

## Acceptability and effects of the raga music listening intervention for blood pressure: a pilot study among the Indian ethnic population in Malaysia

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This study was undertaken with the primary objective of evaluating the feasibility of a raga listening intervention for blood pressure among the Malaysian Indian population. This exploratory study was a single-centered randomized controlled trial consisting of fifty participants. The treatment group was required to listen to raga music daily, twice a day for thirty minutes per session for two weeks. The control group continued their daily activities and was only requested not to listen to raga music. Blood pressure was measured at the start and end of the two-week intervention period. The Depression, Anxiety and Stress Scale-21 was used to evaluate mood parameters. All participants in the treatment group complied and adhered to the required intervention. There was no statistically significant difference in systolic, diastolic blood pressure and heart rate between the treatment and control groups (p-values of 0.822, 0.937 and 0.861). A statistically significant decline in blood pressure was observed within the treatment group (-11.48 mmHg for systolic, -5.61 mmHg for diastolic blood pressure), but not in the control group. There was a significant decrease in stress scores in the treatment group with a p-value of 0.027 at post-intervention compared to the control group. Within the treatment group, there was a significant decrease in depression, anxiety, and stress scores (p-value<0.001 throughout). No adverse effects were reported. Raga music therapy in this setting was feasible. The result of this study lays the foundation to support future studies to determine its effectiveness.

**Keywords:** Blood pressure, Hypertension, Indian classical music, Raga listening

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Music listening for managing blood pressure is a potentially effective intervention<sup>1-3</sup>. The International Society of Hypertension recommended music listening as one of the non-pharmacological interventions for blood pressure management<sup>4</sup>. Several theories may explain the mechanisms behind music-based interventions for cardiovascular health. The literature suggests emotion as an impetus for cardiovascular activity. Koelsch and Jäncke (2015) outlines the possible mechanisms that influence emotions and ultimately evoke a cardiovascular response<sup>5</sup>. Firstly, music is a catalyst for dopaminergic activity in the mesolimbic system providing a source of pleasure for the listener. Secondly, music may give rise to emotional modulation such as anxiety or relaxation which occurs when hormone levels of angiotensin II and adrenaline are influenced, which in turn affects blood pressure. Thirdly, blood pressure may be influenced by one's frequency and depth of breathing which are also affected by emotions<sup>5</sup>.

Various genres of music including Western classical, Pop, Turkish classical, Indonesian classical and Indian classical music have been assessed for their effect on blood pressure<sup>6-9</sup>. Trappe & Voit<sup>8</sup> reported an almost 5 mmHg decrease in systolic blood pressure after 25 min of music listening. Mozart's music also exhibited the highest decline in systolic blood pressure when compared to Strauss, ABBA and silence. Bekiroglu and colleagues reported a decrease of 13 mmHg in (systolic) pressure and 10 mmHg in (diastolic) pressure after daily listening to Turkish classical music for twenty-five minutes throughout twenty-eight days. Researchers have conducted evidence synthesis on music listening and its efficacy regarding blood pressure reduction across different genres<sup>1,2,10</sup>. However, only a limited number of clinical studies have been conducted on the effects of raga music on blood pressure, and when reported were primarily centered in India<sup>11-14</sup>.

Raga Chikitsa translated to 'Raga Treatment' is explored in this study as an intervention for its potential application for managing blood pressure.

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Being an integral component of the classical music landscape of India, the raga system forms the melodic foundation of this ancient form of music. A raga is a set of pitches forming a melody within a specific framework<sup>15</sup>. Infinite combinations can be generated with the raga system, creating a unique raga each time. Research has suggested that culturally familiar music yields greater results in terms of the reduction of blood pressure than non-culturally familiar music<sup>16</sup>. The focal aim of this study was to evaluate the feasibility of the raga music intervention among the Indian ethnic population living in Southeast Asia.

### Materials and Methods

This study was conducted at a university hospital in Kuala Lumpur, Malaysia. Recruitment for this study commenced on 4 January 2023 and ended on 5 May 2023 with informed consent obtained and the privacy rights of participants observed. Participant recruitment was conducted through social media and hospital notice boards. Those eligible were 45 years of age and above, Indian ethnicity, had access to a smartphone, and were non-smokers. Individuals who had cognitive impairment which impaired the person's ability to provide consent independently, had hearing impairment, had severe hypertension which entailed a systolic reading of  $\geq 180$  mmHg and/or a diastolic reading of  $\geq 120$  mmHg or were prescribed two or more anti-hypertensives were excluded. The literature recommends a sample size between 12<sup>17</sup> to 35<sup>18</sup> in each group for a pilot study. Furthermore, as this study was primarily a pilot-exploratory study, with a focus on feasibility rather than hypothesis testing, the sample size was calculated pragmatically. Limitations such as projected recruitment and resources were also taken into consideration while determining sample size. Taking all these factors into account, the sample size was set at 50, with the treatment and control arm having 25 participants each.

The participants were randomized with a ratio of (1:1) to either the treatment (raga listening) or control group using Sealed Envelope<sup>19</sup> (<https://www.sealedenvelope.com/>). The treatment group (raga listening) was instructed to listen via earphones to the raga music daily for two weeks around the same time each day. The research team gave instructions to listen to the raga music twice daily, for thirty minutes per session with a gap of at least six hours between the two sessions. The raga music was a 30-min instrumental flute piece set in raga Bhimpalas

by Rakesh Chaurasia. This totaled 840 min across 28 raga listening sessions. They were instructed to choose a calm environment and to either be seated or lie down while listening to the music. Participants were contacted every three days to address any queries or issues. Those randomized to the control group were instructed to continue their daily routine, except to avoid listening to raga music while in the study.

Once informed consent was obtained, baseline assessments were taken on their characteristics, music listening habits, blood pressure reading, and Depression, Anxiety and Stress Scale (DASS-21)<sup>20</sup>. Raga music exposure was categorized based on limited or low exposure (does not listen to raga music or less than once a week), medium exposure (once a week), moderately high (twice a week) and very high exposure (three times a week and above). Participants also reported their physical activity level based on three categories which were low, moderate and high. Low was defined as  $< 30$  min per week, moderate was 30 to 90 min weekly, and high was  $> 90$  min weekly. Blood pressure measurement was done using a digital blood pressure monitor; an OMRON HEM-7156. Participants were requested to rest while sitting for ten minutes before their blood pressure was recorded. Blood pressure recordings were repeated thrice with two-minute intervals between recordings where the average was established as the finalized value. Participants randomized to the treatment group were asked to maintain a listening log. After two weeks, the participants returned to have their blood pressure and DASS-21 recorded. Those randomized to the treatment group were asked to complete a questionnaire of their experience.

Findings where appropriate were reported descriptively. A comparison of categorical variables was done using the chi-square test. Based on their distribution, continuous variables were compared using the independent and paired t-test for between and within-group comparisons, respectively. An assessment of normality was conducted using the Shapiro-Wilk test. Feasibility of this intervention was primarily determined by the participants' recordings of their raga music listening sessions in their listening logs. The SPSS (Statistical Package for Social Sciences) version 29.0.1.0 (171) was used for statistical analysis. The study was approved by the Universiti Malaya Medical Centre Medical Research Ethics Committee; MREC ID NO: 2022103-11589 on the 3<sup>rd</sup> of December 2022.

**Results**

A total of 50 participants were recruited as illustrated in the diagram below (Fig. 1). The treatment and control arm shared similar participant characteristics (Table 1).

Adherence to raga listening based on the listening log was high. All participants in the treatment group completed all the required total listening time within the 28 raga listening sessions. Participants strongly agreed that raga listening was enjoyable and relaxing, the frequency and duration of listening acceptable, and that they would be keen to listen to other types of raga music. However, only 28% were acceptant of the use of earphones. All participants attended their follow-up visit.

Baseline blood pressure and DASS-21 scores were similar in both groups as shown in (Table 2). In relation to blood pressure, no statistically significant difference was observed between the 2 groups post-intervention. Within the treatment group, a mean (SD) decrease in systolic pressure of 11.48 (8.07) mmHg (p-value<0.001) was observed while a decrease in diastolic pressure of 5.61 (4.52) mmHg (p-value<0.001) was seen. There was no reduction that was observed in the control arm. There was no significant difference in stress, anxiety and depression

at baseline for the two groups (Table 2). After two weeks, those in the treatment group reported lower stress levels.

Comparing changes within the respective groups at the point of baseline and follow-up, changes were seen only in the treatment group. The depression, anxiety and stress categories exhibited a significant fall in scores in the treatment arm only. Within the treatment group, the decrease in scores for the three categories of depression, anxiety and stress in mean (SD) were 5.76 (6.54), 6.24 (6.01) and 9.12 (7.79) points respectively (p-value<0.001). There were no adverse events that were reported in this study.

**Discussion**

There is potential for raga listening as an adjunct method to manage blood pressure. This study has

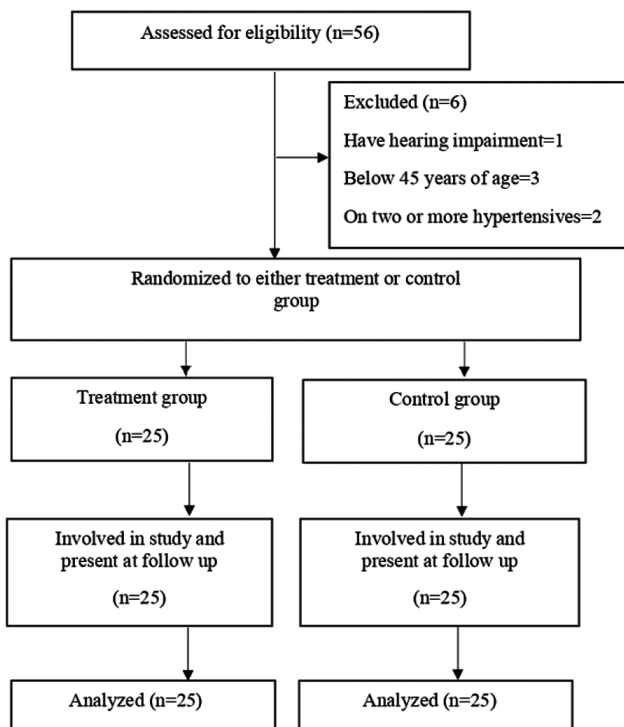


Fig. 1 — Schematic illustration of participants in the study

Table 1 — Comparison of characteristics of participants between the treatment and control group

Variables	Total n = 50	Treatment group n = 25	Control group n = 25	p-value
Age (mean, SD) years	60.4, 7.6	60.7, 7.2	60.0, 8.1	0.899
Body mass index (mean, SD) kg/m <sup>2</sup>	26.1, 2.9	26.3, 3.2	25.9, 2.8	0.421
Gender				0.569
Male	28 (56)	15 (60)	13 (52)	
Female	22(44)	10 (40)	12 (48)	
Health habits				
Ex-smoker	4 (8)	3 (12)	1 (4)	0.297
Alcohol consumers	15 (30)	7 (28)	8 (32)	0.758
Physical activity <sup>1</sup>				0.690
Low	11 (22)	6 (24)	5 (20)	
Moderate	21 (42)	9 (36)	12 (48)	
High	18 (72)	10 (40)	8 (32)	
Health history				
Hypertension	29 (58)	17 (68)	12 (48)	0.152
Diabetes mellitus	12 (24)	7 (28)	5 (20)	0.508
Ischemic heart disease	4 (8)	2 (8)	2 (8)	1.000
Stroke	2 (4)	1 (4)	1 (4)	1.000
Medication history	26	14	12	0.571
Participants on antihypertensives	26 (52)	14 (56)	12 (48)	0.321
ACE inhibitor <sup>2</sup> /ARB <sup>3</sup>	5 (10)	4 (16)	1 (4)	
Beta blocker	4 (8)	3 (12)	1 (4)	
Calcium channel blocker	17 (34)	7 (28)	10 (40)	
Diuretic	0 (0)	0 (0)	0 (0)	
Exposure to raga music <sup>4</sup>				0.242
Low	39 (78)	18	21	0.242
High	11 (22)	7	4	0.306

1 Physical activity, low (< 30 min per week), moderate (30 to 90 min per week), high (>90 min per week)

2 Angiotensin-converting enzyme

3 Angiotensin receptor blockers

4 Exposure to raga music, low =Listens to raga music once a week or less, high = (twice a week or more)

Table 2 — Group comparisons of pre-intervention and post-intervention data for cardiovascular and mood parameters

	Treatment group (n = 25)	Control group (n = 25)	p-value
Baseline, mean (SD)			
SBP	144.55 (12.38)	130.99 (11.94)	0.527
DBP	85.56 (9.54)	82.24 (8.42)	0.770
HR	78.80 (11.81)	79.61 (11.83)	0.603
Follow up, mean (SD)			
SBP	133.07 (11.18)	132.44 (11.83)	0.822
DBP	79.95 (8.89)	82.43 (8.81)	0.937
HR	75.61 (10.80)	79.07 (11.38)	0.861
Baseline, mean (SD)			
Depression	13.76 (11.38)	17.76 (10.20)	0.825
Anxiety	14.56 (10.51)	11.20 (8.64)	0.513
Stress	26.24 (11.95)	26.72 (12.37)	0.957
Follow up, mean (SD)			
Depression	8.00 (7.66)	20.16	0.165
Anxiety	8.32 (7.48)	14.08 (9.53)	0.293
Stress	17.12 (9.53)	26.24 (14.29)	0.027

SBP = Systolic blood pressure  
DBP = Diastolic blood pressure  
HR = Heart rate

reported that it is feasible to deliver such an intervention. There was a high level of acceptability and adherence among the participants. This study's raga listening prescription which was two sessions daily for 30 min each over two weeks was deemed acceptable. A drop was observed in both categories of mood and blood pressure within the treatment group. A Todi raga-based trial has also demonstrated similar outcomes after thirty days of raga exposure with decreases in systolic and also diastolic readings in the raga intervention (treatment) arm. The initial blood pressure (systolic) recorded was 136.3 (2.42) mmHg which decreased to 130.2 (4.21) mmHg post intervention with a p value of <0.001 while no significant difference was observed in the comparator group<sup>14</sup>. The treatment group in the current study exhibited a significant improvement in stress levels in comparison with the control group and a significant within (treatment) group outcome for all three categories of depression, anxiety and stress. Similarly, improvements in mood parameters were observed in a previous study which used raga Bhairavi in a preoperative setting where the participants had raga exposure for thirty minutes for two days. The reported scores in mean (SD) decreased significantly with depression lowering from 22 (0.73) to 17 (0.37),

anxiety from 18 (1.10) to 12 (0.37) and stress from 24 (1.10) to 15 (0.55) all with the p value of <0.0001<sup>21</sup>.

There are some differences between this study and other similar studies. Trials for the raga listening intervention for blood pressure have been conducted mainly in India<sup>9,11,22,23</sup>. This study was the first to look at a Southeast Asian population. Additionally, the majority of studies delivered raga listening in a supervised manner<sup>9,14</sup>. Group listening via a speaker system in a space has been implemented by Sharma *et al.*<sup>24</sup>. In contrast, group listening for two to three participants using headphones was implemented in another study<sup>11</sup>. Raga music administered during medical procedures had the presence of the research team<sup>12,25</sup>. In this study, participants were unsupervised with reminders from the research team every three days. Various forms of raga have been used in such studies<sup>13,14,26</sup>. This study adopted raga Bhimpalās.

Even the listening prescription varied in different studies. For example, Reddy *et al.*<sup>26</sup> conducted raga weekly listening with three sessions (30 min per session) on ten patients. Another study evaluated the raga listening intervention for blood pressure which involved listening for one hour daily for six months, yielding a decline in blood pressure (systolic) that was significant<sup>13</sup>. The prescription adopted in this feasibility study was determined based on a scoping exercise of relevant literature and consensus internally among the research team. The response suggests that this was an acceptable listening prescription.

The usage of earphones was assessed as a variable for acceptance in this study. Earphones have been featured in several studies that evaluated raga music for blood pressure<sup>27-29</sup>. Despite earphones being a common feature in raga listening studies, the acceptability of the earphones has not been systematically studied. The feedback from this study revealed that many were not comfortable with the use of earphones. It could be due to the quality and design of the earphones. However, the questionnaire did not capture the actual reason underpinning this response. It is crucial to note that none of the participants reported having pain or discomfort during this intervention.

This raga listening study was a feasibility study and the effectiveness of raga listening was not the primary aim. There was no significant difference in blood pressure and heart rate changes between the treatment and control group. However, the treatment group did report a decrease in blood pressure and DASS-21 scores, which was not seen in the comparator group. Existing literature has reported improved readings in

blood pressure in raga-based trials<sup>13,25,30</sup>. Padam and team observed an improvement in cardiovascular parameters, with the systolic reading decreasing by 6 mmHg and the diastolic reading by 3 mmHg after a single session of raga listening which occurred during the participants' endoscopy procedure<sup>25</sup>. Meanwhile, in a pre-post assessment conducted during a dental extraction procedure, a systolic decline of 7.84 mmHg and diastolic decline of 6.5 mmHg in the intervention group was reported by Packyanathan *et al*<sup>30</sup>. The impacts of raga music on mood parameters have been investigated in previous studies<sup>31,32</sup>. A similar finding to the present study was reported by Pareek & Shekhawat<sup>33</sup> where stress scores were also observed to have decreased with statistical significance (mean, SD) from 27.5 (3.5) to 18.4 (1.42) after fifteen days with 15 min of daily raga music exposure (p value <0.01).

While this study has contributed to the knowledge gap in these areas, there are several limitations. This study relies on participants' self-reporting their adherence and compliance with the intervention. The participants did provide verbal feedback on possible motivations for the high compliance observed. Many participants reported a heightened interest in raga listening, describing the experience as relaxing and meaningful, as an activity that enabled them to connect to their Indian heritage. As an unsupervised intervention, the study was unable to control the pre-listening physical state, the environment that the raga session was conducted including details like lighting and noise levels, and the psychological and emotional states of the participants. Participants could potentially be doing listening sessions while up and about. Besides that, the control group although asked to avoid listening to raga music, could still be listening to other forms of music. As a feasibility study, only 50 participants were recruited and the study would be unable to conclude much on its effectiveness. This would require a larger sample, calculated to determine any significant reduction in blood pressure.

## Conclusion

The current pilot study was aimed at assessing the feasibility of a self-administered raga-based intervention for blood pressure. The findings indicate that participants reported positive experiences during the intervention and were able to adhere to the raga listening schedule. The observed improvement of

cardiovascular outcomes in the treatment group with a mean (SD) reduction in the systolic reading of 11.48 (8.07) mmHg (p-value<0.001) and diastolic reading of 5.61 (4.52) mmHg (p-value<0.001) demonstrates the potential of this intervention. Additionally, the significant decline in stress levels (p-value 0.027) suggests beneficial effects on mood. Furthermore, the absence of adverse effects further supports the acceptability and feasibility of this intervention. Future studies could include larger samples and improved methods of monitoring adherence, perhaps with the aid of technological tools. Studies that compare supervised and non-supervised raga listening should also be conducted to obtain further insight on the role of instructor involvement in influencing outcomes. The findings support the feasibility of the self-administered raga listening intervention and its potential to be translated into a clinical trial evaluating blood pressure outcomes.

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## Conflict of Interest

The authors declare no conflict of interest.

## Author Contributions

KP: Conceptualization, Data curation and Formal Analysis (equal). Funding Acquisition (lead), Resources (equal) Methodology (equal); Supervision (supporting); Validation (supporting). Writing: original draft and Writing: review and editing (equal), IS & NIS: Conceptualization, Data curation and Formal Analysis (equal). Funding Acquisition (supporting), Resources (equal) Methodology (equal); Supervision (supporting); Validation (supporting); Writing: original draft and Writing: review and editing (equal), TO: Conceptualization, Data curation and Formal Analysis (equal). Funding Acquisition (supporting), Resources (equal); Methodology (equal); Supervision (lead); Validation (lead); Writing: original draft and Writing: review and editing (equal).

### Ethics Statement

This study received ethical approval from the Universiti Malaya Medical Centre Medical Research Ethics Committee; MREC ID NO: 2022103-11589 on the 3<sup>rd</sup> of December 2022.

### Informed Consent

The research team obtained written informed consent from each participant prior to the initiation of study procedures.

### Data Availability

The supporting datasets for this study may be accessed upon reasonable inquiry with the corresponding author.

### References

- Cao M & Zhang Z, Adjuvant music therapy for patients with hypertension: a meta-analysis and systematic review, *BMC Complement Med Ther*, 23 (1) (2023) 110. DOI: 10.1186/s12906-023-03929-6.
- Loomba R S, Arora R, Shah P H, Chandrasekar S & Molnar J, Effects of music on systolic blood pressure, diastolic blood pressure, and heart rate: a meta-analysis, *Indian Heart J*, 64 (3) (2012) 309-313. DOI: 10.1016/S0019-4832(12)60094-7.
- Lorber M & Divjak S, Music therapy as an intervention to reduce blood pressure and anxiety levels in older adults with hypertension: A randomized controlled trial, *Res Gerontol Nurs*, 15 (2) (2022) 85-92. DOI: 10.3928/19404921-20220218-03.
- Charchar F J, Prestes P R, Mills C, Ching S M, Neupane D, *et al.*, Lifestyle management of hypertension: International Society of Hypertension position paper endorsed by the World Hypertension League and European Society of Hypertension, *J Hypertens*, 42 (1) (2024) 23-49. DOI: 10.1097/HJH.0000000000003563.
- Koelsch S & Jäncke L, Music and the heart, *Eur Heart J*, 36 (44) (2015) 3043-3049. DOI: 10.1093/eurheartj/ehv430.
- Bekiroğlu T, Ovayolu N, Ergün Y & Ekerbiçer H C, Effect of Turkish classical music on blood pressure: a randomized controlled trial in hypertensive elderly patients, *Complement Ther Med*, 21 (3) (2013) 147-154. DOI: 10.1016/j.ctim.2013.03.005.
- Eva M, Arimbi Karunia E & Margareta Hesti R, The effect of Java Langgam music therapy as adjuvant therapy towards changes blood pressure in hypertension patients in Puskesmas Depok Ii Sleman Yogyakarta, *J Ners Kebidanan Indon*, 7 (2) (2019) 86-95. DOI: 10.21927/jnki.2019.7(2).86-95.
- Trappe H J & Voit G, The cardiovascular effect of musical genres, *Dtsch Arztebl Int*, 113 (20) (2016) 347-352. DOI: 10.3238/arztebl.2016.0347.
- Ubrangala K K, Kunnavil R, Vernekar M S, Goturu J, Vijayadas, *et al.*, Effect of Indian music as an auditory stimulus on physiological measures of stress, anxiety, cardiovascular and autonomic responses in humans - A randomized controlled trial, *Eur J Investig Health Psychol Educ*, 12 (10) (2022) 1535-1558. DOI: 10.3390/ejihpe12100108.
- do Amaral M A S, Neto M G, de Queiroz J G, Martins-Filho P R S, Saquetto M B, *et al.*, Effect of music therapy on blood pressure of individuals with hypertension: a systematic review and meta-analysis, *Int J Cardiol*, 214 (2016) 461-464. DOI: 10.1016/j.ijcard.2016.03.197.
- Gupta U & Gupta B S, Psychophysiological reactions to music in male coronary patients and healthy controls, *Psychol Music*, 43 (5) (2015) 736-755. DOI: 10.1177/0305735614536754.
- Kotwal M R, Rinchhen C Z & Ringe V V, Stress reduction through listening to Indian classical music during gastroscopy, *Diagn Ther Endosc*, 4 (4) (1998) 191-197. DOI: 10.1155/dte.4.191.
- Kulkarni G B & Chittapur D, Effects of long term Indian classical Raga therapy in reduction of blood pressure among chronic hypertensive patients, *APIK J Intern Med*, 5 (3) (2017) 10-14. DOI: 10.4103/2666-1802.260084.
- Chatterjee S & Mukherjee R, 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, *J Sci Res Banaras Hindu Univ*, 64 (1) (2020) 159-166. DOI: 10.37398/JSR.2020.640123.
- Morris R, Variation and process in South Indian music: Some Kritis and their Sangatis, *Music Theory Spectr*, 23 (1) (2001) 74-89. DOI: 10.1525/mts.2001.23.1.74.
- Maulina T, Djustiana N & Shahib M N, The effect of music intervention on dental anxiety during dental extraction procedure, *Open Dent J*, 11 (2017) 565-572. DOI: 10.2174/1874210601711010565.
- Julious S A, Sample size of 12 per group rule of thumb for a pilot study, *Pharm Stat*, 4 (4) (2005) 287-291. DOI: 10.1002/pst.185.
- Browne R H, On the use of a pilot sample for sample size determination, *Stat Med*, 14 (17) (1995) 1933-1940. DOI: 10.1002/sim.4780141709.
- Sealed Envelope Ltd. Simple randomisation service, Available online: <https://www.sealedenvelope.com/simple-randomiser/v1/> (accessed on 5 May 2023).
- Lovibond S H & Lovibond P F, *Manual for the Depression Anxiety Stress Scales*, 2nd ed, (Psychology Foundation of Australia, Sydney) 1995.
- Achar A, Talwar B, Kumar A & Addanki P S, Effect of traditional raga therapy on depression, anxiety, and stress level in preoperative patients undergoing cataract surgeries, *MAMC J Med Sci*, 7 (3) (2021) 251-253. DOI: 10.4103/mamcjms.mamcjms\_89\_21.
- Mathew E & Mukkadan J K, The therapeutic effect of music on oxidative stress markers and anxiety in hypertension, *J Pharm Res Int*, 33 (47B) (2021) 825-833. DOI: 10.9734/jpri/2021/v33i47B33189.
- Kunikullaya U K, Vijayadas, Kunnavil R, Goturu J, V S Prakash, *et al.*, Short-term effects of passive listening to an Indian musical scale on blood pressure and heart rate variability among healthy individuals - A randomised controlled trial, *Indian J Physiol Pharmacol*, 66 (1) (2022) 29-44. DOI: 10.25259/IJPP\_126\_2021.
- Sharma M, Rajnee D & Mathur K C, Effects of music therapy on clinical and biochemical parameters of metabolic syndrome, *J Bangladesh Soc Physiol*, 6 (2) (2012) 108-115. DOI: 10.3329/jbsp.v6i2.9760.
- Padam A, Sharma N, Sastri O, Mahajan S, Sharma R, *et al.*, Effect of listening to Vedic chants and Indian

- classical instrumental music on patients undergoing upper gastrointestinal endoscopy: a randomized control trial, *Indian J Psychiatry*, 59 (2) (2017) 214-218. DOI: 10.4103/psychiatry.IndianJPsychiatry\_314\_16.
- 26 Reddy B U, Phanisree P, Priyanka M, Kavitha D, Indira S, *et al.*, Effect of music therapy in patients with moderate-to-severe traumatic brain injury, *J Datta Meghe Inst Med Sci Univ*, 12 (1) (2017) 51-54. DOI: 10.4103/jdmimsu.jdmimsu\_23\_17.
- 27 Shankar V M, Geethanjali B, Veezhinathan M, Hariharakrishnan J, Balakrishnan N, *et al.*, Evaluating the effect of music intervention on hypertension, *Curr Sci*, 118 (4) (2020) 612-620. DOI: 10.18520/cs/v118/i4/612-620
- 28 Singh V P, Rao V, Prem V, Sahoo R C & Keshav P K, Comparison of the effectiveness of music and progressive muscle relaxation for anxiety in COPD--A randomized controlled pilot study, *Chron Respir Dis*, 6 (4) (2009) 209-216. DOI: 10.1177/1479972309346754.
- 29 Bernardi L, Porta C & Sleight P, Cardiovascular, cerebrovascular, and respiratory changes induced by different types of music in musicians and non-musicians: the importance of silence, *Heart*, 92 (4) (2006) 445-452. DOI: 10.1136/hrt.2005.064600.
- 30 Packyanathan J S, Lakshmanan R & Jayashri P, Effect of music therapy on anxiety levels on patient undergoing dental extractions, *J Fam Med Prim Care*, 8 (12) (2019) 3854-3860. DOI: 10.4103/jfmpe.jfmpe\_789\_19.
- 31 Deka S, Tiwari P & Tripathi K M, Raga todi intervention on state anxiety level in female young adults during COVID-19, *Mater Today Proc*, 57 (2022) 2152-2155. DOI: 10.1016/j.matpr.2021.12.181.
- 32 Krishna R, Rajkumar E, Romate J, Allen J G & Monica D, Effect of Carnatic raga-Bilahari based music therapy on anxiety, sleep disturbances and somatic symptoms among caregivers of cancer patients, *Heliyon*, 8 (9) (2022) e10681. DOI: 10.1016/j.heliyon.2022.e10681.
- 33 Pareek S & Shekhawat D, A pilot study of therapeutic effects of Indian classical raga on depression, anxiety and stress among adults, *Indian J Pos Psychol*, 13 (3) (2022) 212-215.