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The Effects of Tempo, Texture, and Instrument on Felt Emotions

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ABSTRACT

Previous research has shown that: faster music causes higher arousal levels of emotions (Gomez and Danuser, 2007); non-harmonised texture induces happier emotions (Webster and Weir, 2005); and that different musical instruments are associated with different emotions (Lucassen, 2006). However, studies on the effect of texture on felt rather than perceived emotions are limited. This study explored the effects of tempo, texture, and instrument on felt emotions. Thirty-one participants completed a questionnaire based on the Geneva Emotional Music Scale (Zentner et al., 2008) and rated their emotional responses to five versions of a musical excerpt; varying in tempo, texture, and instrument. Considering the aforementioned studies, my hypothesis proposed that faster tempo would induce positive emotions, and the opposite for slower tempo. In addition, I predicted that a greater number of musical layers would induce a greater emotional response, and that different instruments would provoke varying emotions. Contrary to prediction, the slower excerpts induced more positive rather than negative low arousal emotions. As expected, the version with the thickest texture induced the greatest emotional response, while the music box version induced a unique set of emotion ratings. Therefore, this study showed how differences in tempo, texture, and instrument impact emotional response.

1. INTRODUCTION

Music plays a prominent role in everyday life, with studies having found that music is present 37% of our waking time and evokes emotions up to 64% of the time spent listening to it (Juslin et al., 2008). Evidence suggests that listeners experience emotions (an emotional response) whilst listening to music (Gabrielsson, 2010; Juslin and Laukka, 2004; Sloboda, 1992). It has also been found that the primary reason for listening to music is to evoke or regulate emotion (Juslin and Laukka, 2004). Researchers agree that emotional responses are exhibited in three components: experience, expression, and physiology (Buck, 1994; Ekman, 1993; Izard, 2013; Lang, 1995; Levenson, 1994; Leventhal, 1984; Plutchik, 1993). According to Lundqvist et al. (2009), emotions provoke affective experiences such as feelings of happiness, sadness, pleasure, and displeasure; activate a wide range of physiological adjustments to the evoking conditions; and lead to expressive behaviours that are generally goal-directed and adaptive for one's own sake (Lundqvist et al., 2009).

The principal emotion models are the discrete emotions model, which is based on the notion that all emotions can be derived from a small number of fundamental or basic emotions (Buck, 1988; Ekman, 1992; Tomkins, 1984), and the dimensional model, which originates from a semantic viewpoint that proposes that emotions are best described by a set of underlying dimensions of valence and arousal, i.e. how positive or negative the emotion is and the degree of physiological activity in response to the emotion respectively (Green and Salovey, 1999; Watson and Tellegen, 1985, 1999). Yet, these models do not consider the music-specific emotions. To account for this, the Geneva Emotional Music Scale (GEMS) was designed by Zentner et al. (2008) to measure musically evoked emotions, using forty-five labels that have been shown to be invariably chosen for describing musically evoked emotive states across an extensive range of musical examples. Zentner et al. (2008) also constructed a model which condenses the forty-five labels into nine emotional scales. The GEMS model was employed for the present study, because of its high suitability to measuring emotional responses to music.

Two types of emotions can be present during a music listening experience: perceived and felt emotions (Gabrielsson, 2001), but occasionally listeners find it difficult to distinguish between these two types (Kivy, 1990). Felt emotions can be defined as emotions that are "relatively brief, intense, and rapidly changing reactions to potentially important events (subjective challenges or opportunities) in the external or internal environment - often of a social nature - which involve a number of subcomponents that are more or less 'synchronized' during an emotional episode" (Juslin, 2011, p. 114). Whereas, perceived emotions are emotions that are expressed by the music, and perceived by the listener (Juslin and Laukka, 2004). Therefore, felt emotions focus on the emotional response of the listener to the music, whilst perceived emotions refer to the listener's perception of the emotion being conveyed by the music. The present study, however, was concerned solely with felt emotions. Emotions are also distinguished from moods, as emotions are fairly brief and intense experiences, compared to moods, which are less intense but more prolonged experiences (Frijda, 1993). There are several components to emotions, but this study focussed on the subjective feelings, which were measured by a self-report questionnaire.

Previous studies have identified the effects of varying the tempo, texture, and instrument of music. Gomez and Danuser (2007) showed that physiological responses reveal that faster tempo causes higher arousal levels, and slower tempo causes lower arousal levels. In regard to the effect of texture (i.e. non-harmonised, simpler melodies, or thicker, harmonised music) on emotional responses to music, Sloboda (1991) found that participants reported shivers in response to sudden changes in texture. Most studies have shown that thinner textures with simple harmonies were associated with positive emotions, while thicker textures with complex harmonies

were associated with negative emotions (Gabrielsson and Lindström, 2010). Yet, there is a lack of accessible studies on the effect of texture on felt rather than perceived emotions, which the present study investigated. There has also been a study that found that different musical instruments can have an effect on emotions expressed (Lucassen, 2006). Yet, in contrast to the current study, Lucassen's study (2006) focussed on perceived emotions instead of felt emotions. Furthermore, the study used virtual instruments to simulate the piano, marimba, cello, and alto saxophone; a method that does not have high ecological validity. Lucassen (2006) found that the marimba scored highest for joy, and that the cello was rated the highest for sadness, anger, and fearsomeness. In my study, I investigated the effect of different instruments on emotional response, but with recordings of a varying number of real instruments. In addition, my hypothesis that a denser texture would induce a greater emotional response was based on Lucassen's (2006) observation that different instruments led to participants perceiving different emotions, suggesting that the combination of multiple different instruments would induce a higher number of total emotions in the participants.

Although previous research has studied the effect of single musical components on emotional responses, there is a lack of research investigating the effect of multiple musical components. There does exist, however, a study that explored the interactive effects of mode, texture, and tempo on emotional responses to music in a single experiment (Webster and Weir, 2005). This study used a 2 (mode: major vs. minor) x 2 (texture: non-harmonised vs. harmonised) x3 (tempo: 72, 108, 144 beats per minute) within-participants design and a continuous happy-sad scale to measure the perceived emotions. The results revealed that major keys, non-harmonised melodies, and faster tempos were associated with happier responses, while the relevant opposites were associated with sadder responses. The approach taken by Webster and Weir (2005) avoids the issue in single musical experiments of low ecological validity, caused by the idea that listeners rarely perceive music only as a supplementary function of its elements (Sopchak, 1955). Using this more ecologically valid design, the current study explored the effect of multiple musical components on felt rather than perceived emotions.

The aim of this study was to explore the effect of tempo, texture, and instrument on felt emotions when different arrangements of the same piece were heard. One of the hypotheses was that tempo will affect emotional valence and arousal level, such that fast tempo will induce positive and high arousal level emotional responses, while slow tempo will induce negative and low arousal emotional responses. Another hypothesis was that thicker texture, or a greater number of instrumental layers, will induce a greater intensity of emotional responses. Finally, the last hypothesis was that different instruments will induce different emotions.

2. METHOD

Design. The study was a within-participants quantitative experiment based on a questionnaire conducted through Online Surveys. The variables under consideration included the type of excerpt as the independent variable, and the emotional response ratings as the dependent variable. Within each excerpt, the variables tempo, texture, and instrument were chosen. From fastest to slowest, the order of the excerpts was voice, music box, orchestra, piano, and cello/piano. In terms of texture, from thickest to thinnest was orchestra, cello/piano, voice, piano, and music box. Although the thickness of texture for the orchestra, cello/piano, and voice (with electronic accompaniment) excerpts could be determined by the number of instruments, that of the single-instrument excerpts including the piano and music box excerpts were determined by how polyphonic they were. The piano excerpt consisted of left- and right-hand parts, so was regarded as having a thicker texture than the monophonic music box excerpt. Each excerpt was limited to approximately two minutes, since research has shown that emotions are short-lasting reactions, in contrast to moods (Frijda, 1993).

Participants. There were thirty-one participants in total, but the sample size was reduced to thirty (22 females, 6 males, 2 others). This was because one participant reported that they understood Japanese, and since the vocal excerpt was in Japanese so that participants' emotional responses would not be affected by the words, they were excluded from the sample. The participants' ages ranged from 18 to 34 years (M = 21.8 years) and they completed a number of introductory questions in regard to their musical background, based on the self-reported musical training and engagement questionnaire Goldsmiths Musical Sophistication Index (Gold-MSI). The responses revealed that the majority of participants were musicians; with twenty-five musicians and five non-musicians, based on whether or not the participants indicated that they played an instrument. The primary musical instrument played by the highest number of participants was the piano, followed jointly by the flute and violin, then voice. Table 1 shows the mean, mode, and standard deviation values from the Gold-MSI responses. In order to calculate the mean and mode values, the Gold-MSI statements were converted to numeric values (1-7), with higher numbers corresponding to higher levels of musical engagement.

The participants were recruited through social media platforms including Facebook and Reddit, and through personal messages. The majority of participants, therefore, had a similar profile to the researcher; a female Durham University student with a musical background.

Table 1. Gold-MSI Mean, Mode, and Range Values

Statement	Mean	Mode	Range
Pieces of music rarely evoke emotions for me.	2.47	1	11
I can compare and discuss differences between two performances or versions of the same piece of music.	5.57	5, 7	9
I am able to talk about the emotions that a piece of music evokes for me.	5.47	6	9
I would not consider myself a musician.	4.67	7	10
I engaged in regular, daily practice of a musical instrument (including voice) for __ years.	5.1	7	12
At the peak of my interest, I practised __ hours per days on my primary instrument.	4.2	6	10
I have had formal training in music theory for __ years.	4.1	1	8
I have had __ years of formal training on a musical instrument (including voice) during my lifetime.	5.43	7	18
I can play __ musical instruments.	3.3	3	8

Materials/Stimuli. The experiment was carried out via an online questionnaire. Five musical excerpts of the same piece were utilised as stimuli. The piece chosen is called "Path of the Wind" and appears throughout the film *My Neighbor Totoro* (1988), a Japanese animation film produced by Studio Ghibli. The piece reappears throughout the film and can be interpreted as a musical theme which appears in different forms to suit the different situations. The theme is heard whenever there is a reference to fantasy or the forest spirit Totoro. Just as this theme can be associated with and induces a range of emotions expressed in the film, such as joy, sadness, and transcendence; the excerpt that I have chosen shows a similar effect. "Path of the Wind" was selected because there were no previous studies that used this musical piece or Japanese animation music in general. Furthermore, it was anticipated that the majority of participants would be less familiar with the music from Studio Ghibli films than, for instance, Disney animation films. An advantage of choosing a piece from a Japanese film was that it made it possible to use a voice excerpt in the experiment without having the meanings of the words influence the emotional responses.

The musical stimuli used were (in the order presented to all participants): cello and piano 00:00 – 01:55, voice 00:00 – 01:23, music box 00:00 – 01:36, orchestra 00:00 – 01:37, and piano 00:00 – 01:42. These excerpts were chosen because they feature a mixture of structural and performance features, with different instruments, number of instrumental layers, and tempi. In the order indicated above, the tempi (metronome marking for one beat) for the excerpts were: 30-50; 85-90; 70; 35-55; and 40-60 respectively. The cello/piano excerpt had the most rubato, while the music box excerpt had no rubato or change in tempo. In addition, the excerpts were chosen because they feature common instruments that the participants would most likely be familiar with, so that they could focus on the music rather than the novelty of the instrument. The cello/piano excerpt was selected in order to see if similar emotional responses would be induced to the cello excerpt in Lucassen's study (2006), although it was anticipated that the presence of piano would prevent a direct comparison. The voice excerpt was chosen for its contrasting timbre and because the Japanese lyrics made it possible to eliminate the words as a confounding variable, since all participants in the sample size did not understand Japanese, according to their response in the questionnaire. The music box excerpt was chosen so that it could be established whether participants responded differently to human-powered recordings and mechanism-powered recordings. The orchestra excerpt was selected because it features the most frequently throughout the film and has the highest number of instrumental layers. Finally, the piano excerpt was chosen partly for its simple texture, and partly to compare with the cello/piano excerpt. The music was recorded from existing YouTube videos and edited in iMovie. Since the study was not concerned with visual content, the screen was simply blacked out to leave the music as the only stimulus in the videos. The excerpts were then uploaded to a YouTube channel, so that they could be embedded into the questionnaire.

The main proportion of the questionnaire was based on the GEMS-9 version of the Geneva Emotional Music Scale (Zentner et al., 2008), with the GEMS-45 emotion terms shown in brackets beside each corresponding GEMS-9 emotion category in a table format. The GEMS-45 emotions were included to ensure that participants clearly understood the meaning of each GEMS-9 emotion category. The GEMS question was kept consistent for all the excerpts and formatted so that participants were only able to select one category from the Likert Scale (1 Not at all - 5 Very much) for each emotion.

Procedure. Before participants began the experiment, they were asked to carefully read some information on the study and approve their consent in taking part in the experiment by agreeing to a number of statements. Participants were advised to use headphones and complete the questionnaire in a room where they were not able to be disturbed by phones, other people, etc. It was also recommended that they use a computer to take the study for optimum user experience, but in case they were not able to, the questionnaire was designed to be accessible on other electronic devices such as phones and tablets. Participants were informed that their participation was

voluntary and that they could withdraw from the questionnaire at any time, by closing the browser window. To prevent participants from selecting options that they felt were the most desired by the researcher, the opening page stated only the general area of the study instead of the specific research question. Participants were then asked to complete a set of closed-ended questions derived from the Gold-MSI. In the main part of the experiment, participants were presented with five rounds, each including a musical excerpt formatted as a black-screened video as well as emotional response rating questions based on the Geneva Emotional Music Scale (Zentner et al., 2008). Before the voice excerpt, participants were asked if they were able to understand Japanese to ensure that the meanings of the words would not influence their emotional responses to the excerpt. The videos were formatted so that participants were not able to pause or stop the music once they had pressed the play button, to ensure a consistent listening experience across participants. All participants heard the excerpts in the same order, since they had been arranged in no particular order in regard to type and number of instruments. However, upon further evaluation, randomising the order of the excerpts could have minimised order effects, which introduce confounding variables when participation in one condition may affect performance in another (Schwarz and Hippler, 1990). After the participants had completed the main section of the experiment, they were asked if they had heard of Studio Ghibli films before, if they had ever watched the film *My Neighbor Totoro*, and finally if they had recognised the music in the excerpts (and only participants who indicated "yes" would see the following question).

3. RESULTS

The results were quantitatively analysed in the spreadsheet software Excel, the programming language R, and the statistical computing program Rstudio. Excel was used to calculate the means and standard deviations of the emotional response ratings for each excerpt, while R was used to carry out ANOVA tests and pairwise t-tests, to calculate the variance and compare the means of two conditions to see if they were statistically significant respectively. The excerpts were referred to with the following labels: cello/piano, voice, music box, orchestra, and piano.

Analysing the total number of felt emotions for the excerpts revealed that the orchestra excerpt, with the thickest texture, induced the greatest number of emotions (see Figure 1). The excerpt with the next highest total number of felt emotions was the cello/piano excerpt, and this may be attributed to the fluctuating tempo of the excerpt. However, it does not mean that faster tempo caused a greater intensity of emotions, since the voice excerpt with the fastest tempo induced the least total number of emotions, and the cello/piano excerpt with the slowest tempo induced the second highest total number of felt emotions (see Figure 2). By comparing the two graphs showing the total number of emotion ratings for the excerpts in terms of tempo and texture, it is noticeable that there is a greater correlation between tempo and total felt emotions than texture and total felt emotions.

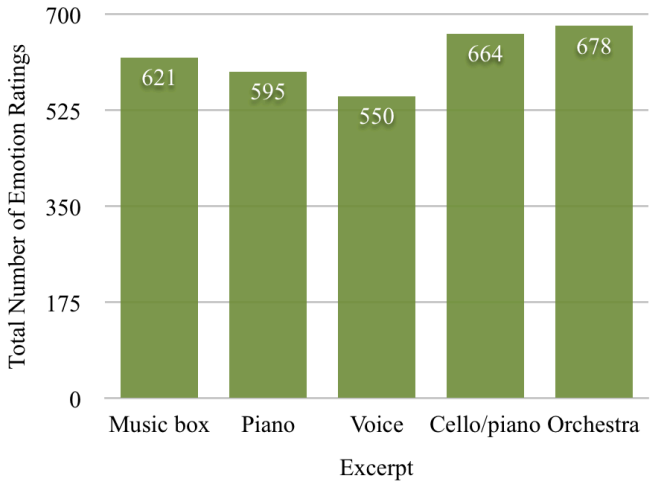

Figure 1. Bar graph showing the total number of emotion ratings for all excerpts in order of thinnest to thickest texture (from the left)

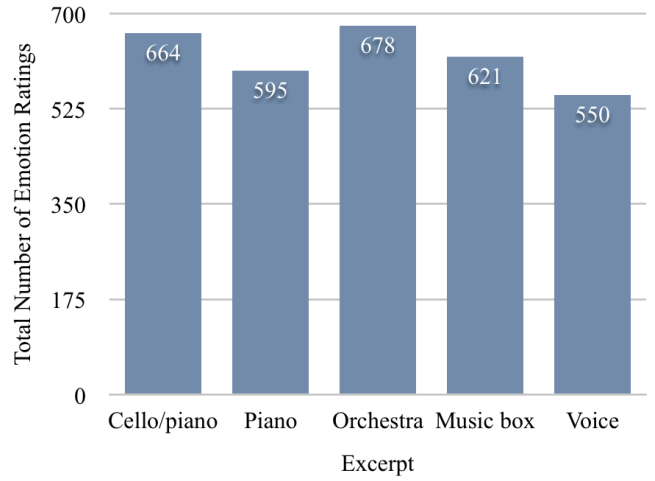

Figure 2. Bar graph showing the total number of emotion ratings for all excerpts in order of slowest to fastest tempo (from the left)

In order to examine whether these differences in total felt emotions were statistically significant, an ANOVA test was conducted. The dependent variable was total felt emotions, which encompassed the summed emotion ratings across all the emotion categories for each participant for each excerpt, and the independent variable was the type of excerpt. The ANOVA test had a p-value of less than .05, where $F[4,116] = 10.24$, $p < .001$, which indicates that there were statistically significant differences between the different excerpts in regard to the magnitude of total felt emotions induced. Pairwise t-tests further revealed that there were three statistically significant pairs of excerpts: voice and cello/piano; piano and orchestra; and voice and orchestra. $M = 18.33$ for the voice excerpt; $M = 22.13$ for the cello/piano excerpt; $M = 19.83$ for the piano excerpt; and $M = 22.6$ for the orchestra excerpt. By comparing the mean emotion ratings between each pair of excerpts, it was found that the cello/piano and orchestra excerpts induced a significantly higher number of emotions, since their mean values were greater than those of the voice and piano excerpts. This analysis highlights how the different

excerpts impacted the participants' magnitude of overall felt emotions differently with statistical significance.

Having established that the differences between total felt emotions for each excerpt were statistically significant, I then conducted further ANOVA tests for each emotion category. These tests revealed that all the emotions were statistically significant ($p < .05$) other than tension (see Table 2), indicating that there was a statistically significant difference in emotional responses between the five different excerpts for almost all emotions.

Table 2. ANOVA Test Results for Each Emotion

Emotion	ANOVA	Statistically Significant
Wonder	$F(4, 116) = 2.70$, $p = .03$	Yes
Transcendence	$F(4, 116) = 8.18$, $p < .001$	Yes
Power	$F(4, 116) = 10.49$, $p < .001$	Yes
Tenderness	$F(4, 116) = 6.82$, $p < .001$	Yes
Nostalgia	$F(4, 116) = 11.12$, $p < .001$	Yes
Peacefulness	$F(4, 116) = 11.51$, $p < .001$	Yes
Joyful Activation	$F(4, 116) = 28.30$, $p < .001$	Yes
Sadness	$F(4, 116) = 10.37$, $p < .001$	Yes
Tension	$F(4, 116) = 1.18$, $p = .32$	No

The pairwise t-tests on the GEMS emotion ratings data revealed that all pairs of excerpts had statistically significant means apart from the music box and cello/piano excerpts. Therefore, there were a total of ten condition differences, with the pairs voice and piano, voice and music box, and voice and cello/piano having the highest number of statistically significant mean emotion ratings, and the orchestra and music box excerpt having the lowest. Table 3 shows the pairs of excerpts between which each of the means differed for each emotion.

Table 3. Pairs of Excerpts Between Which Mean Emotion Ratings Differed

Emotion	Pair of excerpts between which the mean differed
Wonder	Piano and orchestra
Transcendence	Piano and cello/piano, piano and orchestra, voice and orchestra, voice and cello/piano
Power	Orchestra and cello/piano, orchestra and music box, voice and piano, piano and orchestra
Tenderness	Voice and cello/piano, voice and music box, voice and orchestra, voice and piano
Nostalgia	Voice and cello/piano, voice and music box, voice and orchestra, voice and piano
Peacefulness	Voice and cello/piano, voice and music box, voice and piano, piano and orchestra, orchestra and cello/piano
Joyful Activation	Voice and cello/piano, voice and music box, voice and orchestra, voice and piano, piano and music box, piano and orchestra
Sadness	Voice and cello/piano, voice and music box, voice and orchestra, voice and piano
Tension	None

These pairwise t-tests, therefore, showed that wonder had the least pairs of statistically different excerpts, while joyful activation had the most. They also demonstrated that, overall, there were statistically significant differences in emotional responses between the five different versions of the excerpt, aligning with the results from the tests on total felt emotions.

Figure 3 displays the mean emotion ratings and standard deviations for all the excerpts. From the graph, it is apparent that the orchestra excerpt induced the highest mean emotion ratings for wonder, tenderness, and nostalgia; the piano excerpt induced the highest mean emotion rating for transcendence; the music box excerpt induced the highest mean emotion ratings for power and peacefulness; and the voice excerpt induced the highest mean emotion rating for joyful activation. Although the voice excerpt also induced the highest mean emotion rating for tension, the difference between the ratings for the excerpts was not statistically significant. These observations demonstrate that the orchestra excerpt induced the greatest emotional response and that the voice excerpt induced the least emotional response, as seen before in the graphs showing the total number of emotion ratings (see Figures 1 and 2).

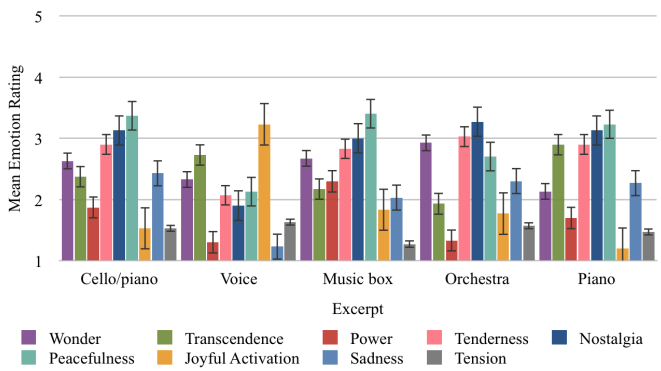

Figure 3. Bar graph showing the mean emotion ratings and standard deviations for all excerpts

4. DISCUSSION

The results of the experiment supported my hypotheses and the majority of previous research outlined in the Introduction. Aligning with previous findings on tempo (Gomez and Danuser, 2007), the mean emotion ratings revealed that excerpts with faster tempo (fast to slow: voice, music box, orchestra, piano, cello/piano), particularly the voice excerpt, induced the highest ratings for positive high arousal emotions such as joyful activation, and lowest for low arousal emotions such as peacefulness and sadness. Regarding the results for the cello excerpt in Lucassen's study (2006), which showed that the cello was associated with sadness, anger, and fearsomeness, the cello/piano excerpt in the present study induced a conflicting outcome. Considering the three most similar emotions to those used in Lucassen's study (2006), sadness was actually rated the fifth highest, power third lowest, and tension joint lowest along with joyful activation. While Lucassen (2006) found that the cello excerpt induced negative emotions, my study rather showed that positive low arousal emotions were induced. This may, however, be influenced by the inclusion of both the cello and piano in my study, and the piece's overall peaceful character. Regarding nostalgia, it had the highest mean emotion rating for the orchestra excerpt. This may be explained by the fact that the orchestra excerpt is featured in the film, and there were eleven participants who indicated that they had previously watched the film *My Neighbor Totoro*. The total number of emotion ratings showed that the orchestra excerpt, which had the most complex texture, induced the highest intensity of emotions. An interesting result that surfaced was that the excerpts which featured human-powered instruments induced a more varied set of emotion ratings, while the emotion ratings for the mechanism-powered music box excerpt did not show any clear variation between the emotion ratings. This may be attributed to the idea that the participants were not able to sense the performer's emotions in the music box version, i.e. they did not feel any emotional empathy. In addition, if joyful activation is reinterpreted as happiness, it and sadness are the two emotions out of the GEMS-9 emotions that also appear in Ekman's model (Ekman, 1999) of basic emotions (anger, disgust, fear, happiness, sadness, and surprise) and the happy-sad scale used by Webster and Weir (2005), and are therefore the two most universal emotions in the GEMS. Considering this, the graph showing the mean emotion ratings reveals that for the music box excerpt, there is no clear difference between the joyful activation and sadness ratings, while for all the other excerpts, there is a noticeable difference. A somewhat surprising result was that the mean emotion rating for power for the orchestra excerpt was the lowest compared to the other emotions, since it was anticipated that with the highest number of instruments, the sense of power would be the greatest. Instead, the music box induced the greatest power response. This may be because the orchestra excerpt features the expressive melody in the violin at one point, whereas the melody in the music box excerpt has a sense of unstoppable momentum without any expression.

In terms of methodology, using quantitative methods facilitates the objective collection of evidence, without influence from the researcher's interpretation, but in comparison to qualitative methods, quantitative methods lead to issues of reductionism and low ecological validity. Conducting the experiment through an online questionnaire allowed high accessibility, but since it was possible to close the browser window at any point during the questionnaire, a large number of people did not complete the experiment, resulting in a significant loss of potential participants. This area of the design could be improved in future research by conducting the experiment in person. Music-related phenomena which could not be controlled by conducting the experiment online included situational factors such as the listening context (social/non-social, live/recorded, location) and extramusical information, and listener attributes including personality, empathy, past listening experiences, musical training, and current mood (Scherer and Zentner, 2001). These various elements, however, would rather benefit from being studied in subsequent research. A limitation of using the self-report questionnaire method is that the emotions that the listeners think that they are feeling may not necessarily correlate with the emotions that they are actually feeling. This subjective element may be eliminated by measuring participants' physiological responses to the music, but this process is reductionist and may cause participants to feel stressed, thus affecting their emotional responses. An alternative methodological approach which would further enhance the accuracy of data collected for emotional responses to music would be to continuously record emotional expression, since music often varies in many ways throughout even shorter excerpts (Gabrielsson and Lindström, 2010, p. 373). Another aspect which could have been regulated was the gender ratio. Because of the recruitment being largely reliant on personal connections, the majority of participants were female, but a randomised recruitment process could further equalise the gender ratio. In regard to using musical recordings instead of MIDI data, although this method ensured high ecological validity, it also meant that the effects of separate structural factors could only be speculative, because they are generally confounded in a musical context. An approach with greater experimental control would be to vary one or more structural factors in shorter sound

sequences, but this would eliminate the musical context and limit the ecological validity. Gabrielsson and Lindström (2010, p. 372) suggest a compromise between these approaches, which involves using systematic manipulation of different factors within a musical context. This compromise, however, would likely still result in simulated-sounding stimuli and low ecological validity.

Future research could investigate the effect of different tempo, texture, and instruments in areas such as marketing and music therapy. Another possible research area could be the relationship between familiarity and felt emotions. Having asked participants at the end of the experiment if they had recognised the music in the excerpts, eight of them responded that they were familiar with the music. Further investigation of their emotional responses is likely to reveal that they had stronger emotional responses to the music, as shown by Pereira et al. (2011). Other potential areas to explore are the effects of age and gender on emotional response to music. Researchers have shown that age influences the intensity of emotional response (Vieillard and Gilet, 2013) and gender moderates the influence of loudness, such that females respond more positively to quieter music (Kellaris and Rice, 1993). Although the current study employed texture as the reason behind the orchestra excerpt's greatest emotional response, volume was also likely to be a contributing factor, and further study could investigate the effects of this variable alongside the variables examined in the present study. Following analysis of the relationship between participants' primary instrument and total number of instruments in excel, it was revealed that out of the twenty-four musicians who took part in the current study, 62.5% of the musicians felt the highest total number of emotions for the excerpt which contained their primary instrument, compared to 23.7% who did not. Although the experiment design was not structured to explore this particular relationship, since the music box excerpt was included, these observations suggest that with further research, musicians are likely to have greater emotional responses to music featuring their instrument.

In conclusion, the study explored the effect of different tempi and texture on emotional responses to five varying versions of an excerpt of film music. The results revealed that there was a clear statistically significant difference in the emotional responses between the versions which cohered with previous literature and my hypotheses.

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