SSRG International Journal of Humanities and Social Science
ISSN: 2394-2703/ https://doi.org/10.14445/23942703/IJHSS-V10I4P108

Volume 10 Issue 4, 48-55, Jul-Aug 2023

Original Article

Understanding the Impact of Music on Heart Rate, Blood Pressure, and Stress Levels of Working Adults

Saksham Aggarwal

The Shri Ram School, Moulsari, India.

Corresponding Author : saksham.aggarwal@gmail.com

Received: 05 June 2023 Revised: 21 July 2023 Accepted: 04 August 2023 Published: 24 August 2023

Abstract *- Roughly 7.11 billion people worldwide listen to music. Music is known to have numerous effects on human physiology, and many studies have been conducted to deduce its effects on pain, anxiety, blood pressure, dopamine, sleep, alertness, memory, and stress. The present study aims to assess various elements of music, specifically its tempo - beats per minute (BPM) - and its effect on physiological indicators like heart rate variability (HRV) and pulse, and in turn, its impact on the stress levels of an individual working in a corporate environment. An experiment was conducted on 20 young adults working in offices to understand the impact of music on their heart rate and stress levels. It was found that certain slower tempi of classical music induced lower distress levels and induced higher eustress levels, causing an increase in focus and reducing the negative feelings associated with traditional stress. It further promotes an overall positive outlook towards the tasks at hand due to increased salivary oxytocin; the heart rate decreased when participants heard the fast-tempo music since it caused a decrease in their cortisol levels and reduced distress. This study has a plethora of implications for being beneficial in fields like education, therapy, corporate work environments, high-stress conditions and general daily usage.*

Keywords *- Music, Heart Rate, Stress, Focus, BPM, Tempo.*

1. Introduction

Stress is a term known to and experienced by most people worldwide. The human body, in fact, is designed to experience stress and react to it. The most common definition of stress is "physical, mental, or emotional strain or tension" (1). Stress is not always detrimental to one's life; it has multiple types. Eustress can be beneficial and motivate working adults, for instance, to work harder for a promotion or to meet a deadline. Distress, however, can cause various health issues in a person's life, such as high blood pressure, heart disease, obesity, diabetes, and coronary heart disease (1). It can have short-term and long-term effects on your body, mood, and behaviour; headache, anxiety, undereating, chest pain, fatigue, restlessness, angry outbursts, social withdrawal, depression, and insomnia are but a few detrimental side-effects of excessive stress in a person's life. "US businesses lose upto $300 billion yearly due to workplace stress". So, the mal-effects of experiencing stress are not just limited to the health and well-being of people but also business revenue and the overall global economy.

Emotional stress majorly contributes to the leading causes of death in the US: coronary heart disease, accidental injuries, respiratory disorders, cirrhosis of the liver, and suicide. According to statistics from Meridian Stress Management Consultancy in the UK, almost 180,000 people in the UK die each year from some form of stress-related illness. The Centre for Disease Control and Prevention of the United States estimates stress accounts for about 75% of all doctor visits (2). A LinkedIn report revealed that 55% of Indian professionals feel stressed, according to a 3-month long survey conducted in 2021 (3).

During a stressful situation, the sensory neurons send a signal to the amygdala in the brain's medial temporal lobe. The amygdala is responsible for emotional processing, particularly fear and other threatening stimuli. Once it perceives a threat, it triggers the hypothalamus with a distress signal which controls the homeostasis function in the body. It controls involuntary functions like blood pressure, heart rate, breathing, vasoconstriction, vasodilation etc. It triggers the fight or flight response in the body and thus often increases the heart rate and blood pressure when faced with chronic stress. Our body goes through a few closely interrelated adaptive reactions to non-specific stress, known as the General Adaptation Syndrome (GAS) concept (4). It develops in three stages: the "Alarm Reaction" (AR), the Stage of Resistance, and the Stage of Exhaustion. The physical changes undergone by the body itself are not harmful; however, if they persist for a long time, they can have the aforementioned long-term effects when the body enters the exhaustion stage. The stress undergone by adults in the workplace most often persists consistently and can therefore have many long-term ill effects detrimental to one's health and well-being.

There are two primary forms of coping with stress: problem-focused coping and emotion-focused coping (5). Some stress management techniques include- regular physical activity, spending time with loved ones and socialising, setting personal time aside for hobbies like reading, practising relaxation techniques, and keeping a sense of humour. Music is known to have various effects on the mind and body.

For instance, it can alter heart rate and cortisol levels, release endorphins that improve well-being, reduce stress levels, and minimise stress-induced symptoms in the body. It is also known to improve the quality of life for people with Alzheimer's disease, help with sleep, and can reduce depression levels (6).

Music directly has effects on heart rate variability (HRV) and blood pressure (BP); therefore, it can reverse the undesirable effects of GAS and stress, leading to a better quality of life and preventing serious health issues like CHD, high blood pressure, diabetes etc.

All the research done till now focuses on how music impacts focus and concentration if it helps with stress, and what types of music may aid in the aforementioned cases. This research aims to explore the impact of varying specificities in the technicalities of certain kinds of music during differing times of day to see if and what kind of songs aid with reducing stress the most.

2. Methodology

2.1. Research Aim

To explore the impact of varying music specifications on stress. To gauge the impact of 60 BPM and 134 BPM music on one's stress levels and other biological indicators like heart rate.

2.2. Research Design

A repeated measures sampling design was used for the quasi-experiment conducted.

2.3. Tools Used

A medical-grade heart rate and blood pressure measuring device were used to get readings of the participants' biological indicators before and after listening to songs with different technical specifications during either the first or last half of the day. The Perceived Stress Scale (PSS) was used, which is the most widely used psychological instrument for measuring the perception of stress. Two classical music pieces by Antonio Vivaldi were used, one being played at 60 beats per minute (slow tempo) and the other at 134 beats per minute (fast tempo).

2.4. Sample

The sample consisted of corporate professionals between the ages of 21 and 33 from a consulting firm. Opportunity purposive sampling was used while selecting the participants for the study. The sample group of 20 young adults belonged to an upper socio-economic background working in the Delhi NCR (Gurugram) region.

2.5. Informed Consent

An informed consent form was filled out by everyone in the sample during the briefing. A single-blind experiment condition was used wherein the participants were unaware of the purpose of the research experiment; this was done to minimise demand characteristics that would have impacted the results. The confidentiality of the participants was maintained throughout the experiment. They were made aware of their right to withdraw at any time during the experiment, and a debriefing was conducted upon the conclusion of the experiment to give details of the purpose of the experiment to the participants.

2.6. Data Collection Strategy

Qualitative and quantitative data both were procured from the participants to provide a more comprehensive view of the effects of music on the biological indicators associated with stress, thereby increasing the ecological validity of the results and leading to a rise in its applicability.

The study participants were brought individually into an office cubicle to simulate the workplace environment as much as possible. The participant was asked a few rapport-building questions to build trust and put them at ease, increasing the accuracy of the data collected later. The questions consisted of but were not limited to the following:

1. How are you? How has your day been so far?
2. What is something nice that has happened in the past month? It could be anything.
3. What have you had to eat today?
4. What was the last place you travelled to? What are some good places to visit there?
5. Have you watched any good shows or movies lately?

Post which the "5 senses activity" was conducted to ground the participant, keep them present and bring them to their resting heart rate levels. The participants were asked to name five things they could see at the moment, four things they could touch while sitting, three things they could hear, two things they could smell, and one thing they could taste. The physical environment can damage or ameliorate coping resources, thus heightening or reducing stress. Therefore to reduce the participants' neuro-physiological responses associated with stress-breathing rate, heart rate, and blood pressure- building a rapport with them and the 5 senses activity is imperative.

At this point, the participant's heart rate is measured to provide a control to be later assessed against. Moreover, they are asked to fill in the Perceived Stress Scale form to gauge each participant's inherent individual stress levels, after which they listen to the song.

The sample was divided into two groups of 10 participants each. Group A was made to listen to classical music at 60 BPM, and Group B was made to listen to classical music at 134 BPM. Classical music was chosen without vocals for both songs to control the variable. The songs chosen were each around 5 minutes for ample effect that was brought by listening to the songs to take place. The participant's heart rate was then measured and recorded right after listening to the song.

After the conduction of the experiment, a debriefing was done wherein participants were asked how they were feeling, how their experience was listening to the music (to gather qualitative data), and telling them the purpose of the experiment.

The experiment was conducted once in the morning with both Group A and Group B and was repeated in the evening a few weeks later. This was done to test for any differences in the data resulting from listening to the music before work versus after work at the end of the day.

Morning (Group A – 60 BPM)
Evening (Group A – 60 BPM)
Morning (Group B – 134 BPM)
Evening (Group B – 134 BPM)

2.7. Data Collection Analysis

The quantitative data thus procured was statistically analysed using the Wilcoxon signed-rank test. The Mean, Standard Deviation, Standard Error Mean, and dependent t-test (two-tailed hypothesis) were calculated and compared to find a statistically relevant correlation among the data collected.

3. Results

The participants rated their familiarity with the pieces of music used in the experiment, consisting of slow-tempo 60 beats per minute and fast-tempo 134 beats per minute. All participants rated every music piece at 0, thus indicating that none of them had heard any of the Vivaldi pieces used in the experiment.

Participants were also interviewed at the end of the experiment to share their experience and general state of being - mentally and physically - after listening to their respective songs to gauge the impact of the different tempi music at distinct times of day: their responses were recorded, and the participants were debriefed.

Table 1. Summary of wilcoxon t-test analysis between group A (60 BPM) morning and evening stress scores before listening to the music on a 5-point Likert scale (N=10)

Source	Morning (60 BPM)		Evening (60 BPM)		t	p
	M	SD	M	SD		
Stress Score	23	8.45	20	7.78	2.76	.028

*Note.*p < .05*

T-test for dependent samples between Group A's Morning (M=23, SD=8.45) and Group A's Evening (M=20, SD=7.78) Stress Scores prior to listening to the song was carried out (t=2.76, p<0.05, two-tailed t-test for dependent samples, Table 1). As seen from the Table, it can be inferred that there is a significant difference between the stress scores of Group A in the morning compared to the evening. The Stress scores in the Morning for Group A were reported to be significantly higher than in the evening.

Table 2. Summary of dependent T-test analysis between group A (60 BPM) before and after music heart rate in the morning (N=10)

Source	Before (60 BPM)		After (60 BPM)		t	p
	M	SD	M	SD		
Heart Rate	70.38	5.45	77.13	10.66	-2.25	.06

*Note.*p = .06*

T-test for dependent samples between Group A's Before listening to music (M=70.38, SD=5.45) and Group A's After listening to music (M=77.13, SD=10.66) Heart rate in the morning (t=-2.25, p=0.06, two-tailed t-test for dependent samples, Table). As can be seen from the Table, it can be inferred that there is a significant difference between the Heart rates of Group A in the morning Before listening to the music as compared to After listening to the music. The Heart Rates in the Morning for Group A After listening to the music were reported to be significantly higher than Before listening to the music.

T-test for dependent samples between Group A's Before listening to music (M=69.88, SD=7.08) and Group A's After listening to music (M=78.25, SD=12.79) Heart rate in the evening (t=-2.78, p<0.05, two-tailed t-test for dependent samples, Table). As seen from the table, it can be inferred that there is a significant difference between the Heart rates of Group A in the evening Before listening to the music as compared to After listening to the music. The Heart Rates in the Evening for Group A After listening to the music were reported to be significantly higher than Before listening to the music.

Table 3. Summary of dependent T-test analysis between group A (60 BPM) before and after music heart rate in the evening (N=10)

Source	Before (60 BPM)		After (60 BPM)		t	p
	M	SD	M	SD		
Heart Rate	69.88	7.08	78.25	12.79	-2.78	.027

*Note.*p < .05*

Table 4. Summary of correlation analysis between stress scores and group A (60 BPM) heart rate in the morning before listening to music (N=10)

	Before Music Heart rate	Stress Score
Before Music, Heart rate M	1	-32.29*
Stress Score	-32.29*	1

*Note.*p < .05*

The two variables 'Before Music Heart Rate in the Morning' and 'Stress Score in the Morning' for Group A were strongly and negatively correlated, r(20) = -0.7, p =.05

As can be seen from the tables, it is inferred that in general, when plotted, as the heart rate in the morning before listening to music for Group A increased, the Stress Levels decreased, and vice versa. Furthermore, participants with higher stress levels (measured before listening to the music) had lower average heart rates before listening to the music, and participants with lower stress scores had higher average heart rates before listening to the music.

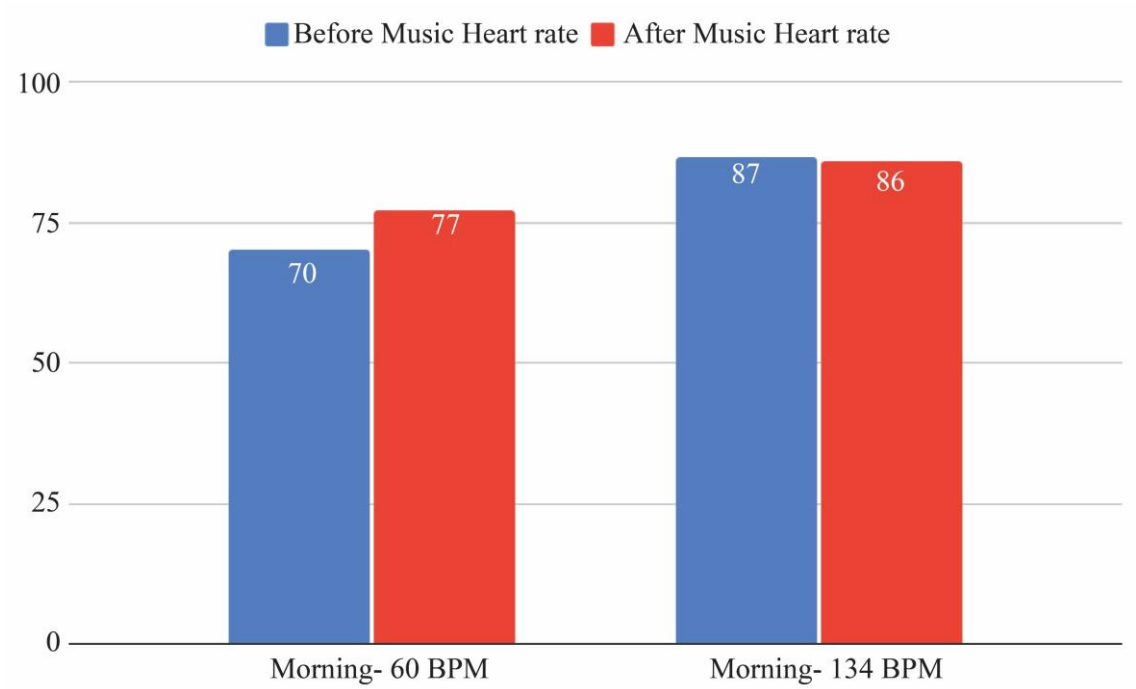

Fig. 1 Graphical representation of mean heart rates before listening to music and after listening to music for group A and group B in the morning (N=20)

Bar graphs showing the quantitative comparisons between participants' heart rates before and after listening to the music in the morning for the slower 60 BPM song and the faster 134 BPM song.

Based on the experiment conducted, an average value from each group was calculated as a measure of the heart rate before and after listening to the different songs. It can be seen that, on average, the value calculated for the heart rate in the morning for Group A (60 BPM) is 77 BPM, 7 points higher after listening to the music than it was before. Conversely, One can see that the average value calculated for the heart rate in the morning for Group B (134 BPM) is 86 BPM, a point lower after listening to the music than before. It can be inferred from the data that in the morning, a slower tempo song increases one's heart rate, thereby exciting them, leading to an increase in the body's stress response. Whereas listening to a song with a higher BPM in the morning can lead to calming effects, thereby causing a decrease in a person's heart rate.

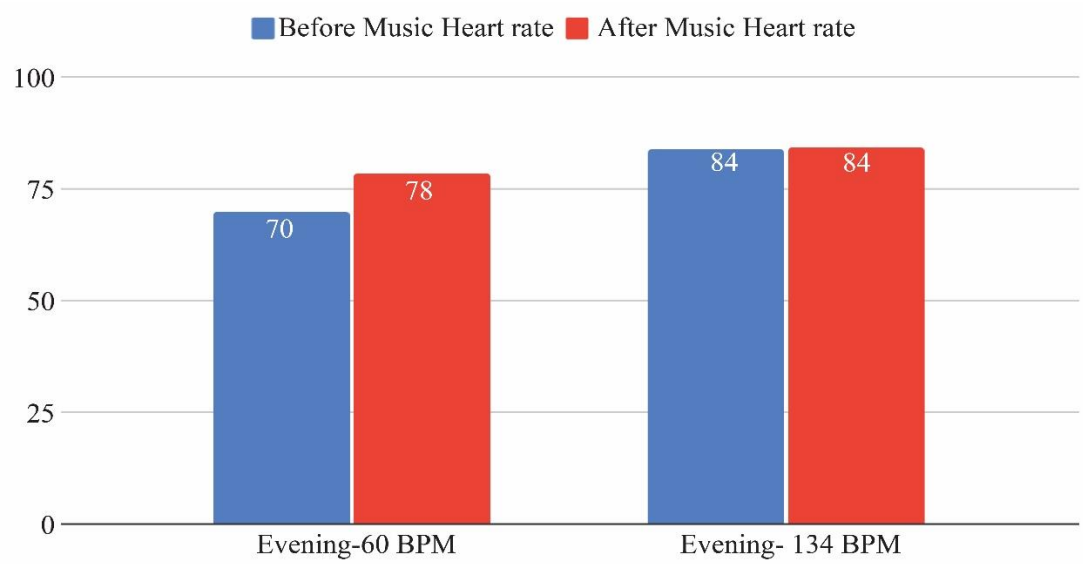

Fig. 2 Graphical representation of mean heart rates before listening to music and after listening to music for group A and group B in the evening (N=20)

Bar graphs showing the quantitative comparisons between participants' heart rates before and after listening to the music in the evening for the slower 60 BPM song and the faster 134 BPM song.

Based on the experiment conducted, an average value from each group was calculated as a measure of the heart rate before and after listening to the different songs. It can be seen that, on average, the value calculated for the heart rate in the evening for Group A (60 BPM) is 78 BPM, 8 points higher after listening to the music than before. Conversely, One can see that the average value calculated for the heart rate in the morning for Group B (134 BPM) is 84 BPM, the same for after listening to the music as before. It can be inferred from the data that in the evening, a slower tempo song increases one's heart rate, thereby exciting them, leading to an increase in the body's stress response. At the same time, listening to a song with a higher BPM in the morning does not significantly affect the person.

Table 5. Group A (60 BPM) qualitative responses thematic analysis for both morning and evening (N=20)

Themes	Frequency of idea unit/theme in interview responses
High stress/anxiety before listening to music	18
Increased Focus/Concentration after listening to music	15
More relaxed/calmer after listening to music	19
More centered/grounded after listening to music	11
Music did not affect stress levels	1
Increased energy levels after listening to music, felt invigorated	7

Table 6. Group B (134 BPM) qualitative responses thematic analysis for both morning and evening (N=20)

Themes	Frequency of idea unit/theme in interview responses
High stress/anxiety before listening to music	18
Increased Focus/Concentration after listening to music	8
More relaxed/calmer after listening to music	16
More centered/grounded after listening to music	9
Music did not affect stress levels	4
Increased energy levels after listening to music, felt invigorated	12

4. Discussion

Listening to music can have a range of effects on human beings, including inducing relaxation and excitation. It has been made clear that the tempo and beats per minute a song is running at will profoundly affect an individual, and this very quality of music can be harnessed for our own benefit.

The Wilcoxon t-test analysis showed that the reported stress levels of Group A were significantly higher during the morning as compared to the evening. This is likely explained by cortisol secretion levels in humans being at the peak in the morning (07:00–08:00 a.m), which is considered the active phase. After this point, it begins to decline throughout the day (7) steadily. Today, most studies consider salivary cortisol levels a reliable measure of the hypothalamus–pituitary–adrenal axis (HPAA) adaptation to psychological stress, and it is routinely used as a biomarker of the same (8). The participants reported higher stress levels in the morning in the qualitative data collected. Most participants had the tasks they had to do for the day running through their minds, contributing to higher stress levels compared to the evening when the work day had ended.

Listening to music with a slower BPM (60 beats per minute) was found to have caused a temporary increase in heart rate (HR) after listening to it in the morning. Similarly, listening to music with a slower 60 beats per minute caused an increase in heart rate after listening to it in the evening as well. It also appears that, compared with silence, music increases HR and respiratory rate (RR) and that HR and RR are higher during pleasant than unpleasant music (9). Participants also reported feeling more centred, focused, and relaxed after listening to slower-tempo classical music. It can be inferred from these findings that music with a slower BPM, while helping a person relax, also increases one's heart rate due to positive stimulation, thus leading to higher levels of concentration and focus (9).

Our findings further corroborate that the morning heart rate is negatively correlated with the stress scores, as calculated via the Perceived Stress Scale. Therefore, participants whose heart rates increased after listening to the slow tempo music reported decreased stress levels due to higher stimulation and activated concentration alluded to the higher heart rate. This phenomenon can be explained by the concept of 'eustress'. Milsum considers eustress as an ideal condition of the well-functioning homeostatic system. Quick et al. considered eustress in a similar light. They identified eustress as "healthy, positive, constructive results of stressful events and stress response." This type of stress is associated with positive feelings and a healthy physical state, while distress is a form of severe stress associated with negative feelings and physical impairments. Harris (10) correlates eustress with a joyful response to a stressor (11).

Essentially, according to the findings, slow-tempo music aids in translating negative distress to positive eustress, wherein one will feel less 'stressed' and more productive, thus also causing an increase in HR.

Moreover, the bar graph for Before Music HR and After Music HR in the Morning for both Groups shows a slight decrease in the mean of Group B's HR after listening to the faster-tempo song. During the morning, as stress levels were reported to be higher compared to the evening, the fast-tempo music may have helped to take the participants' minds off work stress for a while and decreased their heart rates. Contrarily, during the evening, stress scores were already reported to be lower than in the mornings, as discussed earlier, since the work day would have been over and, generally, stressors are in the direct environment. Therefore, Group B's mean heart rate was not changed in the evening. However, the change in mean heart rate is not too significant of a difference for the fast-tempo group; therefore, results may not be as highly generalisable. The mean HR change for Group A in the morning goes from 70 to 77, before and after listening to the 60 BPM music, respectively. In the evening, the mean HR goes from 70 to 78; the delta change for both time periods is similar. However, the higher change in the evening would be explained by the lower levels of distress; hence the eustress effects of the 60 BPM classical music have more of an effect.

Findings also suggest that the salivary level of oxytocin increased when a slow-tempo music sequence was presented, while the salivary cortisol level decreased when a fast-tempo music sequence was presented. The change in the salivary oxytocin level was correlated with the change in the parasympathetic nerve activity, and the change in the salivary cortisol level was correlated with the arousal level. Therefore, the slow-tempo music promoted eustress and an overall positive outlook towards the tasks at hand; the heart rate decreased when participants heard the fast-tempo music since it decreased their cortisol levels and reduced distress. Stress Scores were already low in the evenings. Therefore it did not have much of an impact then (12).

In a highly stressful corporate workplace environment wherein being productive is highly important, listening to slower-tempo classical/instrumental music (without vocals) can prove to be highly beneficial and healthy. Another consideration to look at is low BPM music with lyrics in a language that the listener does not understand, as that will also effectively be classified as instrumental since the listener will not understand the vocals. Therefore, the listener will not have to process the language subconsciously in Wernicke's area of the brain – which is a critical language area in the posterior superior temporal lobe connects to Broca's area via a neural pathway – that is associated with language comprehension and will induce the desired effects.

5. Conclusion

In the present study, it can be concluded that stress levels were significantly higher in the morning than in the evening due to cortisol secretion levels being at their peak. Listening to music with a slower tempo - 60 BPM classical music - at any time of the day was found to have caused a decrease in distress and increased eustress, leading to lower negative stress levels and higher productivity and focus

while also engendering an increase in heart rate. Fast-tempo music - 134 BPM classical music - was revealed to be helpful in some cases: to take the participants' minds off the stress of work and cause a decrease in their heart rates. Findings also suggest that slow-tempo music promoted eustress and an overall positive outlook towards the tasks at hand, and the heart rate decreased when participants heard the fast-tempo music since it decreased their cortisol levels and reduced distress.

The possible implications of the findings of this research are as follows. Professionals and students alike can benefit from the positive impact of 60 BPM classical music on eustress, concentration, focus, and productivity. Listening to such music during or before work, examinations, presentations etc, would be helpful. It also has a calming effect, therefore, can be made use of in high-stress environments such as hospitals. The findings could also be applied to children and adults with attention deficits such as ADD/ADHD. Listening to such music could help them focus, be grounded, and curb any possible inattentiveness.

Furthermore, music therapy can also have positive effects in cases where attention deficits, anxiety, mood disorders, trauma and stress disorders etc. Further study can be done on the same with a larger sample size. The study only focused on classical music and its different technicalities in tempo, and further studies may also include investigations into other genres and classifications of music to determine their effects on human physiology, stress, and concentration.

Limitations

The study's sample size could have been larger than 20 to help make the results more generalisable and increase the experiment's ecological validity. Even though most of the sample participated in the experiment before they had any meetings or done any work (for the morning part of the experiment), 1-2 participants had already attended a meeting and started with their day due to the time taken to conduct the experiment for each individual participant. Demand characteristics while answering the questions on the Perceived Stress Scale might have played a role.

Acknowledgements

I thank Dr Pramit Rastogi (Johns Hopkins University, School of Medicine) for his assistance in corroborating the results of the presented study.

References

[1] D. Boyd, Daily Life, The American Institute of Stress, 2022. [Online]. Available: https://www.stress.org/daily-life

[2] Mohd Razali Salleh, “Life Event, Stress and Illness,” The *Malaysian journal of medical sciences*: MJMS, vol. 15, no. 4, pp. 9-18, 2008. [Google Scholar] [Publisher Link]

[3] Roshni, World Mental Health Day: 55% of Indian Employees Feel Stressed, Says LinkedIn Report, India Today, 2021. [Online]. Available: https://www.indiatoday.in/education-today/latest-studies/story/world-mental-health-day-55-of-indian-employees-feel-stressed-says-Linkedin-report-1863187-2021-10-10

[4] Hans Selye, “Stress and the General Adaptation Syndrome,” *The British Medical Journal*, pp. 1383-1392, 1950. [CrossRef] [Publisher Link]

[5] Kweku Esia-Donkoh, Daniel Yelkpieri, and Kobina Esia-Donkoh, Coping with Stress: Strategies Adopted by Students at the Winneba Campus of University of Education, Winneba, Ghana, ERI, 2011. [Online]. Available: https://files.eric.ed.gov/fulltext/ED528318.pdf

[6] Helia Mojtabavi et al., “Can Music Influence Cardiac Autonomic System? A Systematic Review and Narrative Synthesis to Evaluate its Impact on Heart rate Variability,” *Complement Therapies in Clinical Practice,* vol. 39, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[7] Nor Amira Syahira Mohd Azmi et al., “Cortisol on Circadian Rhythm and Its Effect on Cardiovascular System,” *International Journal of Environmental Research and Public Health*, vol. 18, no. 2, p. 676, 2021.[CrossRef] [Google Scholar] [Publisher Link]

[8] Dirk H. Hellhammer, Stefan Wüst, and Brigitte M. Kudielka, “Salivary Cortisol as a Biomarker in Stress Research,” *Psychoneuroendocrinology*, vol. 34, no. 2, pp. 163-171, 2009. [CrossRef] [Google Scholar] [Publisher Link]

[9] Stefan Koelsch, and Stefan Koelsch, “Music and the Heart,” *European Heart Journal*, vol. 36, no. 44, pp. 3043–3049, 2015. [CrossRef] [Google Scholar] [Publisher Link]

[10] Dorothy V. Harris, “On the Brink of Catastrophe,” *Quest Monograph*, vol. 13, pp. 33-40, 1970. [CrossRef] [Google Scholar] [Publisher Link]

[11] Roman Kupriyanov, and Renad Zhdanov, “The Eustress Concept: Problems and Outlooks,” *World Journal of Medical Sciences*, vol. 11, no. 2, pp. 179-185, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[12] Yuuki Ooishi et al., “Increase in Salivary Oxytocin and Decrease in Salivary Cortisol after Listening to Relaxing Slow-Tempo and Exciting Fast-Tempo Music,” *Journal Plos One*, vol. 12, no. 12, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[13] Abeer Saad Eswi, Sahar Radi, and Hanaa Youssri, “Stress/Stressors as Perceived by Baccalaureate Saudi Nursing Students,” *Middle-East Journal of Scientific Research*, vol. 14, no. 2, pp. 193-202, 2013.[CrossRef] [Google Scholar] [Publisher Link]

[14] R. S. Lazarus, “From Psychological Stress to the Emotions: A History of Changing Outlooks,” *Annual Review of Psychology*, vol. 44, no. 1, pp. 1-21, 1993. [Google Scholar] [Publisher Link]

[15] Richard S. Lazarus, and Susan Floakman, *Stress, Appraisal and Coping*, Springer, New York, 1984. [Google Scholar] [Publisher Link]

[16] Mark Le Fevre, Gregory S. Kolt, and Jonathan Matheny, "Eustress, Distress and their Interpretation in Primary and Secondary Occupational Stress Management: which Way First?," *Journal of Managerial Psychology*, vol. 21, no. 6, pp. 547-565, 2006. [CrossRef] [Google Scholar] [Publisher Link]

[17] William R. Lovallo, *Stress and Health: Biological and Psychological Interactions*, Sage Publication, CA, 2015. [Google Scholar] [Publisher Link]

[18] Ulf Lundberg, and Marianne Frankenhaeuser, "Pituitary-Adrenal and Sympathetic-Adrenal Correlates of Distress and Effort," *Journal of Psychosomatic Research*, vol. 24, no. 3-4, pp. 125-130, 1980. [CrossRef] [Google Scholar] [Publisher Link]

[19] Majid Lotfalian et al., "Occupational Stress Impact on Mental Health Status of Forest Workers," *Middle East Journal of Scientific Research*, vol. 11, no. 10, pp. 1361-1365, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[20] John H. Milsum, "A Model of the Eustress System for Health/Illness," *Behavioral Science*, vol. 30, no. 4, pp. 179-186, 1985. [CrossRef] [Google Scholar] [Publisher Link]

[21] Hans Selye, *Stress without Distress*, Psychopathology of Human Adaptation, pp. 137-138, 1976. [CrossRef] [Google Scholar] [Publisher Link]

[22] Debra L Nelson, and Bret L Simmons, "Eustress: An Elusive Construct, an Engaging Pursuit," *Emotional and Physiological Processes and Positive Intervention Strategies*, pp. 265-322, 2003. [CrossRef] [Google Scholar] [Publisher Link]

[23] Rashid Saeed et al., "Work-Life Balance and Stress with the Turnover Rate of the Employees," *World Applied Sciences Journal*, vol. 26, no. 6, pp. 834-839, 2013. [Google Scholar]

[24] Nor Amira Syahira Mohd Azmi et al., "Cortisol on Circadian Rhythm and Its Effect on Cardiovascular System," *International Journal of Environmental Research and Public Health*, vol. 18, no. 2, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[25] Quick James Campbell et al., *Preventive Stress Management in Organizations*, American Psychological Association, Washington, DC, 1997. [CrossRef] [Google Scholar] [Publisher Link]