The Impact of Major and Minor Music on Mood

Adam McKenna

X20474122

Supervisor: Dr. Michelle Kelly

B.A. (Hons) in Psychology

National College of Ireland

August 2023

Submission of Thesis and Dissertation

National College of Ireland
Research Students Declaration Form
(Thesis/Author Declaration Form)

Name: Adam McKenna
Student Number: X20474122
Degree for which thesis is submitted: Bachelor of Arts (Honours) in Psychology
Title of Thesis: The Impact of Major and Minor Music on Mood
Date: 31/07/23

Material submitted for award

A. I declare that this work submitted has been composed by myself. ☑

B. I declare that all verbatim extracts contained in the thesis have been distinguished by quotation marks and the sources of information specifically acknowledged. ☑

C. I agree to my thesis being deposited in the NCI Library online open access repository NORMA. ☑

D. ***Either*** *I declare that no material contained in the thesis has been used in any other submission for an academic award.
Or *I declare that the following material contained in the thesis formed part of a submission for the award of

_____
(State the award and the awarding body and list the material below) ☑

Acknowledgements

Firstly, I would like to thank both my supervisor, Dr Michelle Kelly, and the lab technicians at the National College of Ireland, Colm Lannon-Boran and Linda Horn, as well as Johnathan Lambert, for all their assistance and guidance throughout the duration of this project. I do not know how I would have got through this year without the constant support and encouragement from the staff at NCI. I would also like to thank all the participants who took time out of their days to take part in my study I hope that each and every person who participated knows just how appreciative I am for their help. Lastly, I want to thank my friends, and especially my family, for offering me support through this year whenever I needed it. I couldn't ask for a better support system of people to surround myself with.

Abstract

The current study's goal is to provide insight into how music listening behaviours can affect an individual's mood. The study specifically investigated how music in a major key can affect mood compared to music in a minor key, both psychologically and physiologically. The Brief Mood Introspection Scale (BMIS) was administered to participants (N=31) both before and after they were introduced to a music stimulus, in either a major or a minor key. As the participants listened to the music, their heartrate was measured to note any physiological changes associated with emotion, calculated by comparing the average bpm during exposure to the music stimulus to a baseline heartrate taken initially. A mixed within and between participants ANOVA was conducted to assess the impact that the music stimuli had on self-reported mood and heartrate scores, and found that statistically significant interaction effects had taken place with major music seeing a rise in heartrate and mood scores, and minor music having the opposite effect. Implications of this study and thoughts for future research on the topic are discussed.

Table of Contents

Introduction

In a recent 2019 report, the International Federation of the Phonographic Industry detailed that individuals spend an average of 18.4 hours a week listening to music (Green, 2021). As music listening is reported as being both a prevalent and an important aspect in people's lives (Lonsdale & North, 2011), it is imperative to understand the effects that this could have on listeners health, or general wellbeing, as exposure to music stimuli is a daily occurrence for many people (Green, 2021; Lonsdale and North, 2011) and has been suggested to impact individuals overall moods and self-reported feelings of stress (Linnemann et al., 2015). The aim of this review is to synthesise and critically examine existing research on why individuals partake in music listening behaviours, as well as what psychological or physiological impacts music listening may have.

Music Listening Behaviours

Lonsdale and North (2011) conducted multiple studies, in which they created a short scale to measure how important music is to an individual, how often music is listened to, and the various reasons behind the music listening behaviour among 300 undergraduate students. Results from this study revealed that participants listened to an average of 3.66 hours of music a day, which is slightly higher than the later International Federation of the Phonographic Industry report as mentioned above (Green, 2021), but consistent with similar research revealing that music is listened to between three to four hours a day (Hallam, 2010; North et al., 2000; Volokhin & Agichtein, 2018). Regarding why people listen to music, various motives have been mentioned throughout the literature such as for background noise (Randall & Rickard, 2016; Schäfer & Sedlmeier, 2009), to alleviate feelings of boredom (Lonsdale & North, 2011; Randall & Rickard, 2016; Volokhin & Agichtein, 2018), or for feelings of social connection (Garrido et al., 2017). The most consistently appearing and

prevalent cause of music listening across the literature however appears to be as a form of mood regulation (Lonsdale & North, 2011; North et al., 2000; Schäfer & Sedlmeier, 2009; Thoma et al., 2012; Volokhin & Agichtein, 2018),

Psychological Impact of Music

As music is often used with the intention of mood regulation (Randall & Rickard, 2016; Stewart et al., 2019), there has been a recent focus in the literature on the psychological effects of music listening, namely on the stress response. Three studies investigated the impact that music listening would have on feelings of stress (Linnemann et al., 2015; Ogba et al., 2019; Thoma et al., 2013), but results appear to be somewhat conflicting. In a study of 55 university students, aged 18 to 31, music listening alone was observed to reduce self-reported stress. Results were seen to be stronger however when the participants were aware that relaxation was the goal of the experiment (Linnemann et al., 2015), however participants being aware that the goal was to reduce stress scores may have affected their self-reported answers. The results of this study appear to be in line with other research showing that stress reducing effects are elicited by music listening when paired with relaxation techniques, but not through music listening alone (Ogba et al., 2019). In contrast to these findings however, Thoma et al. (2013) discovered statistically non-significant change in subjective stress perception between a control group who was exposed to no music, when compared to two groups who listened to ‘relaxing music’, or natural running water sounds, individually. The disparate results of this study may be due to the relatively small sample size used within the conditions, ranging between six to twelve individuals in each. Nonetheless, these contrasted findings suggest that more research needs to be done to establish more accurate effects of music listening as a stress management tool and on differing psychological effects. These studies also do not appear to take into account the key or tempo of the music, which may be an important factor in the effects that they elicit (Linnemann et al., 2015; Thoma et al., 2013).

Physiological Impact of Music

In addition to having psychological impacts such as affecting our stress responses, music has also been seen to elicit physiological changes and motivate us to perform better in physical exercise tasks. A sub-group of participants in the study conducted by Linnemann et al., (2015) were instructed to provide saliva samples at various stages of the experiment process in which music stimuli were frequently experienced. Salivary alpha-amylase levels were seen to increase and decrease with correlation to the music being listened to, with high-energising music increasing activity the most. Although the results of this study appear to lack generalisability for a larger population due to all the participants coming from the same university and being of similar age, the results appeared to show a statistically significant effect indicating that not only can music listening elicit physiological reactions in individuals, but that differing music stimuli correlates to different reactions. More research into investigating the effects that different music conditions may have on physiological responses could benefit this gap in the literature.

Music and Health

Further research into the physiological effects elicited by music have highlighted the importance of gaining a better understanding of the topic. A pairing between emotion and physical responses in response to music stimuli has been observed in the literature, namely in the study conducted by (Bowles et al., 2019), which investigated how using music as a motivative tool could be used to aid cardiac patients. In the study, the Brief Mood Introspection Scale (Mayer & Gaschke, 1988) was employed to track participants self-reported mood over the course of nine weeks. As well as this, the researchers collected data on motivation and walking distance using a treadmill. The results of the study show an increase in motivation to exercise, resulting in longer distances walked when compared to a non-intervention group, suggesting that music can be beneficial to physical health (Bowles et

al., 2019). Similar to these findings, Hutchinson et al. (2017) discovered that patients with diabetes performed better on aerobic exercise tasks in a clinical setting when exposed to a music stimulus, but more significant effects were observed when shown a music video paired with the music itself. These findings suggest that the distraction aspect from the exercise played a larger role than the music itself in boosting exercise-enjoyment scores, but that music could still be used to increase adherence to physical activity (Clark et al., 2015). Pairing the results of this study, to other studies on the topic of stress reducing effects of music (Linnemann et al., 2015; North et al., 2000), it has been suggested that music listening could be adapted into clinical settings to improve the health and overall mood of patients, specifically relating to providing distraction from stressors such as stress related health anxiety (Hamel, 2001).

Music's Impact on Mood

Little to no change was observed however in self-reported mood throughout the nine-week study by Bowles et al. (2019). The researchers state that music was shown to maintain positive moods, but there is a lack of evidence provided to support the claim that the music stimuli is what caused the maintenance of mood scores. The longitudinal design employed in this study is an asset in evaluating and analysing change in the long-term effects that music listening can have on motivation for exercise, however the length of time between retesting with the BMIS may be limiting in measuring the emotive impacts that music can have on mood, as it leaves a long intermission between evaluations in which many other factors could impact the participants mood. Utilising a shorter time frame between establishing baseline mood scores and mood scores following a music stimulus, such as in studies by Ogba et al. (2019) and Thoma et al. (2013), may supply greater criterion validity to the study and ensure that music alone is what is influencing mood scores.

There exists dispute in the literature on if music has significant impacts on mood, with some studies falling short of producing statistically significant results (Bowles et al. 2019; Thoma et al., 2013), which may be due to the lack of attention to different genres, keys, and tempos of music. A study that succeeded in addressing this was conducted by Hunter et al. (2010) in which eight musical excerpts were adjusted into four variations, fast-major, fast-minor, slow-major, slow-minor, in order to account for effects caused by varying keys and tempos, and introduced to 49 undergraduate students. The purpose of the study was primarily to investigate the correlation between the emotions that the participants would apply to the songs themselves, compared to the emotions that they felt whilst listening.

Results of the study conducted by Hunter et al. (2010) appear to show that participants rated their mood as being happier when exposed to high tempo music in a major key, and both sadness ratings and mixed emotions were highest whilst listening to slow tempo or minor key excerpts of music. The research presents evidence of a significant link between music mode (major or minor keys) and emotive responses, however the study only addressed this by measuring self-reported scores of happiness or sadness. Future studies may benefit from using a broader mood assessment such as the Brief Mood Introspection Scale used by Bowles et al. (2019), as well as pairing the psychological self-report measures with physiological measures to gain a further overview of the emotive responses taking place. Further research into the effects of music tempo on mood seem to solidify the claim that a higher tempo is correlated to happier moods or higher arousal moods, with an experiment by Pantoja & Borges (2021) revealing that music of a higher tempo appeared to cause consumers in cafes and restaurants to report enjoying their food more, and showing intent to spend more money. This effect is also seen in Stewart & Koh's (2017) study showing that commercial advertisements using music of a higher tempo improved consumers feelings towards a given brand, suggesting again that music and musical tempo has a correlation to mood.

Overview of the Research

Upon reviewing the current literature surrounding the varying effects that music can have on an individual, such as stress alleviation (Linnemann et al., 2015; Ogba et al., 2019; Thoma et al., 2013), mood regulation (Lonsdale and North, 2011), and affecting our physiological responses (Linnemann et al., 2015), it is evident that music-listening behaviours will impact people in some way or another (Bowles et al., 2019; Hunter et al., 2010; Linnemann et al., 2015; Lonsdale & North, 2011). The variety of results and differing conclusions in the current literature results in the synthesising of data as a whole becoming difficult, and future research needs to be done to be more cohesive in assessing emotional impacts caused by music stimuli, physiologically and psychologically. To the best of my knowledge, no research has yet to investigate the link, if any, between mood changes in relation to physiological changes when exposed to differing music stimuli, primarily focusing on the key of the music, by using measures to assess a broad variety of moods.

The Current Study

The current study aims to assess this gap in the literature by using the Brief Mood Introspection Scale to assess a wider variety of moods than examined in the study conducted by Hunter et al. (2010), whilst drawing on the recommendations for future research detailed by other studies, such as utilising randomised groups (Bowles et al., 2019) and varying the key of the music (Linnemann et al., 2015) to elicit emotive changes. The study will also simultaneously measure heart rate to assess any correlation between the psychological and biopsychological impacts. The results may be of interest to avid music listeners. As more knowledge becomes available on how music listening, and the specific music listened to, can affect people both mentally and physically, this could prove to be an asset in mood regulation strategies for individuals and as positive mood promotion in patients.

The research questions are as follows: Does music affect self-reported assessments of mood; does music have an effect on the physiological measures that may predict mood, such as heart rate; and is there a difference in the effect between listening to major and minor music. Based on current literature, it is hypothesised that both physiological changes and psychological changes in mood will occur based on the type of music listened to, i.e. music in a major or minor key. Directional hypotheses are proposed, expecting that the participants who are exposed to the major music stimulus will report more positive moods whilst exhibiting a higher heart rate, whilst those exposed to the minor music stimulus will exhibit a lower heart rate and report more negative or neutral moods.

Methodology

Participants

The current study collected data from 31 participants (Females: $n = 21$; Males: $n = 10$) with the majority being either students or faculty at the National College of Ireland, as both proximity to, and ability to attend, the National College of Ireland's psychology lab was pertinent to participation. Also affecting those who could take part, the eligibility criteria for this experiment stated that participants must be over the age of 18 in accordance with PSI and NCI ethical guidelines, and must, to their knowledge, not have any pre-existing heart condition as this may affect the physiological data being collected. Participants were randomly assigned to one of two subgroups with differing music stimuli, with 16 being exposed to minor music (Females: $n = 12$; Males: $n = 4$) and 15 experiencing music in a major key. The age of participants ranged from 19 to 46 years with a mean of $M = 24.26$ ($SD = 7.85$).

Participants were collected using methods of both convenience sampling and snowball sampling in order to obtain as many participants as possible within the deadline supplied by the lab software utilised for the experiment, LabChart. This was done by

mentioning the study on social media accounts such as Instagram and Facebook, recruiting students in-person, and asking participants to pass on word of the study to their friends. Initially, a target sample size was created using a formula from Tabachnick and Fidell (2013); ($N > 50 + 8m$), where n indicates the necessary number of participants, and m represents the number of predictor or independent variables. Due to the experimental design of the study making it necessary for the experiment to take place in-person, and factoring in the time constraints, the present study made use of 31 participants as opposed to the goal of 66.

Materials

During the study, participants were required to fill out a Google Form consisting of demographic information such as age and gender, and were then prompted to complete the Brief Mood Introspection Scale (BMIS) (Mayer & Gaschke, 1988) in order to gather data on their baseline mood levels, and to be able to note any changes following the stimulus. This consisted of 16 Likert scale questions, ranging from 1 to 4, where 1 = Definitely do not feel, and 4 = Do feel (See Appendix C). All questions regarded different mood states, such as asking participants how lively, gloomy, or happy they currently feel. Due to the scale covering a wide range of emotions rather than just happy or sad, the revised scoring sheet by Mayer and Cavallaro (2019) allows for numerous ways of reverse scoring in order to analyse pleasant-unpleasant mood ($\alpha = 0.83$), arousal-calm mood ($\alpha = 0.58$), positive-tired mood ($\alpha = 0.77$), and negative-relaxed mood ($\alpha = 0.77$) (Mayer & Gaschke, 1988).

The pleasant-unpleasant mood scale has shown to have the highest reliability with a Cronbach's alpha of $\alpha = 0.83$ whereas the arousal-calm mood scale scored the lowest levels of reliability, yet the overall reliability of the scale proves to be acceptable. A later review by Cavallaro et al. (2019) amassed supportive evidence of the validity of the BMIS by comparing it to a number of similar scales, such as the results of the pleasant-unpleasant mood scale with other positive-affect scales. As self-report scales remain the closest methods

to a golden standard of evaluating mood levels in individuals (Hoge et al., 2019), the BMIS was suitable for the current research.

Physiological data was also collected both before and during exposure to the stimulus, using a finger pulse transducer to measure the average heartrate of participants from their index finger. The equipment was connected to a computer running the software LabChart Pro (version 8) from ADInstruments in order to analyse any physiological changes caused by the stimuli. The length of time in-between P-P values, or the pulse pressure values, was used to calculate the participants average heartbeats per minute.

The music stimuli, in both a major and minor key, was played for the participants using a music streaming app, Spotify, on an Apple iPhone 11. The songs were selected by utilising the streaming service's pre-existing playlists for music in various keys. For the song in a minor key, 'Turning Tables' by Adele (2011) was selected, and 'September' by Earth, Wind & Fire (1978) was chosen as the song in a Major key as these were the first in their respective playlists curated by Spotify.

Design

The current study used a within and between-groups experimental design, as the study manipulated which variables participants were exposed to. The within-groups independent variable was time, and the variable that was changed between groups was the music stimuli the participants were exposed to (major or minor), and the dependent variables of the experiment were the participants self-reported mood scores on the BMIS (Mayer & Gaschke, 1988) and their heartrate averages (BPM). Participants were randomly assigned to one of the two subgroups using a random number generator, with both groups experiencing different stimuli. Group 1 (n=16) were played music in a Minor key, whereas group 2 (n=15) were played music in a major key. In order to keep the experiment consistent and balanced amongst participants, music was played for exactly three minutes whilst the participant faced

away from the computer monitor displaying their heartrate, in order to avoid this having any effect on them. A quantitative approach was pursued in analysing the data collected in the experiment, i.e. the self-reported mood scales and the physiological data collected from the finger pulse transducer as mentioned above. A statistical software, SPSS, was used to carry out a mixed within and between groups ANOVA to analyse any interaction effects.

Procedure

Recruitment for the study primarily occurred online, with participants reading an information sheet (Appendix E) describing the nature of the study, eligibility criteria, where it will take place, how long it will take, and what is expected of participants. Those interested were prompted to leave an email address through which they could be contacted to arrange their participation. Some of these participants also recruited their friends to partake. After a date and time was agreed upon, participants were directed to the psychology lab at the National College of Ireland, as the lab equipment here was necessary for the experiment. Participants were given the opportunity to ask any further questions they had about the study, and were given a consent form to sign (Appendix F). It was made clear to participants that they could withdraw from the research at any point with no consequence up until their experiment was complete, as the data would be anonymised from that point on.

After consent was obtained, participants were asked to fill out a basic demographical information form (Appendix D) to ensure they were eligible to partake in the study, i.e. they were over the age of eighteen and did not have any heart-related issues. This was to avoid any significant outliers in the physiological measures employed.

To obtain the necessary data for the study, participants were requested to answer all 16 likert-scale questions of the Brief Mood Introspection Scale in order to establish their baseline self-reported mood levels. They were then asked to wear a finger pulse transducer connected to a computer running LabChart (version 8) and a three-minute recording of BPM

was taken, the mean of which was calculated to establish baseline heartrate levels. Whilst still wearing the finger pulse transducer, a random number generator was used to sort participants into one of two subgroups; one exposed to a music stimulus in a major key, and the other in a minor. Average BPM was calculated for three minutes during exposure to the stimulus. Lastly, participants were asked to complete the BMIS again so that changes in self-reported moods could be analysed. The total time spent with participants averaged between 12-15 minutes.

Having completed the experiment, participants were thanked for their time and participation, and given a debriefing form (Appendix G) detailing the purpose of the study, informing them what their data will be used for, and supplying contact information for myself and relevant helplines in the case that participants have any follow-up questions or wished to talk to anyone about possible distress caused by the study.

Ethical Considerations

The current study was carried out in line with ethical guidelines set out by NCI and PSI. All participants were over the age of 18 and gave active consent to participate in the research. Participants were made fully aware that they can withdraw consent up until the end of their participation with no consequence, and were informed that their data will be completely anonymised and used as part of an undergraduate thesis, oral presentation, and may go on to be published in a psychological journal. Each participant was also given the opportunity to have any questions they had pertaining to the study answered.

Results

Descriptive Statistics

The current study collected data from a sample of 31 participants, 21 females and 10 males. The descriptive details from the two continuous variables employed by the study;

heartrate as a physiological measure, and the BMIS as a psychological self-report measure, can be seen in Table 1 below. Scores from the BMIS have been reported both before and after exposure to a music stimulus, and the scale has been reverse-scored four different ways to get the following mood scores: Pleasant-Unpleasant mood, Calm-Arousal, Positive-Tired, and Negative-Relaxed. The maximum and minimum possible scores for each can be seen in table 2.

Table 1

Descriptive statistics for all continuous variables

Variable	*M* [95% CI]	*SD*	Range
Age	24.26[21.38, 27.14]	7.85	27
Pre-Stimuli Heartrate	83.68[78.13, 89.23]	15.14	58.55
Post-Stimuli Heartrate	82.92[78.31, 87.54]	12.57	41.88
Pre Pleasant-Unpleasant	44.32[41.12, 47.53]	8.74	32
Post Pleasant-Unpleasant	45.71[42.29, 49.13]	9.32	36
Pre Calm-Arousal	26.52[25.12, 27.91]	3.81	21
Post Calm-Arousal	27.13[25.55, 28.71]	4.31	19
Pre Positive-Tired	17.26[15.78, 18.74]	4.04	17
Post Positive-Tired	18.42[16.77, 20.07]	4.49	16
Pre Negative-Relaxed	11.87[10.49, 13.26]	3.78	14
Post Negative-Relaxed	11.55[10.00, 13.10]	4.23	18

Table 2

Maximum and minimum scores for subscales of the BMIS (Mayer & Cavallaro, 2019)

BMIS Sub-Scales	Minimum	Maximum
Pleasant-Unpleasant	16	64
Calm-Arousal	12	48
Positive-Tired	7	28
Negative-Relaxed	6	24

Inferential Statistics

Preliminary analyses were conducted to ensure that all variables met the assumptions of normality. Deviance from the mean was seen however in the pre and post heartrate scores due to the presence of outliers, with baseline BPM ranging from 61.97 to 120.52. A mixed within and between participants ANOVA was conducted to assess the impact on self-reported mood and heartrate, of music in a major key compared to music in a minor key. The within-participants independent variable used was time, as all participants were tested both before and after exposure to the stimulus. The between-participants IV was music subgroup, major or minor, and the dependent variables were heartrate, and subscales of the BMIS (Mayer & Gaschke, 1988); Pleasant-Unpleasant mood, Calm-Arousal, Positive-Tired, and Negative-Relaxed.

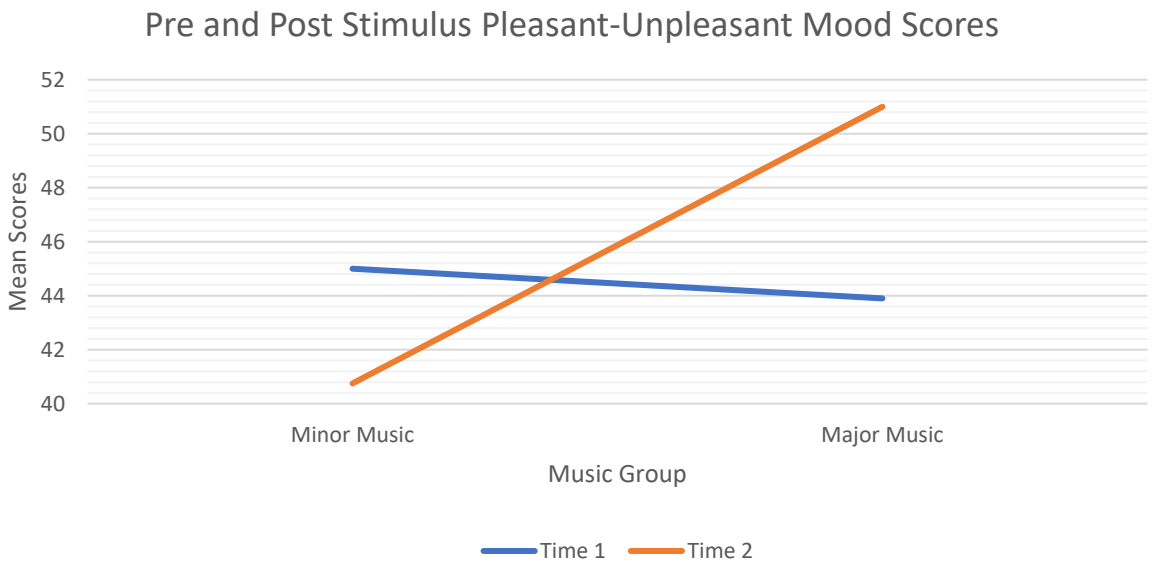
Statistically significant interaction effects between time and music stimulus were discovered, and a non-significant main effect was seen when just time was analysed. This indicates that the music stimulus that participants were exposed to had a direct impact on the changes in DV scores. Significant interactions were seen on heartrate levels (Wilks Lambda = .73, F (1, 29) = 10.69, p = .003), Pleasant-Unpleasant Mood (Wilks Lambda = .74, F (1, 29)

= 10.32, p = .003), Tired-Positive (Wilks Lambda = .74, F (1, 29) = 10.25, p = .003), and Negative-Relaxed (Wilks Lambda = .83, F (1, 29) = 5.92, p = .021). A non-significant effect was seen in the analysis of Calm-Arousal (Wilks Lambda = .99, F (1, 29) = .036, p = .85), however as previously stated, this subscale of the BMIS has the least favourable reliability. Mauchly's test of sphericity was conducted for each variable and was not violated in any case.

In the case of the Pleasant-Unpleasant mood scale, which is the most reliable scale of self-reported mood in the BMIS (α = 0.83), a drop in score can be seen between time 1 and time 2 for the minor music group, whereas the major music groups scores were impacted almost twice as much, in the opposite direction. This shows that the pre and post self-reported mood scores were impacted depending on exposure to the differing music stimuli (See Graph 1).

Graph 1

Interaction effects of Time and Music Subgroup on Pleasant-Unpleasant Mood



Discussion

The current study aimed to investigate the effects that music listening behaviours may have on individual's mood. In order to measure baseline mood levels, the Brief Mood Introspection Scale (BMIS) (Mayer & Gaschke, 1988) was employed, as well as using a finger pulse transducer to calculate the participants resting heartrate. By employing the use of both psychological and physiological measures both before and after stimulus exposure, the study hoped to gain a more comprehensive scope of any possible changes in mood levels. In order to provide a greater understanding of how different music listening behaviours can result in different mood affects, the key of the music stimulus was changed between the participant subgroups, with one experiencing music in a major key and the other hearing a minor key. Prior studies investigating links between music and mood have shown dissimilar findings. Some studies indicate that music has calming effects only when relaxation is the motive behind the music listening behaviour (Linnemann et al., 2015; Ogba et al., 2019) and that intention plays a significant role in what mood effects are experienced (Stewart et al., 2019), whereas other studies saw no impact on self-reported mood scores caused by music listening (Bowles et al., 2019; Thoma et al., 2013). The current study, having withheld the assumed hypotheses from participants initially, was able to rule out the intention behind music listening as having an impact on scores. From analysing prior research, four hypotheses were formulated to assess potential gaps in the literature and gain more knowledge on the subject through an experimental study design.

The current study used a within and between-subjects experimental design in order to assess the following hypotheses: listening to a major music stimulus will have a positive impact on self-reported mood scores; the major music stimulus will increase participants heartrates; listening to a minor music stimulus will result in lower self-reported mood scores; exposure to the minor music stimulus will result in a lowered heartrate. A mixed within and

between groups ANOVA was used to account for interaction effects between changes in self-reported mood scores, and changes in heartrate data before and after stimulus exposure, thus discovering if the music had affected the psychological and physiological data, and in what way.

After analysing the data collected within the study, participants in general showed non-significant changes in both their psychological and physiological scoring for pre and post stimuli recordings. A statistically significant interaction effect was observed however when assessing the between-groups measure of the differing music stimuli. This appears to suggest that the key of the music participants were exposed to, major or minor, was directly responsible for the effect. Of the five dependent variables of interest; heartrate, pleasant-unpleasant mood, calm-arousal mood, tired-positive mood, and negative relaxed mood; four showed a statistically significant change in pre and post scores due to the music stimuli.

Hypotheses one and two, stating that music in a major key was expected to raise heartrate and self-reported mood scores, appear to be accepted in terms of the statistical results. These hypotheses were tested by running a mixed within and between groups ANOVA analysis, with the within-participants independent variable being time, and the between-participants independent variable being music subgroup. Significant changes following exposure to the major music stimulus were seen with results showing a raise in heartrate, pleasant moods were recorded higher than unpleasant moods, positive moods were shown to be significantly higher than tired moods, and scores for negative relaxed moods decreased. The results for the calm-arousal scale were non-significant.

Hypotheses three and four, stating that exposure to music in a minor key would lower individual's heartrate, and result in lower self-reported mood scores, also appear to be accepted in this study. Following interpretation of the mixed within and between groups ANOVA analysis, it was revealed that the interaction effects between pre and post scores,

and the music subgroup, was statistically significant for all dependent variables other than the calm-arousal scale. As mentioned previously however, this scale has proven to have the lowest validity of the BMIS subscales according to Mayer and Cavallaro (2019) and does not have a significant impact on the overall interpretation of results. The use of the minor music stimulus significantly lowered heartrate levels, gave a rise to unpleasant moods and lessened pleasant moods, made individuals report feeling more tired and experiencing less feelings of positivity, and caused higher scores on the negative-relaxed scale.

These results are consistent with some prior research such as the study by Linnemann et al. (2015) which measured the physiological measure of alpha-amylase production in saliva, with energizing music increasing and relaxing music decreasing alpha-amylase activity ($p = 0.025$), suggesting that music is linked with physiological changes, as seen in the current study. In that same study however, Linnenman et al. (2015) stated that they had also measured salivary cortisol levels to observe music's physiological impact on a stress response and they deducted that music listening did not have an effect. The study only took into account whether music listening occurred, not for how long or what sort of music, which the current study hoped to address by using different music stimuli for a set time period of three minutes. In contradiction to the findings of the current research however, a study by Thoma et al. (2013) in which participants were exposed to self-described relaxing music, sounds of running water, or a control group which experienced silence, found that music had no impact on heartrate when compared to the other two subgroups in the context of experiencing a stressor. As the current study's results indicate a statistically significant interaction between heartrate and music listening, further research needs to be done on the physiological aspect of music listening behaviours.

The interaction effects discovered between the music subgroups and the psychological self-report mood scales appear to be consistent with similar research. A study by Hunter et al.

(2010) in which participants were asked to rate how happy or sad music made them feel, and how happy or sad the music itself was, revealed that happiness ratings were elevated for fast-tempo and major-key music stimuli, and sadness ratings were elevated for slow-tempo and minor-key stimuli, much like the assumptions from prior research that musical tempo and key are important factors in affecting individual mood levels (Pantoja & Borges, 2021; Stewart & Koh, 2017). These results were consistent with the current studies findings, however the researchers suggested that future studies could benefit from using an assessment scale able to capture a wider range of mood as opposed to just happiness or sadness, which the current study has built on with the use of the 16 item BMIS in order to give a wider variety of emotive descriptors to participants.

Results of the present study appear to be in line with the studies original hypotheses, but a discovery that was not originally planned was the difference in effect power that the differing music stimuli would have. In the case of the pleasant-unpleasant mood scale, the study expected that the major music stimulus would increase scores whereas minor music would cause a decrease in scores. This expectation appeared true, but in addition to this discovery, a line graph visually showcasing results for the ANOVA showed that the major music had nearly two times the impact on raising scores than the minor music had on lowering them (See Graph 1 in Results). Future research may benefit from investigating this discovery further.

Strengths and Limitations

The present study identifies a number of limitations. Firstly, the sample size of the study (N=31), although delivering a statistically significant effect, would optimally have been larger and allowed for the inclusion of a control group who would listen to silence rather than any music stimulus to further measure the interaction effects of music on mood. The smaller than ideal sample size was unavoidable, due to the strict deadlines imposed by a limited trial

set for the necessary equipment and software for the study: Labchart (Version 8) by ADInstruments. Another limitation of the study surrounds the heartrate data collected from participants. There was a large range among both pre and post heartrate scores for both subgroups of participants. This may be due to various reasons, such as participants feeling nervous partaking in an experiment thus raising their heartrate, the physical exercise of climbing stairs to get to the psychology lab, or caffeine consumption. Future studies may benefit from controlling for these factors. All participants were also from, or attended work or college in Dublin, thus reducing the overall generalisability of the findings to a wider population.

The major strength associated with this study was the investigation into the interaction that music listening has on both physiological and psychological measures, as no studies that I have found have investigated links between physiological indications of mood paired with music, whilst accounting for different forms of music, and employing a self-report mood assessment allowing participants to express a wide range of moods or feelings. By seeing a correlation between the direction of heartrate scores raising or lowering in conjunction with self-reported mood scores, the current study appears to achieve validity in that the physiological and psychological scores support one another. The current study has evaluated previous literature on music and mood related studies, and attempted to improve on them by implementing differing keys of music stimuli as suggested by Linnemann et al. (2015) and allowing for a wider expression of emotion (Hunter et al., 2010).

Recommendations for Future Research

Future research into the effects of music on mood may benefit from employing a larger, and more diverse sample in order to boost the generalisability of their results. This could be done by recruiting participants of different age groups, race, levels of education, and county and/or country of residence in order to investigate if these demographic variables have

a differing interaction effect. The number of outliers in relation to the heartrate variables could suggest that future studies should implement a set waiting time before physiological data is measured, to allow heartrate to fully return to its resting rate. Prohibiting caffeine consumption prior to the experiment may also aid in reducing outliers.

The two songs chosen for this study; Turning Tables (Adele, 2011) and September (Earth, Wind & Fire, 1978) were chosen for the reason that they were the first songs available in respective major music and minor music playlists created by Spotify. Future studies may benefit from using classical music to solely test for the interaction effect of the music key on differences in mood levels, as the song lyrics could have affected scores. Furthermore, a larger study could use songs of different keys, tempos, and genres to do a more thorough investigation of each form of music effects.

Conclusions

Overall, there remains disagreement in the literature regarding what effect that music has, if any, on mood, with some studies suggesting that music listening behaviours have an impact on self-reported mood (Hunter et al., 2010; Linnemann et al., 2015; Lonsdale & North, 2011) and others not finding any significant change (Bowles et al., 2019; Thoma et al., 2013). This study intended to implement both psychological and physiological measures of mood in order to fill a gap in the literature, and revealed statistically significant findings. Results of this study suggest that music directly affects the mood of the listener, that the type of music listened to can have differing effects on mood, namely major music improving mood and minor music resulting in lowered mood, and that exposure to different types of music can have different levels of effect, with the major music subgroup in the current study experiencing a greater change in mood scores overall. The findings of this research have implications for music-based mood regulation strategies for clinical settings or at an individual level. As the results of this study appear to suggest that music listening behaviours

have a significant effect both physiologically and psychologically, it may be worth investigating the performance or success of music therapies for clinical settings also.

References

Adele. (2011). *Turning Tables* [Streamed]. XL Recordings. https://open.spotify.com/track/5O6yk6U8L3rTbFsIwuqe8H?si=f4349ba215cb4a03

Bowles, L., Curtis, J., Davies, C., Lengerich, A., & Bugajski, A. (2019). The effect of music on mood, motivation, and exercise among patients in a cardiac rehabilitation program: A pilot study. *Nursing Forum*, *54*(3), 340–344. https://doi.org/10.1111/nuf.12334

Cavallaro, R. M., Bryan, V., & Mayer, J. D. (2019). A Review and Evaluation of an Open-Source Mood Assessment, the Brief Mood Introspection Scale. *Manuscript in Preparation*.

Clark, I. N., Baker, F. A., & Taylor, N. F. (2015). The modulating effects of music listening on health-related exercise and physical activity in adults: a systematic review and narrative synthesis. *Nordic Journal of Music Therapy*, *25*(1), 76–104. https://doi.org/10.1080/08098131.2015.1008558

Earth, Wind & Fire. (1978). *September* [Streamed]. ARC/Columbia. https://open.spotify.com/track/2grjqo0Frpf2okIBiifQKs?si=16f18f74f7e94336

Garrido, S., Tuomas Eerola, & Katrina Skewes McFerran. (2017). *Group Rumination: Social Interactions Around Music in People with Depression*. *8*. https://doi.org/10.3389/fpsyg.2017.00490

Green, A. (2021, October 20). Hours spent listening to music on the rise globally – report. *Independent*; Independent.ie. https://www.independent.ie/entertainment/music/hours-spent-listening-to-music-on-the-rise-globally-report-40969728.html

Hallam, S. (2010). The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education*, *28*(3), 269–289. https://doi.org/10.1177/0255761410370658

Hamel, W. J. (2001). The effects of music intervention on anxiety in the patient waiting for cardiac catheterization. *17*(5), 279–285. https://doi.org/10.1054/iccn.2001.1594

Hoge, E. A., Philip, S. R., & Fulwiler, C. E. (2019). *Considerations for mood and emotion measures in mindfulness-based intervention research*. *28*, 279–284. https://doi.org/10.1016/j.copsyc.2019.02.001

Hutchinson, J. C., Karageorghis, C. I., & Black, J. D. (2017). The Dia beat es Project: Perceptual, Affective and Psychophysiological Effects of Music and Music-Video in a Clinical Exercise Setting. *41*(1), 90–96. https://doi.org/10.1016/j.jcjd.2016.07.009

Linnemann, A., Ditzen, B., Strahler, J., Doerr, J. M., & Nater, U. M. (2015). Music listening as a means of stress reduction in daily life. *Psychoneuroendocrinology*, *60*, 82–90. https://doi.org/10.1016/j.psyneuen.2015.06.008

Lonsdale, A. J., & North, A. C. (2011). Why do we listen to music? A uses and gratifications analysis. *British Journal of Psychology*, *102*(1), 108–134. https://doi.org/10.1348/000712610x506831

Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology*, *55*(1), 102–111. https://doi.org/10.1037/0022-3514.55.1.102

Mayer, J., & Cavallaro, R. (2019). Methods of Scoring the BMIS 1 *Brief Mood Introspection Scale (BMIS): Technical and Scoring Manual (3 rd Edition)*. https://mypages.unh.edu/sites/default/files/jdmayer/files/bmistechnicalandscoringmanual-3rded-2019-02-26fin.pdf

North, A. C., Hargreaves, D. J., & O'Neill, S. (2000). The importance of music to adolescents. *70*(2), 255–272. https://doi.org/10.1348/000709900158083

Ogba, F. N., Ede, M. O., Onyishi, C. N., Agu, P. U., Ikechukwu-Ilomuanya, A. B., Igbo, J. N., Egenti, N., Manafa, I., Amoke, C., Nwosu, N. C., Omeke, F. C., Nwafor, B. N.,

Amadi, K. C., Nwokenna, E. N., & Ugwoke, S. C. (2019). Effectiveness of music therapy with relaxation technique on stress management as measured by perceived stress scale: Retraction. *Medicine*, *98*(15), e15107. https://doi.org/10.1097/MD.0000000000015107

Pantoja, F., & Borges, A. (2021). Background music tempo effects on food evaluations and purchase intentions. *63*, 102730–102730. https://doi.org/10.1016/j.jretconser.2021.102730

Randall, W. M., & Rickard, N. S. (2016). Reasons for personal music listening: A mobile experience sampling study of emotional outcomes. *Psychology of Music*, *45*(4), 479–495. https://doi.org/10.1177/0305735616666939

Schäfer, T., & Sedlmeier, P. (2009). From the functions of music to music preference. *Psychology of Music*, *37*(3), 279–300. https://doi.org/10.1177/0305735608097247

Stewart, J., Garrido, S., Hense, C., & Katrina Skewes McFerran. (2019). Music Use for Mood Regulation: Self-Awareness and Conscious Listening Choices in Young People With Tendencies to Depression. *10*. https://doi.org/10.3389/fpsyg.2019.01199

Stewart, K., & Koh, H. (2017*).* Hooked on a feeling: The effect of music tempo on attitudes and the mediating role of consumers' affective responses. *16*(6), 550–564. https://doi.org/10.1002/cb.1665

Tabachnick, B. G., & Fidell, L. S. (2013). Using multivariate statistics. (6th ed.). Boston: Pearson.

Thoma, M. V., La Marca, R., Brönnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The Effect of Music on the Human Stress Response. *PLoS ONE*, *8*(8), e70156. https://doi.org/10.1371/journal.pone.0070156

Thoma, M. V., Scholz, U., Ehlert, U., & Nater, U. M. (2012). Listening to music and physiological and psychological functioning: The mediating role of emotion

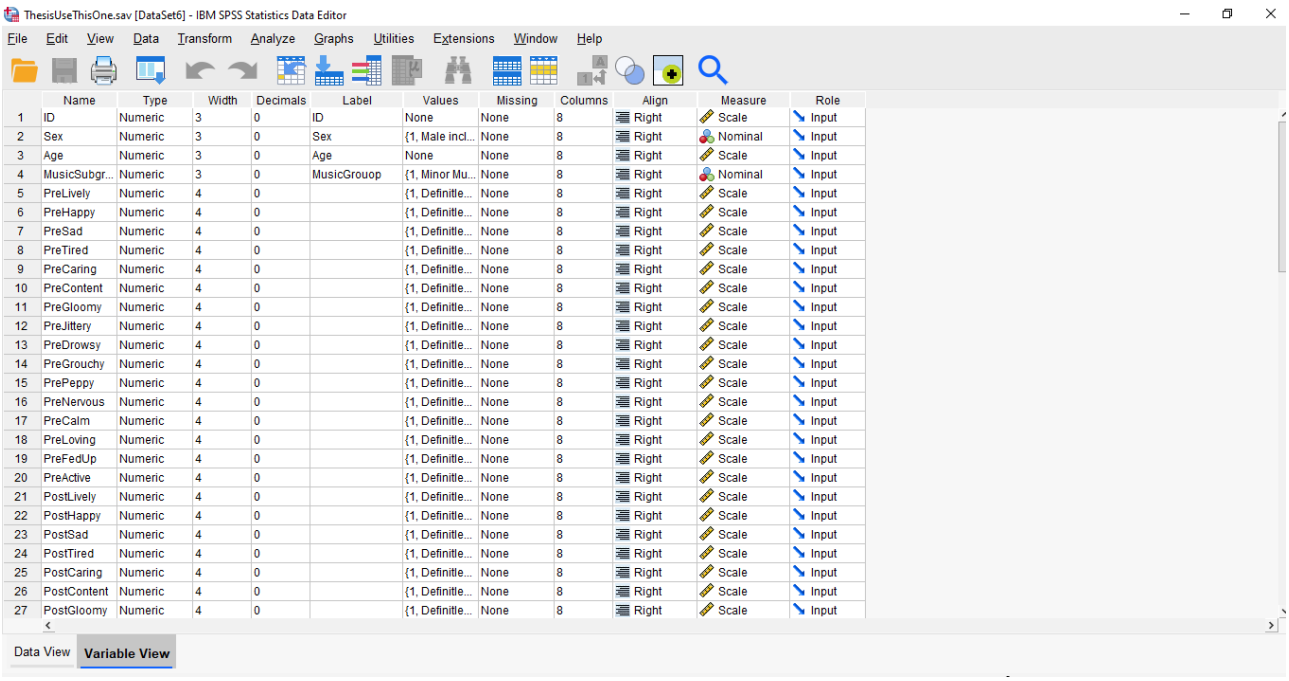
regulation and stress reactivity. *Psychology & Health*, *27*(2), 227–241. https://doi.org/10.1080/08870446.2011.575225

Volokhin, S., & Agichtein, E. (2018). Understanding Music Listening Intents During Daily Activities with Implications for Contextual Music Recommendation. *Proceedings of the 2018 Conference on Human Information Interaction&Retrieval - CHIIR '18*. https://doi.org/10.1145/3176349.3176885

Appendices

Appendix A

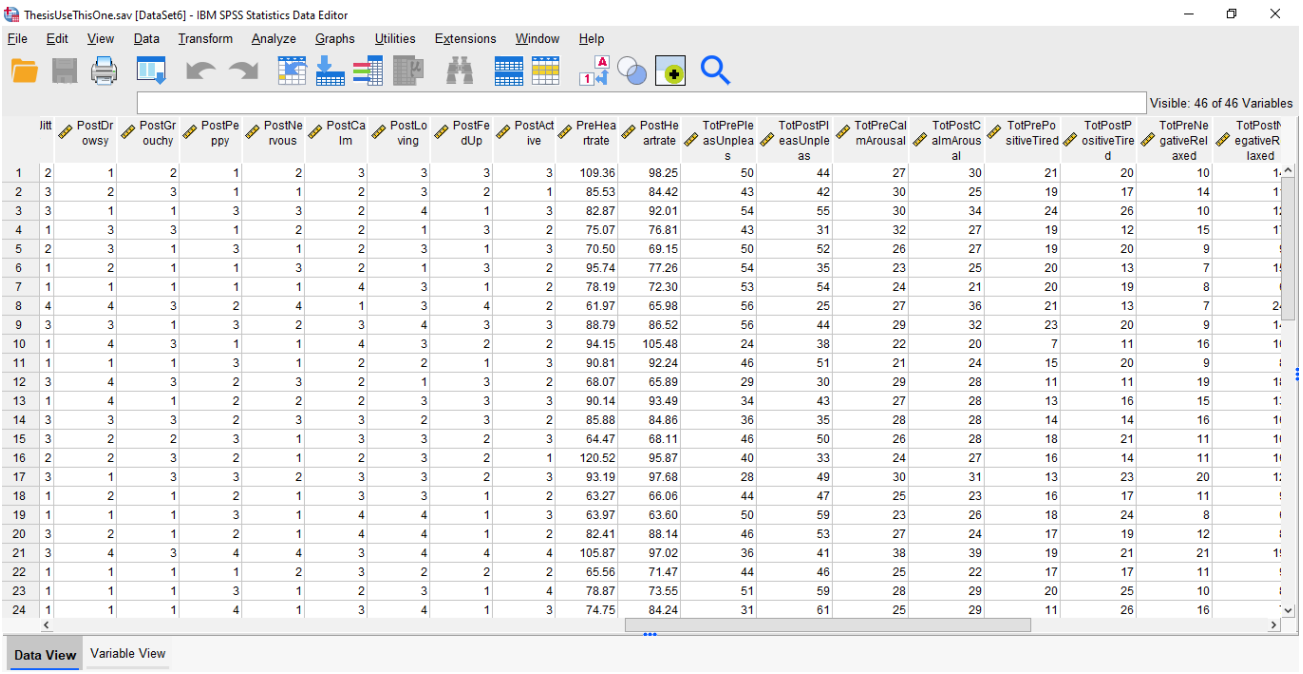
Evidence of SPSS data file and output file (full files available upon request)


ThesisUseThisOne.sav [DataSet6] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	Numeric	3	0	ID	None	None	8	Right	Scale	Input
2	Sex	Numeric	3	0	Sex	{1, Male incl...	None	8	Right	Nominal	Input
3	Age	Numeric	3	0	Age	None	None	8	Right	Scale	Input
4	MusicSubgr...	Numeric	3	0	MusicGrouop	{1, Minor Mu...	None	8	Right	Nominal	Input
5	PreLively	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
6	PreHappy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
7	PreSad	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
8	PreTired	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
9	PreCaring	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
10	PreContent	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
11	PreGloomy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
12	PreJittery	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
13	PreDrowsy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
14	PreGrouchy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
15	PrePeppy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
16	PreNervous	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
17	PreCalm	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
18	PreLoving	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
19	PreFedUp	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
20	PreActive	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
21	PostLively	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
22	PostHappy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
23	PostSad	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
24	PostTired	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
25	PostCaring	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
26	PostContent	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input
27	PostGloomy	Numeric	4	0		{1, Definitle...	None	8	Right	Scale	Input

Data View | Variable View


ThesisUseThisOne.sav [DataSet6] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Graphs Utilities Extensions Window Help

Visible: 46 of 46 Variables

	litt	PostDrowsy	PostGrouchy	PostPeppy	PostNervous	PostCalm	PostLoving	PostFedUp	PostActive	PreHeartrate	PostHeartrate	TotPrePleasUnpleas	TotPostPleasUnpleas	TotPreCalmArousal	TotPostCalmArousal	TotPrePositiveTired	TotPostPositiveTired	TotPreNegativeRelaxed	TotPostNegativeRelaxed
1	2	1	2	1	2	3	3	3	3	109.36	98.25	50	44	27	30	21	20	10	1
2	3	2	3	1	1	2	3	2	1	85.53	84.42	43	42	30	25	19	17	14	1
3	3	1	1	3	3	2	4	1	3	82.87	92.01	54	55	30	34	24	26	10	1
4	1	3	3	1	2	2	1	3	2	75.07	76.81	43	31	32	27	19	12	15	1
5	2	3	1	3	1	2	3	1	3	70.50	69.15	50	52	26	27	19	20	9	
6	1	2	1	1	3	2	1	3	2	95.74	77.26	54	35	23	25	20	13	7	1
7	1	1	1	1	1	4	3	1	2	78.19	72.30	53	54	24	21	20	19	8	
8	4	4	3	2	4	1	3	4	2	61.97	65.98	56	25	27	36	21	13	7	2
9	3	3	1	3	2	3	4	3	3	88.79	86.52	56	44	29	32	23	20	9	1
10	1	4	3	1	1	4	3	2	2	94.15	105.48	24	38	22	20	7	11	16	1
11	1	1	1	3	1	2	2	1	3	90.81	92.24	46	51	21	24	15	20	9	
12	3	4	3	2	3	2	1	3	2	68.07	65.89	29	30	29	28	11	11	19	1
13	1	4	1	2	2	2	3	3	3	90.14	93.49	34	43	27	28	13	16	15	1
14	3	3	3	2	3	3	2	3	2	85.88	84.86	36	35	28	28	14	14	16	1
15	3	2	2	3	1	3	3	2	3	64.47	68.11	46	50	26	28	18	21	11	1
16	2	2	3	2	1	2	3	2	1	120.52	95.87	40	33	24	27	16	14	11	1
17	3	1	3	3	2	3	3	2	3	93.19	97.68	28	49	30	31	13	23	20	1
18	1	2	1	2	1	3	3	1	2	63.27	66.06	44	47	25	23	16	17	11	
19	1	1	1	3	1	4	4	1	3	63.97	63.60	50	59	23	26	18	24	8	
20	3	2	1	2	1	4	4	1	2	82.41	88.14	46	53	27	24	17	19	12	
21	3	4	3	4	4	3	4	4	4	105.87	97.02	36	41	38	39	19	21	21	1
22	1	1	1	1	2	3	2	2	2	65.56	71.47	44	46	25	22	17	17	11	
23	1	1	1	3	1	2	3	1	4	78.87	73.55	51	59	28	29	20	25	10	
24	1	1	1	4	1	3	4	1	3	74.75	84.24	31	61	25	29	11	26	16	

Data View | Variable View

ThesisOutputFile.spv [Document1] - IBM SPSS Statistics Viewer

File Edit View Data Transform Insert Format Analyze Graphs Utilities Extensions Window Help

- MusicGrouop * Time
- Frequencies
  - Title
  - Notes
  - Statistics
  - Frequency Table
    - Title
    - Sex
    - Age
- General Linear Model
  - Title
  - Notes
  - Within-Subjects Factors
  - Between-Subjects Factors
  - Multivariate Tests
  - Mauchly's Test of Spherici
  - Tests of Within-Subjects E
  - Tests of Within-Subjects C
  - Tests of Between-Subject
- Profile Plots
  - Title
  - MusicGrouop * Time
- General Linear Model
  - Title
  - Notes
  - Within-Subjects Factors
  - Between-Subjects Factors
  - Multivariate Tests
  - Mauchly's Test of Spherici
  - Tests of Within-Subjects E
  - Tests of Within-Subjects C
  - Tests of Between-Subject
- Profile Plots
  - Title
  - MusicGrouop * Time

Factors

Measure: MEASURE_1

Time	Dependent Variable
1	TotPrePleasUnpleas
2	TotPostPleasUnpleas

Between-Subjects Factors

		Value Label	N
MusicGrouop	1	Minor Music	16
	2	Major Music	15

Multivariate Tests[a]

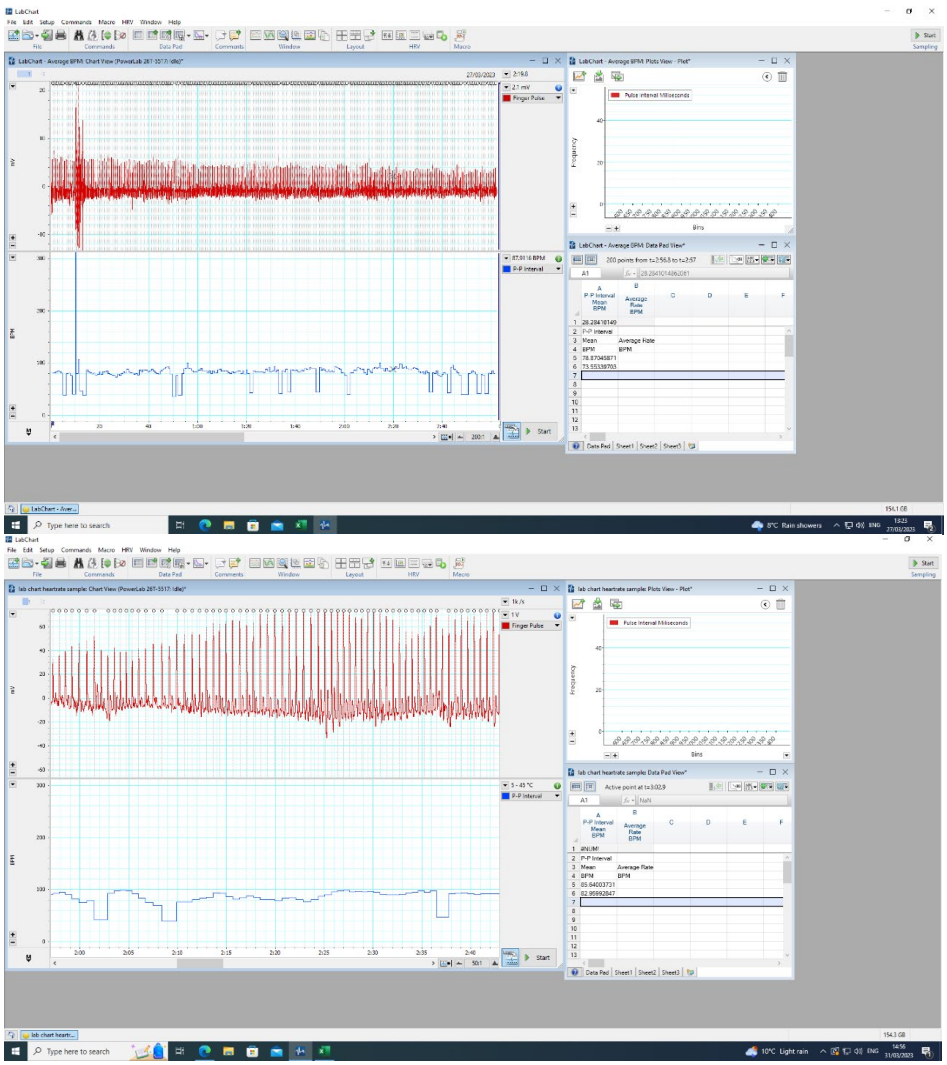
Effect		Value	F	Hypothesis df	Error df	Sig.
Time	Pillai's Trace	.026	.785[b]	1.000	29.000	.383
	Wilks' Lambda	.974	.785[b]	1.000	29.000	.383
	Hotelling's Trace	.027	.785[b]	1.000	29.000	.383
	Roy's Largest Root	.027	.785[b]	1.000	29.000	.383
Time * MusicSubgroup	Pillai's Trace	.262	10.322[b]	1.000	29.000	.003
	Wilks' Lambda	.738	10.322[b]	1.000	29.000	.003
	Hotelling's Trace	.356	10.322[b]	1.000	29.000	.003
	Roy's Largest Root	.356	10.322[b]	1.000	29.000	.003

a. Design: Intercept + MusicSubgroup
Within Subjects Design: Time

b. Exact statistic

Appendix B

Evidence of physiological (heartrate) data from LabChart



Appendix C

Brief Mood Introspection Scale (BMIS) (Mayer & Gaschke, 1988)

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

(Definitely do not feel)	(do not feel)	(slightly feel)	(do feel)
1	2	3	4

Lively	1	2	3	4	Drowsy	1	2	3	4
Happy	1	2	3	4	Grouchy	1	2	3	4
Sad	1	2	3	4	Peppy	1	2	3	4
Tired	1	2	3	4	Nervous	1	2	3	4
Caring	1	2	3	4	Calm	1	2	3	4
Content	1	2	3	4	Loving	1	2	3	4
Gloomy	1	2	3	4	Fed up	1	2	3	4
Jittery	1	2	3	4	Active	1	2	3	4

Appendix D

Participant Demographic Questionnaire

Thank you for taking an interest in this project! Please find below some questions which are necessary to assess your eligibility for participation within the study, as well as supplying us with data that can be used to help analyse the results of the study. Please answer all questions so the relevant data can be collected.

Q1. What gender do you identify as?

A. Male (Including FTM Trans) B. Female (Including MTF Trans)

C. Other, please specify:_____ D. Prefer not to say

Q2. What is your age?

A. Please write your age in years:_____ B. Prefer not to say

Q3. Do you, to your knowledge, have an existing heart condition or any blood pressure related issues?

A. Yes B. No

Thank you for your time!

Appendix E

Participant Information Leaflet

The Impact of Major and Minor Music on Mood

If you are reading this information sheet, you have been chosen to take part in a research study. Before deciding whether you wish to participate, please read through this document in its entirety, as it explains what is involved in the research, and what is expected from you. Any questions you have regarding the research or the information on this sheet will be answered by the researcher, so please feel free to ask.

What is the study about?

My name is Adam, and I am currently a final year student doing a Bachelor of Arts (Honours) Degree in the National College of Ireland. As part of our final year, we must carry out an independent research project to showcase the skills and knowledge that we have picked up throughout our degree. The research project that I am carrying out aims to investigate the effect that music, specifically in a major or a minor key, can have on an individual's mood. The research will be conducted by myself, and supervised by Dr Michelle Kelly, a researcher and lecturer at the National College of Ireland.

What will taking part in the study involve?

If you choose to take part in this study, you will be asked to complete a self-report assessment, both before and after listening to music. The scale being used is a Brief Mood Introspection Scale which will give information about your current mood, and it will take approximately five minutes to complete each time. You will also have your heartrate measured whilst listening to the music, to measure any possible changes. The total length of the experiment is expected to be between around 15 minutes. The testing will occur on the National College of Ireland campus, at Mayor Street Lower, IFSC, Dublin 1, where you will be met by myself and escorted to the lab.

Who can take part?

You are eligible to take part in this project if you are above the age of 18, are able to travel to the NCI campus, and as long as you do not have an existing heart condition or any issues surrounding blood pressure that you are aware of, as heartrate will be a factor that will be measured.

Do I have to take part?

No, participation in this project is completely voluntary and you may make your decision upon reading this information sheet. If you choose not to take part, there will be no

consequences due to that decision. If you do choose to take part, you will still have the right to withdraw your participation at any point during the research process. Once the data has been fully collected and analysed, it will no longer be possible to withdraw from the study, as your data will be anonymous at this stage. Please feel free to ask any questions you have about this.

What are the risks and benefits of taking part?

There are no direct benefits of taking part in this research study, however the data that will be collected will be of great help to my project and will contribute to the scientific literature surrounding music and mood studies. There are minimal risks in the study, however if any problems or anxieties arise during the testing process, such as from the use of lab equipment, just make this known and you can immediately withdraw.

Will taking part be confidential and what will happen to my data?

If you choose to take part in the study, you will be assigned a unique identification number. This number will be associated with your assessment results, as to have you remain anonymous throughout the study. Your name will be used only on the consent form for this study and will be kept separate from any data collected to ensure anonymity in the results. The consent form will be kept for five years in accordance with NCI guidelines, and then destroyed. After completion of the experiment, you cannot withdraw your data, as it will not be able to be traced back to you. Your data will then be anonymously published in our findings. The data collected from you in this study may be used for secondary analysis or for future research.

What will happen to the results of the study?

The results of this study will be presented in my final dissertation for the National College of Ireland, which I will be graded on. It will also be used in an oral presentation of this dissertation at NCI. There is a possibility of this research being submitted to an academic journal in order to be published, or to be presented at a conference. The results and data of this study may also be kept for use by future research studies exploring similar topics. Thank you for taking the time to read this information sheet, any further questions can be directed to myself on the below email address.

Who should you contact for further information?

Adam McKenna (researcher), National College of Ireland
Email: X20474122@student.ncirl.ie
Dr Michelle Kelly (academic supervisor), National College of Ireland
Email: Michelle.Kelly@ncirl.ie

Appendix F

Participant Consent Form

The Impact of Major and Minor Music on Mood

- I _____ voluntarily agree to take part in this research study.
- I am over the age of 18, and do not to my knowledge have any form of heart condition or blood pressure related issues.
- I understand that I am aware that I will retain the right to withdraw consent at any point during the experiment.
- I understand that I can no longer withdraw my data from the study once the experiment has concluded, and data analysis has begun.
- I have had the nature of the study explained to me by the researcher, and I have had the opportunity to ask any questions I have about the study.
- I understand that if I participate in the study, I am expected to fill out a self-assessment scale called the Brief Mood Introspection Scale, on two separate occasions.
- I understand that equipment in the lab will be used to monitor my heartrate in the study.
- I understand that I will not directly benefit from participating in this study.
- I understand that all data I give to this study will be treated confidentially.
- I understand that my data will be anonymous in the published research, as my name will not be included.
- I understand that my data will be used in a dissertation and may be published in a psychological journal or used in future research and secondary analysis.
- I have been given relevant helplines and reminded of my right to withdraw from the study in the case that I feel overwhelmed by any of the research material.
- I understand that a signed copy of this consent form will be kept secure and private by the researcher, until the exam board of the National College of Ireland confirms the results of their dissertation.
- I understand that copies of my online completed scales in which all identifying information has been removed shall be kept by the researcher for a period of five years following NCI data retention policy.
- I understand that I am free to contact the researcher to seek further clarification and information.

Signature of research participant _____
Signature of participant Date _____

Appendix G

Participant Debriefing Sheet

The Impact of Major and Minor Music on Mood

Firstly, I would like to thank you for taking the time to participate in this study!

What is being studied? The study is investigating the link between music and our mood. Specifically, we aimed to investigate how songs in a major key affect us compared to a minor key. This was measured using the Brief Mood Introspection Scale as well as analysing your heartrate. The key hypothesis of this study was that music in a major key would cause an improvement in mood, whereas music in a minor key would lower your mood.

What happens to my data? The results from the scales you filled out and from your heartrate will be transferred on to a statistical software called SPSS, to analyse any patterns or trends with the other participants. The results will be used in my final dissertation for the National College of Ireland and may be submitted for publishing to a scientific journal, presented at a conference, or used in future research. Your data will be anonymous throughout this process.

Useful contact information: If you have any further questions regarding the study, its procedures, or information regarding your data, feel free to contact the following:

Researcher: Adam McKenna

Email: X20474122@student.ncirl.ie

Relevant helplines:

If you feel upset or distressed having completed the study, and wish to speak to someone other than the researcher, please make use of the attached helplines.

Aware: 1800 804 848

Samaritans: 116 123