Music and Stress: An Experimental Analysis of Genre and Music Selection

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Abstract

Music has been a useful and effective option for the treatment of anxiety and various other mental illnesses. However, there have not been many studies that have precisely determined which specific genre of music or the person's personal preference for a certain genre of music causes decreased symptoms of stress and anxiety. Various studies utilized the participants' self-selected songs and reported a decreasing trend in the participants' anxiety and stress level. Yet, there were a few studies in which a specific genre of music was chosen, and they had reported the same results. This study aims to answer this discrepancy through the measurement of heart rate variability and respiration rate of four participants as they listened to various genres of music and their own selected songs during the week of the midterm exam. The Tau-U analysis method was then utilized to determine the relationship between specific music genres/ self-selected songs and the participants' parasympathetic responses compared to baseline measurement. Each participant had different results and showed no overall trend of decreasing or increasing in level of stress and anxiety for a specific genre of music. However, the data showed a connection between the participants' feelings and preference for a song and their stress and anxiety level. Thus, the study concluded that each participant's personal preferences and emotional connection towards the song and music genre itself have great influence on whether the song or music genre could decrease the participant's stress and anxiety level.

Music and Stress: An Experimental Analysis of Genre and Music Selection

The human stress response has been studied extensively (Selye, 1955), and human reactions to physical, emotional, and cognitive events are considered to be things that can introduce challenges, thereby creating stress and leading them to be labeled as "stressors". According to Selye (1955), stress-induced illnesses do not have specific causes. Stress-related diseases can be attributed to various nonspecific stressors and inappropriate responses to those stressors. Among the common treatments for mental disorders linked to stress, clinicians have utilized music therapy for many years. Despite its usage, there are still a few questions that researchers have not answered regarding music therapy's procedure and the effectiveness of music to the patients.

Literature Review

The Use of Music in Treatment of Mental Disorders

There are various types of psychotherapies that clinicians and researchers developed in order to treat mental disorders. According to Aalbers et al. (2017), among the psychotherapeutic approaches to treat major depressive disorder, two types of music therapy were considered: receptive music therapy and active music therapy. In active music therapy, the patient and the therapist actively make music (Aalbers et al., 2017). In receptive music therapy, the patients listen to music. Aalbers et al. compared studies on the effectiveness of both types of music therapy along with other types of psychological therapies. There seemed to be a significant decrease in depressive symptoms when music therapies were used, but in comparison to other psychological therapies, there were no significant differences. However, the studies did not compare the effectiveness of

different genres of music in the decrease of symptoms of depression (Aalbers et al., 2017).

While there are many studies on different genres of music and their effects on stress or other mental disorders, none of them so far has reached a definitive conclusion about which genre produces the best outcome, especially for persons with anxiety and depression. A recent study of female patients' self-selected music following gynecologic surgery indicated some preferences (e.g., Disney tunes, classical music, and the Beatles; Xu et al., 2021). However, given that patients were awakening from anesthesia and that only 70 of 135 patients chose to listen to any music, it is unclear whether the findings can be generalized to therapeutic environments outside of post-operative settings. Whether post-operative or in other therapeutic environments, it may be that the great diversity in music preferences plays a vital role in the use of music for relaxation and/or elevation of mood.

Music Genre, Music Preferences, and Stress

Gebhardt and von Georgi (2015) talked about the importance of music preferences. According to their analysis, the patients' attachment to music and what role music had played in their family contributed to the mood regulation of the participants. Their analysis also showed that their subjects preferred music such as rock and pop over other genres like jazz and blues. They suggested that the timing of exposure to specific music and the timing of onset of a mental disorder may be important in determining whether particular music is effective in reducing the severity of symptoms of the disorder. However, a challenge in their methodology is that measures were self-report and retrospective with regard to behaviors, emotions, and music preferences prior to the

onset of symptoms (see Gebhardt et al., 2014). While the article stated that there is no

known relationship between music preferences and health, it is still worth investigating.

      To determine whether there is a predictive relationship between the frequency of

listening to a certain genre of music and stress among university students, Alagha and

Ipradjian (2017) conducted a study with two kinds of questionnaires: the Perceived Stress

Scale (PSS) and a music scale to determine the type of music the participants listen to.

They evaluated four different genres of music: rock, classical, jazz, and blues, and their

effectiveness in reducing students' stress levels after an exam. Since this was a

correlational study, there are no explanations about why the classical genre has no

correlation with stress level or why there was no positive correlation of jazz, blues, and

rock genres on the students' stress level. Additionally, the students who participated in

the study took the questionnaire at different times throughout the week, thus potentially

influencing the final result. Similar to Alagha and Ipradjian (2017), Bartel (2013)

conducted a study regarding music genre, music listening habit, and stress level through a

long questionnaire that included an anxiety questionnaire, depression scale, demographic

questionnaire, and music listening questionnaire. Bartel reported that there were

significant correlations between music genre and the participants' anxiety and stress

levels, especially the genre of "alternative music" and show tunes/soundtracks. Since this

was also a correlational study, it is not possible to offer a causal explanation that genre of

music decreases anxiety and/or the stress response. In order to determine possible causal

effects of music on stress levels, an experimental procedure is required.

Heart Rate Variability as a Measure of Autonomic Function in Music Listening

Using the ratio of low frequency (LF) to high frequency (HF) components to evaluate heart rate variability (HRV), Harada et al. (2017) concluded that classical music decreases the reaction of the sympathetic nervous system (an indicator that stress might be reduced, as well); however, Quintana and Heathers (2014) have questioned the validity of the low frequency to high frequency ratio as an indicator of autonomic function. Nonetheless, Harada et al.'s multiple self-report and physiological indicators (like the State-Trait Anxiety Inventory [STAI], the Self-Rating Depression Scale [SDS], accelerated plethysmography [APG], venous oxygenation index [VOI], and the width of a peripheral vein) provided convergent evidence for parasympathetic activation and reduced stress when participants listened to classical music. While the experiment showed that classical music decreases stress responses (i.e., via parasympathetic activation), there were no other music genres used in the experiment to show if other genres can or cannot produce the same outcome.

Heart rate variability has been used in multiple experiments in order to measure the participants' stress levels. Iwanaga et al. (2005) examined the effects of exposure to music on heart rate variability. The researchers used a "sedative music condition", an "excitative music condition", and a no music condition. They attached electrodes to the thorax and a thermo-sensitive resistor to one nostril in order to measure heart rate and respiration, respectively, for five minutes. Then, the participants were asked to answer subjective emotion questions. LF and the LF/HF ratio were higher during sedative music and excitative music than in no music. In contrast, HF during sedative music was higher in comparison to HF during excitative music and equal to the HF value during no music; so, they concluded that excitative music decreased activity of the parasympathetic

nervous system. Since the results indicated some differences in experimental conditions, heart rate variability seems ideal as a measure in music-stress investigations.

Thoma et al. (2013) also conducted a study on the effects of three music-related conditions–which included relaxing music (RM), the sound of rippling water (SW), and no acoustic stimulation–on the endocrine, autonomic, cognitive, and emotional responses in healthy women. They tested the effects with the Trier Social Stress Test (TSST) following the listening condition. In order to determine the influences of the music conditions on the moderate stress that TSST caused, Thoma et al. measured the concentration of salivary cortisol and salivary alpha-amylase, which are two indicators of the activation of the hypothalamus-pituitary-adrenal axis (which responds to stress via changes in, heart rate, respiratory sinus arrhythmia [RSA; i.e., a feedback mechanism that changes heart rate when respiration is altered--e.g., slowing heart rate when an individual take a long breath out and increasing it when one breathes in; Ben-Tal et al., 2012]). They also measured subjective stress perception and anxiety. There was a decrease in heart rate and an increase in respiratory sinus arrhythmia when the participants were exposed to all three music conditions; the recovery rate of RSA was faster in groups who listened to music in comparison to the resting control group that did not listen to music (Thoma et al., 2013). The study also showed a decrease in salivary cortisol level prior to the TSST test, which was consistent with the heart rate and RSA data prior to the TSST test. So, overall, music may have the capacity to change a person's stress response and perception of stress.

With the usage of various stress indicators that are consistent with each other, it can be established that heart rate values are reliable to use in research on the response to

music. As indicated in the previous studies by Quintana et al (2014), increasing breathing

rate has a positive correlation with heart rate, which in turn affects heart rate variability.

Indeed, heart rate can be used to estimate respiration rate, and respiration can be used to

estimate heart rate, and this is important in one's methodology in HRV studies (see

Methods).

Brouwer et al. (2011) a Foundational Study

The current study's procedure is loosely based on Brouwer's et al. (2011)

experiment's protocol where they tested gradual exposure of virtual reality stressful

events on coping with stressful situations in soldiers. The protocol has seven major

sections and approximately three to four different steps in each section. In the first

section, the researchers gave out instructions and obtained informed consent from the

participants. The researchers also installed the electrodes to measure brain activity and

obtained an initial salivary sample in order to evaluate baseline stress. In the second

section, the researchers let the participants close their eyes and relax for eight minutes

before collecting a second sample of salivary cortisol. In the third stage, with the

participants' eyes closed, the researchers introduced a bomb explosion virtually and

provided negative feedback on their performance in order to induce stress. Within five

minute intervals, the researchers obtained the third, fourth, and fifth salivary cortisol

samples. Then, in the fourth section, they allowed the participants to have an additional

eight minute to relax in a non-stressful virtual environment, provided positive feedback,

and obtained the sixth salivary cortisol sample. In the fifth section, the researchers

introduced a stressful stimulus, provided positive feedback on their performance, and

collected the seventh salivary cortisol sample. After the fifth section, they allowed the

participants to have an eight minute non-stress period and drew the final sample of

salivary cortisol. Finally, the researchers looked at the EEG, the salivary cortisol, and the

questionnaires to see the effectiveness of virtual reality induced stress on policemen and

soldiers. Additionally, in between each section, they also asked the participants to answer

a few subjective state questionnaires.

Due to the concise and effective structure of Brouwer's et al (2011) procedure, the

current study's protocol will be loosely based on this protocol with some adjustments.

The virtual reality instrumentation, the negative and positive feedback cycle, the

collection of salivary cortisol, and the installation of electrodes will not be used. In the

present study, I added a randomized order of genres of music and the measurement of

HRV (and respiration), which Brouwer et al. did not use.

The Current Study

While music has been a useful option for treatments in anxiety and various other

mental illnesses, there has not been much studies that precisely determined which

specific genre of music causes decrease symptoms of stress and anxiety. Considering the

use of multiple instances of self-selected songs in previous studies as well as the fact that

every human being is unique, the participants' individual references and emotional

connection to a genre of music might affect whether that music genre can decrease their

stress and anxiety level. However, studies by Harada et al (2017) and by Iwanaga et al

(2005) provided evidence that non-self-selected music genres produce the same effects as

self-selected songs. Thus, research is not conclusive. The current study aimed to find an

answer to this discrepancy of results.

Method

Participant

Participants were recruited at Malone University by sending invitations through email, which were sent by the Student Development Office. The email (Appendix A) briefly summarized the purpose of the experiment and offered a $15 Amazon gift card as a reward for the first three female students and the first three male students who commited to take part; the gift card was awarded at the end of their study participation. My goal was to have at least three females and three males take part. However, due to two dropouts, there were only two females and two males participating in the study.

In addition to the brief summary of the study, the email invitation included a demographic survey questionnaire (Appendix B) and a consent form (Appendix A). The criteria for the eligibility of interested participants was the age range, which needed to be between eighteen and twenty-six years of age since the focus of the experiment was limited to traditional college-age students. Another criteria for the eligibility of interested participants was the amount of exams that the students would be taking during the time of midterm. Since the experiment used the numerous midterm exams as a source of stress, it was crucial that the interested participants have more than three midterm exams. In order to determine the amount of exams that the interested participants would have during the midterm week, a question regarding this topic was included into the demographic survey questionnaire.

Once enough participants had volunteered, the experimenter arranged morning appointments to conduct the experiment, as this was suggested in the literature as the best time to measure HRV (see Quintana, 2019). In advance of the appointment date, the researcher sent an email with a request to send the researcher a list of five self-selected

songs that range from three minutes and thirty seconds to four minutes and thirty seconds

as well as the links to access these songs. The participants also answered the question of

why they choose those particular songs for the study and give a detailed explanation.

Additionally, the researcher also sent another email to schedule a morning appointment

with each participant one week prior to the appointed date of the experiment in order to

measure the heart rate variability and respiration rate baseline; there was no listening to

music and answering any of the questionnaires. The rationale to this step lies in the

necessity to observe whether the participants' perceived stress levels decrease or increase

until the time of the experiment date. Prior to each appointment, the participants were

requested to abstain from drinking caffeinated beverages, consuming alcohol, and taking

over-the-counter medication that can affect one's heart rate during the 12 hours prior to

the study. Subjects were advised to eat a light breakfast (such as a bowl of cereal and a 6-

ounce glass of milk or juice) and drink 4-6 ounces of water prior to their appointment.

However, they were asked to abstain from eating and drinking during the ninety minutes

before their appointment (Quintana, 2019).

Due to the ongoing COVID-19 pandemic, the participants were required to wear

masks and keep a six feet distance as much as possible to ensure the safety of both the

participant and the experimenter. If the participants cannot adhere to the requirements,

then they will not be permitted to take part in the study (exclusion criteria).

Materials

Prior to taking part in the experiment, a survey was sent to Malone University

students through the Student Development Office; it included demographic items and

requested that potential participants contact the experimenter if they are interested in taking part in the music-listening portion of the study.

The volunteered participants completed a questionnaire that concerns their thoughts about each song and their emotional perspective on each song, which was provided to the participants after the participants listened to a song. The experiment also included the usage of four stress/ anxiety scales: the Perceived Stress Scale, Spielberger State Anxiety Inventory-Short version (STAIS-5 and STAIT-5) (Zsido et al., 2020), and Zung Self-Rating Anxiety Scale, to indicate the level of stress of the participants prior and after the experiment. The information regarding all four scales was recorded in Appendix D. In addition to the two questionnaires and the four stress/anxiety scales, a Sonohealth™ measuring device was used to accurately measure the participants' heart rate variability. A Vernier™ Go Direct Respiration Belt was used simultaneously with the Sonohealth™ measuring instrument to measure the participant respiration rate, which aided in detection of possible errors in the HRV data.

The questionnaires, the scales, as well as the measuring devices were of minimal risk and non-invasive. The initial survey that was sent to all students was anonymous; it was only those who chose to give their contact information in the pre-survey would no longer be anonymous. However, the experimenters kept their identities confidential/ Contact information for the researchers and the Institutional Review Board was included in the email. The study proposal was submitted to the Institutional Review Board (IRB) and did not take place without IRB approval.

Procedure

An invitation and screening for eligible participants was done through an email, which was sent by the Student Development Office. The full text of the email was attached below in appendix A. In order to screen for eligible participants, the participants took a demographic questionnaire that was attached to the invitation email. Once six participants were selected for the study, the researchers scheduled morning appointments with each individual participant in order to conduct the study. The researcher also scheduled an additional appointment one week prior to the scheduled morning appointment of the experiment date in order to measure the first HRV and respiration baseline. However, due to one participant's contact with COVID-19 and one participant's conflict of schedule, only four participants finished the experiment. Since the study focuses on the effect of music genre on an individual's stress level, the both of the experimenting sessions was a one-on-one session.The study commenced during the week of the midterm exam of the spring semester 2022. In advance of the appointment date, the researcher sent an email with a request to send the researcher a list of five self-selected songs that range from three minutes and thirty seconds to four minutes and thirty seconds as well as the links to access these songs. The participants also answered the question of why they chose those particular songs for the study and gave a detailed explanation. Additionally, the participants were requested to abstain from drinking caffeinated beverages, alcohol, and medication that can affect one's heart rate, eating a light amount of food, and drinking small amounts of water. According to the studies by Quintana et al (2014), these external factors have significant effects on the value of heart rate variability. Therefore, these restrictions were necessary. Due to the ongoing COVID-19 pandemic, the participants were required to wear masks and keep a six feet distance as

much as possible to ensure the safety of both the participant themselves and the

conducting experimenter. If the participants cannot adhere to the requirement, the

participants will contact the experimenter through the provided email and telephone

number prior to the day of the experiment.

On the day of the experiment, the researcher briefed the participants about the

procedure and purpose of the study. After answering any possible questions that the

participants had after the briefing of the procedure, the researcher let the participants put

on the Vernier[TM] Go Direct Respiratory Belt in order to measure their respiration rate

during the experiment. The instructions on how to secure the belt properly was in

accordance with the package instruction. Once the belt was secured, the participants were

asked to take a short Perceived Stress Scale (PSS), Zung Self-Rating Anxiety Scale

(Zung SAS), and two of the (Spielberger) State-Trait Anxiety Inventory-Short versions.

During this process, the researcher was not present in the room. Then, the

participants were instructed to hold a Sonohealth[TM] heart rate variability sensory motor,

which was connected to the researcher's mobile phone in order to record the heart rate

variability. The participants were instructed to gently hold the monitor by crossing their

thumbs to form a stable platform to rest the device. Next, they placed their left index

finger onto the left side of the monitor before placing their right index finger on the right

side of the monitor. Additionally, the researcher asked the participant to concentrate on

the music instead of the machines around them.

Once all of the devices were turned on and ensured that the machines were

running smoothly, the participants did a vanilla task that lasted five minutes long.

According to Quintana et al (2015), enforced relaxation can affect the baseline reading of

heart rate variability. Therefore, vanilla tasks that require minimal cognitive function and

sustained attention was used in order to establish a stable and reliable baseline heart rate

variability. The participants watched a video of fish swimming for five minutes. The link

for this video is provided in Appendix C. During the five minutes, the participants held

the Sonohealth™ as instructed previously and counted as many fish as they could. After

five minutes of measuring the baseline respiration rate and heart rate variability, the

participants put on a pair of provided headphones/ earphones and listened to five pre-

selected songs in the genre of classical music, R&B, hiphop, Christian, and pop as well as

five additional self-selected songs that the participants had sent to the researcher prior to

the experiment date. The list of the pre-selected songs is available in Appendix C. The

order of the song was randomized, depending on the music application's randomization

function. Each song lasted approximately 3 minutes and 30 seconds to 4 minutes and 30

seconds. As the participants listened to the songs, the Vernier™ Go Direct Respiration

Belt measured their respiration rate while the Sonohealth™ heart monitor measured their

heart rate variability. The heart rate variability data from the Sonohealth™ device and the

respiration rate data from the Vernier™ Go Direct Respiration Belt were recorded in the

researcher's mobile device. After each song, the participants answered a few questions to

describe whether they felt relaxed when they heard the song. Also, they mentioned their

feelings when the song was playing. The list of questions is in Appendix E.

  At the end, the researcher did a session of answering questions. During this

process, the researcher explained to the participants that the goal was to determine the

effect of the music genres on their perceived stress, so they need to do these

questionnaires once again (i.e., the two Spielberger State-Trait Anxiety questionnaires).

Finally, the researcher debriefed and let them ask any questions they had. The researcher left them a card with her information as well. If the researcher's supervisor noticed that a particular participant had a high Zung SAS, Spielberger State Anxiety Inventory-Short version, and/or PSS score, she followed up with an email expressing caring concern and giving information about available mental health resources, such as Malone's Counseling Center.

Data Analysis

HRV RR intervals were calculated with software called *ImageJ*™ (U.S. Department of Health & Human Services [HHS]. n.d.), and then entered into Kubios software for further analysis. Firstly, the electrocardiogram (ECG) results from the Sonohealth™ device were downloaded as PDF files into the computer and sorted in different folders that corresponded to each participant. Each PDF file was converted into a TIFF file at 300 pixels because the software *ImageJ*™ does not support PDF formatted files. After the TIFF file was uploaded into *ImageJ*™, the cursor was utilized to set the length of one box on the ECG, and the measurement scale was reset to one second = one box. Once the scale was adjusted, the RR intervals could be measured by placing the cursor as close as possible to the first R peak and extending the cursor to the second, consecutive R peak. The result of the RR interval along with the angle of the measurement line was displayed on the *ImageJ*™ window. Those measurements were documented by selecting the option "measure," or pressing the letter "m" on the keyboard. Thus, *ImageJ*™ was used to measure each RR interval with precision.

Once all of the RR intervals measurements were recorded and saved in each participant's corresponding folder, the text files were uploaded to the Kubios HRV Standard software in order to visualize the trend of the RR intervals along with its histograms, standard deviation, mean RR intervals, and SNS and PNS indexes. Since RR intervals are susceptible to external factors such as breathing rate, there were outliers in the RR intervals data. In order to eliminate those outliers, as outliers have significant effects on the mean and standard deviation value, two standard deviations were utilized as the criterion for inclusion/exclusion. To ensure the outliers were from deep inhalation and exhalation, I utilized Vernier™ Graphical Analysis to both analyze respiration rate and contrast the respiration rate against the outliers. Both the Sonohealth™ ECG device and the Vernier™ Respiration belt experience periodic five to ten second gaps in measurement due to constraints on their microprocessors. However, it was easy to track where those gaps occurred. This was taken into account when I performed my calculations.

Once the outliers were replaced with the mean RR intervals, a new mean RR was calculated through Kubios HRV Standard, which would be utilized in Tau-U analysis. Tau-U methodology analyzes individual-subject data (Parker et al., 2016). Since the experiment focuses on the participants' individual references and emotional connection to a genre of music, the Tau-U analysis is an appropriate match because it indicates effect sizes for single-case designs. To begin the Tau-U analysis, all of the new mean RR intervals were sorted into seven columns: Baseline Experiment, Classical, Pop, Hip-Hop/ Rap, Christian, Jazz, and Self-Selected (5 songs). The mean RR values were placed in the Tau-U calculator in accordance with the seven columns. Then, I performed seven contrast

Tau-U calculations where I paired two columns together to obtain the Tau value and the

P value. Finally, four different graphs were generated based on the mean RR intervals for

each seven categories. All of the data were recorded in the Results section.

Results

The mean RR intervals of the baseline measurements, five music genres, and an average

of five self-selected songs were calculated by Kubios HRV Standards. The RR intervals

utilized for calculating these values were the ones after the replacement of the outliers

with the mean value.

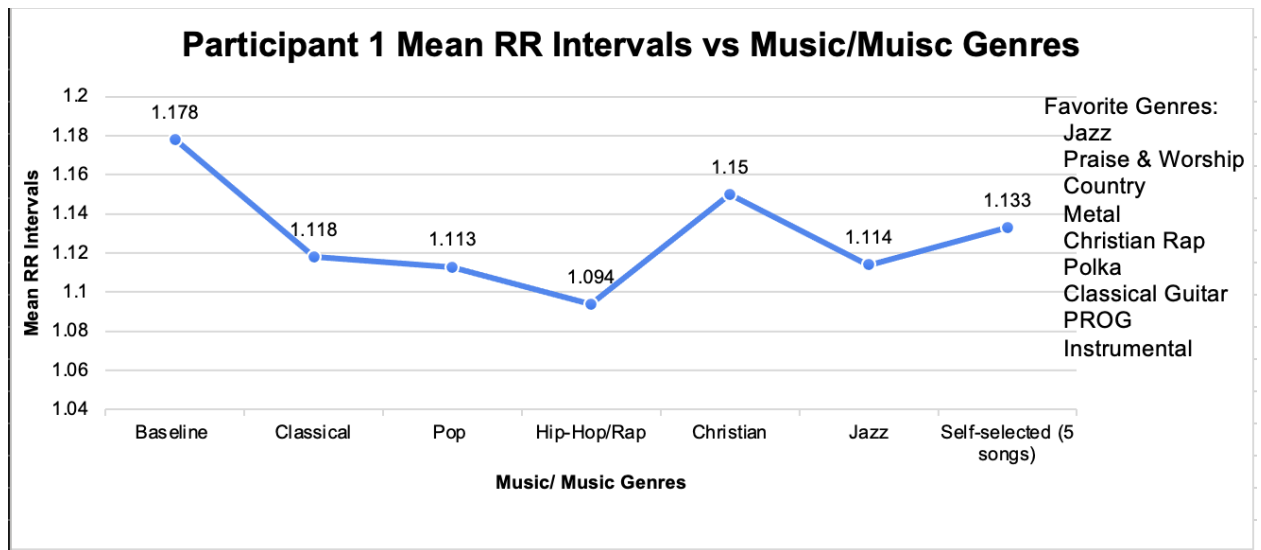|	Baseline	Classical	Pop	Hip-Hop/Rap	Christian	Jazz	Self-selected (5 songs average)
Participant 1	1.178	1.118	1.113	1.094	1.15	1.114	1.133
Participant 2	0.754	0.726	0.726	0.747	0.733	0.759	0.7384
Participant 3	0.815	0.841	0.886	0.756	0.787	0.812	0.7936
Participant 4	1.185	1.151	1.207	1.124	1.213	1.182	1.1456

Table 1. Mean RR intervals

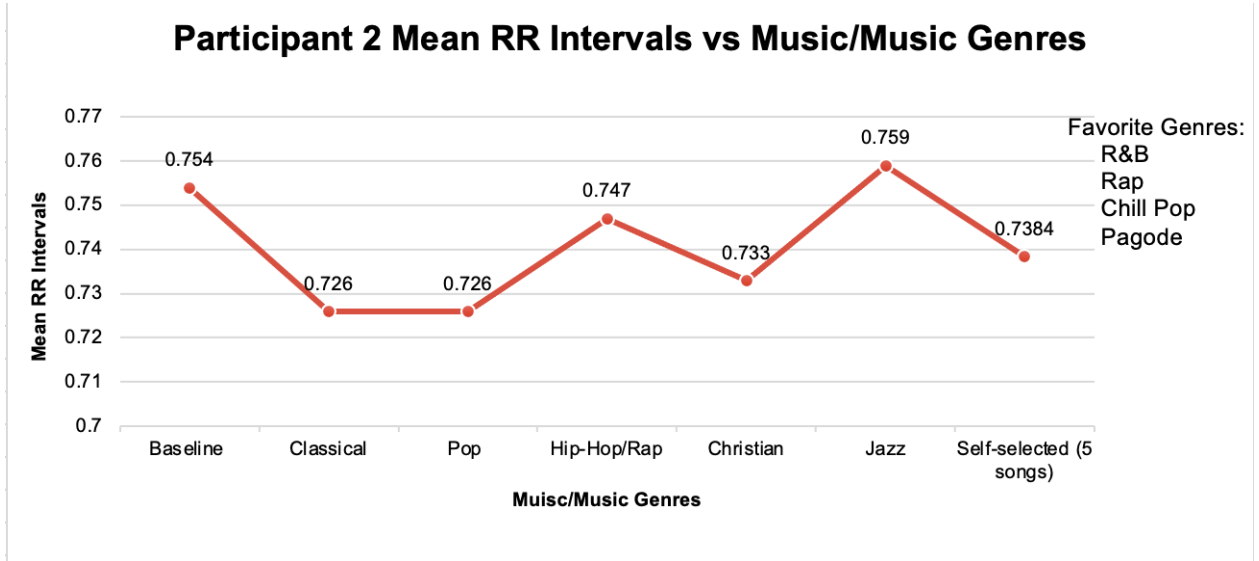Figure 1. Participant 1 Results

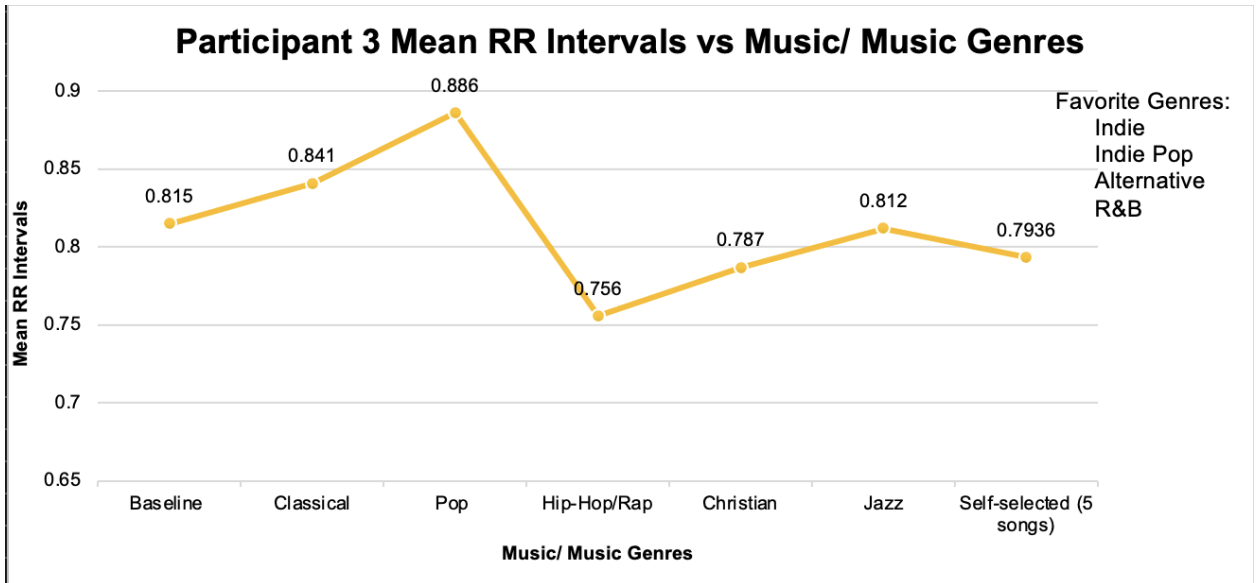
Figure 2. Participant 2 Results
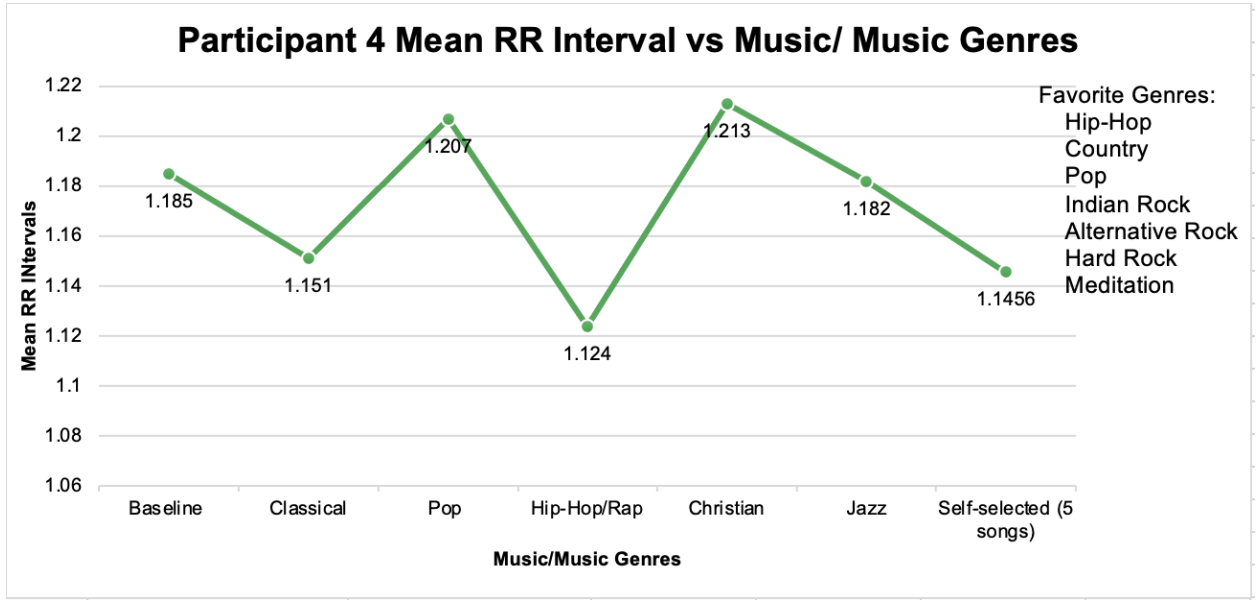

Figure 3. Participant 3 Results

Figure 4. Participant 4 Results

The Tau-U values and p-values of each pairing were computed through the website of the

Tau-U calculator (Parker et al., 2016). Tau-U values range from -1 to +1. As the value

approaches +1, the correlational relationship between two variables or the selected pairs

becomes stronger. As the value approaches -1, the correlational relationship between two

variables or the selected pairs becomes weaker. When the value equals zero, the value

indicates the lack of correlation between the variables or the pairs (Brossart et al. 2018).

The significance threshold for this experiment is 95%. Thus, any p-value above the value

of 0.05 indicates the acceptance of the null hypothesis: there is no significance

statistically between the baseline values and the music genres/ self-selected songs.

Pairs	Tau-U value	P-value
Baseline vs Baseline	0.3333	0.4969
Baseline vs Classical	-0.25	0.5637

Baseline vs Pop	0	1
Baseline vs Hip-Hop/Rap	-0.375	0.3865
Baseline vs Christian	-0.125	0.7728
Baseline vs Jazz	-0.125	0.7728
Baseline vs Self-Selected	-.0375	0.3856

Table 2. Tau-U and P-values

Favorite Genres	Songs' Order	Songs' Names	Songs' Genres	If you had a choice, would you choose to listen to this particular song again?	How did this song make you feel? On a scale from 0 (no stress at all) to 10 (the most stress that you have ever felt).	How anxious did the song make you feel? On a scale from 0 (not anxious at all) to 10 (the most anxious that you have ever felt)	On a scale from 0 to 100, did this song help you to feel the way that you wanted to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I wanted to feel during this song.	How did you want the song to make you feel? Circle the best response.	Why did you choose these songs for this study?
Jazz	1	Keeper of the Castle	R&B/ Soul	Yes	1	0	50	Happy	Represent variety of music genre that the participant listens to and enjoys
Praise and Worship	2	You Are Faithful	Christian	Yes	0	0	100	Comforted	
Country	3	*Kazemachi*	New Age	Yes	0	3	100	Excited	

Metal	4	All I Ask of You	Classical	Yes	0	2	50	Comforted	
Christian Rap	5	Happy Day	Christian	Yes	0	3	100	Happy	
Polka	6	Let It Shine	Hip Hop/ Rap	No	0	0	50	Content	
Classical Guitar	7	I Need You	Christian	Yes	0	0	100	Happy	
PROG	8	Can I Have This Dance?	Pop	No	0	0	50	Excited	
Instrumental	9	Wild Blue	Rock/ Pop	Yes	0	0	100	Comforted	
	10	My Boo	Jazz	Yes	0	0	50	Happy/ Nostalgic	

Table 3. Participant 1's report on the songs

*Highlighted box in the Songs' Order category represent experimenter-selected songs

Favorite Genres	Songs' Order	Songs' Names	Songs' Genres	If you had a choice, would you choose to listen to this particular song again?	How did this song make you feel? On a scale from 0 (no stress at all) to 10 (the most stress that you have ever felt).	How anxious did the song make you feel? On a scale from 0 (not anxious at all) to 10 (the most anxious that you have ever felt)	On a scale from 0 to 100, did this song help you to feel the way that you wanted to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I wanted to feel during this song.	How did you want the song to make you feel? Circle the best response.	Why did you choose these songs for this study?
R&B	1	Ao Vivo	Pop	Yes	0	0	70	Comforted	The participants'

Favorite Genres	Songs' Order	Songs' Names	Songs' Genres	If you had a choice, would you choose	How did this song make you feel? On a scale from 0	How anxious did the song make you feel? On	On a scale from 0 to 100, did this song help you	How did you want the song to make you feel? Circle the best	Why did you choose these songs for this
									favorites, help calm them down and help them "get going" to start their day. The participant likes the way the music and the lyrics make them feel.
Rap	2	Day 1	Alternative Indie	Yes	0	0	85	Happy	
Chill Pop	3	Let It Shine	Hip Hop/ Rap	Yes	0	0	90	Excited	
Pagode	4	All My Life	Christian	Yes	0	0	94	Sense of peace	
	5	Love Yourz	R&B/ Soul and Hip-Hop/Rap	Yes	0	0	80	Happy	
	6	My Boo	Jazz	Yes	0	0	85	Excited	
	7	You Are Faithful	Christian	No	0	0	50	Indifferent	
	8	All I Ask of You	Classical	No	0	0	50	Sad	
	9	Satellites & Rearview Mirrors	Hip Hop/ Rap	Yes	0	0	90	Happy	
	10	Can I Have This Dance?	Pop	Yes	0	0	94	Comforted	

Table 4. Participant 2's report on the songs

*Highlighted box in the Songs' Order category represent experimenter-selected songs

Favorite Genres	Songs' Order	Songs' Names	Songs' Genres	If you had a choice, would you choose	How did this song make you feel? On a scale from 0	How anxious did the song make you feel? On	On a scale from 0 to 100, did this song help you	How did you want the song to make you feel? Circle the best	Why did you choose these songs for this

				to listen to this particular song again?	(no stress at all) to 10 (the most stress that you have ever felt).	a scale from 0 (not anxious at all) to 10 (the most anxious that you have ever felt)	to feel the way that you wanted to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I wanted to feel during this song.	response.	study?
Indie	1	You Are Faithful	Christian	No	5	3	30	Feel odd	Put the participant in a good mood and make the participant feel better no matter what mood they are in
Indie Pop	2	Good Pain	Alternative/Indie	Yes	0	0	100	Happy	
Alternative	3	Saturday Sun	Alternative/Indie	Yes	0	0	100	Excited	
R&B	4	My Boo	Jazz	Yes	0	0	87	Comforted	
	5	Stoned Nights	Alternative/Indie	Yes	0	0	100	Happy	
	6	Let It Shine	Hip Hop/Rap	Yes	0	0	64	Comforted	
	7	Missing Piece	Alternative/Indie	Yes	0	0	100	Happy	
	8	Maine	Alternative/Indie	Yes	0	0	100	Comforted	
	9	All I Ask of You	Classical	No	0	1	24	Sleepy	

	10	Can I Have This Dance?	Pop	Yes	0	0	98	Comforted	

Table 5. Participant 3's report on the songs

*Highlighted box in the Songs' Order category represent experimenter-selected songs

Favorite Genres	Songs' Order	Songs' Names	Songs' Genres	If you had a choice, would you choose to listen to this particular song again?	How did this song make you feel? On a scale from 0 (no stress at all) to 10 (the most stress that you have ever felt).	How anxious did the song make you feel? On a scale from 0 (not anxious at all) to 10 (the most anxious that you have ever felt)	On a scale from 0 to 100, did this song help you to feel the way that you wanted to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I wanted to feel during this song.	How did you want the song to make you feel? Circle the best response.	Why did you choose these songs for this study?
Hip-Hop	1	Let It Shine	Hip-Hop/ Rap	Yes	1	1	95	Excited	Put the participant in a good/mellow mood or promote nostalgic association to life experiences and moments in the

								participants' past
Country	2	Free	Country	Yes	2	2	100	Comforted	
Pop	3	Forever Young	Synth-Pop/ New Wave	Yes	0	0	100	Happy	
Indian Rock	4	All I Ask of You	Classical	Yes	1	1	95	Happy	
Alternative Rock	5	My Boo	Jazz	Yes	2	1	90	Comforted	
Hard Rock	6	You Are Faithful	Christian	Yes	1	0	95	Happy	
Meditation Music	7	Time After Time	Soft Rock/ New Wave	Yes	1	0	97	Excited	
	8	Doing It Wrong	Hip-Hop/ Rap	Yes	1	1	NA	Sad	
	9	Island Song	Country	Yes	0	0	100	Comforted	
	10	Can I Have This Dance?	Pop	Yes	0	0	70	Happy	

Table 6. Participant 4's report on the songs

*Highlighted box in the Songs' Order category represent experimenter-selected songs

Initially, six participants were scheduled to perform the experiment. However, two participants dropped out due to conflict in schedule and contact with COVID-19. All of the participants' scores on the STAIS-5, the STAIT-5, and the Zung SAS were in the normal range. According to the PSS, participant 1, 2, and 4 experienced moderate stress, and participant 3 experienced low stress. All participants slept seven hours on average, and on the mornings of testing, drank little water (minimum "a sip" and maximum eight fluid ounces), ate little breakfast (none to a banana for breakfast), and

barely did any exercise (the most exercise was the five minute walk to the testing site).

Additionally, three of four participants began the experiment at 7:00 AM in the morning;

one participant began the experiment at 6:45 AM in the morning.

Discussion

Based on the values of the mean RR intervals of the baseline in comparison to the

values of the mean RR intervals of the five music genres and the self-selected songs, the

initial hypothesis of the study was supported. The initial hypothesis stated that the

participants' personal preference and emotional connection to the music and the genre of

music greatly influenced whether that music genre could decrease their stress and anxiety

level. In Table 1, participants 1's, 2's, and 4's mean RR interval values when they

listened to classical music demonstrated a tremendous decrease from the baseline mean

RR intervals, indicating the experience of stress. Participant 1's mean baseline RR value

was 1.178, which decreased to 1.118 after s/he listened to classical music. Participant 2's

mean baseline RR value was 0.754, which decreased to 0.726 after s/he listened to

classical music. Participant 4's mean baseline RR value was 1.185, which decreased to

1.151 after s/he listened to classical music. However, this trend did not exist in

participant 3's data. Participant 3's mean baseline RR value was 0.815, which increased

to 0.841 after s/he listened to classical music. This inconsistency applied to the other four

music genres, which can be observed in Table 1 and Figures 1-4.

The Tau-U value and the p-value further supported the hypothesis. All of the Tau-

U values, with the exception of Baseline vs Pop, were negative values. Negative value

indicates that there is a weak correlation between the selected pairs. The Baseline vs Pop

scored a Tau-U value of 0, indicating that there is no correlation between the pair. The

participants' p values were also much higher than the threshold value of 0.05, meaning

that it is unlikely or there is no strong evidence that a specific music genre would have

caused an increase or decrease in the mean RR intervals. Since RR intervals are related to

the person's stress and relaxation, then it can be stated that a specific music genre would

not make the person feel relaxed or stressed in a stressful situation. Although the Tau-U

values for Self-Selected was close to zero, all of the other evidence supported the

hypothesis. Thus, it is arguably safe to state that the hypothesis was supported.

Additionally, the mean RR intervals value of each participant in comparison to

the participants' favorite genre of music also supported the hypothesis that the person's

personal preference strongly influenced whether the music is relaxing or stressful for

them. Participant 1's mean RR intervals values for Christian music genre and Self-

selected category were the higher ones in their data set, although it was still lower than

the baseline mean RR interval value. They reported that they enjoyed Christian and jazz

music (Figure 1), and two of the participant's self-selected songs were of the Christian

genre and one of the R&B genre, which has elements of jazz in it (Table 3). Therefore, it

made sense that the mean RR values in these two categories were higher than the other

categories. Although the mean RR value in the jazz genre was much lower, they reported

that they only felt 50 percent content on the scale from 0 to 100 (Table 3). Thus, it

explained why the jazz genre's mean RR value was lower.

Participant 2's mean RR values for hip-hop and jazz were the higher ones in their

data set. They reported that they preferred the R & B and rap music genres (Figure 2).

Therefore, it made sense that the mean RR values in these two categories were higher

than the other categories. Their mean RR value in the self-selected category was the third

highest among the six values, excluding the baseline mean RR value. This lower in value

probably lied in the participant's feelings towards the song itself. They reported that the

songs made them feel the way that they wanted to feel, which were happy and

comforting, by only 70 to 90 percent on the scale from 0 to 100; this value was much

lower in comparison to the other participants, which were 97 to 100 percent (Table 4).

Participant 3's mean RR intervals for classical and pop music genres were the

higher ones in their data set. They reported that they preferred the pop music genre

(Figure 3). Additionally, they reported that the classical music made them feel sleepy,

which might have caused the RR intervals to increase and showed signs of relaxation.

Thus, it made sense that the mean RR values in these two categories were higher than the

other categories. A possible explanation of the participant's lower mean RR value in the

self-selected category was because of their feeling towards the song. The participant

reported 100 percent feeling of happiness, excitement, and comfortedness (Table 4). The

feeling of excitement is a common sign of arousal, which means that the participant's

SNS was activated and caused the RR intervals to decrease. Therefore, the mean RR

value was lower although all of the songs were in the participant's favorite genre of

music.

Participant 4's mean RR intervals for pop and Christian music genres were the

higher ones in their data set. They reported that they favored the pop music genre (Figure

4). Thus, it explained the reason why the value was one of the higher ones. A probable

reason behind the higher value of mean RR for the Christian genre was the participant's

report on the selected song. They stated that the song made them feel happy by 95

percent on the scale from 0 to 100. The self-selected category for participant 4 was one of

the lowest mean RR intervals in their data set. This is probably because they reported a

feeling of sadness, which can be interpreted as stressful, as well as 97 percent excitement

(Table 5). Both of these feelings fall under the control of the SNS, thus causing the RR

intervals to decrease.

Limitation

The first limitation of this study is the small sample size. Due to two drop outs

from contact with COVID-19 and conflict in schedule, the initial sample size of six

dropped down to four. Another reason for this small sample size was due to the lack of

time to finish the measurement of RR intervals and analysis of the data. Since all of the

RR intervals were measured manually, which took over forty hours to accomplish, there

was simply not enough time to perform the task. Despite this limitation, the main focus of

the study was to look at each case as separate, unique scenarios instead of aiming to have

some form of generalization so it did not jeopardize the purpose of the study. Regardless,

for future research, having more than four participants would potentially provide more

data and improve variation in Tau-U analysis.

The second limitation is that the measurement of the RR intervals was done

manually. Therefore, the data is susceptible to human error. The reason why

measurement intervals had to be performed manually was due to the incapability of

finding a free and compatible software that would do the measurements. Although the

Kubios software offered the Premium option, the price was more than the budgeted

amount. Therefore, for future research, having a usable, compatible, and reliable RR

interval measuring software is crucial to avoid this problem; additionally, having a group

of computer and software engineers might be beneficial to fix any unforeseen technical

problems.

      The third limitation is that the Sonohealth™ device and the Vernier™ respiration

belt experience periodic five to ten second gaps in measurement due to constraints on

their microprocessors. Although the discrepancy can be tracked manually, the fact that

there were pauses in between and that the tracking was done manually means that there

are chances of error during the tracking and measuring. Therefore, further regulation on

this obstacle can greatly improve the accuracy of the data.

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Appendix A: Email Invitation and Statement of Informed Consent:

Music & Relaxation Study

Email:

My name is Anh Thu Huynh Nguyen and I am working with Dr. Lauren Seifert of the

Psychology Department at Malone University. I am interested in the effects music has on

relaxation.

If you agree to take part in my study, you will be helping us to understand the ways that

music may influence your emotions.

You will be asked to stay listening to music and to complete survey questions. During

your time in the study, we will ask you to wear a device that can measure your heart rate.

The device is just like the common ones that people often use.

Your participation time will be approximately 1-1.5 hour, and you will be able to receive

a $15 Amazon gift card as my thanks for your participation.

If you are interested in taking part, please, email me at tanguyen1@malone.edu

Statement of Informed Consent:

My name is Anh Thu Huynh Nguyen and I am working with Dr. Lauren Seifert of the

Psychology Department at Malone University. I am interested in the effects music has on

relaxation.

If you agree to take part in my study, you will be helping us to understand the ways that

music may influence your emotions.

You will be asked to stay listening to music and to complete survey questions. During

your time in the study, we will ask you to wear a device that can measure your heart rate.

The device is just like the common ones that people often use. It may be a little phone-like device that you are asked to touch and hold with your fingers, or it may be a belt that the researcher will help you to place on your chest.

In return for your completion of this 1- 1.5 hr study, you will be able to receive an Amazon gift card for $15.

This study is completely voluntary and there are no penalties for not participating.

The potential benefit of this study is that you may find that sharing with me about your experiences may help to enhance the richness of your perceptions about your experiences while listening to music.

There are no known direct risks to this study beyond those of your everyday life. The devices in use in this study are just like those that are used at the Malone University Fitness Center to track people's physiological data (like heart rate) while they exercise.

My supervisor and I will maintain confidentiality with respect to your identity as a participant in this study. All informed consent pages will be kept in a locked file at Malone University for 3 years.

This study has been approved by the Human Research Committee of Malone University. If you have questions about ethics in human research, please contact Dr. Lora Wyss of the Human research Committee at Malone University at lwyss@malone.edu

If you have additional questions about this study, please, contact my supervisor, Dr. Lauren Seifert at 330-471-8558 or at LSEIFERT@malone.edu. If

you should experience discomfort at any time during this study, please, let me know. You

may stop at any time without penalty.

Thank you for your participation!

Participant's Statements: I am 18 years or older and have read this page and agree to take

part in the study described on this page.

Signed: _____ Date:_____

Appendix B: Pre-Survey Demographic Questionnaires

Hello, my name is Anh Thu (Crystal) Nguyen and I am an Honors student at

Malone University. I am studying people's experiences of listening to music and wonder

whether you would be willing to take part in this brief survey.

At the end of this survey, you will have a chance to volunteer for a music

listening session and those who take part in a music listening session will receive a $15

Amazon gift card.

This survey is anonymous and minimal risk. It should take about 10 minutes for

you to complete.

You must be 18 years or older to take part. Do not take this survey if you are under 18.

In this survey, you will be asked some demographic items that will help me to better understand the sample of respondents. You will also be asked about your perceptions of music and experiences of stress and various emotions. If you experience discomfort, please, contact my supervisor, Dr. Lauren Seifert for assistance at LSEIFERT@malone.edu or at 330471-8558.

This study has been reviewed and approved by the Research Participants Protection Program at Malone University. If you have questions about your rights as a research participant, contact Dr. Lora Wyss at lwyss@malone.edu for assistance.

1. Please state your gender.

    a. Male

    b. Female

    c. Other (Please, specify)

2. What is your age in years?

3. Which one of the following best describes your ethnicity/race:

    a. Asian ( )

    b. Native Hawaiian, or Pacific Islander ( )

    c. White, non-Hispanic ( )

    d. African American, or African ( )

    e. American Indian or Alaska Native ( )

    f. Hispanic, or Latinx (Latino/Latina) ( )

g. Other ( )

4. Where are you from?

5. What faith or religion do you most identify with?

6. What is your current relationship status?

        a. Single (not dating)

        b. Dating casually

        c. Dating in a committed relationship

        d. Engaged

        e. Married.

        f. Divorced.

        g. Other

7. What is the highest level of education you have completed?

        a. High school diploma or GED.

        b. Some college, but no degree.

        c. Associate's Degree.

        d. Bachelor's Degree.

        e. Post-graduate Degree.

8. What is your year in college/ university?

        a. First Year

        b. Second Year

        c. Third Year

        d. Fourth Year

        e. Fifth Year

     f.   Other (Please, specify)

9. What is your current employment status?

     a.   Student with full-time employment

     b.   Student with part-time employment

     c.   Full-time student without employment

     d.   Part-time student without employment

     e.   Other

10. If you are employed, please state how many hours you are working per week? If you are not employed, please type N/A for not applicable.

11. Are you a member of a JV or Varsity sport?

12. In an average week, approximately how many hours do you exercise?

13. How many midterm exams and assignments do you have to take between February 14th and March 4th?

14. Would you be willing to share with me about any medications that you currently take? My reason for asking is that medications can influence mood and emotions. If you share your identity at the end of this survey, My supervisor and I will keep your medications CONFIDENTIAL.

15. Have you ever had a diagnosis of clinical depression, major depression, or major depressive disorder?

16. Have you ever had a diagnosis of anxiety or of an anxiety disorder?

17. Are you currently having any acute or chronic health conditions? I am asking about this, because some health conditions can affect mood/emotion. If you share

your identity at the end of this survey, my supervisor and I will keep your medical

information CONFIDENTIAL. Please list them all.

18. Have you ever had music therapy?

19. What are your favorite genres of music? Please list them all.

20. Thank you for taking this brief survey. Now, I would like to invite you to take

part in a Music Listening Study that is designed to help me better understand your

music listening preferences and emotions. The first few people who volunteer will

be able to receive a $15 Amazon gift card as thanks for completing the study. If

you are interested in taking part in a session (not to exceed 90 minutes) of

listening to music and responding to questions about your emotions and

experiences, please, provide your email address, and my supervisor or I will

contact you. Your identity information will be kept CONFIDENTIAL.

Appendix C: List of Pre-Selected Songs

Music Playlist:

1. R&B

    a. *My Boo* (Usher featuring Alicia Keys) 3:43

    https://www.youtube.com/watch?v=M_mYf8s3Azw

2. Classical Music

    a. *All I Ask of You* by Patrick Wilson and Emmy Rossum (4:15)

    https://youtu.be/dML7t149ATE

3. Pop Music

    a. *Can I Have This Dance?* by Zac Efron and Vanessa Hudgens (4:00)

    https://youtu.be/R6_LZYkizaQ

4. Hip Hop

    a. *Me and You* by Coco Jones and Tyler James William (3:39)

    https://youtu.be/jVjNgEXe8Gw

5. Christian

    a. *You Are Faithful* by Great Christian Duet Vol 3 from 1989 album (3:53)

    https://youtu.be/wJz6j_6Cwyg

6. Five self-select songs (must be in the range of 3 minutes 30 seconds to 4 minutes 30 seconds)

Vanilla Task:

1. Fish Swimming Video

    https://youtu.be/1wYsGGTo1vU

Appendix D: STAIS-5 / STAIT-5, Zung Self-Rating Anxiety Scale, Perceived

Stress Scale, and Pre-Experiment Questions

STAIS-5

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the number at the end of the statement that indicates HOW YOU FEEL RIGHT NOW, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best. Thank you.

Item nr. Not at all Somewhat Moderately so Very much so

1 I feel upset. 1 2 3 4

2 I feel frightened. 1 2 3 4

3 I feel nervous. 1 2 3 4

4 I am jittery. 1 2 3 4

5 I feel confused. 1 2 3 4

STAIT-5

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the number at the end of the statement that indicates HOW YOU GENERALLY FEEL. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel. Thank you.

Item nr. Not at all Somewhat Moderately so Very much so

1 I feel that difficulties are piling up so that I cannot overcome them. 1 2 3 4

2 I worry too much over something that really doesn't matter. 1 2 3 4

3 Some unimportant thoughts run through my mind and bother me. 1 2 3 4

4 I take disappointments so keenly that I can't put them out of my mind. 1 2 3 4

5 I get in a state of tension or turmoil as I think over my recent concerns and interests. 1 2 3 4

Zung Self-Rating Anxiety Scale

For each item below, please circle the one of the available options which best describes how often you felt or behaved this way during the past several days. There are no right or wrong answers. Do not spend too much time on each statement. Thank you.

1. I feel more nervous and anxious than usual.

A little of the time   Some of the Time   Good part of the time   Most of the time

2. I feel afraid for no reason at all.

A little of the time   Some of the Time   Good part of the time   Most of the time

3. I get upset easily or feel panicky.

A little of the time   Some of the Time   Good part of the time   Most of the time

4. I feel like I'm falling apart and going into pieces.

A little of the time   Some of the Time   Good part of the time   Most of the time

5. I feel that everything is alright and nothing bad will happen.

A little of the time   Some of the Time   Good part of the time   Most of the time

6. My arms and legs shake and tremble.

A little of the time   Some of the Time   Good part of the time   Most of the time

7. I am bothered by headaches, neck and back pain.

A little of the time   Some of the Time   Good part of the time   Most of the time

8. I feel weak and get tired easily.

A little of the time   Some of the Time   Good part of the time   Most of the time

9. I feel calm and can sit still easily.

A little of the time   Some of the Time   Good part of the time   Most of the time

10. I can feel my heart beating fast.

A little of the time   Some of the Time   Good part of the time   Most of the time

11. I am bothered by dizzy spells.

A little of the time   Some of the Time   Good part of the time   Most of the time

12. I have fainting spells or feel like it.

A little of the time   Some of the Time   Good part of the time   Most of the time

13. I can breathe in and out easily.

A little of the time   Some of the Time   Good part of the time   Most of the time

14. I get numbness and tingling in my fingers and toes.

A little of the time   Some of the Time   Good part of the time   Most of the time

15. I am bothered by stomach aches or indigestion.

A little of the time   Some of the Time   Good part of the time   Most of the time

16. I have to empty my bladder often.

A little of the time   Some of the Time   Good part of the time   Most of the time

17. My hands are usually dry and warm.

A little of the time   Some of the Time   Good part of the time   Most of the time

18. My face gets hot and blushes.

A little of the time   Some of the Time   Good part of the time   Most of the time

19. I fall asleep easily and get a good night's rest.

A little of the time   Some of the Time   Good part of the time   Most of the time

20. I have nightmares.

A little of the time   Some of the Time   Good part of the time   Most of the time

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last

month. In each case, you will be asked to indicate by circling how often you felt or

thought a certain way. There are no right or wrong answers. Do not spend too much time

on each statement. Thank you.

References:

0 = Never 1 = Almost Never   2 = Sometimes   3 = Fairly Often   4 = Very

Often

1. In the last month, how often have you been upset because of something that
    happened unexpectedly? 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the
    important things in your life? 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"? 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle
    your personal problems? 1 2 3 4

5. In the last month, how often have you felt that things were going your way? 1 2 3
    4

6. In the last month, how often have you found that you could not cope with all the
    things that you had to do?   1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

   1 2 3 4

8. In the last month, how often have you felt that you were on top of things? 1 2 3 4

9. In the last month, how often have you been angered because of things that were

   outside of your control? 1 2 3 4

10. In The Last Month,how often have you felt difficulties piling up so high that you

    could not overcome them? 1 2 3 4

Pre-Experiment Questions:

1. What medications (if any) did you take in the last 24 hours? Please, note doses

   and when (keeping in mind that any information you share will be kept strictly

   confidential by me and my supervisor).

2. How long did you sleep last night? And when did you get up this morning?

3. How much did you drink this morning? What kind of beverages did you drink?

4. Were any of those beverages caffeinated or alcohol? (Keeping in mind, again, that

   your responses are confidential.)

5. How much did you eat this morning?

6. Keeping in mind that heart rate can be affected by bathroom habits, can you tell

   me when was the last time you went to the bathroom?

7. What kind of exercise did you do this morning? How long did you exercise?

Appendix E: Survey Questions after The End of Each Song

Questions to follow each experimenter-selected song:

1. If you had a choice, would you choose to listen to this particular song again?

   Yes   b. No

2. How did this song make you feel? On a scale from 0 (no stress at all) to 10 (the most stress that you have ever felt)

 (Mark the scale; Circle your response.)

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

3.   How anxious did the song make you feel? On a scale from 0 (not anxious at all) to

10 (the most anxious that you have ever felt).

(Mark the scale; Circle your response.)

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

4.   On a scale from 0 to 100, did this song help you to feel the way that you wanted

to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I

wanted to feel during this song.

5.   How did you want the song to make you feel? Circle the best response.

    a. Angry

    b. Happy

    c. Sad

    d. Excited

    e. Comforted.

    f. Other (please specify):

Questions to follow each self-selected song:

1. If you had a choice, would you choose to listen to this particular song again?

    a. Yes   b. No

2. How did this song make you feel? On a scale from 0 (no stress at all) to 10 (the

most stress that you have ever felt),

(Mark the scale; Circle your response.)

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

3.   How anxious did the song make you feel? On a scale from 0 (not anxious at all) to

10 (the most anxious that you have ever felt).

(Mark the scale; Circle your response.)

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

4.   On a scale from 0 to 100, did this song help you to feel the way that you wanted

to feel, with 0 = absolutely not, 50 = somewhat, and 100 = absolutely, yes. I felt the way I

wanted to feel during this song.

5.   How did you want the song to make you feel? Circle the best response.

   a. Angry

   b. Happy

   c. Sad

   d. Excited

   e. Comforted.

   f. Other (please specify):

Appendix F: The Thesis Timeline

August, 2021 – December, 2021: Thesis proposal written.

January 15th, 2022: Finalized thesis proposal.

January 22nd- February 5th, 2022: Finalize screening questions.

February 7th-18th, 2022: Send the pre-survey questionnaire and invitation to join the

experiment.

February 21st, 23th, and 25th 2022: Measure the first heart rate and respiration rate

baseline for all six subjects.

February 28th, 2022: Experiment day with the first subject.

March 1stth, 2022: Experiment day with the second subject.

March 2nd, 2022: Experiment day with the third subject.

March 4th, 2022: Experiment day with the fourth subjects.

April 25th, 2022: Thesis defense and presentation.

April 26th, 2022: Finalized version of the thesis sent to Dr. Seifert and Dr. Jensen.