HIGH SCHOOL EDITION
Journal of Student Research
Volume 11 Issue 2 (2022)

The Relationship Between Classical Music Therapy and Heart Disease: A Systematic Review and Meta-Analysis

Maya Chivakula[1] and Kimberly Dao[#]

[1]Leland High School, San Jose, CA, USA
[#]Advisor

ABSTRACT

Music has long been perceived as a healing agent for various ailments (UW Health, 2019). Music therapy is the use of musical interventions to accomplish personalized goals, often related to healthcare (American Music Therapy Association, 2005). It has proven to have positive effects on many conditions, such as helping stroke survivors or changing brain chemistry (Harvard Health Publishing, 2021). Music has also shown promising benefits with regard to the heart. Heart disease was responsible for every 1 in 5 deaths in the United States as of 2020 and is the primary cause of death for many groups within the United States (Centers for Disease Control and Prevention [CDC], 2022.). Thus, it's imperative to explore various methods of cardiac treatment as it's clear that heart disease is a highly threatening and widespread condition. This paper is a meta-analysis of randomized controlled trials that focus on classical music as the specific music intervention being used and its impact on heart disease. These studies found that classical music reduces blood pressure, heart rate, and anxiety. Classical music is also an accessible, safe, and affordable intervention that has been shown to improve heart health. This approach should be considered more often as an adjunct to standard heart disease care.

Introduction

In the United States, approximately 647,000 people die each year from heart disease (Thomas, 2020). Heart disease, classified under a larger category of cardiovascular diseases, includes a wide range of more specific conditions including coronary artery disease, heart rhythm issues (arrhythmias), and heart valve disease (Mayo Clinic, 2022). Coronary artery disease is the most prevalent form of heart disease in the United States, caused by a buildup of plaque in the arteries (New York State Department of Health, 2012). Hypertension, or high blood pressure, is also strongly associated with heart disease and can even lead to hypertensive heart disease (Drazner, 2011). High blood pressure, high cholesterol, an unhealthy diet, and obesity are all leading risk factors for the development of heart disease today (U.S. Department of Health and Human Services, 2022).

Additionally, cardiac healthcare is expensive — heart disease costs the United States about $219 billion every year (CDC, 2021). Thus, with the prevalence of heart disease being so apparent not only in the United States but in other countries such as China, India, and Russia, and with its numerous adverse effects, it is becoming increasingly important to explore other methods of healthcare (Preidt, 2020).

Music therapy — the clinical utilization of music in order to achieve personal goals often related to one's health — has been one such option in the field of healthcare (American Music Therapy Association, 2005). In today's age, music is universal and virtually accessible anywhere, thus showing promising uses in the healthcare industry. Simply listening to music is thought to yield a number of positive effects that extend to a myriad of conditions including Alzheimer's disease, autism, diabetes, and headaches (Wong, 2021). Music's

effect on such conditions might potentially show promise for heart disease as well. However, conclusions regarding the various music types that yield the most significant results are still lacking. The primary aim of this paper is to explore classical music and its impact on the heart in order to determine whether classical music can help treat and even prevent heart disease.

Methods

Search Strategy

Google Scholar was the primary database that was used and was searched for full-text articles and studies on classical music's effects on the heart using the following question formats: How does classical music help heart disease, classical music AND heart disease, classical music AND blood pressure AND heart rate, or classical music AND blood pressure AND heart rate AND stress. Simple Google searches were also frequently used. No restrictions on date were placed during the search process.

Article Screening and Inclusion and Exclusion Criteria

Inclusion criteria for studies included randomized studies that examined the relationship between classical music interventions and heart health. Participants across all selected studies had to be at least 18 years old; studies that examined infants or young children were not considered. Exclusion criteria included studies that did not observe classical music at all. This meta-analysis focused specifically on Raga Todi of Hindustani Classical Music, Indian Classical Music, classical Turkish and Western music, and compositions by W. A. Mozart. Instances when classical music was not played directly to the participants (e.g. singing to oneself, playing an instrument, etc.) also fell under the exclusion criteria. Observational studies were not utilized in this meta-analysis; randomized controlled trials were the only type of study used. Studies that did not examine classical music's impact on blood pressure and heart rate were not included. Studies that examined stress and anxiety were also considered.

An elevated heart rate can be associated with increased blood pressure and therefore, can further increase the risk of cardiovascular disease (Reule & Drawz, 2012). High blood pressure could lead to heart disease as the coronary arteries used by the heart may become narrower due to plaque — a process called atherosclerosis (American Heart Association, 2022). Blood clots become more probable and blood flow through the heart is cut off, leaving the heart muscle with insufficient nutrients and oxygen. This in turn can result in a heart attack. In addition, tachycardia — the term used for a heart rate over 100 beats per minute, can have serious effects such as heart failure and cardiac death if sustained and left untreated (Mayo Clinic, 2022). Thus, since blood pressure, heart rate, and heart disease are so closely related, studies examining blood pressure and heart rate were the ideal endpoints.

Additionally, anxiety is the body's natural response to stress (Johnson, 2022). Anxiety itself can also be stressful. Stress is a risk factor for heart disease and can increase an individual's chances of getting this condition (University of Rochester Medical Center, n.d.). Thus, due to its close relationship with heart disease, studies that examined stress and anxiety were included. Stress was measured using an anxiety scale in one study due to stress and anxiety's mutual effects on each other.

Data Abstraction

Data was primarily taken from the tables of the 5 studies analyzed. Demographic tables, blood pressure, heart rate, and anxiety tables were all used for data collection. Only the data for the music by Mozart was utilized for

the study by Hans-Joachim Trappe and his associates. Additionally, only data for male coronary patients was used for the study by Uma Gupta and B.S. Gupta.

Statistical Analysis

Given the data available and the focus of this meta-analysis, differences were analyzed by paired t-tests. However, due to my limited knowledge of statistical analysis, help from a third party (a doctoral student at Emory University) was enlisted to assist with calculations.

Results

Table 1. Study and participant characteristics

Control Group				
		Gender		
Study	Age (years)	Number of Females	Number of Males	Number of Subjects
Trappe & Voit (2016)	45.9 ± 14.1	30	30	60
Chatterjee & Mukherjee (2020)	50-60	0	40	40
Siritunga et al. (2013)	45-55/56-65	Female to Male Ratio: 1.08:1		125
Akpinar et al. (2020)	18-21/22-25	25	23	48
Gupta & Gupta (2014)	43-64	0	20	20
Experimental Group				
		Gender		

Study	Age	Number of Females	Number of Males	Number of Subjects
Trappe & Voit (2016)	46.4 ± 13.5	30	30	60
Chatterjee & Mukherjee (2020)	50-60	0	40	40
Siritunga et al. (2013)	45-55/56-65	Female to Male Ratio: 1.08:1		127
Akpinar et al. (2020)	18-21/22-25	21	19	40
Gupta & Gupta (2014)	43-64	0	20	20

Table 2. Pre-intervention to post-intervention blood pressure changes (mm Hg)

	Experimental Group						Control Group					
	Systolic Blood Pressure (mm Hg)			Diastolic Blood Pressure (mm Hg)			Systolic Blood Pressure (mm Hg)			Diastolic Blood Pressure (mm Hg)		
Study Name	Pre-test	Post-test	P-value	Pre-test	Post- test	P-value	Pre-test	Post-test	P-value	Pre-test	Post-test	P-value
Trappe & Voit (2016)	123.9	119.2	<0.001*1	77.5	75.4	0.004*2	123.9	121.8	0.038*1	77.5	74.9	0.013*1
Chatterjee & Mukherjee (2020)	136.3 ± 2.42	130.2 ± 4.21	<0.001	86.2 ± 1.93	80.5 ± 2.51	<0.001	137 ± 1.26	136.5 ± 1.53	>0.05	87.1 ± 1.62	86.5 ± 1.72	>0.05
Siritunga et al. (2013)	126.1 (12.4)	117.5(10.9)	<0.01	77.2(8.9)	71.4(7.4)	<0.01	123.2 (13.3)	123.0(13.7)	>0.05	76.0(8.2)	76.8(8.8)	>0.05
Akpinar et al. (2020)	130.55 ± 17.00	115.20 ± 19.3	<0.001	75.1 6± 13.80	72.58 ± 12.19	<0.001	140.02 ± 13.77	140.25 ± 15.95	0.285	73.72 ± 7.64	72.99 ± 9.87	0.226
Gupta & Gupta (2014)	125.67	120.59	<0.05	81.54	77.63	<0.05	126.43	125.97	n.s.	81.67	81.79	n.s.

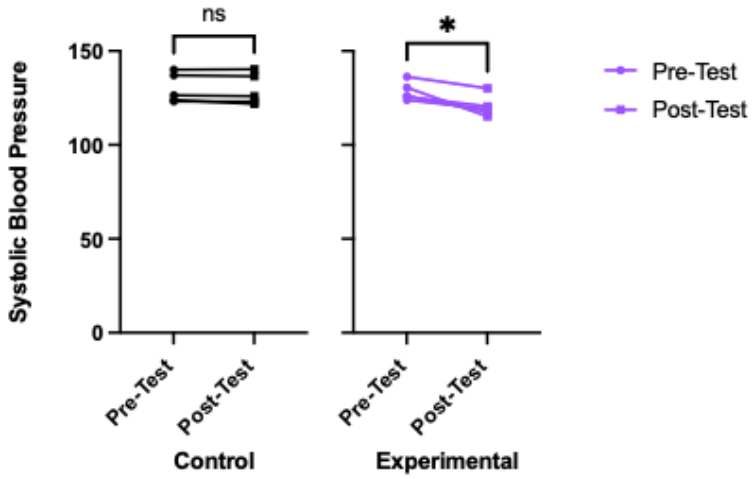

Figure 1. Systolic blood pressure changes

Table 2A. Systolic Blood Pressure Data Points

	Control Group	Experimental Group
95% confidence interval	-1.704 to 0.492	-13.43 to -2.504
P-value	0.2002	0.0155
One- or two-tailed P-value?	Two-tailed	Two-tailed
Number of pairs	5	5
Significantly different (P<0.05)?	No	Yes

*See Appendix 1 for full data points

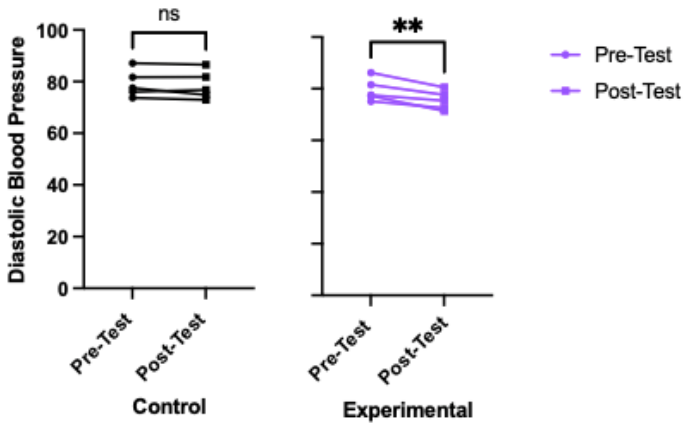

Figure 2. Diastolic Blood Pressure Changes

Table 2B. Diastolic Blood Pressure Data Points

	Control Group	Experimental Group
95% confidence interval	-2.184 to 0.980	-6.147 to -1.889
P-value	0.3504	0.0063
One- or two-tailed P-value?	Two-tailed	Two-tailed
Number of pairs	5	5
Significantly different (P<0.05)?	No	Yes

*See Appendix 1 for full data points

Table 3. Pre-intervention to post-intervention heart rate changes (bpm)

	Experimental Group			Control Group		
Study Name	Pre-test	Post-test	p-value	Pre-test	Post-test	p-value
Trappe & Voit (2016)	70.9	65.3	<0.001	70.9	65.5	< 0.001
Chatterjee & Mukherjee (2020)	85.3 ± 1.85	79.8 ± 2.39	< 0.001	85.4 ± 1.87	85.2 ± 1.82	> 0.05

Siritunga et al. (2013)	77.5 (11.9)	72.3 (9.2)	<0.01	77.4 (11.7)	76.9 (11.2)	> 0.05
Akpinar et al. (2020)	82.38±10.50	78.50±8.11	0.004	85.60±14.85	85.70±15.54	0.90
Gupta & Gupta (2014)	78.74	74.97	<0.05	78.62	79.37	n.s.

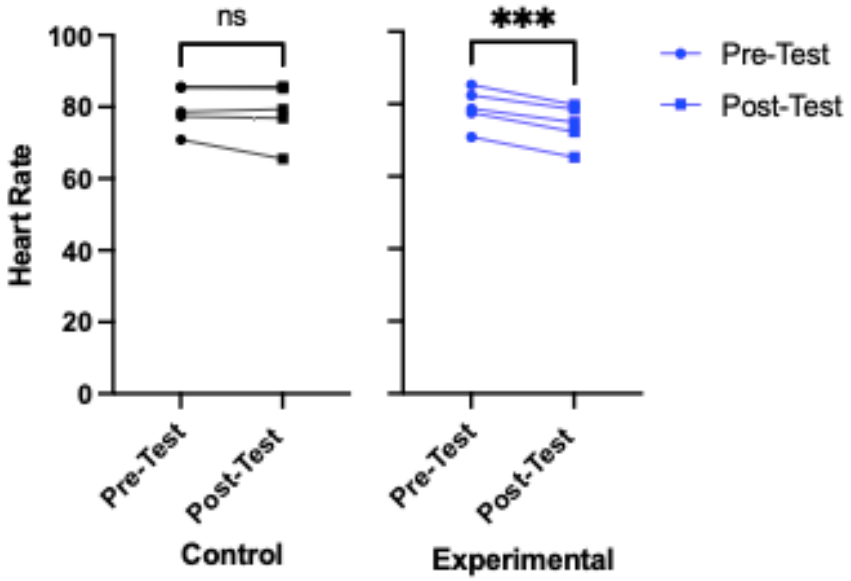

Figure 3. Heart Rate Changes

Table 3A. Heart Rate Data Points

	Control Group	Experimental Group
95% confidence interval	-4.124 to 2.024	-5.900 to -3.680
P-value	0.3966	0.0003
One- or two-tailed P-value?	Two-tailed	Two-tailed
Number of pairs	5	5

Significantly different (P<0.05)?	No	Yes

*See Appendix 1 for full data points

Table 4. Pre-intervention to post-intervention anxiety changes

	Experimental Group			Control Group		
Study Name	Pre-test	Post-test	p-value	Pre-test	Post-test	p-value
Akpinar et al. (2020)	41.40±9.40	23.20±4.16	p<.001	56.10±13.25	55.23±12.94	p=0.165
Gupta & Gupta (2014)	54.36	46.65	p<0.01	54.67	54.72	n.s.

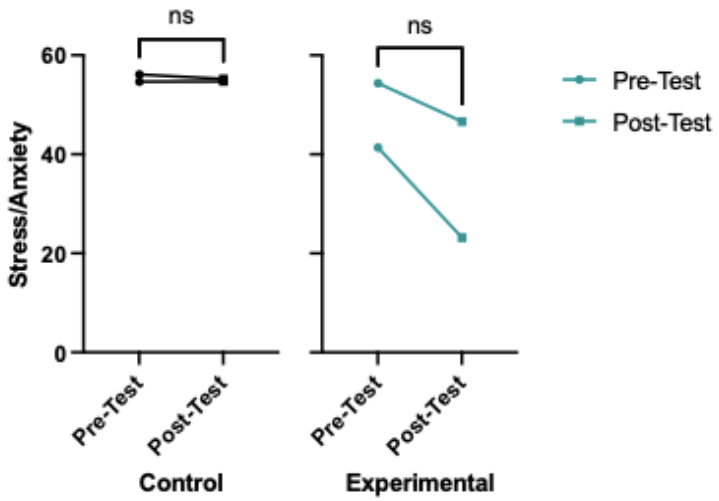

Figure 4. Anxiety Changes

Table 4A. Anxiety Data Points

	Control Group	Experimental Group
95% confidence interval	-6.255 to 5.435	-79.60 to 53.69
P-value	0.5365	0.2449
One- or two-tailed P-value?	Two-tailed	Two-tailed

Number of pairs	2	2
Significantly different (P<0.05)?	No	No

*See Appendix 1 for full data points

This meta-analysis looked at 5 different studies — all randomized controlled trials — to determine the effects of classical music on participants' heart-related health. Participants varied in age but were all at least 18 years old and older. Patients also varied in their starting health conditions — one study examined coronary patients in addition to healthy controls, while other studies examined the effects of classical music on a healthy heart. Overall, the general consensus among all studies was that classical music therapy has a positive effect on the heart. All studies examined the effects of classical music on heart rate and blood pressure, while 2 studies also examined its impact on anxiety levels. These studies revealed a reduction in systolic blood pressure, with a p-value of 0.2002 in the control group (not statistically significant) and a p-value of 0.0155 in the experimental group (which was statistically significant). There was also a reduction in diastolic blood pressure; the p-value for the control group was 0.3504 (not statistically significant), while the p-value for the experimental group was 0.0063, showing a statistically significant positive impact on heart health. Heart rate data also revealed reductions; the p-value for the control group was 0.3966 (not statistically significant), while the p-value for the experimental group was 0.0003 (statistically significant). Lastly, there was a positive relationship between anxiety and classical music. However, statistically significant results were not possible as linear correlation requires at least three pairs; this meta-analysis only included 2 pairs. For anxiety, the p-value for the control group was 0.5365, while the p-value for the experimental group was 0.2449. Overall, music therapy seemed to improve heart health when compared with treatment without music.

Discussion

Classical music therapy should be used as an adjunct to standard cardiac care. The studies used in this meta-analysis revealed that classical music therapy has the potential to reduce blood pressure, heart rate, and anxiety, all of which are associated with heart disease. The role of classical music therapy can become especially important in preventative health, especially for those who don't necessarily have heart disease but are at high risk for getting it.

Medications

Heart disease patients may be administered medicines to lower blood pressure (Donovan, 2020). Beta-blockers are one such type of medication that inhibit chemicals that stimulate the heart, and therefore, can reduce patients' heart rates and blood pressures. Propranolol, labetalol, and metoprolol are all types of beta-blockers. Classical music therapy, as studies have shown, has the potential to reduce blood pressure and heart rate and may be a safer and less invasive alternative; this is because all medicines come with the risk of unwanted side effects (Stuart, 2021). Beta-blockers, for example, may lead to side effects such as hypotension (low blood pressure), bradycardia (low heart rate), dizziness, asthma symptoms, depression, and sleep problems. Additionally, heart disease patients all vary depending on how the heart disease is affecting a patient's cardiovascular system; therefore, multiple medications may need to be prescribed in order to control heart disease symptoms (Donovan, 2020). Taking multiple medications could be harmful in some cases as this could put patients at risk for more side effects or drug interactions, in which one medicine affects another medicine's functionality (MedlinePlus, 2020). Thus, classical music therapy may be a safer alternative to help limit the number of medications

a patient must take. Classical music therapy could also prove useful in cases where individuals strongly dislike or even fear medications. Studies have shown that 30% to 50% of the population does not follow their prescribed regimens (Petelinšek & Korajlija, 2020). Pharmacophobia, the fear of medications, has been identified as one major reason for this. Listening to classical music could be an alternative for those who refuse to take medications.

Anxiety

When someone is highly anxious, their body's reaction may place extra strain on the heart (Johns Hopkins Medicine, n.d.). Anxiety may lead to an unusually high heart rate, called tachycardia, which can disrupt heart function and lead to sudden cardiac arrest. Anxiety may also lead to decreased heart variability, leading to a higher risk of death following an acute heart attack. Equally important to note, anxiety has the potential to disrupt heart attack recovery by interfering with patients taking medications, following prescribed regimens, getting adequate sleep, etc.

As previously mentioned, anxiety and stress are closely related. High levels of cortisol from stress has the potential to increase blood pressure, blood cholesterol, triglycerides, and blood sugar (University of Rochester Medical Center, n.d.). Stress, a risk factor for heart disease, can also cause a buildup of plaque in the arteries. Therefore, since classical music therapy has the potential to reduce stress and anxiety, it could further be used in the prevention and management of heart disease.

Affordability and Accessibility

Music therapy with classical music is an affordable form of healthcare that can be conducted from a home setting, making it a highly suitable alternative for families who may find today's healthcare costly or don't have the means to afford large procedures or daily medications. In one study that examined how music therapy reduces the cost of an echocardiogram in children, the results revealed that the total cost per patient with music therapy was $13.21, while the cost per patient without music therapy was $87.45 (Walworth, 2005). This led to a savings of approximately $74.24 (85%), showing how music therapy is cost-effective. And the benefits of classical music therapy extend to its sheer accessibility as well; patients could listen to music from the comfort of their own homes. Music therapy could also be shared; it could garner a community and create shared experiences, helping with accountability. Socialization can even help patients cope with anxiety (American Addiction Centers, n.d.).

Measurements in Analyzed Studies

Anxiety was one aspect of heart health that was examined. 2 studies were used to examine classical music's effect on anxiety. Both studies used different questionnaires to measure anxiety; one study used the Examination Anxiety Scale (EAS) while the other study utilized the Hindi version of the State-Trait Anxiety Inventory (STAI). However, both questionnaires are very similar — they both include 20 statements where participants are required to answer each statement on a 4-point Likert scale ranging from 1 to 4. For both scales, the lowest score is 20 and the highest score is 80. Since both anxiety scales are so similar, it could be assumed that the results are clinically similar as well. However, future research in this area could find studies that use the same scales for measurements of anxiety for better comparison.

The measurement of blood pressure is also important to consider. There is much debate and thorough research on the best way to measure blood pressure as several factors such as the setting, time, observer, device, posture, reading, and calculation may affect the measurement of blood pressure (Stergiou & Parati, 2011). In

some of the studies analyzed, blood pressure was assessed in a sitting position. A digital blood pressure apparatus was also used. Future research in this field should streamline the process of blood pressure assessment using the most accurate and accessible method of blood pressure measurement.

Potential Concerns

Despite all of classical music therapy's promising benefits, it does come with its drawbacks. Firstly, the novelty of music therapy may be a barrier for patients as there's lots of data and research done for medications compared with music therapy. Music therapy isn't as well known in the healthcare industry yet and is not as fully integrated into healthcare as medications; thus, it may be difficult for patients to accept it and trust that it will yield effective results. Moreover, issues may arise with patient compliance; patients may not adhere to music therapy treatments, rendering them ineffective. Classical music may also not be largely accepted among today's youth — it generally attracts the attention of older audiences (Tommasini, 2020). Therefore, classical music may not be ideal for all age groups. As the music industry progresses, other types of music such as pop, hip hop, and rock music may become more accepted and popular as people slowly shy away from classical music. Thus, future research should examine the impact of other music genres on cardiovascular health.

Limitations to the Meta-Analysis

As a high-school student, this is my first research paper and this paper lacks the insight of an experienced researcher. Furthermore, this meta-analysis only analyzed 5 studies; examining more studies might have enhanced the quality of this meta-analysis. Date restrictions were also not placed during the search process; however, all studies were conducted within the past 10 years. Additionally, this meta-analysis examined studies that involved healthy patients and coronary patients. Future research could focus on one group instead of both in order to fully examine music's effect on that group. Some of the studies used in this meta-analysis also did not include participant information like BMI, weight, whether or not participants smoked, etc. Thus, we don't know if there are any other confounding factors that may have affected heart health as well. Lastly, this meta-analysis also only observed two studies on anxiety and therefore, could not show a complete linear correlation. In order to obtain statistically significant results, more power (greater N) is needed.

Conclusion

Overall, classical music therapy shows promising results in cardiac treatment and prevention. Its benefits are plentiful: reducing systolic and diastolic blood pressure, heart rate, and anxiety. It's a safer alternative that eliminates potential risks and side effects from other treatments or medications, and it's affordable. And lastly, music is universal and easily accessible, making it an ideal form of cardiac treatment. Therefore, classical music therapy should be pursued more in the future and should be considered for integration into cardiac healthcare and prevention.

Acknowledgments

I would like to thank my mentor, Kim Dao, MD, for her guidance and support through this whole process of writing my first research paper. I would also like to thank the Polygence platform for giving me the opportunity to research a topic I am truly interested in. And lastly, I would like to thank my parents for their unwavering support in all my educational endeavors.

References

Akpinar, N. B., Ceran, M. A., & Özkalp, B. (2020). The effect of classıcal Turkish and Western music on university students' exam stress level, blood pressure and pulse rate: A randomized controlled trial. *Journal of Health Sciences and Medicine*, 216–220. https://doi.org/10.32322/jhsm.681640

American Addiction Centers. (n.d.). *Socialization and Altruistic Acts as Stress Relief.* MentalHelp.net. Retrieved August 7, 2022, from https://www.mentalhelp.net/stress/socialization-and-altruistic-acts-as-stress-relief/#:~:text=Socialization%20also%20directly%20impacts%20our,outward%20(rather%20than%20inward)

American Heart Association. (2022, March 4). *How high blood pressure can lead to a heart attack.* www.heart.org. Retrieved August 7, 2022, from https://www.heart.org/en/health-topics/high-blood-pressure/health-threats-from-high-blood-pressure/how-high-blood-pressure-can-lead-to-a-heart-attack#:~:text=The%20excess%20strain%20and%20resulting,are%20more%20likely%20to%20form
American Music Therapy Association. (2005). *What is Music Therapy?* American Music Therapy Association (AMTA). Retrieved July 19, 2022, from https://www.musictherapy.org/about/musictherapy/
Centers for Disease Control and Prevention. (2022, July 15). *Heart disease facts.* Centers for Disease Control and Prevention. Retrieved August 2, 2022, from https://www.cdc.gov/heartdisease/facts.htm

Centers for Disease Control and Prevention. (2021, August 17). *Health Topics — Heart Disease and Heart Attack.* Centers for Disease Control and Prevention. Retrieved August 7, 2022, from https://www.cdc.gov/policy/polaris/healthtopics/heartdisease/index.html#:~:text=Economic%20Burden,%2C%20medications%2C%20and%20premature%20death

Chatterjee, S., & Mukherjee, R. (2020). Evaluation of the effects of music therapy using todi raga of Hindustani classical music on blood pressure, pulse rate and respiratory rate of healthy elderly men. *Journal of Scientific Research*, 64(01), 159–166. https://doi.org/10.37398/jsr.2020.640123
Donovan, R. (2020, February 1). *Drugs to Treat Heart Disease*. Healthline. Retrieved August 7, 2022, from https://www.healthline.com/health/heart-disease/drugs
Drazner, M. H. (2011). The progression of hypertensive heart disease. *Circulation*, 123(3), 327–334. https://doi.org/10.1161/circulationaha.108.845792

Gupta, U., & Gupta, B. S. (2014). Psychophysiological reactions to music in male coronary patients and healthy controls. *Psychology of Music*, 43(5), 736–755. https://doi.org/10.1177/0305735614536754

Harvard Health Publishing. (2021, March 30). *Tuning in: How music may affect your heart.* Harvard Medical School. Retrieved August 15, 2022, from https://www.health.harvard.edu/heart-health/tuning-in-how-music-may-affect-your-heart

Johns Hopkins Medicine. (n.d.). *Anxiety and Heart Disease*. Johns Hopkins Medicine. Retrieved August 7, 2022, from https://www.hopkinsmedicine.org/health/conditions-and-diseases/anxiety-and-heart-disease#:~:text=The%20Effect%20of%20Anxiety%20on%20the%20Heart&text=Rapid%20heart%20rate%20(tachycardia)%20%E2%80%93,heart%20muscle%2C%20and%20heart%20failure
Johnson, J. (2022, July 21). *Acid reflux and anxiety: What to know*. Medical News Today. Retrieved July 28, 2022, from https://www.medicalnewstoday.com/articles/acid-reflux-and-anxiety

Mayo Foundation for Medical Education and Research. (2022, May 20). *Tachycardia*. Mayo Clinic. Retrieved August 7, 2022, from https://www.mayoclinic.org/diseases-conditions/tachycardia/symptoms-causes/syc-20355127

Mayo Foundation for Medical Education and Research. (2022, August 5). *Heart disease.* Mayo Clinic. Retrieved August 7, 2022, from https://www.mayoclinic.org/diseases-conditions/heart-disease/symptoms-causes/syc-20353118

New York State Department of Health. (2012, December). *Types of Cardiovascular Disease*. New York State Department of Health. Retrieved August 4, 2022, from https://www.health.ny.gov/diseases/cardiovascular/heart_disease/types_of_cv.htm#:~:text=Coronary%20Heart%20Disease%20(CHD)%20is,is%20also%20known%20as%20atherosclerosis

Petelinšek, A., & Lauri Korajlija, A. (2020). Predictors of pharmacophobia. *Health Psychology Research*, 8(1), 8853. https://doi.org/10.4081/hpr.2020.8853

Preidt, R. (2020, December 10). *Heart disease is world's no. 1 killer.* WebMD. Retrieved August 7, 2022, from https://www.webmd.com/heart-disease/news/20201209/heart-disease-is-worlds-no-1-killer#:~:text=10%2C%202020%20(HealthDay%20News),the%20United%20States%20and%20Indonesia

Reule, S., & Drawz, P. E. (2012). Heart rate and blood pressure: any possible implications for management of hypertension?. *Current hypertension reports,* 14(6), 478–484. https://doi.org/10.1007/s11906-012-0306-3

Siritunga, S., Wijewardena, K., Ekanayaka, R., & Mudunkotuwa, P. (2013). Effect of music on blood pressure, pulse rate and respiratory rate of asymptomatic individuals: A randomized controlled trial. *Health*, 05(04), 59–64. https://doi.org/10.4236/health.2013.54a008

Stergiou, G. S., & Parati, G. (2011). How to best assess blood pressure? *Hypertension*, 57(6). https://doi.org/10.1161/hypertensionaha.111.172924

Stuart, A. (2021, March 7). *Side Effects of High Blood Pressure Medications*. WebMD. Retrieved August 7, 2022, from https://www.webmd.com/hypertension-high-blood-pressure/guide/side-effects-high-blood-pressure-medications

Thomas, J. (2020, July 16). *Heart Disease: Facts, Statistics, and You*. Healthline. Retrieved August 4, 2022, from https://www.healthline.com/health/heart-disease/statistics#Who-is-at-risk

Tommasini, A. (2020, August 6). *Classical music attracts older audiences. Good.* The New York Times. Retrieved August 7, 2022, from https://www.nytimes.com/2020/08/06/arts/music/classical-music-opera-older-audiences.html

Trappe, H. J., & Voit, G. (2016). The Cardiovascular Effect of Musical Genres. *Deutsches Arzteblatt international*, 113(20), 347–352. https://doi.org/10.3238/arztebl.2016.0347

University of Rochester Medical Center. (n.d.). *Stress Can Increase Your Risk for Heart Disease.* University of Rochester Medical Center. Retrieved August 7, 2022, from https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=1&ContentID=2171#:~:text=Studies%20suggest%20that%20the%20high,risk%20factors%20for%20heart%20disease

U.S. Department of Health and Human Services. (2022, February 6). *Heart disease and stroke.* Heart Disease and Stroke | Healthy People 2020. Retrieved August 29, 2022, from https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-

stroke#:~:text=In%20addition%20to%20being%20the,disproportionately%20distributed%20across%20the%20population

U.S. National Library of Medicine. (2020, August 13). *Taking multiple medicines safely*. MedlinePlus. Retrieved August 7, 2022, from https://medlineplus.gov/ency/patientinstructions/000883.htm#:~:text=Risks%20of%20Taking%20Multiple%20Medicines&text=You%20may%20be%20more%20likely,higher%20risk%20for%20drug%20interactions

UW Health. (2019, May 22). *The Healing Power of Music*. News | UW Health. Retrieved August 2, 2022, from https://www.uwhealth.org/news/the-healing-power-of-music

Walworth, D. D. L. (2005). Procedural-support music therapy in the healthcare setting: A cost–effectiveness analysis. *Journal of Pediatric Nursing*, 20(4), 276–284. https://doi.org/10.1016/j.pedn.2005.02.016

Wong, C. (2021, July 14). *What Is Music Therapy?* Verywell Mind. Retrieved August 7, 2022, from https://www.verywellmind.com/benefits-of-music-therapy-89829