Investigating the Effects of Lyrical and Instrumental Music on Reducing Stress
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Abstract

The common feeling of stress is typically combatted with the listening of music of various genres. Previous studies conducted on music and stress have shown lyrical and instrumental music have the same effect in terms of reducing physical stress. However, certain meta-analyses have produced seemingly differing results, highlighting instrumental music as more efficient for psychological stress-reduction. This paper seeks to identify the effects of both lyrical and instrumental music on physical and psychological stress. This was accomplished by having participants listen to a ten minute instrumental and ten minute lyrical song. Stress was calculated via blood pressure, heart rate, and a visual analog scale survey.This study found that both lyrical and instrumental music are equally effective at reducing physical stress but instrumental music was found to be more effective at reducing psychological stress. These findings will allow the public to be better informed as to what effect their music choices will have on their stress level. This will be highly relevant for people who lead high-stress lifestyles, including but not limited to students, professionals, and athletes.

Rationale/Background

Stress is a prevalent issue in today's society (deVries et al., 2003). Many health problems, including cardiovascular disease, chronic pain, anxiety disorders, depression, burnout, and addictions are associated with increased amounts of stress (American Psychological Association [APA], 2017). People turn to different outlets, including music, in order to reduce their stress. Consistently, many studies have been shown that music helps lower stress levels (e.g., Adiasto et al., 2022). However, there are many different types of music that humans listen to, making this data less conclusive. Music can have varying tempos, instruments, singers, and pitch, among other elements, which could have different impacts on stress and may contribute to a varying impact on people with anxiety or stress (de Witte et al., 2020). This led me to hypothesize that people could increase or decrease their stress while being completely unaware, depending on the type of music. Thus, this paper aims to address how specific types of music, specifically instrumental and lyrical, can affect humans' stress.

Some people choose quiet or instrumental music to listen to because they feel it could lessen their stress. Two recent meta-analyses conducted on a very broad scope of stress and music showed, however, that there was no significant difference between lyrical and instrumental music on reducing stress (de Witte et al., 2019). Thus, despite certain conscious decisions people make on music choice to better reduce their own stress, their efforts are in vain since there is little difference in the effect. Some other research has, however, shown significant differences between lyrical and instrumental music, which is contradictory to other information published. For example, one magnetic resonance imaging (MRI) study, although centering on how different types of music impact human emotions as opposed to stress specifically, has shown that instrumental music causes a different human reaction (with different brain activation and different emotions evoked) than lyrical music (Brattico et al., 2011). Thus, based on the aforementioned seemingly conflicting studies, it is possible that stress can also be affected by lyrical and instrumental music in different respective ways, especially considering it from a more brain and emotion-focused approach such as the Brattico MRI study. However,

there appears to be little-to-no independent research conducted specifically focusing on the impacts of lyrical and instrumental music on stress, considering most experiments discussed in the two meta-analyses and other aforementioned studies focus on one genre or the other. I found little-to-no studies doing a side-by-side comparison as I planned to do.

The purpose of this study is to determine whether instrumental versus lyrical music impacts stress levels. Evidence of whether or not one of these two types of music is better at reducing stress will help people be able to effectively choose music that will help their mental state, improving overall health and well-being. These results will show which specific aspects of music may be important for reducing stress, which can then help inform people in choosing what kind of music they want to listen to to reduce their stress.

My proposed study will be using three stress indicators (heart rate, blood pressure, and a pre-and-post survey based on various scales of psychological stress) to measure the change in physiological and psychological stress in participants. These stress indicators will be measured before and after listening to both instrumental and lyrical music.

To develop my hypothesis for this study, I considered that using music containing lyrics could be more overwhelming and distracting due to more content within the music. Several studies agree, supporting that music with lyrics may be more distracting and activating instead of soothing (Good et al., 2000; Halpern & Savary, 1985). The stimulation of being bombarded with musical content could increase stress in listeners. Therefore, I hypothesized that instrumental music would be more effective than lyrical music in reducing both physiological and psychological stress.

Methods
Participants and Recruitment

I used a convenience sample, recruiting 30 participants from my suburban area, including my friends and family. Those who were minors had their parents sign the consent form for them. I recruited these participants via phone and provided a general overview of the study and an explanation of what participating in this experiment would involve. Participants were not compensated. To avoid placebo results, participants were not entirely informed of the purpose of this experiment. However, in line with APA ethical guidelines, all subjects were debriefed immediately after the study as to what the purpose of the study was. This group consisted of ages 12-79, the average age being 34.6 years old. My area of Granite Bay, California, is a primarily White area; however, I was able to include some racial and ethnic diversity. My study was 80% White, 16.67% Asian, and 3.34% Middle Eastern. 73.33% of my study was female due to increased willingness to participate; however, I did include a significant number of male participants as well (26.67%). The inclusion criteria for these participants was that my participants did not have hearing difficulties and did not suffer any heart issues, such as arrhythmias. Both of these factors would have produced discrepancies in my experiment. Someone being hard of hearing would make music have a lesser effect on them. Someone with a heart problem would produce unreliable results for my physiological markers of heart rate and blood pressure, since they are both dependent on a consistent and well-functioning heart. This criteria was outlined in the consent form, which participants were required to sign.

Variable	Classification	Frequency	%
Gender	Female	22	73.33%

	Male	8	26.67%
Race	White	24	80.00%
	Asian	5	16.67%
	Middle Eastern	1	3.33%
Music Experience	none	20	66.67%
	<2 years	3	15.00%
	>2 years	7	23.33%
Music Preference	Pop	14	46.67%
	Country	7	23.33%
	Rock	4	13.33%
	Rap	4	13.33%
	Classical	1	3.33%
Age	Mean	34.5667	

Figure 1. Participant Characteristics

Study Design

This is an experimental study. The two conditions are listening to instrumental music versus listening to lyrical music. Each participant participated in both an instrumental music listening block and a lyrical music listening block. These blocks were randomized between participants (flipping a coin), such that there is an equal likelihood that a participant would be assigned to complete the instrumental or the lyrical condition first.

Procedures

I carried out this study in my house, specifically in our music room. I carried out this study using headphones, an iPad, my phone to play music, a sphygmomanometer (to measure blood pressure), and my Garmin smart watch to measure heart rate. Participants sat down in a naturally lit room on a small couch. Between conditions, the participants took a short five-minute break within this room. Participants used an iPad to evaluate their stress levels on a validated Visual Analogue Scale (VAS) on Google Forms (as described in detail below). I sat adjacent to the left side of the participant. Participants were instructed to sit, complete a survey, and place on the smartwatch and headphones prior to listening to music. The smartwatch and sphygmomanometer were placed on participants five minutes before listening to the music. The smartwatch was placed on the right hand of participants. Before the music played, participants were instructed to sit silently and relax for the next ten minutes, focusing only on the music. While the music was playing, heart rate data was taken every minute. Participants were not informed of the intent of this study. Participants were not informed of what type of music they were listening to. I also used a Google Form for each participant to evaluate their stress levels before and after each condition. Heart rate data was collected using a minute-by-minute analysis and a before-and-after analysis for each condition.

This study takes roughly 30-35 minutes per participant. The procedure for this experiment followed these steps:

1. Complete pre-stress survey.
2. Put on a smartwatch and measure heart rate and heart rate variability (HRV) for five minutes as a baseline measure. This data will be viewed firsthand on the watch and also stored on my iPhone.
3. Take blood pressure.
4. Play ten minutes of instrumental music (or lyrical music based on randomization).
5. Measure heart rate and HRV every minute. Complete post-stress survey.
6. Take blood pressure.
7. Take a five-minute break.
8. Re-complete steps 1-5 for lyrical music (or instrumental music based on randomization).
9. Fill out a final survey, which includes questions on musical experience and preference.

Measures

Music preference. Results from a meta-analysis of various experiments showed that there was a possible difference in how self-selected and predetermined music types affect stress levels (Adiasto et al., 2022). To take these differences into account, a survey was conducted immediately after the experiment (including the VAS and musical experience questions), asking each participant, "What is your preferred genre of music?" with six different answers: rap, rock, pop, country, classical, and jazz.

Music experience. Music familiarity can also cause differences in stress levels (van den Bosch, et al., 2013). Should a certain participant have more experience with classical music, it is likely that they would have a different stress response to this music than an average participant with little-to-no musical training. To control for this, a survey was conducted immediately after the experiment (including the VAS and musical experience questions) asking each participant, "Have you received classical training?" with a scale of three answers: never, for two or less years, and for two or more years.

Psychological Stress

Visual Analogue Scale (VAS). Before and after listening to each music group, participants completed a Google Form containing questions on visual analogue scales. The VAS was used to record the characteristics of the symptom severity in participants (in this case, acute stress) since this scale is able to achieve a rapid (statistically measurable and reproducible) classification of symptom severity (Klimek et al., 2017). The VAS includes 5 items ('I feel on edge at present,' 'I feel emotionally uncomfortable,' 'I feel like my heart is pounding in my chest,' 'My mind is racing right now, I have a lot of thoughts,' and 'I feel fidgety right now, I need to walk around or move'), requesting that participants rate their severity on a scale of 1-10 (1 being the least severe and 10 being the most). This information was placed into a composite score out of 50 for each participant for before and after each condition.

Physiological Stress

Heart Rate in beats per minute (BPM). Before the participant listened to music, their heart rate was calculated for one minute. Once the participant began to listen to the music, their heart rate was calculated by a minute-by-minute scale. This provided an analysis of change in heart rate over time as well as a before-and-after comparison. Heart rate was calculated using a Garmin smart watch, which was placed on the right wrist of participants.

Blood Pressure (BP). Blood pressure was measured immediately before and after listening to each music group. A sphygmomanometer was used to obtain this data.

Data Analysis

I used a paired t-test to analyze both physiological measures (BPM and BP), as well as the results of the psychological VAS. The VAS scores from five questions were combined into a composite score out of 50. The information recorded before the experiment from the pre-survey, smart watch, and sphygmomanometer was used as pre-test indicators, whereas the post-survey and final recordings of physiological measures served as post-test indicators. For blood pressure, data was broken into four different groupings: initial systolic (pressure in arteries when the heart beats before listening to music), initial diastolic (pressure in arteries when the heart rests between beats before listening to music), ending systolic (pressure in arteries when the heart beats after listening to music), and ending diastolic (pressure in arteries when the heart rests between beats after listening to music).

Results

There appears to be little to no significant difference between instrumental and lyrical music and their effects on both physical stress. However, there is a significant difference between instrumental and lyrical music on a psychological level, and instrumental music is more effective at reducing psychological stress.

For heart rate, instrumental music appeared to be significantly better at reducing heart rate when minutes = 3, 6, 7, and 9. At minutes 3, 6, 7, and 9 (*p=0.03, 0.013, 0.014, 0.005, d=-0.4167,-0.4846,-0.4800,-0.5544*), the mean heart rate values for instrumental were 67.2, 67.6, 67.2, and 68.1 respectively, compared to lyrical mean heart rate values of 69.8, 70.2, 70.6, and 70.3. The other 7 timestamps reported no significant statistical difference between groups (lyrical and instrumental).

For blood pressure, there appeared to be no statistical significance between instrumental and lyrical groups (*p=0.963, 0.472, 0.320, 0.810, and d=-0.0690, 0.7931, 3.4286, 0.6667*) for initial systolic, initial diastolic, ending systolic, and ending diastolic.

For the visual analogue scale results, the composite score provided no significant difference for initial data but a significant difference for the ending data (*p=0.457, 0.031, d=-1.13, -1.20*). For the ending survey results, instrumental music had a mean composite score of 7.7 while lyrical music had a score of 8.9. A lower score indicates lower stress, so instrumental music is psychologically more effective at decreasing stress than instrumental music.

Overall, there is no trend on a physiological level between stress levels and instrumental music compared to lyrical music, though instrumental music is more effective at decreasing psychological stress than lyrical music.

Discussion

The purpose of this research study was to measure the impacts that lyrical and instrumental music have on stress, and whether one genre of music has a more significant impact on stress levels than the other.

These findings appear to match those of similar studies done in the past. Like the two meta-analyses, my data showed there was little difference between instrumental music and lyrical music when it came to reducing physiological stress (de Witte et al., 2020). It also

supports MRI research with my visual analogue scale data, demonstrating that there is a significant difference between the ability of lyrical versus instrumental music to reduce psychological stress (Brattico, et al., 2011). That being said, there are little-to-no other studies that show both of these results simultaneously: an ability for instrumental and lyrical groups to be equally successful at reducing physiological stress but unequal at psychological stress.

The study is limited by the song choice. The song played was "All Too Well Ten Minute Version" by Taylor Swift in both its original (non-explicit) form and an instrumental piano version. This song was chosen for its length of 10 minutes, since it was necessary for the pop song to be continuous so as to not interrupt the listening experience. A longer listening time provides more reliable results. That being said, Taylor Swift is a musical artist whose music may evoke strong feelings for some people, whether it be a love or hate for her. These feelings would likely work to skew heart rate and blood pressure results. Such skewing was found in four of my participants, who instantly recognized the song and began to smile and bob their head, which produced higher than average heart rate values.

 More extensive retesting using various songs and longer listening periods could help remove any of these errors. Furthermore, the visual analogue scale was a self-report measure which could also produce human error. Additionally, this study of convenience was done in my predominantly White area, and therefore, there was a large discrepancy of racial diversity in my study. Retesting with a larger and more diverse group of subjects could help address this and increase the generalizability of results. The study had strengths in the various different forms of stress being evaluated, including heart rate, blood pressure, and the survey.

My findings will allow the public to be more informed when selecting music to reduce stress. If someone wishes to listen to music to reduce stress, they should potentially choose whichever genre they prefer. Neither selecting instrumental nor lyrical music will make an impact on how stress is reduced on a physical level. My findings will allow people to more effectively choose the music that will help their mental state, and the ability to make more informed choices could improve health and well-being in those who listen to music. My findings will also allow the general public to understand how their feelings of stress may or may not be reflected on a physiological level considering there appears to be a disconnect between changes in psychological and physiological stress.

In terms of implications for future research, additional research such as studies involving increased listening time, larger subject pools, and more psychological stress indicators should be conducted to ascertain these results. A more diverse and extensive follow-up study would be valuable in terms of my results. It would be valuable to see if listening to instrumental music versus lyrical music for roughly an hour compared to ten minutes would skew results in any way. Additional research topics that should be investigated include whether someone's favorite genre of music can help reduce stress and whether song familiarity impacts stress levels. Additional research should also be done on whether there appears to continuously be a disconnect between psychological and physiological stress, which would confirm the results of this present study.

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