J. Pharm. Res. 2024;23(3):157–163

Print ISSN: 0973-7200
Online ISSN: 2454-8405

Journal of Pharmaceutical Research

RESEARCH ARTICLE

Melodic Medicine: To Evaluate Cause and Effect Relationship of Music on the Quality of Headache in Subjects with Migraine

Simranjeet Kochar[1], Varun Pareek[1], Lokendra Sharma[1], Susheel Kumar[1,*]

[1]*Department of Pharmacology, RUHS College of Medical Sciences, Jaipur, 302033, Rajasthan, India*

ARTICLE INFO

Article history:
Received 06.08.2024
Accepted 14.09.2024
Published 14.10.2024

* *Corresponding author.*
Susheel Kumar
susheelpn72@gmail.com

https://doi.org/10.18579/jopcr/v23.3.74

ABSTRACT

Recurrent, intense headaches that are accompanied by a number of other symptoms are the hallmark of the complicated neurological illness known as Migraine. This research focuses on finding a therapeutic relationship between Migraine and Music. Music therapy, a specialised field that employs music to address physical, emotional, cognitive, and social needs of individuals, has gained traction in diverse medical settings. We have taken in account several musical characteristics like duration of listening, category of music, effectiveness of music in improving the migraine associated pain, gender wise differences in music listening habits, and many more. Between August 31, 2023, and October 6, 2023, a Pan-India cross-sectional analysis was carried out across several medical colleges in India. A self-administered questionnaire was utilised to collect data using web-based links and statistical analysis was made using appropriate tools. All participants were 18 years old or older, moreover all of them were enrolled in MBBS colleges in India. A total of 384 students participated in the study (170 Females and 214 Males). With the help of Headache Screening Questionnaire (HSQ) 8.41% males and 13.52% females are suspected migraine patients. Furthermore, the type of music preferred by subjects and the duration of music listening was taken into account. Then, the Chi-squared value was obtained as 4.40649125 and with the help of the same, P-value was obtained to be 0.110449. The p-value < 0.05, indicating that the result is not statistically significant. While this study did not find a robust relationship between music and migraine pain relief, future research with more advanced tools and a larger sample size could potentially uncover a significant association. The current findings suggest that music may play a modest role in the therapeutic management of migraine pain. However, further exploration is warranted, as music therapy holds promise as a fascinating complementary approach that could aid in migraine treatment with minimal or no medication. Delving deeper into the psychological and neurological mechanisms underlying music's perceived efficacy in migraine management may elucidate its true therapeutic potential.

Keywords: Migraine; Music Therapy; Migraine Treatment; Music; Migraine

INTRODUCTION

Migraine headaches severely impact quality of life, characterized by recurrent attacks of severe headache with symptoms like nausea, vomiting, and sensitivity to light and sound. The prevalence increases with age, affecting up to 11.6% of adolescents, with a 2:1 female to male ratio after puberty. While medications provide relief for some, others experience limited benefits or intolerable side effects. As a result, researchers are exploring complementary approaches like music therapy to not only alleviate migraine symptoms but improve overall well-being.[1–3]

Music has long been recognized for its effects on human psychology and physiology. It can influence the autonomic nervous system, modulating neurotransmitters involved in pain and mood. Music engages brain regions related to emotion, attention, memory, and reward, facilitating pain modulation, and enhancing coping mechanisms. Several studies demonstrate music's benefits for pain management across different conditions.[4–6]

In the context of migraines, limited research suggests music may reduce headache intensity, duration, and frequency. A pilot study found listening to self-selected music decreased pain and need for medication during acute migraines.[7,8] A randomized trial revealed pleasant music

KRUPANIDHI COLLEGE OF PHARMACY

significantly reduced pain levels compared to controls. While promising, the underlying mechanisms of music's therapeutic effects on migraines are largely unexplored.[9–11]

Understanding neurophysiological and psychological processes involved is crucial for optimizing music interventions and developing personalized migraine management approaches.[12–14] Factors like individual preferences, musical characteristics, timing, and duration may influence outcomes. Investigating synergies between music and techniques like relaxation or cognitive-behavioral therapy could enhance overall effectiveness.[15–17]

This research aims to explore the relationship between music and migraine relief, shed light on effective music types, and study incorporating music as an adjunctive therapy. We consider characteristics like listening duration, music category, and effectiveness in improving migraine-associated pain. By conducting comprehensive studies and trials, we aim to deepen understanding of music's therapeutic potential for managing migraines and contribute to evidence-based interventions that can improve well-being and quality of life for those suffering from this debilitating condition.[18–20]

MATERIALS AND METHODS

- **Study Design:** This was a cross-sectional study conducted among MBBS students at medical colleges in India. Written consent was obtained from all participants before their results were used in this research. The data were collected through questionnaires made on Google Forms. A preliminary search was performed through PubMed and Google Scholar.
- **Inclusion criteria:** All participants were 18 years old or older. Patients should be enrolled in MBBS courses at Indian medical colleges.
- **Exclusion criterion:** The exclusion criterion was age younger than 18 years. Students not enrolled in MBBS courses at Indian medical colleges.
- **Sampling Method:** All the eligible participants were recruited directly for the study; hence, no sampling was needed.

The sample size was calculated based on the following formula (for an infinite population):[21]

$$S = Z2 \times P \times (1 - P)/M2$$

where, S=sample size for an infinite population, Z=Z score, P=population proportion (assumed to be 50% or 0.5), and M=margin of error. Given the following: Z=1.960, P=0.5, M=0.05 (we have taken the confidence level as 95% and the margin of error as 5%). Thus, the sample size was calculated to be 384.16.

- **Study Tool: Questionnaire**- The questionnaire had various sections and included demographic details, headache screening, headache characteristics, headache relief factors, music screening, and music characteristics.

Table 1: Headache Questionnaire

1	How often in your life have you had a headache?
2	How long does your headache last when you do not take any medication?
3	What is the presentation of your headache?
4	What word would you use to describe your headache?
5	Does your headache aggravate by physical activity like climbing stairs/walking?
6	Do you experience nausea or vomiting associated with your headache?
7	Do you experience photophobia(discomfort or pain induced by light) when you have headache?
8	Do you experience phonophobia(discomfort or pain induced by sound) when you have headache?

- **Ethical Considerations:** Ethical approval was obtained. Written consent was obtained from all eligible participants. The aim and nature of this research were explained to the participants beforehand.

Table 2: Consent Statement

Consent Statement	Response
I understand that all the information provided by me will remain confidential and submitted information will not be shared with anybody. Information provided will be published as research study, poster presentation and academic articles etc. I confirm my consent to allow the use of the above information for the purpose of the study and that I understand, appreciate and can reason through all the information provided to me regarding the questionnaires and the objective of this study.	Yes/No

- **Statistical analysis:** The obtained data were analysed through the Microsoft Excel toolpak extension.

RESULTS

There were 384 students who participated in this study. All of them provided written consent and agreed to participate in the study. A total of 170 females participated in the study, and 214 males participated in the study- for 44.27 % and 55.79%, respectively (Figure 1).

Among the students in the 1st year are 229 i.e. 59.63 %, from 2nd year are 110 i.e. 28.64 %, from 3rd year are 18 i.e. 4.86 %, from 4th year are 21 i.e. 5.46 % and from internship are 11 i.e. 2.86% (Figure 2).

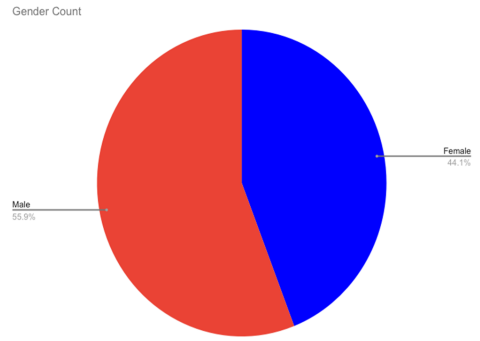

Fig. 1: Number of males and females who participated in the study

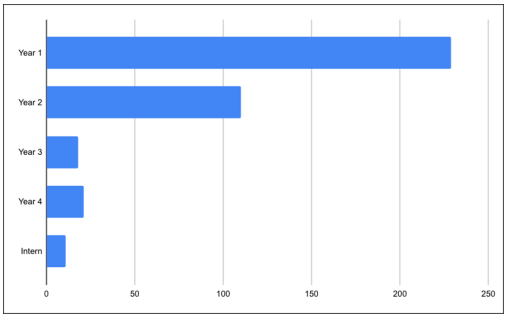

Fig. 2: Pictorial representation of students in various years of experience with the MBBS

Most students experienced headaches in their day-to-day lives. In total, 271 (72.65%) students used music therapeutically to aid headache. Out of 271 students, 85 (i.e. 21.9%) preferred listening to Rhythm & Blues, 82 (i.e. 21.6%) preferred listening to classical music, 72 (i.e. 18.8%) preferred Rock music and 25 (i.e. 6.5%) preferred Jazz, 9 (i.e. 2.3%) preferred Techno, 9 (i.e. 2.3%) preferred Opera and 102 (i.e. 25.6%) other types of music (Figure 3).

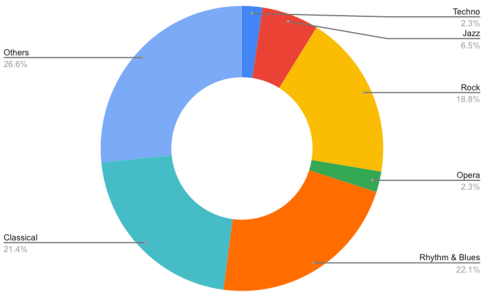

Fig. 3: Type of music preferred by students

When the numbers of students with no migraine, probable migraine and migraine were compared by sex, the following results were obtained (Figure 4):

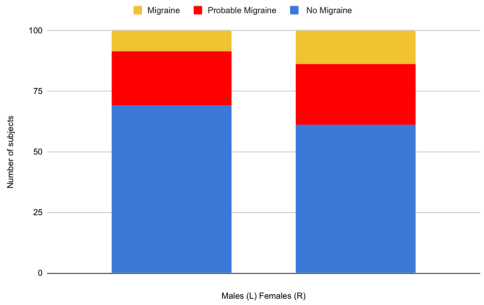

Fig. 4: Gender wise distribution of students with 'no migraine', 'probable migraine' and 'migraine'

The observatory results indicated that there are a total of 214 Males and 170 Females as a part of this study. Out of 214 Males, the number of 'No Migraine' males are 148, 'Probable Migraine' males are 48 and 'Migraine males' are 18 whereas, out of 170 Females the number of 'No Migraine' females are 104, 'Probable Migraine' females are 43 and 'Migraine' females are 23.

Percentage of Males with 'no migraine', 'probable migraine' and 'migraine' are represented in the pie chart as follows (Figure 5):

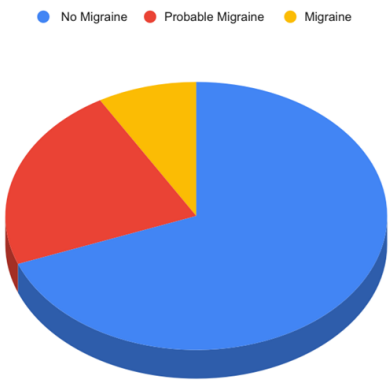

Fig. 5: Comparison of the percentages of males with 'no migraine', 'probable migraine' and 'migraine'

The percentages of Females with no migraine, probable migraine and migraine are represented in the pie chart as follows (Figure 6):

Furthermore, a comparative pictorial representation of the type of music preferred by male and female subjects/students was derived as follows (Figure 7):

In particular, male students mostly preferred classical and other music types whereas the least preferred music type was opera. This information is represented in the following graph (Figure 8).

Compared to Female students, the most preferred music type was Rhythm & Blues, followed by Others, whereas the

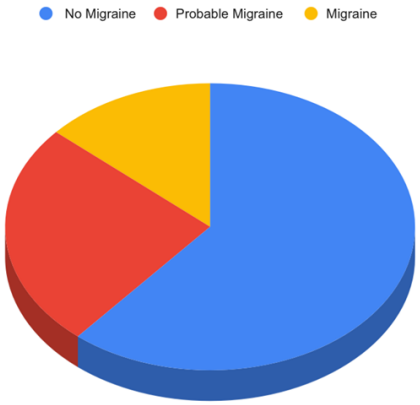

Fig. 6: Comparison of Females with 'no migraine', 'probable migraine' and 'migraine'

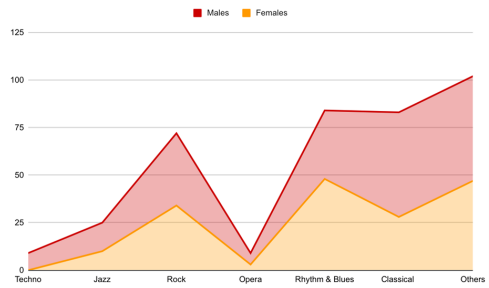

Fig. 7: Graphical representation comparing varying music types preferred by male and female students

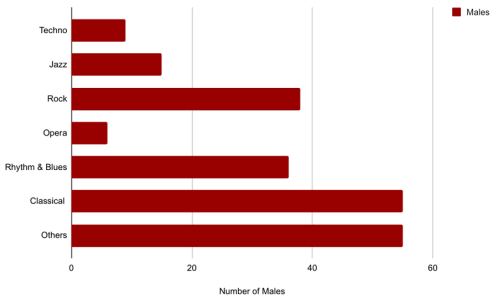

Fig. 8: Type of Music preferred by Males

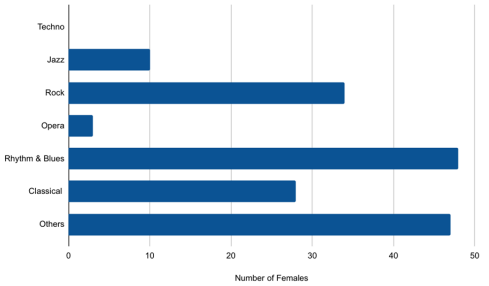

Fig. 9: Type of music preferred by females

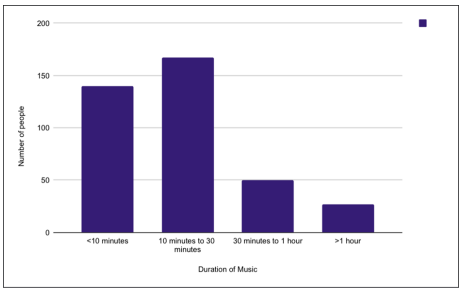

Fig. 10: Duration of music preferred by students

When asked about the effectiveness of music over time, it was maintained at 261 (67.96%) students but declined at 123 (32.03%) students. Of the total students who opted maintained effectiveness on a scale of 1 to 5 (1 being least effective and 5 being most effective), 190 (49.47%) opted for 2, and for the students who opted to decline effectiveness, 196 (51.04%) opted for 1 (least decline in effectiveness) (Table 3).

Table 3: Improving the effectiveness of music

Row Labels	Count of Name
1	158
2	190
3	36
4	0
5	0
Grand Total	**384**

On a scale of 1 to 5 (1 being the slightest improvement and 5 being the maximum improvement)

least preferred music type was Techno in females compared to Opera in males. The graphical representation as follows (Figure 9):

The majority 167 (43.48%) of the students listened to music for a duration of 10 minutes to 30 minutes, 140 (36.45%) of the students listened to music for a duration of less than 10 minutes, 50 (13.02%) of the students preferred a duration of 30 minutes to 1 hour and 27 (7.03%) preferred more than one hour (Figure 10).

190 students opted for 2 i.e., the effectiveness of music in treating their migraine pain was moderately improved but 158 students opted for 1; i.e., the defectiveness of music in treating their migraine pain showed slight improvement (Table 4).

196 students opted for 1, i.e., the effectiveness of music in treating their migraine pain declined slightly whereas 155 students opted for 2, i.e., the effectiveness of music in treating their migraine and pain declined moderately.

Table 4: Declining effectiveness of music

Row Labels	Count of Name
1	196
2	155
3	33
4	0
5	0
Grand Total	**384**

On a scale of 1 to 5 (1 being the least declinement and 5 being the maximum declinement)

Table 5: Study Results vs. Expected Values

Effect of music	No Migraine		Probable Migraine		Migraine	
	Study Results	Expected	Study Results	Expected	Study Results	Expected
1	182	174.5625	55	63.03646	29	28.40104
0	70	77.4375	36	27.96354	12	12.59896
Total	252		91		41	

Table 6: The Chi-squared Analysis

Effect of music	No Migraine	Probable Migraine	Migraine
1	0.316886	1.02456	0.012632
0	0.714336	2.309602	0.028475

Table 7: Results for P-value

DOF	2
Chi-squared	4.40649125
P-value	0.110449

A comparison between the study results and expected values for the effect of music on no migraine subjects, probable migraine subjects and migraine subjects is shown in Table 5. Here, 1 denotes improvement in migraine pain with the use of music and 0 denotes worsening of migraine pain with the use of music. As per the collected responses from MBBS students, 182 non migraine subjects experienced improvement in Migraine pain with use of music and the expected result for the same was calculated to be 174.5625 whereas in 70 No migraine subjects worsening of migraine pain was seen and the expected result for the same was calculated to be 77.4375. For Probable Migraine subjects, 55 subjects saw improvement in pain with use of Music, the expected results for the same was 63.03646 and 36 subjects experienced worsening of pain, the expected result for that was 27.96354. In the case of Migraine subjects, 29 subjects saw improvement in pain when paired with music, the expected result as per calculation is 28.40104 and 12 subjects experienced worsening of pain, the expected result for that was 12.59896.

Results of the Chi-squared analysis are depicted in tabular form in Table 6. Here as well, 1 denotes improvement in migraine pain with use of music and 0 denotes worsening of migraine pain with use of music. The obtained results were further used to calculate p-value for this research.

Furthermore, Table 7 depicts final results as per Degree of Freedom=2, Chi-squared value was obtained as 4.40649125 and P-value obtained to be 0.110449, The P-value is 0.110449. The result is not significant at $p < .05$.

DISCUSSION

A study with similar objectives was performed in 2021 by G. Parlongue et al. Comparing the results obtained with the results of this research:

Both studies highlight the potential of music as a therapeutic intervention for migraines. While this study examines the subjective experiences and preferences of people who use music for migraine relief, the pilot study offers quantitative proof of the efficacy of a particular music intervention, taking into account various genres of music such as Rhythm and Blues, Classical, Opera, etc.

By examining how long students listened to music, this study further emphasised the customised nature of music therapy. The distribution of preferences suggests that there is no single ideal duration for using music to relieve migraines, which emphasises the need for a tailored approach when using music therapy.

As per the research performed by G. Parlongue et al. on smartphone-based music intervention for the treatment of episodic migraine headaches in 2021, the primary outcome was focused on the frequency of migraine attacks whereas; in this research, the primary aim was to investigate the effect of music on managing migraine. Both studies have significant value in terms of treating migraine pain and establishing a causal relationship between migraine and music.

Comparing the P-values obtained in both studies: The P-value of the study performed by Guilhem Parlongue et al. in 2021 was 0.01, wherein the frequency of migraine attacks was considered based on smartphone-based music intervention, whereas the P-value obtained in this research was 0.11, wherein the effect of music was considered to occur on migraine subjects, probable migraine subjects and no migraine subjects. Both of these values show a significant difference. The probable reason for this difference might be increased awareness of the use of music in migraine treatment, which is the purpose of this research.

Together, both of these studies provide a comprehensive understanding of how music can be used to effectively manage migraines and lessen the need for conventional medications, especially when applied in certain specific sequences or customised to the needs of the individual. The results support additional research and the incorporation of music therapy into migraine prevention techniques to treat migraine patients with minimal pharmacological

intervention.

Comparing this research with that of another study performed by AAG Sanchez et al. on music therapy as a migraine treatment in 2021; the latter focused on the effectiveness of music therapy as a single or coadjuvant treatment in patients with migraine attacks ; however, in this research, there were only two variables, improvement or worsening of migraine pain, associated with the use of music as a therapeutic intervention. The findings of the by AAG Sanchez et al. are consistent with the findings of this study because both of these studies aimed to determine the effectiveness of music therapy for the treatment of migraine.

A similar study titled Music therapy for chronic headaches was performed in 2001. Evaluation of music therapeutic groups for patients suffering from chronic headaches by M Risch et al. Citing from the abstract results of that research, the comparison of the statistical means directly before and after the treatment did not reveal many therapeutic effects. However, 6-12 months later many patients reported fewer days at which they suffered from headaches, and they also significantly improved their ability to control their pain. These findings correlate with the results of the present study, as music can be used for therapeutic management of migraine if done under proper guidance.

CONCLUSION

An interesting field of research that explores alternative remedies for a common and frequently incapacitating ailment is the therapeutic potential of music in migraine management. This study sheds light on the preferences, experiences, and perceived efficacy of music therapy among students who suffer from migraines by investigating the connection between music and migraine relief.

The information that was provided demonstrated a notable tendency among students to use music as a therapeutic means of reducing migraine symptoms. A significant proportion of the students, specifically 72.65%, used music as a headache relief technique. This clear preference for music therapy emphasizes how valuable and perhaps effective music is at reducing migraine symptoms.

The musical genres that students choose to listen to when they are suffering from migraines reveal a range of tendencies. Different genres are preferred by different percentages of students who use music therapeutically: 21.9% choose Rhythm & Blues, 21.6% choose Classical, 18.8% choose Rock, and fewer choose Jazz, Techno, Opera, and other genres. This variation in preferences highlights how subjective music selection is when used therapeutically, implying that personal preferences and views are key factors in its efficacy.

Additionally, there is variation in the length of time students spend listening to music; 43.48% of them choose a duration of 10 to 30 minutes. This distribution highlights the individualised nature of music therapy by showing that there is no single optimal length for obtaining migraine relief with music.

Students' reports of music's perceived effectiveness over time show a fairly balanced viewpoint. A sizable minority (32.03%) claimed that music's effectiveness in treating migraines has decreased, despite the majority (67.96%) believing it to be still useful. On a scale of 1 to 5, 49.47% of those who felt their effectiveness had been maintained chose a moderate improvement rating of 2. On the other hand, 51.04% of those who reported a decline selected the lowest rating (1) for the least amount of efficacy decline.

These results highlight the complex connection between music therapy and migraine prevention. They propose that although a sizable fraction of students benefit from music therapy and that it will continue to be helpful over time, a significant subset of students report that it is becoming less useful.

In summary, important insights into the subjective character of this alternative treatment are provided by research on the therapeutic potential of music in migraine management. It draws attention to how different music genres and listening times are preferred by students who are looking for migraine relief. Furthermore, the complex views regarding efficacy—a considerable fraction of which have reported sustained efficacy, although others have reported a decline—highlight the variation in people's reactions to music therapy for migraines.

Subsequent studies may explore the precise processes by which various musical genres or lengths affect the alleviation of migraines. Furthermore, investigating the psychological and neurological aspects underlying music's perceived effectiveness in migraine management could provide deeper insights into its therapeutic potential. Overall, this study paves the way for further investigation and potential integration of music therapy as a complementary approach to migraine management.

LIMITATIONS OF THE STUDY

This research was not conducted at an international level; rather it was solely observational. The results are derived from individual perceptions, so the final outcome may not be entirely accurate. The study was limited by a small to medium sample size; therefore, the findings cannot be generalized to a larger population. The results may not be relevant or applicable outside of the exact situations that were examined in this study.

ACKNOWLEDGEMENT

The author acknowledges the contribution and support provided by the Department of Pharmacology, RUHS College of Medical Sciences, Jaipur.

REFERENCES

1. Damen L, Bruijn J, Verhagen AP, Berger MY, Passchier J, Koes BW. Prophylactic treatment of migraine in children. Part 2. A systematic review of pharmacological trials. *Cephalalgia*. 2006;26(5):497–505. Available from: https://doi.org/10.1111/j.1468-2982.2005.01047.x.
2. Evans RW, Seifert T, Kailasam J, Mathew NT. The use of questions to determine the presence of photophobia and phonophobia during migraine. *Headache*. 2008;48(3):395–397. Available from: https://doi.org/10.1111/j.1526-4610.2007.00920.x.
3. Huntsman DD, Bulaj G. Healthy Dwelling: Design of Biophilic Interior Environments Fostering Self-Care Practices for People Living with Migraines, Chronic Pain, and Depression. *International Journal of Environmental Research and Public Health*. 2022;19(4):1–16. Available from: https://doi.org/10.3390/ijerph19042248.
4. Koenig J, Oelkers-Ax R, Kaess M, Parzer P, Lenzen C, Hillecke TK, et al. Specific music therapy techniques in the treatment of primary headache disorders in adolescents: a randomized attention-placebo-controlled trial. *The Journal of Pain*. 2013;14(10):1196–1207. Available from: https://doi.org/10.1016/j.jpain.2013.05.006.
5. Milde-Busch A, Kries RV, Thomas S, Heinrich S, Straube A, Radon K. The association between use of electronic media and prevalence of headache in adolescents: results from a population-based cross-sectional study. *BMC Neurology*. 2010;10:1–10. Available from: https://doi.org/10.1186/1471-2377-10-12.
6. Jha T, Pawar A, Jha KM, Monga M, Mondal S, Gandhi A, et al. The Effect of Indian Classical Music on Migraine Episodes in Young Females of Age Group 18 to 23 Years. *Music and Medicine* . 2015;7(4):24–31. Available from: http://dx.doi.org/10.47513/mmd.v7i4.154.
7. Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia*. 2004;24(Suppl 1):9–10. Available from: https://doi.org/10.1111/j.1468-2982.2003.00824.x.
8. Lyngberg AC, Rasmussen BK, Jørgensen T, Jensen R. Incidence of primary headache: a Danish epidemiologic follow-up study. *American Journal of Epidemiology*. 2005;161(11):1066–1073. Available from: https://doi.org/10.1093/aje/kwi139.
9. Sajobi TT, Amoozegar F, Wang M, Wiebe N, Fiest KM, Patten SB, et al. Global assessment of migraine severity measure: preliminary evidence of construct validity. *BMC Neurol*. 2019;19(1):1–9. Available from: https://doi.org/10.1186/s12883-019-1284-8.
10. Bagley CL, Rendas-Baum R, Maglinte GA, Yang M, Varon SF, Lee J, et al. Validating Migraine-Specific Quality of Life Questionnaire v2.1 in episodic and chronic migraine. *Headache*. 2012;52(3):409–421. Available from: https://doi.org/10.1111/j.1526-4610.2011.01997.x.
11. Antonaci F, Nappi G, Galli F, Manzoni GC, Calabresi P, Costa A. Migraine and psychiatric comorbidity: a review of clinical findings. *The Journal of Headache and Pain*. 2011;12(2):115–125. Available from: https://doi.org/10.1007/s10194-010-0282-4.
12. Risch M, Scherg H, Verres R. Music therapy for chronic headaches. Evaluation of music therapeutic groups for patients suffering from chronic headaches. *Schmerz*. 2001;15(2):116–125. Available from: https://doi.org/10.1007/s004820170035.
13. Feigin VL, Vos T, Nichols E, Owolabi MO, Carroll WM, Dichgans M, et al. The global burden of neurological disorders: translating evidence into policy. *The Lancet Neurology*. 2020;19(3):255–265. Available from: https://doi.org/10.1016/s1474-4422(19)30411-9.
14. Harpole LH, Samsa GP, Jurgelski AE, Shipley JL, Bernstein A, Matchar DB. Headache management program improves outcome for chronic headache. *Headache*. 2003;43(7):715–724. Available from: https://doi.org/10.1046/j.1526-4610.2003.03128.x.
15. Chanda ML, Levitin DJ. The neurochemistry of music. *Trends in Cognitive Sciences*. 2013;17(4):179–193. Available from: https://doi.org/10.1016/j.tics.2013.02.007.
16. Soto D, Funes MJ, Guzmán-García A, Warbrick T, Rotshtein P, Humphreys GW. Pleasant music overcomes the loss of awareness in patients with visual neglect. *Proceedings of the National Academy of Sciences of the United States of America*. 2009;106(14):6011–6016. Available from: https://doi.org/10.1073/pnas.0811681106.
17. Terry PC, Karageorghis CI, Saha AM, D'Auria S. Effects of synchronous music on treadmill running among elite triathletes. *Journal of Science and Medicine in Sport*. 2012;15(1):52–57. Available from: https://doi.org/10.1016/j.jsams.2011.06.003.
18. Kemper KJ, Danhauer SC. Music as therapy. *Southern Medical Journal*. 2005;98(3):282–288. Available from: https://doi.org/10.1097/01.smj.0000154773.11986.39.
19. Nilsson U. The anxiety- and pain-reducing effects of music interventions: a systematic review. *AORN Journal* . 2008;87(4):780–807. Available from: https://doi.org/10.1016/j.aorn.2007.09.013.
20. Dubé L, Bel JL. The content and structure of laypeople's concept of pleasure. *Cognition and Emotion*. 2003;17(2):263–295. Available from: https://doi.org/10.1080/02699930302295.
21. Aggarwal OP. Bayes and minimax procedures in sampling from finite and infinite populations-I. *The Annals of Mathematical Statistics*. 1959;30(1):206–218. Available from: https://doi.org/10.1214/aoms/1177706376.