Full-Length Article

The Effect of Indian Classical Music on Migraine Episodes in Young Females of Age Group 18 to 23 Years

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Abstract

Music has been known for its soothing effects since ancient times. The purpose of this study was to assess the effects of Indian classical music during migraine episodes in young (18 to 23 years) female patients. A standard music playlist was prepared and distributed to the test group of 25 patients. They listened to the music during every migraine attack occurring for a period of 4 months. Questionnaires containing pain scales were administered at 0 month, 2 month and 4 month. The statistical analysis of the responses provided by the patients of the 2 groups (A and B) showed significant differences. The pain intensity during an attack, the duration of an attack and frequency of attacks showed significant decline while alertness after an attack showed considerable improvement in the music group (Group A) subjects. However, subjects of Group B, our non music group, showed no improvement in their migraine symptoms with respect to pain intensity, duration, alertness and frequency of attacks. Our results demonstrate the potential role of Indian classic music as an adjuvant therapy for management of migraine episodes.

Keywords: ***migraine, music, intensity, frequency, alertness*** multilingual abstract | **mmd.iammonline.com**

Background

Migraines are extremely painful, recurring headaches that occur in association with a number of autonomic nervous system symptoms [1] such as nausea, vomiting etc. They can be associated with aura (a perceptual disturbance) [2] and also carry risk of co-morbid anxiety [3]. It can be triggered by physical or emotional stress, skipping meals, hormone fluctuations, certain odors, alcohol, smoking and certain foods like chocolate, nuts, onions, pickled food etc [4].

Migraine is becoming an increasingly common complaint, especially amongst the younger population of the world. Increasing stress, deteriorating lifestyle, better awareness and improved diagnostic technology has increased the number of migraine cases being diagnosed worldwide [5-8]. Furthermore, with the arising proof of familial hemiplegic migraine, it has been proven that migraine risks being passed down to an increasingly huge population over the years [9].

Studies have shown a male: female ratio of approximately 1:2 (for migraine with aura, migraine without aura, migraine aura without headache and migrainous disorders) [10]. A fall in estrogen in migraine-vulnerable females may trigger a migraine episode [11]. Thus, migraine is now being referred to as a predominantly female disorder [12].

Migraine headaches have, traditionally, been believed to be the result of dilatation of blood vessels caused by a decrease in serotonin levels in the brain, which in turn activates a series of events called the migraine cascade [13]. However, the latest study in this field has challenged this theory [15]. Migraine has also been found to be associated with possible structural changes in the brain parenchyma, possibly indicating another mechanism for the development and progression of migraine [14-17]. As of now, no single theory describing the etiopathogenesis of migraine has been completely accepted. Hence, migraine is currently being treated symptomatically and little success in prophylaxis of the headaches has been achieved [18]. Conventional medical intervention for migraine usually involves pharmacological treatment. Even though many people report benefits from these treatments, these interventions are not without limitations or side effects [19]. This has compelled a large number of migraine patients to look into complementary and alternative medicines (CAM) such as acupuncture, massage, homeopathy, exercise and relaxation techniques [20]. Most of these CAM techniques require patients to visit trained personnel in order to receive such therapeutic interventions. In addition, it has been

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reported that a higher number of people using CAM do not relinquish their use of prescribed medications [21] This suggests that CAM is likely used as a adjuvant treatment along with conventional medicine intervention. The possible interaction between the 2 treatments and the overall safety and efficacy of CAM is inconclusive and still debatable [20]. Hence, there is an increasing need to find an alternative therapy that addresses the grievances of the patients with not only minimal side effects, but also treatments that can easily provide ease of institution, without any additional inconvenience to the patient.

Music has emerged as an important aspect of medical practice in the last century. It has always been a part of our civilization, whether in temple rites or in the form of lullabies. Music, in the ancient world, was believed to be a powerful tool of devotion and healing.

However, it was only after the Second World War, that modern music therapy was officially recognized as a therapeutic discipline and subsequently developed in hospitals in USA [22].

Several studies have investigated the benefits of music in various ailments. After stroke, for instance, music has been shown to enhance cognitive recovery, improve auditory and verbal memory, attention and mood in patients [23,24]. During medical procedures, music has been reported to relax and reduce anxiety in patients before, after and during the procedure [25-27]. Most of these studies were undertaken using Western music. Only a few studies have investigated the benefits of Indian classical music (ragas) [28-30].

Indian ragas are among the most ancient and enduring forms of music in the world. Different ragas have been conventionally known to be associated with varying moods. A few descriptions of the benefits of Indian classical music have become available [28-30]. Their benefits have been investigated primarily in patients with head injury [31, 32]. However, its benefits, if any, have not been well explored in migraine patients. On the other hand, there has been a study where the effect of Western music or butterbur root on childhood migraine against placebos [33] was investigated. The results were found to be encouraging for the prevention of childhood migraine. However, it did not address the effect of music on migraine sufferers of the adult age group, especially and in particular its effect upon females who constitute the major affected group.

The current study, thus, aimed to examine the role of Indian classical music on migraine episodes in young females by asking the patients to listen to the standardized instrumental classical music playlist for the duration of the migraine attacks occurring within the 4-month period of the study. The study was based on the patient's response to the music, which was assessed with the support of questionnaires. These questionnaires helped to compare the patient's responses to the questions both before and after listening to the music playlist in the study period.

Research Design and Method

The study was conducted on a sample population of 50 females (within the age group of 18-23 years) with previously diagnosed cases of migraine from the Outdoor Patient Department of a hospital in North India for a period of 4 months (from mid August to mid December) after obtaining the approval of the institutional ethical committee (reference no. KSCH/Paeds/IEC/AS/2013/47).

Only those cases that had been diagnosed by a medical practitioner (neurologist/ neurosurgeon), after a complete medical work up were selected. They were asked to fill out questionnaires created on the basis of the ICHD I and II guidelines [34]. 62 patients fulfilled the diagnostic criteria. Details of 62 patients are given in Table 1.

Out of the 62 patients thus selected, only 50 patients were enrolled for the study based on their levels of stress, work load, sleeping habits, socioeconomic background (based on the Modified Kuppuswamy Scale) and marital status (Table 1). Informed consent forms were provided to each subject and they were included in the study only after they had completely read, understood and signed a consent form. They were free to withdraw from the study at anytime they wished to, without any residual consequences. An Indian-based randomization procedure was implemented to divide consented patients into Group A (music) and Group B (non-music). The first patient was given chits, and depending on which chit she picked, she was placed in either of the two groups. Subsequently, each odd numbered patient was given chits to pick and the even numbered patient was automatically allotted to the other group (not selected by the odd patient before her). Hence, 2 groups of 25 subjects each—A and B—were created. The subjects of Group A had a mean age of 19.67 ± 0.260 years and sleep hours 6.792 ± 0.180, while Group B subjects had 19.750 ± 0.290 and 6.417 ± 0.190.

The music was chosen based on the benefits of the ragas that have been reported in previous studies [31,32]. Raga AhirBhairav is known to relieve stress, Raga Yaman provides relaxation and Raga Bageshree has been seen to be beneficial in sleep disorders. The playlist was selected and created by a DMus (instrumental) from Banaras Hindu University. It was created, played and recorded by him and his students into identical 25 CDs. They were all completely unrelated to the study in an attempt to reduce bias. The music playlist consisted of the following Ragas: Raga Rageshwari played for 20 minutes 12 seconds on santoor, sitar and tabla; Raga Yaman played on the violin and the sitar for 14 minutes 30 seconds; Raga AhirBhairava played for 7 minutes on flute and sitar; Raga Bageshree played on harmonium, sarangi and santoor for 3 minutes 19 seconds and Raga Todi played for 34 minutes on veena, tabla and harmonium. The santoor consists of 72 strings set on a trapezoid shaped wooden hammered dulcimer and can provide a range of 3 octaves. The veena is a plucked string instrument, whose origins lie in ancient India.

The sitar is believed to be a modified form of veena, and is longer and consists of 3 strings. The sarangi is a string instrument, with a bowed shape and a short neck, and is characterized by its ability to mimic the sound of human voice. Tabla is an instrument of percussion and harmonium is a smaller, more portable form of reed organ. The sequence of the music playlist was in the following order: Raga Rageshwari, Raga Yaman, Raga AhirBhairava, Raga Bageshree and Raga Todi.

Subjects were asked to rate the intensity of their migraine attacks on a Likert scale of 1 to 10 (1 being the minimum and 10 the maximum) using a Faces Pain Scale [35] and similarly, their alertness after a migraine attack using visual analogue scales [36] that also employ Likert scales. They were asked to list the associated symptoms and give the approximate duration of their migraine episodes.

Group A (n =25) subjects received a softcopy of a pre-recorded standardized Indian classical music playlist, which was transferred to their preferred media of music-listening (i-pod, mobile phones, cassette players, CD players, etc.), keeping in mind their comfort and availability. These devices were kept handy and readily accessible. All of the subjects were given a set of instructions as to what and what not to do in case of a migraine episode. When they felt a headache approaching, they were asked to try to find a quiet, preferably, dark room. They were told to lie down (if possible) and get comfortable; to try to relax by taking deep breaths. They were asked to try to concentrate on breathing evenly and counting their breaths. They were supposed to then, listen to the music playlist, adjusting the volume controls as per their comfort level. The music was listened to for a minimum of 10 minutes. This process was repeated for each migraine attack in the duration of the 4 months of the study.

The participants were contacted every alternate day via telephonic conversations, and personal meetings were set up once a week. They were questioned about their music listening practices, explained the importance of adhering to the playlist and to repeat the information provided to them about the measures to be taken during each migraine attack as explained to them.

Group B subjects (n = 25) were not given any music playlist. They were instructed to find a quiet, dark place in case of a migraine attack and to try to relax. They were asked to try to lie down or at least be at rest; take deep breaths and count their breaths. The subjects of this group were requested to refrain from listening to Indian Classical Music for the duration of the study and weekly conversations and checks were maintained to eliminate contamination.

Both groups were advised to continue the medications prescribed to them by their doctors as before. However, they were instructed to reduce their intake of bananas, chocolates, coffee, cheese, vinegar and citrus fruits [2]. Further, they were requested to ensure adequate sleep (not less than 5 hours) and were advised not to skip meals. In this regard, they followed the following guidelines: Bananas- not more than 1 per day; Chocolates- not more than 4 in a week; Coffee- not more than 2 cups per day; Vinegar- must avoid Chinese food altogether; Not more than once in a fortnight; Sleep- not less than 5 hours every day; Meals- 3 meals everyday.

The above guidelines were strictly followed for the duration of the 4 months of the study. No other changes were made in their routine medication or exercise.

After 2 months (t-1), both the groups were asked to fill out a second set of questionnaires, on the basis of which conclusive evidence regarding changes in the intensity, duration and frequency of migraine attacks was collected. Again, at the end of another 2 months (t-2), the process was repeated.

One subject from the test group withdrew from the research as she moved out of the country.

The quantitative data was analyzed as absolute values or as average of the range (i.e., 2-3 hrs were taken as (2 + 3)/2 = 2.5 hrs). All data are presented as mean ± SE. Statistical significance was assessed by paired and unpaired "t" test. P values < 0.05 were considered significant.

Results

Effect of Indian Classical Music on the Intensity of Pain in Migraine Subjects

A comparison of Group A and B at the beginning of the study (*Figure 1*), showed that the pain intensity at t-0 in Group B, (6.62 ± 0.41) and that in Group A, (7.19 ± 0.40) were comparable. After a duration of 2 months (t-1), the data collected from the subjects was analyzed using Paired "t" test. The analysis showed a significant decrease in the intensity of pain ($P < 0.001$) suffered by Group A subjects, (5.69 ± 0.32) after the music intervention. On the other hand, Group B, showed no such change ($P = 0.946$, 6.68 ± 0.44). At the end of the 4th month (t-2), the pain intensity showed a further decline ($P = 0.004$) as compared to intensity at t-1, (5.396 ± 0.334) in Group A subjects. A comparison was made in Group A subjects between the pain intensity at the beginning of the study and that obtained at the end of the study. This data showed a significant decline in the pain suffered ($P < 0.001$). However, in Group B subjects, t-2 showed an increase in intensity ($P = 0.007$), which was significant when compared to the intensity of pain at t-0.

Effect of Indian Classical Music on the Duration of a Migraine Episode

At t-0 (*Figure 2*), the duration of an episode of migraine in Group A subjects (12.42 ± 3.39) was comparable to those of Group B (11.71 ± 3.33). At t-1 the duration of a migraine episode in Group A subjects (6.52 ± 2.25), showed a

Criteria	n
Age:	
< 18 years	5*
18- 23 years	51
Above 23 Years	6*
Marital Status:	
Unmarried	57
Married	5*
Profession:	
Students	56
Housewives	5*
Unemployed	1*
Socioeconomic Background (Modified Kuppuswamy Scale):	
Upper	
Upper Middle	1*
Lower Middle	50
Upper Lower	7*
Lower	4*
	0
No. of Hours of Sleep:	
< 5	1*
5-6	17
6-7	33
8-9	11*
Type of Migraine:	
Without Aura	57
With Aura	5*
Age at Onset of Migraine:	
11 years	4*
13-15 years	43
16 years	8
18 years	2*
21 years	2*
During Pregnancy	3*
Medication:	
Prophylaxis	0
Analgesic (depending on the severity of headache 1-2 tablets)	57
Alternative therapies	0
Experience with Indian Classical Music:	
Never Heard	47
Rare	12
Casual/Occasional listening	2*
Active Learning	1*

Table 1: Characteristics of the subjects initially selected. * were the subjects who were later not included in the final study population.

significant decrease (P < 0.001) from t-0; whereas the duration in Group B, (11.17 ± 2.85) remained similar to that seen at t-0. But there was a significant increase in the duration observed in Group B (P = 0.013) at t-2, when compared to that observed at t-0. On the other hand, at t-2, Group A, (7.972 ± 3.983) did not show a significant decline in the duration compared to t-1. However, a comparison of t-0 and t-2 showed a significant decline (P < 0.001).

Effect of Indian Classical Music on Alertness Post a Migraine Attack

The alertness seen in subjects of both groups after a migraine attack was comparable (*Figure 3*).

At 0 months (t-0) alertness in Group A subjects was 5.63 ± 0.32. At the end of 2 months (t-1), alertness after a migraine episode rose significantly (P = 0.001, 6.29 ± 0.30). At the end of 4 months (t-2) there was no significant ascent from t-1 levels. However, the alertness at t-2 when compared to that at t-0 showed a highly significant improvement (P < 0.001) in Group A subjects.

On the other hand, alertness in Group B at 0 month (t-0) was 5.96 ± 0.47. There was no significant alteration in the alertness levels at the end of 2 months (t-1, P = 0.424, 5.50 ± 0.49) or at the end of 4 months (t-2, P = 0.528, 6.46 ± 0.27).

Effect of Indian Classical Music on the Frequency of Episodes of Migraine

At 0 month (t-0), the frequency of migraine attacks in Group A was 4.44 ± 1.13 and in Group B was 4.96 ± 0.71. At the end of 2 months (t-1), there was no significant difference in the number of episodes in Group A subjects (P = 0.903) as well as in Group B subjects (P = 0.454), *Figure 4*.

However, at the end of the 4th month (t-2), there was a significant decline in the frequency of migraine episodes in patients of Group A (P = 0.026). A comparison of the frequency recorded at t-1 with that at t-2 also shows a significant decline (P = 0.018). Group B, on the other hand, showed no such change in t-2 (P = 0.229).

Discussion

In this study, we investigated the effects of Indian Classical music in migraine subjects. We subjectively assessed the patient's response to similar questions via a questionnaire and to visual analogue scales [36], before and after the study, which helped to succinctly understand the effects of music on the migraine symptoms.

A significant decrease in the intensity of pain, the duration of a migraine episodes and the number of episodes of migraine suffered were reported. Further, a significant increase in the alertness levels after an attack was seen in subjects given the Indian Classical Music playlist for the period of 4 months.

A few subjects reported that "the pain became more bearable." They found that listening to the music provided to them was "soothing" and that it made "falling asleep easier." Many subjects have reported positive effects and "would like to continue to listen to the music in future."

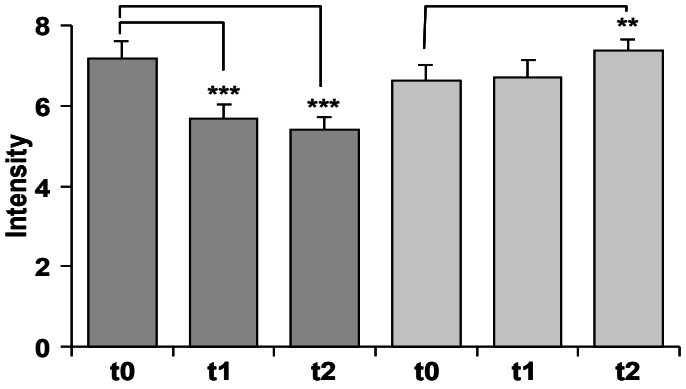

Figure 1: *The dark gray bars show intensity of pain of Group A (music) and the light gray ones that of Group B (non-music) at the beginning of the study (t-0), after 2 months (t-1) and after 4 months (t-2). A significant decline in pain intensity was observed in Group A at t-1 (P < 0.001) and t-2 (P < 0.001) as compared to t-0. Though not shown in the figure, the intensity showed a significant decline (P = 0.004) at t-2 when compared with that recorded at t-1. On the other hand, at t-1 and t-2 in Group B, the intensity showed a significant increase (P = 0.007). Data are means ± SE of Group A and B subjects. ** P < 0.005, *** P < 0.001.*

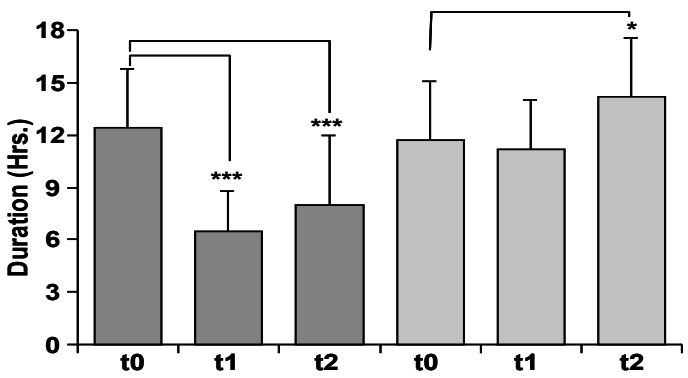

Figure 2: *The dark gray bars show the duration of a migraine attack in Group A (music) and the light gray that of Group B (non-music) at the beginning of the study (t-0), after 2 months (t-1) and after 4 months (t-2). A significant decline in the duration of the migraine attacks was observed in Group A at t-1 (P < 0.001) and at t-2 (P < 0.001) as compared to t-0. The duration of attacks at t-2 also showed a significant increase (P = 0.013) when compared to that seen at t-1 (not showed in figure).At t-1, the duration in Group B remained comparable. But at t-2, a significant increase (P = 0.023) in the duration of the migraine attacks was observed as compared to that at t-0. Data are means ± SE of Group A and B subjects. * P < 0.05, *** P < 0.001.*

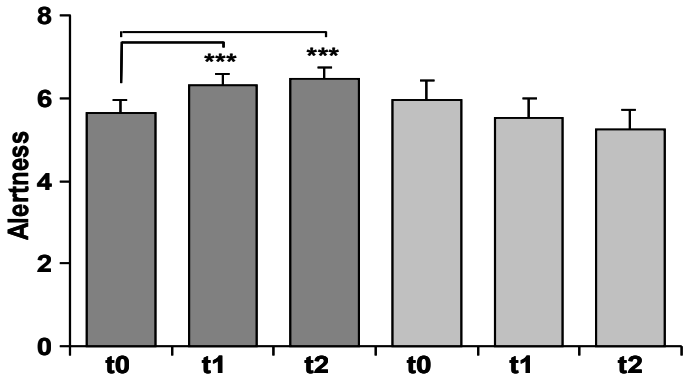

Figure 3: *The dark gray bars show the level of alertness after a migraine attack in Group A (music) and the light gray that of Group B (non-music) at the beginning of the study (t-0), after 2 months (t-1) and after 4 months (t-2). Alertness in Group A showed significant improvement at t-1 (P <0.001) and t-2 (P < 0.001). The alertness reported by subjects of Group B remained comparable at t-0, t-1 and t-2. Data are means ± SE from Group A and B subjects. *** P <0.001*

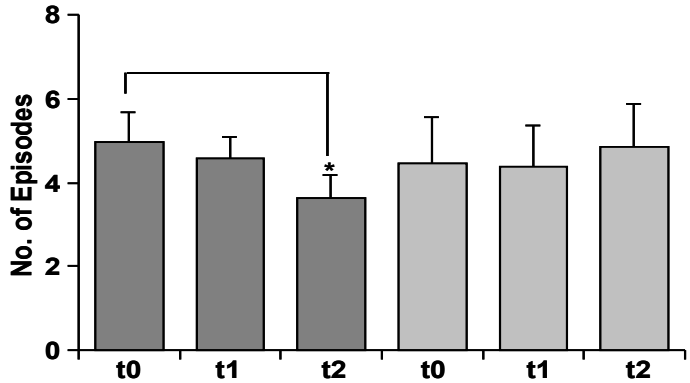

Figure 3: *The dark gray bars show the number of migraine episodes in Group A (music) and the light gray that of Group B (non-music) at the beginning of the study (t-0), after 2 months (t-1) and after 4 months (t-2). The frequency of migraine attacks in Group A showed little change at t-1 as compared to t-0. However, frequency at t-2 in Group A, showed significant decrease (P = 0.026) from t-0. A comparison of the data collected at t-2 and those at t-1 showed a significant decrease (P = 0.018) in the frequency of migraine episodes (not shown in figure). In Group B, the frequency of the migraine episodes remained comparable at t-0 and t-1. However, at t-2, no significant increase (P = 0.229) was observed from the t-0 level. Data are means ± SE from subjects of Group A and B. * P < 0.05.*

The results that were observed in our studies on migraine patients are supported by similar results that were observed in other studies involving utilization of music in headaches. Risch et al reported that patients of chronic headaches were able to find newer methods of pain control after 8 months of music therapy [37].

Oelkers-Ax et al [33] discovered that at the end of 7 months of music therapy, the frequency of migraine episodes in young children had decreased. Our study differs from above listed studies by the duration for which the music was given, the type of music used (Western music in the above) and the parameters under study (frequency in Oelkers-Ax et al [33] and frequency and intensity in Risch et al [37]). In addition, these studies do not provide intermediary information about the parameters under evaluation within the period of the intervention. In our study, Indian Classical music, provided for a period of 4 months, could significantly decrease the intensity and duration of pain in migraine subjects and in addition, also significantly improve the alertness in subjects after a migraine attack. We also found significant changes in the frequency of migraine episodes in these subjects. In using questionnaires, we evaluated the

intensity of pain, duration of attack, frequency of episodes and alertness after an event of migraine midway through the study, allowing us to make a more thorough comparison.

One of the recent studies had reported that listening to music of personal choice has pain-relieving power to thermal noxious stimuli [38]. This further strengthens the role of music as a treatment which can affect pain perception.

The question arises as to how listening to music diminishes the pain perception. Music can affect pain perception by activating regional brain networks mediating reward and anxiolytic effects that also overlap with regions in analgesia [39]. Risch et al [37] and Oelkers-Ax et al [33] explain the favorable response in the music group citing this reason. The decrease in pain perception also allows people to come up with "creative" and more "accessible relaxation and coping techniques."

It has also been suggested that it is the positive emotional valence which might contribute to music-induced analgesia [40]. This has been supported by the subjects of Group A in our study as well, who reported that the "calming effect" of the music made the pain more bearable and allowed them to "relax" and "fall asleep."

Hauck et al. [41] explored the neuronal mechanisms underlying the pain modulation by music by using 2 different music therapies. The receptive method, involving listening to preferred music, decreased pain ratings by detaching the subject from pain and/or shifting the focus of attention from pain stimuli to music while the entrainment method involved modulation of pain perception at early cortical processing stages and possibly through top down modulation. However, the study does not draw conclusions as to whether distraction or active coping mechanisms, such as integration, are superior for pain modulation. Since in our study we have not investigated the subject's pain coping mechanisms, it is difficult for us to comment which of the 2 mechanisms were involved.

Various studies have shown the association of migraine with structural changes in the brain parenchyma [14-17] demonstrating altered functional connectivity of hypothalamus with autonomic nervous system and locus ceruleus and also, the thickening of somatosensory cortex in patients with migraine without aura. Music has been shown to stimulate different centers within the brain [42, 43], showing hippocampal and thalamic activity, which, in turn, modulate the endocrine activity of hypothalamus. Thus, music might play an important role in conditions associated with abnormalities in the functional structural connectivity within the different areas of the brain, hence, providing a reasonable explanation for the results obtained in this study.

Another plausible mechanism by which music alleviates pain could be "the gate control theory" put forward by Ronald Melzack and Patrick Wall [44]. They provided an outline of a pain pathway projecting from the periphery to the cortex via the spinal cord, the brainstem and the thalamus. Neural gates in the spinal cord may be modulated either by ascending or descending pathways or both, to allow more or less pain impulses to be transmitted to the brain [45, 46]. Modulation of neural gates might be one of the ways by which music is alleviating pain [47]. However, specific factors contributing to music analgesia have not yet been firmly established.

Another observation made was that migraine frequency and duration of each attack varied in the Group B subjects and was potentially associated with the change in seasons. The subjects of Group B showed an increase in frequency and duration of migraine attacks with change in season. On the other hand, such an observation was not seen in Group A subjects suggesting that the music helped in suppressing the observed potential of "seasonal variation" of migraine. There is, however, no conclusive evidence supporting the seasonal nature of migraine [48-50] and further research remains to be undertaken in this direction.

Our study measured symptoms within a relatively short duration of time. We believe that this study, if continued further, may show more stark and significant results. Also, due to a small sample size, the findings of this study need to be expounded upon a larger population. The possible placebo effect and subject bias also, cannot be excluded here.

Furthermore, many questions still remain unanswered. Can music also improve the sleep quality in migraine patients? Can music, when heard over a period of years, act in a prophylactic manner? Can migraine, in short, be prevented by the simple act of listening to a particular genre of music? Is Indian classical music better than personally chosen music in alleviating symptoms of migraine? There is, thus, the requirement of a study that can compare the effects of Indian classical music with personally chosen music in patients of migraine. In addition, the long-term effects of music need to be explored as well. Further research is required in Indian raga interventions before it can be introduced formally as a clinical intervention for migraine. Also, a formal recognition for music therapy is required in India to further scientific pursuits towards expanding the knowledge of its therapeutic benefits.

Conclusion

Listening to Indian classical music for a period of 4 months improved the symptoms of migraine both during and after an episode in young adult females. They reported a decrease in the duration of migraine attacks and in the intensity of pain suffered during each attack. They were more alert in the period after a migraine attack. Over time, the music listeners also reported a decline in the frequency of migraine attacks. These observations were not seen in the control group. Music, therefore, seemingly may act as a therapeutic medium and thus, healthcare professionals must be encouraged to suggest music therapy as an effective adjuvant in the treatment of migraines.

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