surprise) was not always rated significantly higher than other emotions in all examples. Gross (1995) concludes that prior viewing is associated with more intense emotion ratings suggesting sensitisation effect or as Tan (2007) stated 'understanding the significance', as a result of knowing the total emotional content of the film from which the clip is taken. For this reason, the present study attempted to use films and film clips less likely to be known to the selected audience.

2.2 MUSIC AND MIXED-EMOTION

According to Felix Mendelssohn, “emotional experience with music is so rich and complex that even language cannot account for it.” (Bigand, 2006:117) Mendelssohn's words prove insightful considering the problem of labelling emotions, particularly when identifying mixed-emotion states.

Hunter et al. (2007) investigated the possibility of induced mixed-emotions during music listening. The aim of the study was to allow participants to rate 48 commercial music excerpts of various genres according to separate scales for happiness and sadness. Ratings for pleasantness or unpleasantness were used as a control for the ratings of happy and sadness. The examples were specifically chosen according to tempo and mode. Pieces considered unambiguously happy were of fast tempo and in major mode. Unambiguously sad pieces were of slow tempo and in minor mode. The condition hypothesised to induce mixed-emotions were pieces of either fast tempo and minor mode, or pieces of slow tempo and major mode (A condition possibly considered 'non-congruent' with regard to mismatched acoustic features). Hunter et al. (2007) conclude that feelings of happiness and sadness can be co-activated and that they are not completely independent. The authors also conclude that happy examples are considered pleasant and sad examples are considered unpleasant although this contradicts

research dealing with music and mood regulation, where studies have shown sad music to score highly on pleasantness scales. (Levinson, 1997; Saarikallio & Erkkilä, 2007).

Bigand (2005) states that to restrict the induction of emotion by music to only three or four basic emotions is to underestimate the array of emotional reactions a listener can experience. Bigand cautions against the use of predetermined verbal labels as this can encourage participants to simplify what they actually experience. Verbal labels can also be misinterpreted especially across languages where the issue of translation arises. But open-ended questionnaires can present as many problems to a researcher, especially when trying to group emotion words into categories of similarity. Consider melancholy, would this label be better grouped with terms denoting sorrow or terms associated with memory and nostalgia? This was the task attempted by Zentner, Grandjean and Scherer (2008) in devising a model for accurately measuring mixed-emotion responses in music listeners.

A more philosophical issue arises when considering the definition of aesthetic emotion. Aesthetic emotions are felt during an aesthetic activity or period of aesthetic appreciation, such as looking at art or listening to music. Aesthetic emotions are only a part of the overall aesthetic experience. Examples of these emotions include fear, wonder, sympathy as well as feelings of the sublime such as transcendence. Aesthetic emotions, according to Clive Bell (1992) are unique to the aesthetic experience and are evoked by the aesthetic qualities being observed, specifically the form and structures of the given art work. When listening to music, an aesthetic emotion would be that which is evoked by the melodic contour, the harmonic progressions, the form of the piece and the instrumentation. Emotions arising due to association, such as memories – feeling sad during a violin piece with 'happy' acoustic features because it reminds the listener of a deceased grandparent who used to play the violin – are not considered aesthetic emotions. The 'Darling, they're playing our tune' phenomenon is also an example of non-aesthetic emotion induced by the mechanism of episodic memory, that is associating a piece of music with a previous event in the listener's life.

When studying induced emotion in music listeners it is the aesthetic emotion upon which researchers tend to focus. Hence, researchers often ask listeners to respond within a given time frame (generally short intervals) and to not to think too much before answering emotion related questions as this provides the most intuitive, reactive emotional response to the music itself without the interference of

complex associations. These emotions are dubbed 'musical emotions' as they are induced only by the music. (Juslin & Västfjäll, 2008). A problem arises when trying to distinguish between an aesthetic and non-aesthetic emotion even for the listeners themselves. It is often impossible for a listener to detach from a strong, memory-triggered emotion, and sometimes even impossible to distinguish between an emotion induced only by the music or by an association with a certain piece of music. To avoid these complex, induced non-aesthetic emotions, this thesis made use of film music considered less well-known or even obscure and film scenes equally less well-known and obscure. In this way, it was hoped that strong associations and emotion induced by the mechanism of episodic memory would be mostly avoided.

2.2.1 Measuring Mixed-Emotion

Several emotion models have been developed in an attempt to better understand the relationship between music and emotion. An overview of these models and how they apply to this study is provided in the next section.

2.2.1.1 Discrete Emotion Model

The discrete emotion model consists of between 5 and 14 emotions. These emotions are considered fundamental or basic. The set of basic emotions are based on evolutionary process established in ethological research. Many of the discrete emotion models are derived from Darwin who, for many emotion labels, demonstrated the functionality, evolutionary history, and universality across species and cultures. (Scherer, 2004).

The basic emotions typically include: anger, fear, joy, disgust, sadness, happiness, shame and guilt. (Zentner & Eerola, 2010). These emotions have functions in the adaptation and adjustment of the individual to potentially important real-life consequences in order to preserve one's physical and psychological integrity. Fear, for example, triggers the instinctual fight or flight reaction when an individual is presented with danger. These emotions tend to be intense reactions for mobilizing the body mechanisms necessary for survival. Such reactions are not often observed in individual's listening to music.

The basic emotions are just that, basic reactions for survival, not easily attributed to aesthetic events

such as music listening. For this reason the discrete emotion model is not the best suited to measuring emotional responses to aesthetic experience where music listening is not likely to produce strong reactions of fear and desperation. (Scherer, 2004). For this reason, labels such as tenderness and peacefulness have replaced labels like disgust in the discrete model when applied to music and emotion research (Eerola & Vuoskoski, 2011).

2.2.1.2 Dimensional Emotion Model

The most commonly used dimensional model in music and emotion studies is the Circumplex Model of Affect as described by Russell in 1980 (Zentner & Eerola, 2001). This model represents two core dimensions, *valence* and *arousal.* Valence represents the displeaure-pleasure continuum while arousal represents the activation-deactivation (energy level) continuum. This model is depicted in **Figure 2** below.

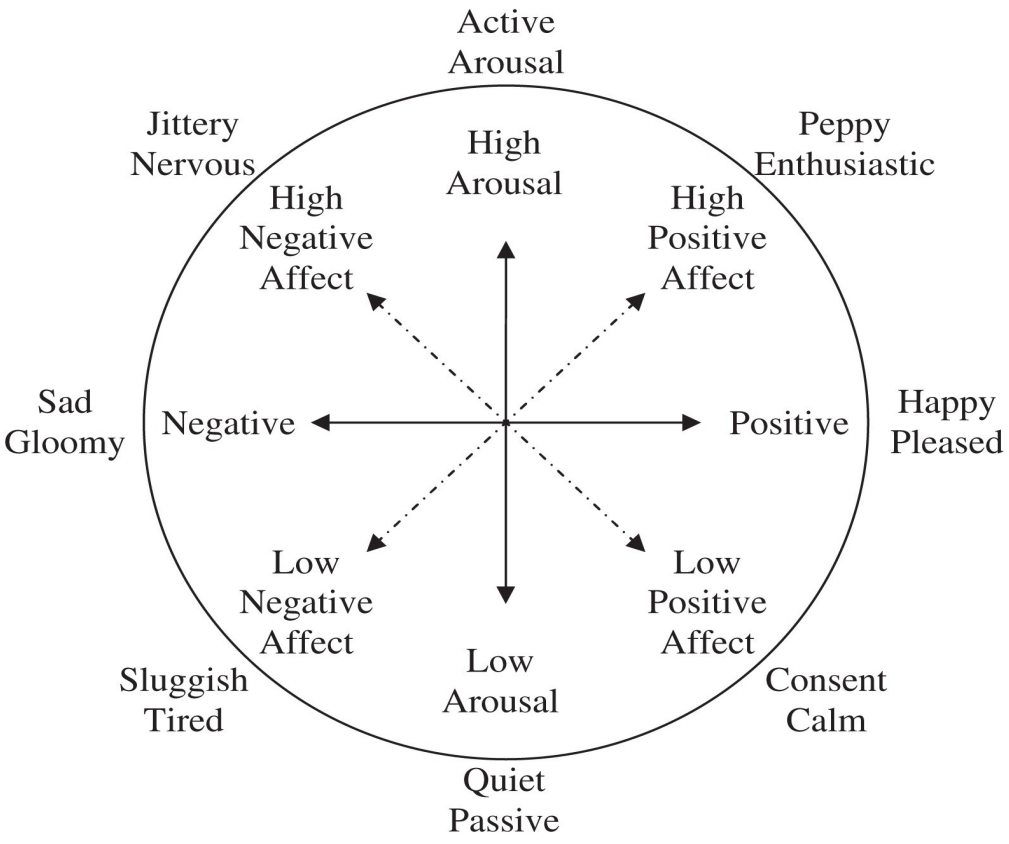


Figure 2. *Russell's Circumplex Model of Affect illustrating various possibilities across the two dimension of valence and arousal.*

Thayer (1989) suggested that the two dimensions of affect were energetic arousal and tension arousal. Thayer explains valence as varying combinations of energetic and tension arousal. By adding a tension-calmness axis, the two-dimensional model easily becomes three-dimensional. **Figure 3** illustrates an overlay of Russell's and Thayer's model and also includes the 6 basic emotion labels (Eerola and Vuoskoski, 2011).

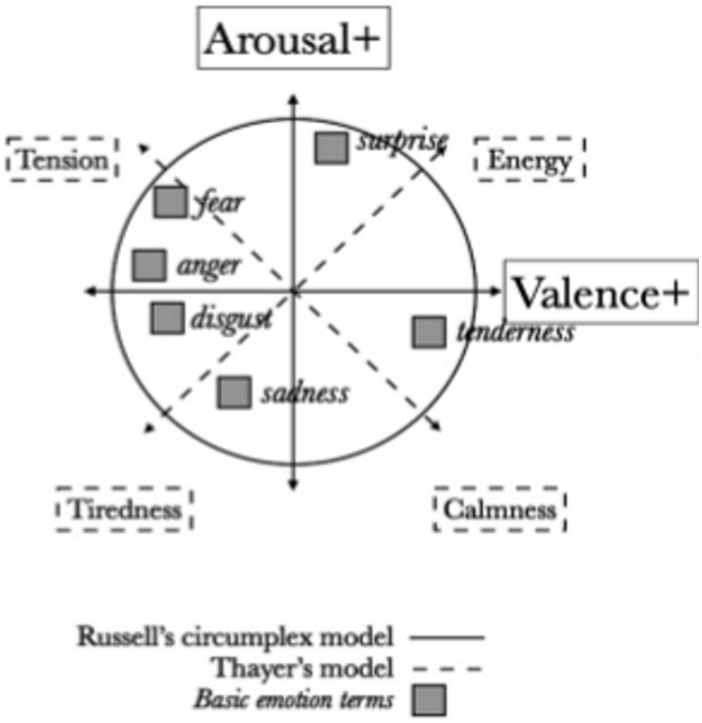


Figure 3. *Integrated illustration of two-dimensional models from Eerola and Vuoskoski (2011 p. 21)*

Though better than the discrete emotion model, the two-dimensional models have been criticised for their lack of differentiation between emotions that share valence-activation space, such as anger and fear. Two-dimensional models and even the adapted three-dimensional model depicted above, still do not account for all the variance in musically induced emotions

2.2.1.3 The Geneva Emotional Music Scale

The 2008 study by Zentner, Grandjean, and Scherer examines musically induced emotion and attempts to develop a domain-specific system for measuring and labelling emotions. In their study, Zentner,

Grandjean and Scherer (2008) developed the Geneva Emotional Music Scale (GEMS) model for measuring musically induced emotion. This model also provides a method for measuring mixed-emotion, emotions of potentially differing valence and arousal felt simultaneously.

At the time of their study, there was no empirically derived method of categorisation for musically induced emotions. Consequently, researchers applied models developed for non-musical areas of study (for example, the discrete emotion model). The authors therefore endeavoured to create a domain-specific model for musically-induced emotions. The labels for the musically-induced emotion model were progressively characterised in 4 interrelated studies in order to create a comprehensive list of words actually suited to describe the subjective experience of induced emotion in music listeners.

Zentner, Grandjean and Scherer (2008) made use of instrumental western art music, comparable to the film music used in this thesis. Using an open response form, participants described their felt emotions using whichever verbal labels they felt correctly described their emotional experience. Exploratory factor analyses was used to reduce the number of terms from 515 to a workable list, categorised into groups of synonyms or similar adjective labels, that is, descriptors such as joyful, amused, felt like dancing, and animated were grouped together under the broader label of Happiness. This process of reduction can be seen in **Figure 4,** over page. The labels correspond to three second-order factors: Sublimity, Vitality and Unease. These labels are used instead of the dimensional model axes (valence, arousal and tension) though they are comparable in affect. Vitality is comparable with arousal and Unease is comparable with tension. Sublimity, though not directly corresponding with the understanding of valence as a rating of pleasure could be compared with the valence dimension if one considers high ratings of labels such as nostalgia, tenderness and peacefulness to indicate a more pleasurable experience.

The study indicated that emotions were more often perceived than felt in response to music. Negative emotions were reported fairly frequently as perceived, expressive properties of the music though these same negative emotions were rarely reported as felt or induced in the listener. (Zentner, Grandjean and Scherer, 2008) The GEMS-9, as used in this thesis, though offering significantly less emotion labels, enables a music listener to rate a broad category of emotions in a minute or less. (Zentner, Grandjean and Scherer, 2008).

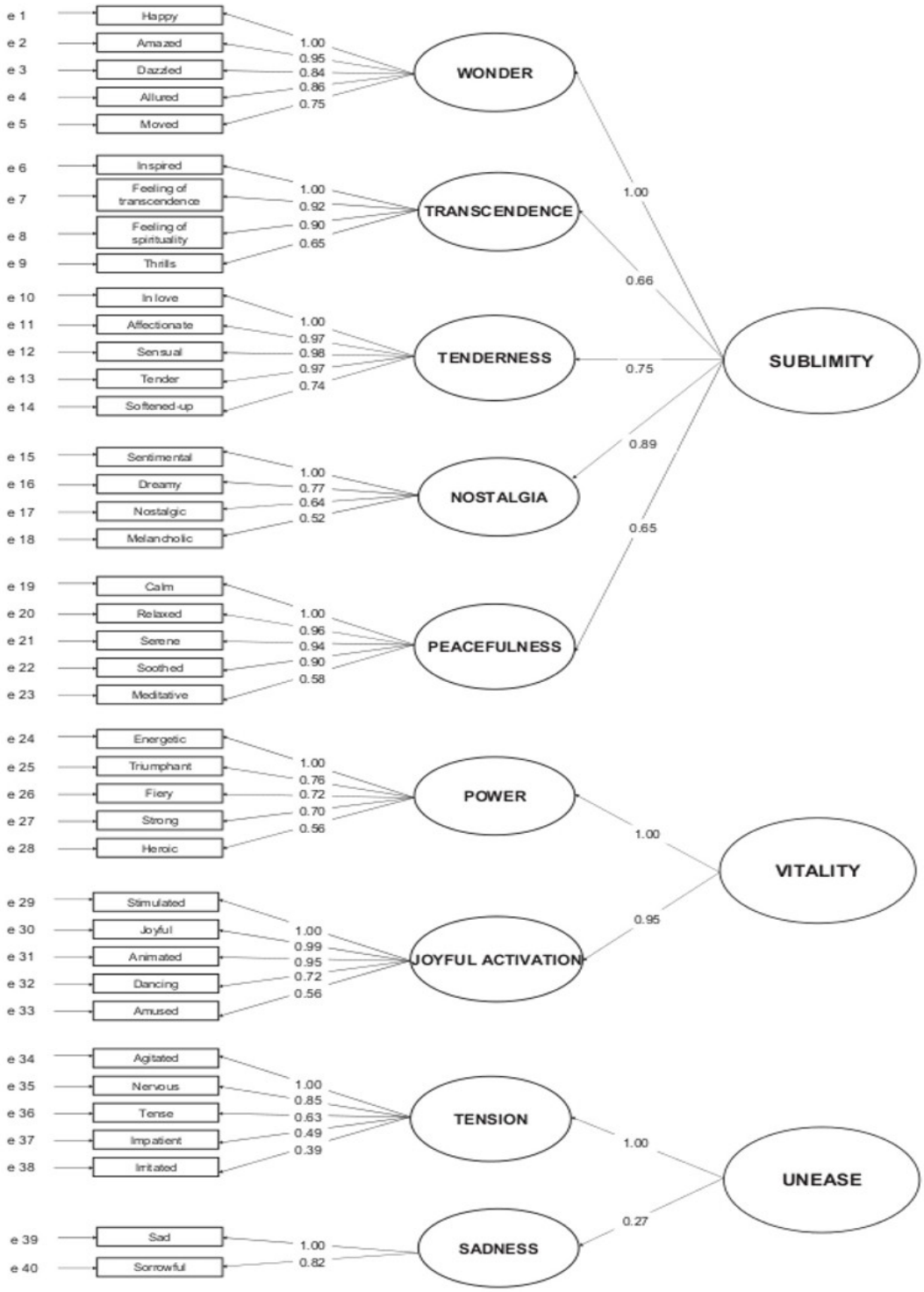


Figure 4. *Confirmatory factor analysis on musically-induced emotion ratings. Labels in circles (centre) are the descriptors used in the GEMS-9 model. (Zentner, Grandjean & Scherer, 2008:507)*

2.2.1.4 EMuJoy

Although not specifically designed to measure musically induced mixed-emotion, the EmuJoy software developed by Nagel et al. (2007) presents a different approach to measuring emotion responses to music and film.

Nagel et al. (2007) state that emotions in music and film should be measured in real-time using a self-report, continuous-response method. This thesis used a real-time, self-report method although the responses were not continuous. The EmuJoy approach may be better for studies involving the simultaneous presentation of film and music.

The EmuJoy, Emotion measurement with Music by using a Joystick, software is an opensource program for multiple platforms that can be used with a mouse, joystick or other interface devices such as Wii game controllers. The software was developed based on the dimension models as described in section **2.2.1.3** and makes specific use of the valence-arousal 2-dimensional model as seen in **Figure 5.**

The EmuJoy interface was tested with participants who rated their emotional responses to both music and images. The images used came from the IAPS and the song examples used were from pop and metal genres. All media were chosen according to valence and arousal. Participants were then asked to rate how they felt while either viewing or listening to the given stimulus. The continuous response method illustrated a change in felt emotions during the course of viewing/listening to the stimulus. This method of continuous report could be adapted for a study similar to the one described in this thesis as a more accurate way of measuring mixed-emotion. (Nagel et al., 2007)

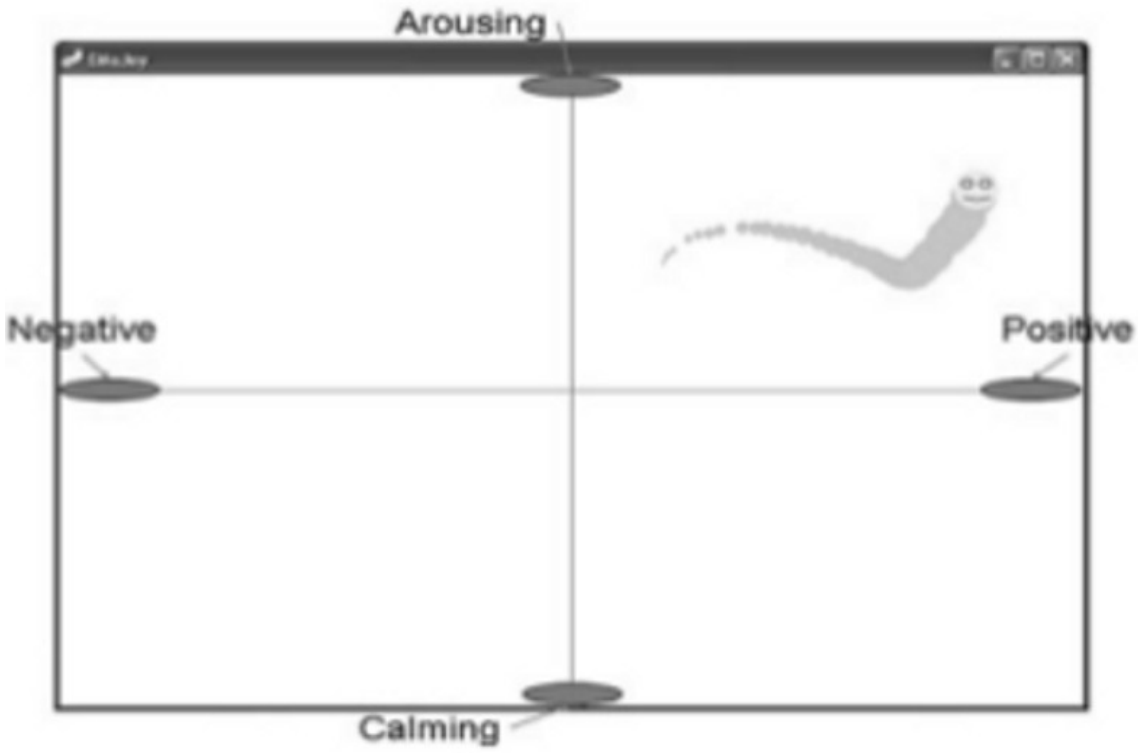


Figure 5. *A screenshot of the EmuJoy interface using the 2-dimensional model of musically induced emotion. (Nagel et al, 2007, p. 284)*

Asking participants to rate felt emotions after an event measures only which emotions they felt, or at least which they remember or think they felt, during the presented stimulus. By having a continuous measure of emotion across perhaps the GEMS-9 categories would allow a more accurate measure of which emotions were felt when and with what intensity. This may help researchers also understand why certain emotions are felt at a given point in music or film and which emotions are more likely to be felt simultaneously in a given condition.

2.3 MUSICIANS VS NON-MUSICIANS

The difference between musicians and non-musicians is an aspect frequently studied in fields ranging from psychology to neuroscience. Evidence for the various differences between musicians and non-musicians, from the more obvious musical development and skill range (Schellenberg 2001, 2004, 2005) to the more obscure differences in brain anatomy (Schlaug et al. 1995), exist in numerous

research. Given this amount of evidence supporting the difference between musicians and non-musicians, the hypothesis of this thesis states that musicians will tend to be more sensitive to the emotional content of the music during film watching and thus their ratings of induced emotion will align more distinctly with the emotional content of the music than the film. This premise is based on the assumption that musicians are more experienced music listeners than non-musicians, however, ongoing research by Bigand does not support this.

Although recent studies show that musicians' and non-musicians' brains differ in both anatomical and functional ways, supporting the notion that years of intense, formal music training has a profound effect on both cognitive and neural architectures of the brain, Bigand (2006) states that individuals without explicit music training but who have sufficient exposure to a given musical idiom (for the purpose of this thesis, film music) may then be viewed as 'experienced listeners' since these non-musicians use the same principles as trained musicians when listening to and structuring the music they hear. (Bigand & Poulin-Charronnat, 2006). This ability developed by non-musicians comes as a consequence of hearing and experiencing music in every day life. As Bigand (2006) states, “the most critical aspect of the human capacity for music resides in the ability to emotionally or affectively respond to musical stimuli” (p. 117) and there is no evidence to support a correlation between formal music training and the strength of an individual's emotional responses to music.

Bigand (2006) does concede that musically trained listeners may have a larger variety of affective responses to music being better able to discriminate subtle differences in musical expressiveness, which may assist in identifying emotions within the music. This does not imply, however, that musically trained listeners therefore experience more powerful induced emotions. Bigand addresses this issue in a 2003 article, stating that the effects of musical expertise should not be confused with the effect of familiarity on a given task.

Film watching is by no means limited to musicians, and, identifying the expressed emotions and experiencing induced emotions due to both the visual and auditory stimuli within a film is also by no means unique to musicians.

3 AIMS OF THE RESEARCH PROJECT

The research project's schedule spanned several months from October 2009 to May 2011. Twenty-four sessions with individual participants were conducted in November 2010.

3.1 EXPERIMENTAL DESIGN

The methodology employed in the empirical part of this thesis is similar to previous studies conducted (Marshall & Cohen, 1988; Lipscomb & Kendall, 1994; Tan et al*,* 2007.) where excerpts taken from a film were paired with music not originally intended for the same film. Studies have shown that film music can induce strong emotion in listeners (Cohen, 2001) and that images, particularly of human facial expression, can also induce strong emotional reactions (Baumgartner et al*,* 2006), although generally limiting the emotion labels to the five basic emotion 'happiness', 'sadness', 'anger', 'tenderness' and 'fear' (Bigand, Filipic & Lalitte, 2005). In an effort to simulate the real world film watching experience, excerpts from existing film music and commercial films were used. Film music is composed for very specific purposes with more explicit emotional content directly related to the visual images of the film thus pre-existing film music was used in this study for its dramatic and deliberate emotional content (Lipscomb & Kendall, 1994).

This study investigated the effect of congruency on induced emotion by combining both visual and auditory stimuli to produce two conditions: emotionally congruent and emotionally non-congruent. Previous studies have tended to avoid the participation of musicians (Ellis & Simons, 2005), as a consequence of this 'gap' in the research, the intention of this study was to explore the effect of musical background on induced mixed-emotion given varied conditions of semantic congruency.

The novel attributes of this study were:

a) The focus was on a wider category of emotion, using an extended GEMS model of mixed-emotion (Zentner, Grandjean, & Scherer, 2008).

b) The GEMS model was adjusted with the addition of 'Humour' and 'Overall Intensity.' Finnish translations of the emotion labels were provided in conjunction with English labels for all participants.

c) The participants were asked to focus on induced emotion rather than perceived emotion.

d) The effect of deliberate emotional non-congruence on induced mixed-emotion was explored.

e) The relationship between the musical background of participants and their emotional response to

film watching, indicating whether or not the emotional content of the music had a stronger effect on musicians, was also investigated.

It was the intention of this study to support two hypotheses:

1) Semantic congruency and the intensity of induced emotion has a strong correlation, so that when music and film are considered semantically congruent the ratings (intensity) of those induced emotions also considered congruent will increase (That is, happiness will increase given a happy congruent condition)

2) Given an emotionally and semantically non-congruent condition, musicians will tend to rate induced emotion according to the emotional content of the audio rather than visual stimuli.

The study presented in this thesis is quantitative, making use of Likert-type rating scales, with values ranging from 1 – not at all, to 5 – very much so. (Eerola & Vuoskoski, 2011). An additional rating of 0 was used so as to avoid skew results should a participant accidentally miss an answer. This linear rating method minimized the need for an interpretation of responses and also increased the accuracy of the study by limiting emotional options to the given emotions. (Hunter et al., 2008). The study made use of verbal, self-report methods including adjective check-list (forced-choice) with quantitative ratings, and a basic, background information questionnaire (Juslin & Laukka, 2004).

Sixteen film music excerpts and twelve film scene excerpts were expert-selected according to their emotional content. The initial selection of music and film excerpts were made according to two basic emotions: happiness and sadness. The selection was limited to only two basic emotions as too great a variety of base emotions was considered too extensive for the purpose of this study. The basic emotions of happiness and sadness were also selected because these two emotions have clear indicators both musically and visually (Cohen, 2005). Acoustic features in music representing sadness include quiet dynamics, slow tempo, legato articulation and large deviations from metrical tempo while the acoustic features of happy music include fast tempo, staccato features as well as few deviations from metrical tempo (Juslin, 2001).

Film music excerpts used in this study were borrowed from a study conducted by (Eerola & Vuoskoski, 2011) in which film music excerpts were classified according to the five basic emotions. Only excerpts classified as either happy or sad (according to a variety of musical features) were used for the purpose of this study. All music excerpts were between 15 and 30 seconds in length as a short excerpt of music was considered sufficient to induce a large variety of emotional responses in both musicians and non-musicians (Bigand, 2006).

Six film scenes were chosen for their depiction of human happiness, including positive attributes associated with happiness such as high levels of energy, playfulness and joy. Scenes chosen reflected these aspects of happiness in physical movement as well as in facial expressions (dancing, laughter and smiles). Six film scenes were chosen for their depiction of human sadness, including other attributes associated with sadness such as despair, physical pain, loneliness and grief. Scenes chosen reflected these aspects of sadness most strongly in facial expressions, particularly tears or weeping (Tan, Spackman & Bezdek, 2007), and in body language such as a hunched posture and trembling shoulders. (Baumgartner et al, 2006). According to Bigand (2005) responses to emotional stimuli in film such as facial expression and body gestures occur extremely fast, therefore all film excerpts were approximately 30 seconds in length. This was considered long enough to allow an induced emotion reaction in participants.

Film excerpts were selected from a variety of genres so as to avoid the issue of preference or familiarity arising from homogeneity. An attempt was made to select films from various countries, filmed in a variety of styles (high colour saturation, film noir, black & white etc.) and films considered 'blockbusters' from the USA were generally avoided to limit issues of familiarity. The films from which excerpts were taken are listed in Appendix B. All film excerpts were around 30 seconds in length and were edited using Avidemux (Linux, Ubuntu open-source software).

The music excerpts were edited in Audacity (Linux, Ubuntu open-source software) to produce a continuous length of music to accompany the 30 second film excerpts. The music excerpts were looped with the appropriate fade in, cross-fade and fade out applied to produce a smooth, aesthetically pleasing piece of music without a gap between the looped sections, or abrupt ending.

The film music and film excerpts were then paired to produce two conditions of congruency. Emotionally congruent pairs were considered to represent the same basic emotion while emotionally non-congruent pairs were considered to represent opposing basic emotions. (eg. Happy film music excerpt paired with sad film excerpt and vice versa). Aesthetic principles were carefully considered when pairing the music and film excerpts. Pairs were carefully matched to produce an aesthetically pleasing experience, especially for the emotionally congruent condition. While the non-congruent condition deliberately used emotionally mismatched music for the film scene, the overall aesthetic was still considered, such that if the film scene was considered highly dramatic then dramatic music, be it happy or sad, was selected to match it.

A comedic effect was observed particularly in the non-congruent pairing of happy music with sad film. For this reason the addition of 'humour' to the GEMS scale was appropriate and necessary. The overall intensity rating was added as a means for participants to rate how strongly they reacted emotionally to the stimulus even if they had difficulty naming or deciding on a specific emotional response. Participants were asked to rate the induced emotion they experienced whilst watching these pairs (congruent and non-congruent) according to the adjusted GEMS scale. Although participants were instructed to rate induced emotion, it does not ensure that participants responses reflected induced emotion. This is especially true in the non-congruent condition when, if emotionally confused, participants may have resorted to rating the emotion they perceived in either the visual or auditory stimulus (Bigand, 2006).

3.1.1 Media and Data Collecting

Questionnaire and database: An electronic self-report questionnaire was created in PHP with a comma separated value-file back-end, which saved the participant data creating csv result files. The PHP script created a trigger file, which interfaced with a Python script enabling automatic randomised play of the next example.

The questionnaire, coded in html with css (cascading style sheets), gave participants complete control over the length of time between examples. Participants used the mouse to select answers.

Computers: A laptop running Linux, Ubuntu was used to host the electronic questionnaire. A second

screen was used to display the film excerpts. Participants were thus able to watch the excerpts and rate their emotional responses simultaneously.

Speakers: Two Genelec speakers were used for stereo sound. Participants were able to adjust the volume according to their own level of comfort.

3.1.2 Set-up and Procedure

The experiment was conducted in the EEG room of the Music Therapy Department as well as in the Motion Capture Lab. In both locations the set-up was the same: a laptop, secondary screen and stereo speakers.

The study was conducted with individual participants in hour long slots. Participants were made aware of the time and encouraged to complete the questionnaire in the designated time. All participants completed the experiment within the hour.

3.1.3 Participants

Participants were recruited by email from the general student body of the University of Jyväskylä. In this way a homogeneous sample group was obtained without limiting the study to one faculty. Participants were of various nationalities (Finnish, Russian, Canadian, Japanese, German, American, Indian, Spanish, Lithuanian, Dutch and Bahrainian) with the majority being non-native English speakers with Finnish as their mother-tongue. Participants were asked to describe their musical background, daily consumption of music and level of interest in both film and music. Based on the recruitment email, participants without considerable or professional film knowledge and of varying musical background were selected to take part in the study. While aware of the purpose of the study (measuring emotional reactions to film excerpts), participants were naïve to the hypotheses.

The first page of in-study questionnaire required basic demographic data from each participant as well as information about the individual's musical background. This page also included instructions and an example of the Likert-type scale response page. Participants were required to select one of the following when answering How many years of formal music training have you received? *1) 0-4 years, 2) 4-10 years, 3) More than 10 years*. Participants were then required to select on of the following

when answering the question Describe your musical background *1) Professional musician, music student with continuous, active participation in performance 2) Music as hobby, non-professional performance or self-taught musician 3) Used to play an instrument/have formal tuition but no longer active 4) Basic, in-school music education or 5) No musical training whatsoever*.

The definition of musician for the purpose of this study is a person who has had no less than four years of formal music training and who still regularly participates in musical activities, specifically performance related. Non-musicians are classified as having no formal music training or a person with less than four years of formal music tuition who no longer actively participates in music related activities.

The final page of the questionnaire included a rating of familiarity for each film used in the experiment. Based on English and, where possible, Finnish titles of the film, participants were asked to rate their familiarity with the film. *1) Never heard of it or seen it 2) Heard of it but never seen it 3) Seen it once 4) Seen it more than once 5) Seen it multiple times, it's one of my favourites.* The films were consistently rated between 1and 3, with few exceptions. No correlation between familiarity with the film and emotion rating was explored as the intent of the film choice was obscurity.

3.1.4 Pilot Study

The original design of the experiment consisted of three sections: combined visual-audio examples, visual only and audio only conditions. The combined condition consisted of 10 sad and 10 happy film clips. The clips were then combined with congruent and non-congruent audio as described in section **3.1.**

During the visual only condition, participants were required to rate their emotional response to the clip without any accompanying audio. They were also required to rate their familiarity with the film excerpt as well as their preference for it on a Likert-type scale. The audio only condition required participants to rate their emotional response to, familiarity with and preference for the audio excerpt without an accompanying visual.

A pilot study was conducted in which four participants (including native and non-native English

speakers) completed the questionnaire according to the set-up described above in the EEG room. Each participant was given an hour to complete the experiment. Due to the time participants took to evaluate their emotional response, only the first section was ever completed during the allotted time. Because of this, and participant feedback which emphasized emotional fatigue after having to watch 40 excerpts, the experimental design was modified taking these problems into account. The number of excerpts was reduced from 20 to 12 and section two and three, involving visual and audio only conditions, were removed from the study.

3.2 ANALYSIS

Participant csv result files were imported into an OpenOffice Spreadsheet. The data was formatted and then imported into MatLab. All analyses were completed in MatLab.

Data was divided into four conditions consisting of 6 music-film combined excerpts as rated by 24 participants:

1. Congruent condition - happy film excerpt paired with happy film music (HapCon)
2. Non-congruent condition - happy film music paired with sad film music (HapNCon)
3. Congruent condition – sad film excerpt paired with sad film music (SadCon)
4. Non-congruent condition – sad film excerpt paired with happy film music (SadNCon)

Results were also divided into ten musicians and ten non-musicians based on the information provided by participants regarding their musical background. The additional four participants were excluded from the musician/non-musician groups as they were considered neither musicians nor non-musicians based on their answers to the musical background questionnaire, a result of being self-taught hobbyist musicians or having long since quit formal music tuition. Due to the ambiguous nature of their musical background, their ratings were omitted from the statistical analysis.

3.2.1 Cronbach alpha

The cronbach alpha coefficient was calculated, testing the internal consistency of the ratings. A result above .7 is considered satisfactory in psychological studies (Salkind, 2003). The cronbach alpha coefficients per condition can be found in the table below as well as the cronbach coefficient for all results regardless of condition. All coefficients are above the .7 threshold of satisfaction.

Table 1. *Cronbach alpha coefficients measuring internal consistency per condition and for the study as a whole.*

Cronbach-alpha	
Happy Con	0.8017
Happy N Con	0.7651
Sad Con	0.7385
Sad N Con	0.7924
Overall	**0.7187**

The highest inter-rater agreement (per condition) was for the happy congruent condition, while the lowest inter-rater agreement was for the sad congruent condition. The overall inter-rater is above the .7 threshold of satisfaction for internal consistency.

3.2.2 Mean Ratings

The mean per emotion per condition was taken for both musicians and non-musicians to establish whether or not musicianship and musical background had a significant effect on emotion ratings. While both musicians' and non-musicians' ratings tend to follow similar trends across conditions, certain emotions are consistently rated differently. Humour is consistently rated higher by musicians across all conditions, as is Tenderness and Power. Joy and Sadness are rated the same by musicians and non-musicians in the happy-congruent condition, after which musicians tend to rate Joy higher than non-musicians across all other conditions. Musicians rate both the happy and sad congruent conditions lower for Overall Intensity than non-musicians. Musicians also give higher ratings to Overall Intensity for both non-congruent conditions. This suggests a relationship between congruency and musicianship. **Figure 6** contains graphical representations of the difference between musicians' and non-musicians' emotion ratings. Please see Appendix E for emotion abbreviations.

A priori intuition of which emotions would be rated highest in a given condition is reflected in the trends of both musicians and non-musicians, however, there are some differences as expected according to the hypothesis that musicians would be more likely to align their emotions with the audio rather than visual content.

The most obvious expectation was that Joy would be rated significantly higher than Sadness for the happy congruent condition and that Sadness would be rated significantly higher than Joy for the sad

congruent situation. These expected ratings are reflected in both musicians and non-musicians. And as expected, Joy and Sadness both received higher ratings in their given conditions regardless of congruency.

Wonder and Transcendence were expected to be more highly rated in the happy conditions and given the results below, this seems the correct assumption for Transcendence though the ratings for Wonder show no significant difference between conditions. It should be noted that participants seemed to have the most difficulty in understanding the concept of Wonder and Transcendence as emotions and also questioned the difference between the two. Possible confusion or misunderstanding of these emotion labels may be responsible for the low ratings across all conditions.

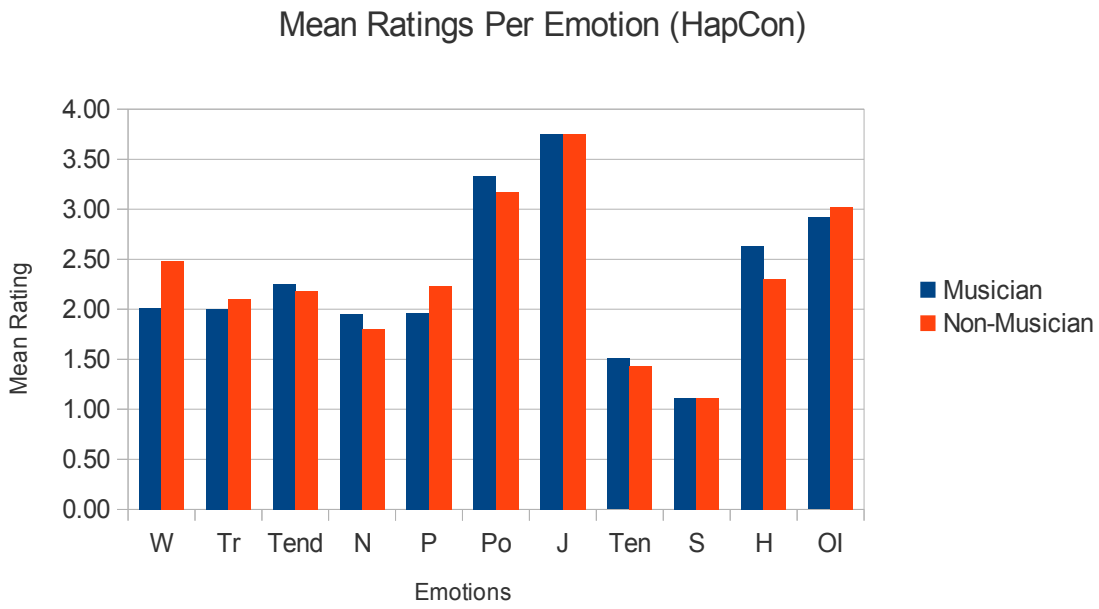
Tenderness had surprisingly high ratings for the happy non-congruent condition while keeping with the expected ratings for all other conditions. Nostalgia received the highest ratings during the happy non-congruent condition. This was expected as this condition could evoke strong associations through the mechanism of episodic memory, especially as this condition evoked the highest ratings of Tenderness as well.

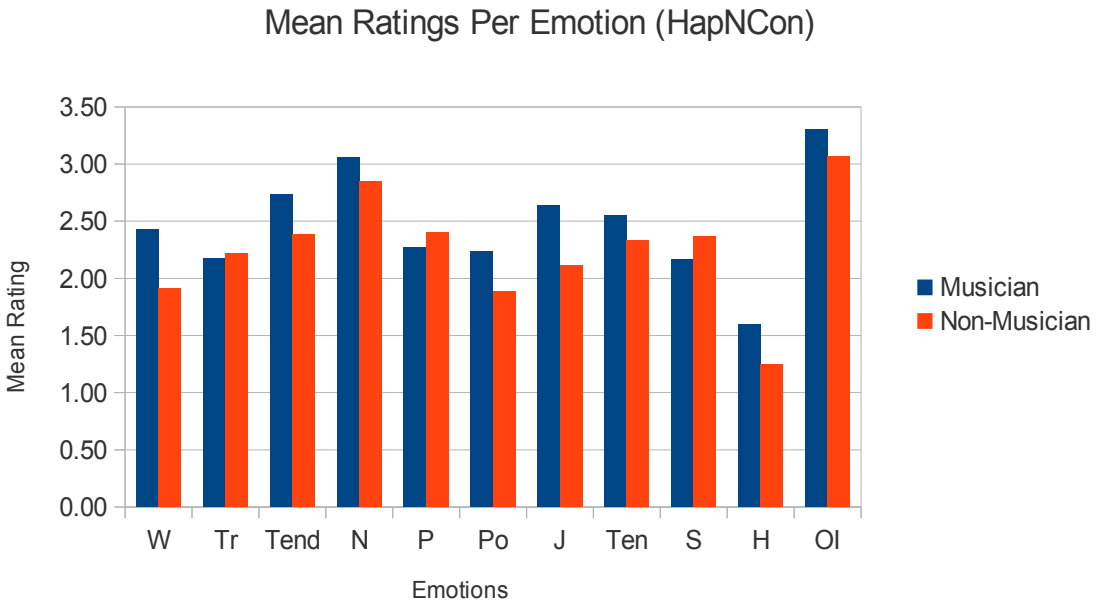
The highest ratings for Peacefulness were expected in the sad congruent condition but results show that Peacefulness was most highly rated for the happy non-congruent condition. This seems a contradiction as Tension ratings were also high for the happy non-congruent condition. (High Tension ratings were expected for this condition). Surprisingly, Tension ratings were highest for the sad congruent condition, again a seeming contradiction as there is no significant difference between the ratings of Tenderness and Tension for the sad congruent condition. This implies that Tenderness and Tension can be felt simultaneously and with similar intensity.

As expected, Power was rated most highly for the happy congruent condition followed by the sad non-congruent condition. This implies a relationship between the emotion of Power and happy music which is not unexpected as the acoustic features of happy music (major mode, faster tempo, thicker texture) tend towards the Power label, which includes other emotion words such as 'energetic' and 'triumphant'.

Despite the addition of Humour due to an observed comedic effect during the sad non-congruent

condition, Humour received highest ratings for the happy congruent condition. Overall Intensity received highest ratings for the sad congruent condition, this is in keeping with the expectation that Sadness tends to be felt with greater intensity than happiness. The condition rated second highest in terms of Overall Intensity was the happy non-congruent condition – this was not expected as the congruent conditions were expected to evoke the strongest emotional reactions in participants. That this condition received second highest intensity ratings might suggest an emotional alignment with the sad film music as sadness is felt with greater intensity than happiness. This also suggests that the emotional content of the music in this condition overwhelmed the emotional content of the film clip.





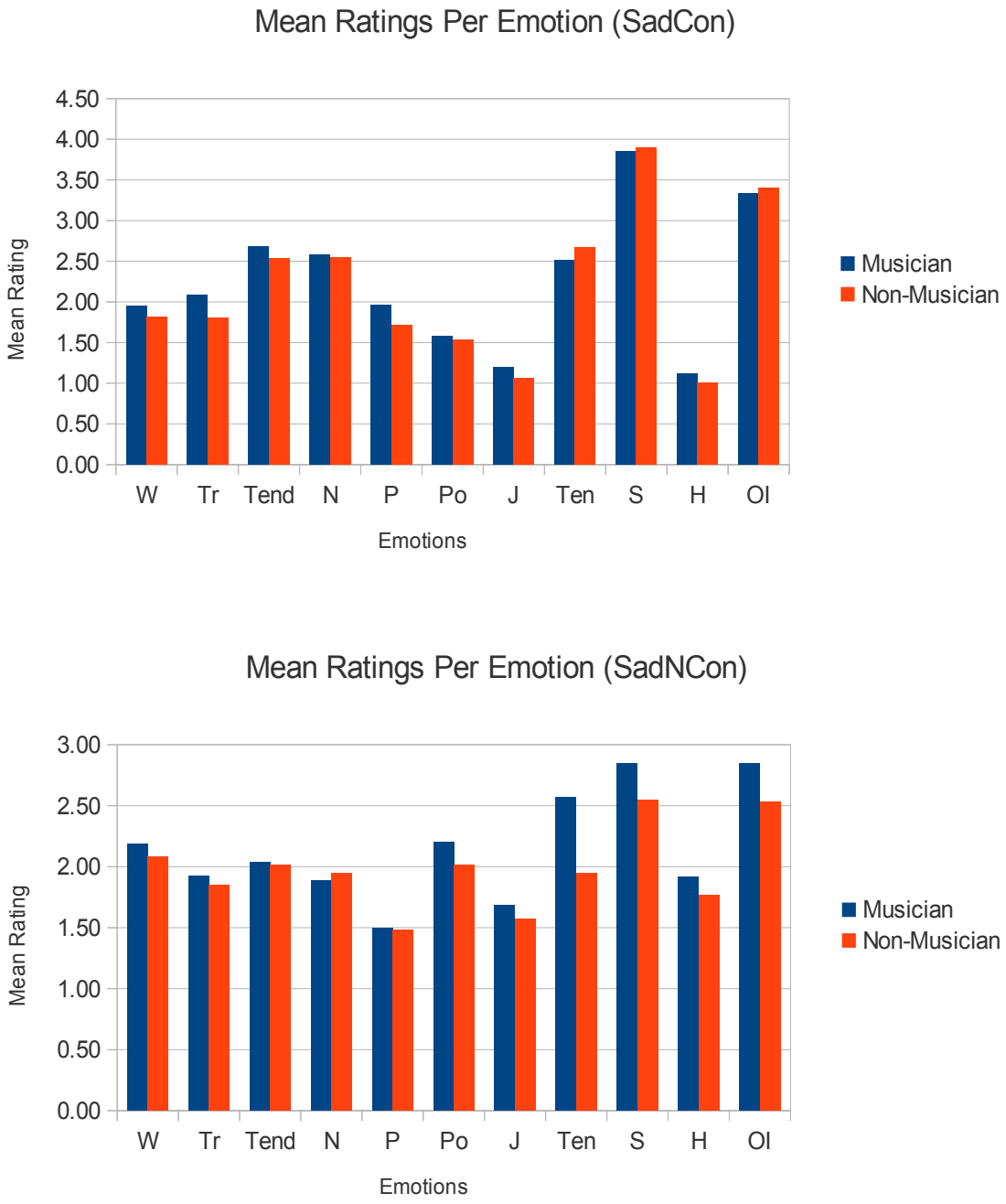


Figure 6. *Graphical representation of the difference in mean ratings per emotion per condition for musicians and non-musicians (1 – musicians; 2 – non-musician)*

3.2.3 One-way Anova

A one-way Anova was conducted to measure the effect of congruency on emotion ratings. The Anova was run separately for the happy condition and sad condition. These Anova results can be found in **Table 1.1** and **Table 1.2** below. Congruency only had a significant effect on 6 of the 11 specific emotions in the happy condition and a significant effect on 8 of the 11 specific emotions in the sad condition. Why certain emotions were effected more than others, and how this differed between conditions will be discussed later in this section.

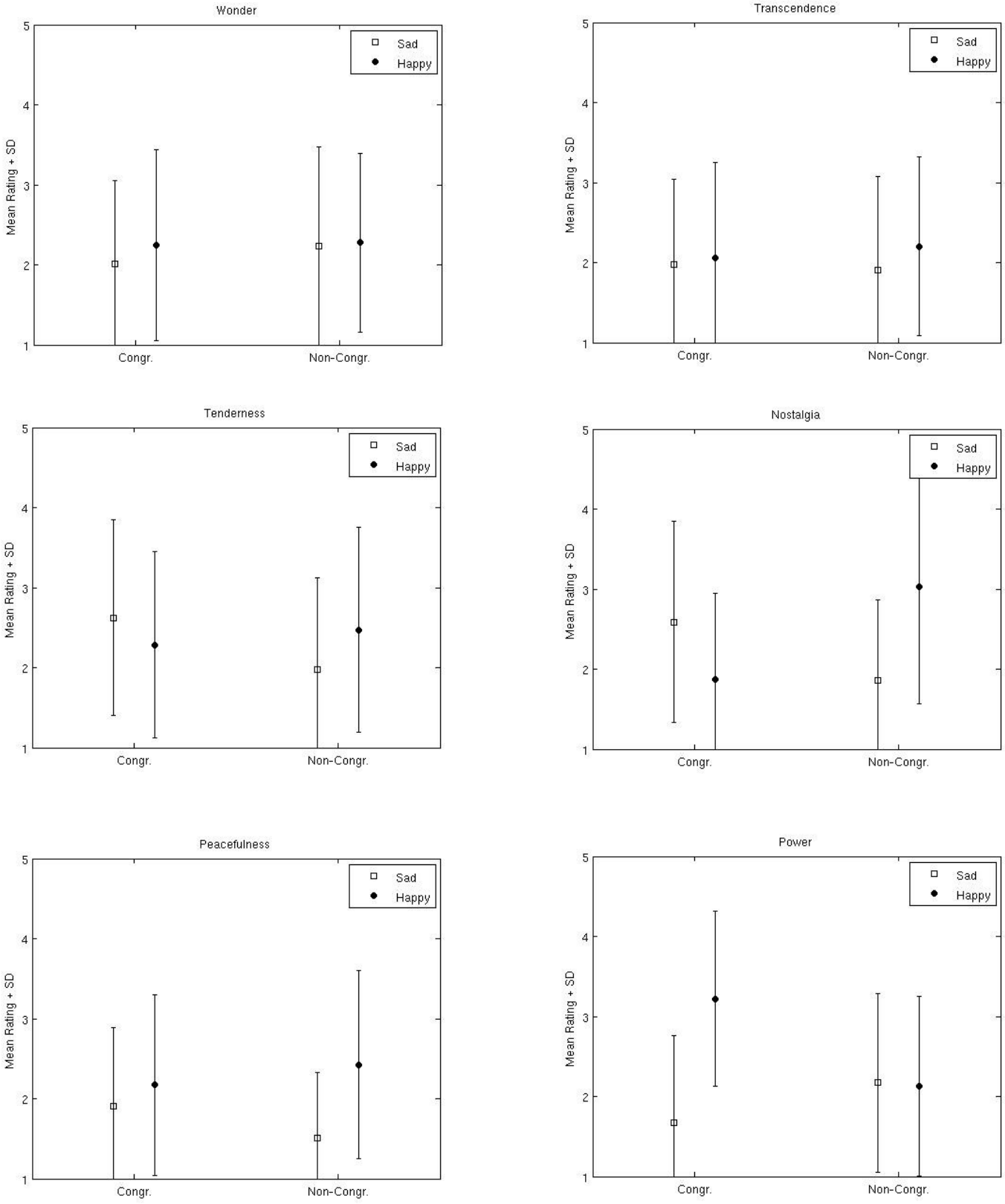
Table 1.1: *One-way Anova results showing the effect of congruency (happy congruent / happy non-congruent) on emotion ratings.*

Anova Congruency (Happy) for all df=1,46			
Emotion	**F**	**P**	**Effect Size**
Wonder	0.00	0.96	0.00
Transcendence	1.26	0.26	0.00
Tenderness	5.25	0.02	0.02
Nostalgia	0.03	0.87	0.00
Peacefulness	32.17	p <.001	0.10
Power	64.70	p <.001	0.18
Joy	305.86	p <.001	0.52
Tension	41.46	p <.001	0.13
Sorrow	198.32	p <.001	0.41
Humour	13.97	p <.001	0.05
Overall Intensity	5.59	0.02	0.02

Table 1.2: *One-way Anova results showing the effect of congruency (sad congruent / sad non-congruent) on emotion ratings.*

Anova Congruency (Sad) for all df=1,46			
Emotion	**F**	**P**	**Effect Size**
Wonder	2.7	0.1011	0.01
Transcendence	0.25	0.6176	0.00
Tenderness	21.74	p <.001	0.07
Nostalgia	29.8	p <.001	0.09
Peacefulness	13.27	p <.001	0.04
Power	14.95	p <.001	0.05
Joy	36.36	p <.001	0.11
Tension	8.82	0.023	0.02
Sorrow	86.12	p <.001	0.23
Humour	69.24	p <.001	0.19
Overall Intensity	41.35	p <.001	0.12

Figure 7. (below) illustrates the effect of congruency on emotion ratings for each individual emotion across all conditions. The graphs also indicate the distribution of emotion ratings and indicates the variance in ratings per condition per emotion.



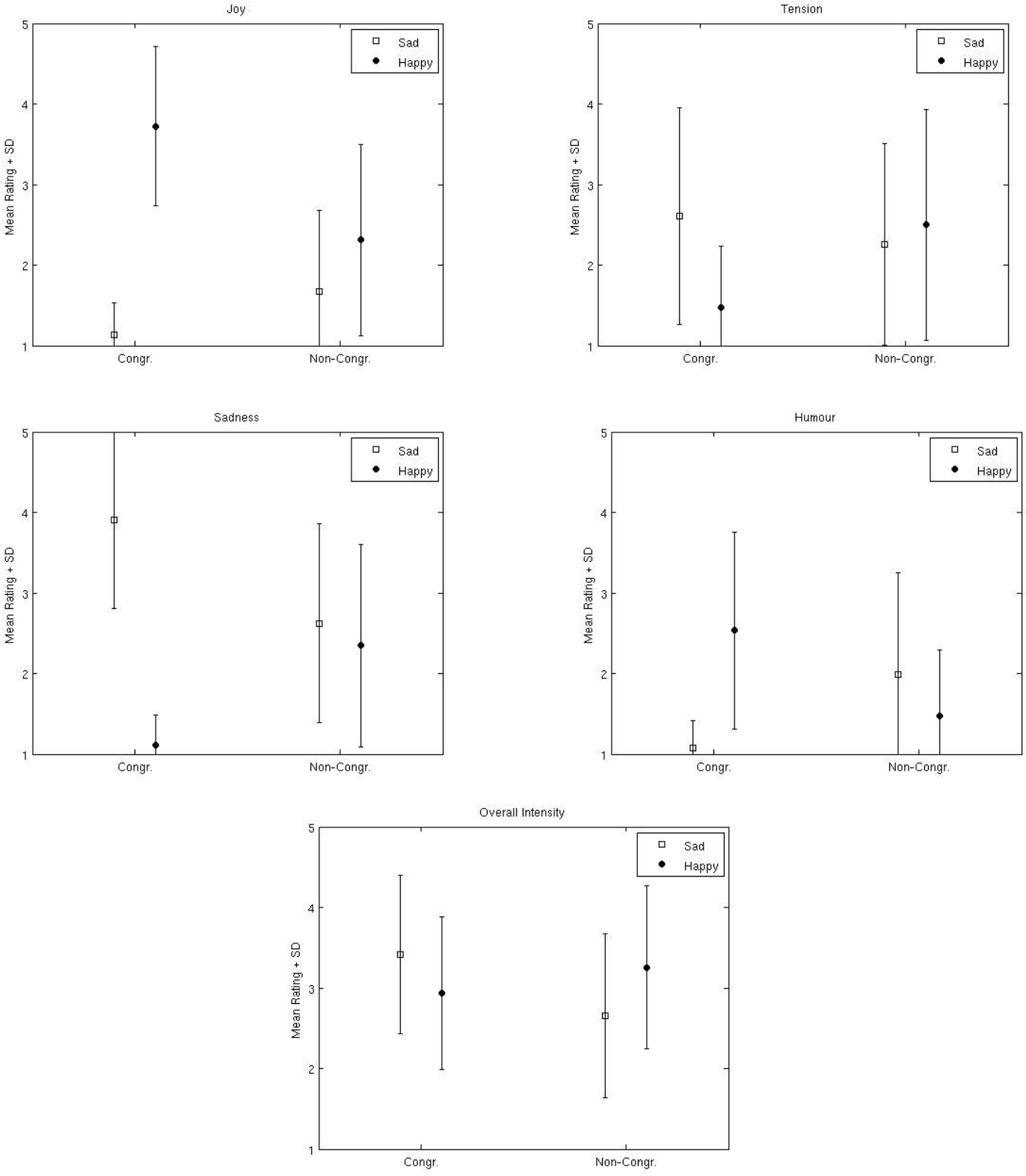


Figure 7. *Graphical representation of one-way Anova results for Congruency per emotion.*

According to the one-way Anova tests performed on happy and sad conditions, as seen in **Table 1.1 and Table 1.2,** and in **Figure 7.**, certain emotions seem more significantly effected by semantic congruency than others. From the results it is evident that different emotions are effected based on the basic emotional content of the film excerpt. The following emotions were significantly effected by congruency for both film conditions: Peacefulness, Power, Joy, Sadness and Humour. This suggests that only certain emotions are dependent on congruency. Had the basic emotion in the films been different, however, the ratings for Joy and Sadness might not have been so significant. Discarding Joy and Sadness (their results possibly inflated by the fact that the basic emotion within the film excerpts was either Joy or Sadness) leaves only Peacefulness, Power and Humour as having been significantly effected by congruency across all conditions. This suggests that these emotions are more effected by the emotional content of the music than other emotions.

A significant effect on Tension was observed in the happy film excerpts. A happy visual when combined with sad music created a sense of foreboding and impending doom. In terms of film and use of music as subtext, this is a familiar device used to indicate that something bad is going to happen either to the characters or in terms of plot development (Boggs & Petrie, 2008). Tension, therefore, received higher ratings for the happy non-congruent condition. That Tension received higher ratings for the sad conditions, but was not effected by semantic congruency for the sad conditions, indicates that visual stimuli with sad emotional content produces feelings of Tension in the viewer irrespective of the emotional content of the music.

Tenderness, Nostalgia and Overall Intensity were significantly effected by congruency in the sad conditions. Tenderness, Nostalgia and Overall Intensity received higher ratings for the sad congruent condition. This could be attributed to the observed comedic effect produced when a sad visual was paired with happy music.

That there was no significant effect of congruency on Wonder or Transcendence across all conditions suggests that either these emotions are weak and not strongly induced during film watching or that participants' understanding and ability to rate these emotions was compromised by the verbal label.

A one-way Anova was conducted to measure the effect of musicianship on emotion ratings. The Anova was run separately for the four sets of film and music conditions (HapCon, HapNCon, SadCon, SadNCon). These Anova results can be found in **Table 2.1** and **Table 2.2** below. Musicianship seems to have little to no effect on emotion ratings.

Table 2.1: *Anova results showing the effect of musicianship on emotion ratings for both happy congruent and happy non-congruent condition*

Anova Musicianship (HapCon)			
Emotion	**F**	**P**	**Effect Size**
Wonder	4.54	0.03	0.04
Transcendence	0.20	0.65	0.00
Tenderness	0.10	0.75	0.00
Nostalgia	0.58	0.44	0.00
Peacefulness	1.74	0.18	0.01
Power	0.65	0.42	0.01
Joy	0.00	1	0.00
Tension	0.27	0.60	0.00
Sorrow	0.00	1	0.00
Humour	2.31	0.13	0.02
Overall Intensity	0.36	0.54	0.00

Anova Musicianship (HapNCon)			
Emotion	**F**	**P**	**Effect Size**
Wonder	6.98	0.01	0.06
Transcendence	0.04	0.84	0.00
Tenderness	2.43	0.12	0.02
Nostalgia	0.58	0.44	0.00
Peacefulness	0.40	0.52	0.00
Power	2.99	0.08	0.02
Joy	6.21	0.01	0.05
Tension	0.71	0.40	0.01
Sorrow	0.79	0.37	0.01
Humour	6.81	0.01	0.05
Overall Intensity	1.48	0.22	0.01

Table 2.2: *Anova results showing the effect of musicianship on emotion ratings for both sad congruent and sad non-congruent condition*

Anova Musicianship (SadCon)			
Emotion	**F**	**P**	**Effect Size**
Wonder	0.52	0.47	0.00
Transcendence	2.22	0.13	0.02
Tenderness	0.42	0.51	0.00
Nostalgia	0.02	0.89	0.00
Peacefulness	2.08	0.15	0.02
Power	0.08	0.77	0.00
Joy	3.26	0.07	0.03
Tension	0.36	0.54	0.00
Sorrow	0.06	0.80	0.00
Humour	4.73	0.03	0.04
Overall Intensity	0.13	0.71	0.00

Anova Musicianship (SadNCon)			
Emotion	**F**	**P**	**Effect Size**
Wonder	0.20	0.65	0.00
Transcendence	0.11	0.73	0.00
Tenderness	0.01	0.93	0.00
Nostalgia	0.12	0.72	0.00
Peacefulness	0.01	0.91	0.00
Power	0.79	0.37	0.01
Joy	0.39	0.53	0.00
Tension	7.18	0.01	0.06
Sorrow	1.69	0.19	0.01
Humour	0.47	0.49	0.00
Overall Intensity	2.80	0.09	0.02

As observed in **Figure 6**, musicians gave higher ratings than non-musicians to Overall Intensity for both non-congruent conditions. This suggests a relationship between congruency and musicianship. However, the one-way Anova results as listed above in **Table 2.1** and **2.2** indicated no significance between musicianship and emotion ratings across all conditions. Minute effects were observed in Joy and Humour for the happy non-congruent and sad congruent conditions. Similarly, tiny effects were observed for Wonder in both the happy congruent and happy non-congruent conditions as well as for Tension in sad non-congruent condition. These effects are so tiny however, as to be considered negligible.

Bigand (2006) suggests that the lack of effect of musical background on emotion ratings may be because emotional responses do not depend on the extent of a listener's music tuition and that musicians do not categorize induced emotions in a more sophisticated way than non-musicians. Bigand (2005) also states that since music serves an evolutionary function, all humans, regardless of training, share a certain innate level of musical competence.

3.2.4 Two-way Anova

A two-way Anova was conducted per condition per emotion to investigate the possible simultaneous correlation between congruency and musicianship on emotion ratings.

There was no main effect of either musicianship or congruency given the happy condition (both $F(1,236)<0.30$, p=ns). There was no significant interaction between musicianship and congruency for the happy condition ($F(1,236)=2.6$, p=ns).

Similarly, no main effect of either musicianship or congruency was observed in the sad condition (both $F(1,236)<3.64$, p=ns). Again, there was no significant interaction between musicianship and congruency for the sad condition ($F(1,236)=1.6$, p=ns).

These results reiterate that congruency had the greater effect on emotion ratings while musicianship had little to no effect whatsoever.

3.3 Summary of Results

Hypothesis 1: Semantic Congruency and Emotional Intensity

Semantic congruency and the intensity of induced emotion has a strong correlation, so that when music and film are considered semantically congruent the ratings (intensity) of those induced emotions also considered congruent will increase.

The film excerpts were chosen deliberately to reflect one of two basic emotions, either happiness or sadness. Without exception, Joy was rated significantly higher than Sadness for the happy congruent condition (Joy being the congruent emotion). Sadness was rated significantly higher than Joy for the sad congruent situation (Sadness being the congruent emotion). This supports the hypothesis regarding semantic congruency and emotional intensity and supports Gabrielsson's (2002) positive relationship between music/film and induced-emotion.

Joy was never rated higher on the Likert-scale than in the happy congruent condition. This indicates a clear relationship between the emotion Joy and semantic congruency. Music perceived as happy when combined with semantically congruent visuals (happy film) produce the highest ratings for Joy across all participants. It is interesting to note, however, that despite intense ratings of Joy in the happy congruent situation, the Overall Intensity of the emotional experience was significantly lower than both the sad congruent condition and happy non-congruent situation. This indicates that the intensity of an emotional response (across all emotions, not only those considered congruent) is not dependent on semantic congruency.

Similarly, Sadness was never rated higher than in the sad congruent condition. The sad congruent condition was also rated the highest on the scale of Overall Intensity. Trainor & Schmit (2003) state that although positive emotions (eg. joy, tenderness, peacefulness) are associated with approach behaviours, negative emotions (eg. anger, tension) are associated with withdrawal behaviours. Music expressing and inducing Sadness, though considered a negative emotion, is associated with approach behaviour because it is often considered the most beautiful as well. This might explain why the sad congruent condition received the highest Overall Intensity ratings. This also indicates that people have a tendency to experience Sadness far more intensely than they experience Joy.

Joy and Sadness both received higher ratings in their given conditions, that is when sad film excerpts were used regardless of congruency with music, the emotion Sadness received higher ratings and similarly for Joy during happy film excerpts. This supports Cohen's (2001) theory of visual primacy. The only exception to this is in the happy non-congruent condition where non-musicians rated Sadness slightly higher than Joy.

Hypothesis 2: Influence of Musical Background on Emotional Alignment

Given an emotionally and semantically non-congruent condition, musicians will tend to rate induced emotion according to the emotional content of the audio rather than visual stimuli.

Despite minor differences in emotion ratings between musicians and non-musicians, this study did not provide any empirical evidence to support the hypothesis stated above. A two-way Anova was conducted in the hopes of finding a correlation between musicianship and congruency but this only reiterated the original findings that semantic congruency has a far greater effect on the intensity of induced emotion than musicianship.

3.4 DISCUSSION

Hypothesis 1

It is clear from the results that only certain emotions are effected by semantic congruency and that the emotional content of the film seems to be the more powerful force in determining which emotions are experienced. While the ratings of Joy and Sadness relative to their congruent condition supports the hypothesis stated above, the Overall Intensity ratings (higher for the sad congruent and happy non-congruent condition) seem to dispute this hypothesis. Therefore, emotional intensity can not be considered solely dependant on semantic congruency.

Verbal labels, as provided in English and Finnish with a variety of synonyms, proved problematic as many non-English or Finnish natives battled with the terminology and asked for repeated clarification on the words and concepts. A misunderstanding of terms, in particular Wonder and Transcendence, may have resulted in skewed ratings as participants may have been less inclined to rate an emotion high on the Likert-scale if they were unsure of its meaning and therefore if they were even feeling it. Language

itself may be a barrier in conveying meaning as the way in which a Russian speaking person interprets Transcendence may differ greatly from a Spanish speaking person's interpretation. Discrepancies in language and verbal labels may account for certain emotions seeming weak and lacking any correlation with semantic congruency for all conditions.

Hypothesis 2

Although musicianship and musical background did not seem to have a significant effect on the participants' emotion ratings of induced mixed-emotion, a difference in musical sensitivity may have a greater effect in how an individual reacts to simultaneous audio and visual stimuli.

In post experiment discussions with individual participants, comments were made by several participants regarding the way in which the music had been edited. Each music clip, averaging around 15 seconds in length, was looped and edited with fade in, fade out and cross-fade filters to make the music sound as natural as possible. Despite this attempt, several participants found the edited music and repetition of a 15 second section to be annoying and distracting, disrupting their emotional experience. It was initially accepted that those who found fault with the soundtrack edit were more likely to be musicians, given their more developed listening skills. However, when these participant comments were compared with musical background, there was no correlation between musical background and soundtrack fault finding. Several musicians when asked what they thought about the soundtrack edit, admitted they had not even been aware of an edit or of the music being looped. This suggests a sensitivity to music unrelated to musical background.

The following aspects should therefore be taken into consideration in future research as they may have a more significant effect than musical background (particularly years of formal music tuition) on how a person emotionally responds to a given visual and audio stimulus: cognitive styles including Baron-Cohen's empathizer-systemizer theory (Kreutz, Schubert & Mitchell, 2008), mood, and personality type (Rentfrow & Gosling, 2003).

4 CONCLUSION

Although this thesis provides no conclusive evidence supporting the hypotheses, it does offer an opportunity for future research into the relationship between film, music and induced mixed-emotion. A summary of the main findings of this thesis are listed below.

- There is an implicit relationship between expressed emotion in film (happiness or sadness) and the intensity of the corresponding emotion (Joy or Sadness) in congruent conditions,
- Semantic congruency has a significant effect on the intensity of certain emotions only,
- There is no significant effect of musical background on the intensity of induced mixed-emotion,
- There is little difference between the emotion ratings of musicians and non-musicians,
- Verbal labels and language choice can effect emotion ratings,
- Familiarity and preference may play a more significant role in the intensity of induced emotion than this study illustrates,
- Traits, other than musical background, may be responsible for the difference in sensitivity of individuals to music and consequent induced emotions.

4.1 Caveats and Future Research

At no point in this study is musical or cinematic preference taken into account. Although an attempt was made to measure preference and familiarity with all visual and audio excerpts in the pilot study, these measures were abandoned due to time constraints in the final experiment in favour of allowing a broader excerpt selection for the purpose of rating induced mixed-emotion. The experiment described in this thesis could be repeated using fewer excerpts so as to include additional ratings of preference and familiarity.

The questionnaire participants completed regarding their familiarity with the film excerpts, used the original film titles only (in English and Finnish). This method proved inappropriate as many participants were not familiar with either the English or Finnish titles, did not associate the original film title with the excerpt used in the experiment or were unable to recall from which film an excerpt was taken, thus rendering the questionnaire almost useless. The question of familiarity and preference therefore needs to be posed at the same time the excerpt is presented to the participant.

This study has shown that there is no significant correlation between musicianship and induced mixed-

emotion while watching short film excerpts. Repeating a similar style experiment focusing instead on cognitive styles and not specific levels of musicianship may provide a greater insight into how musically inclined or musically intelligent (not dependent on formal music tuition) individuals react to situations in which visual and audio stimuli are presented simultaneously.

Verbal labels are still problematic as each individual interprets and understands emotions and their labels differently. This is especially true across languages. Emotions do not always translate their inferred meaning when simply translating the label. Nostalgia as understood by an English native speaker can be quite different when translated and interpreted by a Finnish native speaker. Therefore, using a standardised emotion model such as the GEMS-9 (Zentner, Grandjean & Scherer, 2008) that makes use of verbal labels only may not be the best approach to emotion research involving participants of various nationality. This has greater implications for emotion research as a whole if nationality proves a strong factor in how and what one feels in response to music.

Music is in an integral part of the film watching experience and to separate the two may be detrimental to the overall experience. Though human beings, as cognitivist theory maintains, are rational creatures, able to apply logic and reasoning to everyday life, we are still a species governed by our emotions. Understanding the origins of these emotions, how and why they are triggered and the implications thereof on human behaviour is more than enough motivation for continued research into music and induced emotion. Methods made possible by software such as EmuJoy could be adapted to better suit musically induced mixed-emotion research. The possibility of using an interface, which allows for the continuous and simultaneous measurement of emotions across multiple dimensions (including an alternative to verbal tags) could provide answers to several fundamental questions regarding which emotions are induced by music and why.

4.2 Closing Thoughts

In an era of film making which focuses on the brilliance of visual effects, the film score remains integral by providing a source of emotion. A film, despite being visually spectacular, would fall flat were it not able to elicit strong emotion in the audience. The relationship between music and induced emotion, and the relationship between visual stimuli and induced emotion is fairly well established. How and why such strong emotion is evoked in audience members where music and film are presented

simultaneously are questions that have yet to be conclusively answered, prompting further research along this line of enquiry.

Music is ubiquitous. Humans are drawn to music because of how it makes us feel. How individuals process emotion, the underlying mechanisms of these processes and the way in which we identify and express these emotions are intrinsic to understanding human nature. This thesis suggests that understanding and interpreting emotion could be language specific and that individual traits such as personality and cognitive styles may be involved in these processes, ideas worth further exploration if we are to truly understand the complexity of human emotion.

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APPENDICES

APPENDIX A – Film Music Excerpts

List of film music excerpts used and the emotional classification of each excerpt (Eerola & Vuokoski, 2011)

No.	Emotion	Name of Film	Excerpt
021	Happy	The Rainmaker	02:55-03:13
022	Happy	Batman	00:55-01:15
023	Happy	Shallow Grave	02:02-02:17
024	Happy	Man of Galilee CD1	03:02-03:18
025	Happy	Oliver Twist	00:17-00:34
031	Sad	The English Patient	00:07-00:32
032	Sad	Running Scared	02:06-02:27
033	Sad	The Portrait of a Lady	00:00-00:22
034	Sad	Big Fish	00:55-01:11
035	Sad	Man of Galilee CD1	01:20-01:37
037	Sad	Batman	01:08-01:22
038	Sad	Dracula	00:00-00:12
039	Sad	Shakespeare in Love	00:59-01:17
040	Sad	The English Patient	00:00-00:31
055	Happy	Dances with Wolves	00:28-00:46
056	Happy	Man of Galilee CD1	00:19-00:42

APPENDIX B – Film Excerpts

List of film excerpts used and the emotional classification of each excerpt according to the researcher.

No.	Emotion	Film	Excerpt
1	Happy	Mao's Last Dancer†	01:49:14-01:49:34
2	Happy	500 Days of Summer	00:32:15-00:32:45
3	Happy	The Tango Lesson†*	00:18:20-00:18:52
4	Happy	Thirteen	00:22:16-00:22:50
5	Happy	Kisses†	00:50:36-00:51:06
6	Happy	The Black Dahlia	00:17:56-00:18:26
7	Sad	Stay	00:52:25-00:52:55
8	Sad	Sensation of Sight	02:03:51-02:04:24
9	Sad	Control†*	01:07:56-01:08:26
10	Sad	Dorian Gray†	01:11:43-01:12:13
11	Sad	Sky Blue†**	01:17:15-01:17:45
12	Sad	Pathfinder	00:24:31-00:25:01

† International production (Non-American)

* Black and white film

** Animated film

APPENDIX C – Film Music and Film Excerpt Pairings

List of film music and film excerpt pairings. Each film excerpt was used twice in different combination with music to produce an emotionally congruent and non-congruent condition.

Film Music No.	Film No.	Emotional Congruency
021.mp3	2	Congruent
021.mp3	8	Non-Congruent
022.mp3	11	Non-Congruent
022.mp3	3	Congruent
023.mp3	4	Congruent
023.mp3	9	Non-Congruent
024.mp3	7	Non-Congruent
024.mp3	5	Congruent
025.mp3	12	Non-Congruent
031.mp3	3	Non-Congruent
032.mp3	6	Non-Congruent
032.mp3	12	Congruent
033.mp3	4	Non-Congruent
034.mp3	9	Congruent
035.mp3	11	Congruent
035.mp3	2	Non-Congruent
037.mp3	10	Congruent
038.mp3	1	Non-Congruent
039.mp3	7	Congruent
040.mp3	8	Congruent
040.mp3	5	Non-Congruent
055.mp3	1	Congruent
056.mp3	6	Congruent
056.mp3	10	Non-Congruent

APPENDIX D – Adjusted and Translated GEMS

The GEMS mixed-emotion labels (Zentner, Grandjean, & Scherer, 2008) with the addition of 'Humour' and 'Overall Intensity.' Finnish translations provided by Tuomas Eerola.

1. Wonder, awe, amazement
   Ihmeissään, vaikuttunut, liikuttunut

2. Transcendence, inspiration, overwhelming
   Luomoutunut, häkeltynyt

3. Tenderness, affection, love
   Hellä, rakastava, rakastunut

4. Nostalgia, melancholy, dreamy
   Nostalginen, haaveileva, melankolinen

5. Peacefulness, serenity, calm
   Seesteinen, rauhallinen, tyyni

6. Power, energy, triumph
   Vahva, voitonriemuinen, energinen

7. Joyful, playful, happy
   Riemukas, huvittunut, eloisa

8. Tension, agitation, suspense, anxiety, feat
   Kireä, kiihtynyt, hermostunut

9. Sadness, sorrow, agony, misery
   Surullinen, muheellinen

10. Humour, amusement, comical, funny
    Hauska, huvittava, koominen

11. Overall intensity
    Yleinen intensiteetti

APPENDIX E – Abbreviations of Emotion Labels

A list of abbreviations as used for emotion labels in **Figure 6.**

Abbreviation	**Emotion**
W	Wonder
Tr	Transcendence
Tend	Tenderness
N	Nostalgia
P	Peacefulness
Po	Power
J	Joy
Ten	Tension
S	Sadness
H	Humour
OI	Overall Intensity