

## *CHAPTER 3*

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### 3.1 LIERATURE SURVEY ON CHANDAS AND SANSKRIT CHANTING

*Chandas* are the meters in Sanskrit language that have been inspired from the rhythms of Nature and her creations. They are an important and highly developed tool reflecting and representing the great creative universal rhythms; they lend an aesthetic value in dance, music and language making one conscious of the beauty, harmony, symmetry and proportion present in nature. According to Acharya Bharata, the author of *Natyashastra*, “No speech is possible without *Chandas* and a *Chandas* without speech is equally impossible”. Thus, the presence of *Chandas* in language has been since ancient times, embedded in hymns, mantras, songs and poetry.

In Sanskrit poetry every metre is categorized according to certain rules based on the number and arrangement of syllables, the arrangement of pauses and the number of syllabic instants in the verse. In the hymns of the Vedas only a few select metres, such as the *Gayatri*, *Uśnik*, *Anuśthup*, *Bruhati*, *Pankhti*, *Triśthup* and *Jagati*, are observed to be the regularly used metres. The later classical Sanskrit poetry covers a wider range of meters of which some are more popular, such as the *Indravajra*, *totakam*, *tunakam*, *śragdharā*, *Vasantatilakam* and *Bhujangaprayatam* (Mishra, 2011). Compilations by modern scholars contain collections of more than 600 metres, much more than that of any other tradition in which prosody is observed (Patwardhan M, 1937; Velankar, 1949). While the *Chandas* were studied in great detail in the ancient times to facilitate the easy learning of the Vedas, in modern times they have regained the interest of researches primarily due to their technical aspects and mathematical implications (Kulkarni, 2007; Hock, 2015).

When one considers the *Vedic* mantras which hold scientifically structures metres, while also carrying with them the quality of resonance, it has been observed that the chanting of these mantras has some beneficial effects on the persons who recite as well as who listen to them

by evoking certain movements of energy within the individual (Ghaligi et al., 2006; Wolf & Abell, 2003).

The tradition of chanting the Sanskrit verses is more closely aligned to the rhythmical structure of music than to the spoken verse (DEO, 2007). In recent decades, a lot of interest has been shown in the subject area of music being used as a therapeutic tool to address various neurological conditions like ADHD (Attention Deficit Hyperactivity Disorder), anxiety, depression. The works of many scientists suggest that the use of rhythmic music affects the functioning of the brain through the process of brainwave entrainment i.e. a process by which the brain is stimulated causing the brainwaves to resonate in the same rhythm as the stimulus. By changing the frequency of the music, states of alertness and concentration could be achieved on faster rhythms, while that of meditateness was observed on slower rhythms. When different scientists experimented on different target audience - elementary and middle school students, college students and on elderly people, improvement in concentration, better cognitive functioning and reduced behavioral problems were some of the results observed (Saarman, 2006).

Another link that was explored by scientists during this time was the interaction between breathing, cardiovascular activity and neural activity. It was found that certain types of breathing exercises modulated the neural rhythms (Stancák et al., 1991). In the ancient Indian texts, the effect of *prānāyāma* (regulation of breath through exercises) has been mentioned as a technique that has the ability to control the mind. Some of the more widely practiced *prānāyāma* exercises result in an increase in blood flow through the brain, impose a certain level of control on the vital body rhythms as well as the brain rhythms, and enhance stress resilience through their influence on the Autonomic Nervous System. Thus, by optimizing the breath patterns and breathing frequency for each individual, the electrical rhythms of the heart, the lungs and the brain can be synchronized (Jovanov, 2011). This synchronization of

body rhythms may indeed be related to many mental activities such as attention, learning, conscious perception, working memory, long-term memory and language processing (Bhattacharya et al., 2001; Cvetkovic & Cosic, 2011).

Ancient Indian healing methods and musical traditions such as *Rāga Cikitsa*, *Nāda yoga*, *Nāadopāsana* and *vedic* chanting were believed to have curative qualities (Sundar, 2007). In a recent study conducted on the effects of *Bhramari prānāyāma* and *Omkar* chanting, it was seen that the participants of this experiment showed a significant improvement in pulmonary function, memory and concentration while the levels of fatigue decreased noticeably (Mooventhan & Khode, 2014). An experiment conducted on patients having hypopharyngeal cancer resulted in them reporting alleviated levels of pain and anxiety after listening to traditional Indian music (Sundar, 2006). Music with varying rhythms could help children with mental retardation increase their level of alertness by inducing relaxation or by bringing stability in their wavering emotional levels (Sairam, 2006). The study conducted by the Krishnamacharya Yoga Mandiram on a target audience comprising individuals with mental retardation found that breathing exercises and Vedic chanting proved beneficial in their oral articulation movements as well as in matching the pitch during sound production (UMA et al., 2008)

### **3.2 MUSIC, COGNITION AND ANXIETY:**

A study by Susan Hallam reviewed the most promising works in the area of music and brain activity in children and young people, stating, how musical skills have high impact on emotional stability, concentration, self-confidence, fine motor coordination and relaxation (Hallam, 2010). A longitudinal study conducted on primary school children showed enhancement in inhibition, planning and verbal intelligence in the music group compared to the control group (Jaschke et al., 2018). Another study conducted on children following early childhood music education showed that music training is associated with enhanced cognitive

inhibitory control (Joret et al., 2017). Another longitudinal study conducted on primary school children showed that music training benefits those aspects of cognitive function that are closely related to auditory information processing (Roden et al., 2014). A study conducted on under privileged children aging between 3-5 years, shows that music training along with attention from adults can improve spatial cognition and cognitive abilities in non-verbal IQ (Svalina & Vukelić, 2020). A study conducted on children with autism spectrum disorder showed promising impact of music therapy on selective attention skills (LaGasse et al., 2019). A pilot study conducted on high functioning autistic children showed positive trend on attentional control/switching and selective attention following the intervention of musical attention control training (MACT) for 6 weeks (Pasiali et al., 2014). A study conducted on pre-school children in North-China suggests that integrated music training is capable of enhancing executive functions (Yue Shen et al., 2019). Music has also proved to be beneficial in reducing internalizing symptoms in adolescents (Geipel J. et al., 2018). A study conducted on school going adolescents suggests that music therapy given along with cognitive behavioural therapy helps reducing social anxiety (Egenti N. T. et al., 2019). Another study conducted on Korean adolescents with smart phone addiction, showed that music therapy combined with cognitive behavioural therapy has the potential to help improve symptoms of addiction and reduce anxiety and impulsivity (Bong S.H. et al., 2021). A study conducted on adolescents who had committed child to parent violence showed that music therapy is promising in reducing the levels of anxiety in such socially vulnerable groups (Pérez-Eizaguirre, M. et al., 2021). It has also been observed that adolescents and young adults receiving chemotherapy, when given music therapy, had significant improvement in reduction perceived stress (Knoerl, R. et al., 2021). Music interventions are also highly influential in improving attention control in children compared to video game intervention (Kasuya-Ueba, Y. et al., 2020). A survey conducted in England showed the importance of music in adolescence and also states that it helps them satisfy their emotional needs (North,

A. C. et al., 2010). Another survey study conducted on over 1000 adolescents reported that they use music as a means of consolation for daily sorrows and stress in life (Ter Bogt. et al., 2017). Music therapy has also proved potential in reducing anxiety, pain and stress in patients undergoing various surgeries. Music therapy can also be used as adjunct therapy for hospitalised children to reduce anxiety (Johnson, A. A. et al., 2021). Music therapy can also be helpful for females undergoing gynaecologic surgeries to decrease their anxiety and depression, suggesting it to be safe and highly recommended in pre-operative settings (Xu, X. et al., 2021). A similar study shows that music therapy is effective in reducing anxiety and pain in patients following cardiac surgery (Chandrababu, R. et al., 2021). So far we saw the impact of music and music therapy, now let's discover the studies done on the impact of vedic chanting.

### **3.3 VEDIC CHANTING AND COGNITION:**

According to a study, Gayatri mantra has been proved to be beneficial to improve cognitive abilities like sustained attention, divided attention, concentration, working memory and also aggression in an ADHD child and thus can be considered a solid non-pharmacological tool to be used for better results in this population (VK & Chaube, 2021). Gayatri mantra chanting has been equally proved worthy for young athletes in reducing state and trait anxiety and improvement in memory and attention domains (Samajdar et al., 2020). Another study conducted on Hindu Priests who have memorized Vedic mantras and can chant then in proper diction with controlled breathing showed an enhancement in grey matter and white matter in midbrain, thalamus, Para hippocampus, and orbitofrontal regions and also noticed gyrification supplementary motor area and increased cortical thickness (CT) in the right temporal pole and caudate regions of the brain thus suggesting promising association between long-term recitation of Vedic mantras and crucial memory regions in the brain (U. Kumar et al., 2021). Another study by Pragya showed that gayatri mantra merged up with cognitive approach is effective in fostering the protective factors like conscience and resilience in

juvenile delinquents helping them to understand life with a spiritual perspective (Pragya Saharae and Anuradha Kotnala, 2020). A study conducted on children with autism spectrum disorder, where Vedic chants were given as auditory stimulus, it was found by the special educator that there was significance decrease in their hyperactivity and other common traits in ASD like head nodding, self-biting, hand flapping etc. which then reflected in their sitting hours in class. Some of them could response to gestures like Namaste while others remembered the mantras and would repeat them frequently, specially, the word OM (Pragya Saharae and Anuradha Kotnala, 2020). A study conducted on 30 healthy subjects listening to gayatri mantra reported significant reduction in reaction time and the study suggested that it could be used as an effective tool in development of children with special needs (Malhotra et al., 2014). A study conducted to see the benefit dog vedic chanting showed that gayatri mantra chanting had significant improvement in both state and trait anxiety compared to meditation group (Samajdar, S. S. et al., 2020). A study conducted on under grad. students from a yoga university showed that listening to vedic chants helps improving state mindfulness and reducing state anxiety (Chanu, S. R. et al., 2015).

### **3.4 INDIAN CLASSICAL MUSIC AND COGNITION**

According to a study conducted on young adults who were made to listen to an Indian classical Raga called 'Raag Darbari' for 15 mins a day for 30 days, results showed significance improvement in memory and sleep quality in the intervention group (Nayak et al., 2020). There are various studies which show that Indian classical ragas have therapeutic effects and can be used as complimentary therapy (Deshmukh et al., 2009). A study conducted on school going adolescents, where one group chose to listen to Indian classical music (Rāga Śanmukhapriyā) as background music while performing various tasks and the other group chose to listen to western music (Mozart's symphony no. 35), results showed that the subjects performed better with Indian music condition compared to western music

condition considering their cultural preference (Mohan & Thomas, 2020). A study conducted on children with special needs, combining homeopathic treatment and Indian classical music, results showed improvement in cognitive development, emotional learning and communication skills (Rajalakshmi, 2017). Another interesting study was conducted using EEG to understand the impact of Indian classical music to enhance cognitive functions and the results promising suggesting improved brain efficiency through well-defined mechanism (Ashish gupta et al., 2018). Surprisingly a study conducted on young rats also showed that Indian instrumental classical music is a highly effective tool to release negative affects of stress induced cognitive impairment (Kour, H. et al., 2012). A study conducted on a group of trained musicians compared with non-musicians with happy and sad ragas from Indian classical music, showed that they impacted those regions of the brain which are associated to cognitive behaviour, language processing and memory (Nizar. et al., 2021). A pilot study states that music therapy based on Indian ragas is potential to improve the health of patients with chronic diabetes and hypertension (Nemade, M. U., 2021). A study conducted on healthy individuals aiming to reduce their stress using salivary alpha-amylase (SAA) after listening to Hindustani classical-music like raag ahir bhairava and bhimpalasi, showed that stress significantly reduced post intervention (Kunikullaya, K. U. et al., 2021). Another similar study was conducted on pre-operative patients, giving them the intervention of listening to Indian classical music (Raag Bhairavi) showed that post intervention the stress levels and depression anxiety of the subjects had reduced. This study further suggests a strong need of implementing Indian raga therapy in management of mental health issues in patients (Achar, A. et al., 2021). A study conducted to evaluate the impact of Indian classical music therapy during cardiopulmonary bypass showed that it effectively reduced the intra-operative stress and requirements of drugs (Kar, S. K., Ganguly. et al., 2015). Instrumental music with incremental variations in tempo and octave in Carnatic ragas, when given as intervention to healthy participants, induced controlled mind wandering (Sharma S. et al.,

2021). Another recent research states that Raag Todi (Indian classical music) can be helpful in reducing state anxiety during stressful life events (Deka, S. et al., 2021). Indian classical music, due to its element of rhythm brings one in harmony with the nature and develops the natural healing process in a human being and thus is both physically and mentally uplifting. It has been observed that poetic metres (Chandas) have significantly influenced the rhythms of Indian classical music (Hall, 2008) and there is a need to understand what role Chandas can play when offered as a mode of intervention therapy in light of growing evidence that musical traditions like shloka chanting and Raga therapy have health benefits. As everything in nature has its own rhythm or frequency which has a very specific role to play, we are motivated to explore the role of rhythms and pauses in Sanskrit poetry called *chandas*.

While there are quite a good number of studies on music therapy, raag-chikitsa, Indian classical music, instrumental music, vedic-chanting etc., the common element, present in all the above, which is *chandas* or prosody that is the rhythm and pauses present in poetry, music and chanting has not been studied so far. Our attempt was to identify the impact of *chandas* alone irrespective of language, words or their meaning on the psychology of adolescents.

### 3.5 SUMMARY OF SCIENTIFIC LITERATURE

**Table 1: Summary of Literature review**

Sl. No.	Authors, Year, Title and Journal's Name	Sample size and Design of the study	Variables studied	Intervention given	Results	Conclusion
1.	Artur C. Jaschke, Henkjan Honing, Erik J.A. Scherder Exposure to a musically-enriched environment; Its relationship with executive functions, short-term memory and verbal IQ in primary school children	176 Primary school children. Cross-sectional study. RCT.	Short-term memory, and verbal IQ	Listening to music at home, during play or when attending concerts	Linear and multiple regression analyses showed no significant relationship between exposure to a musically-enriched environment, executive sub-functions (planning, inhibition and working memory), and short-term memory. The relationship between an enriched musical environment and verbal IQ has revealed trends.	Experiencing a musically enriched environment does not serve as predictor for higher performance on executive sub-functions, however, can influence verbal IQ.
2.	ME Joret, F Germeys, Y Gidron. 2017. Cognitive inhibitory control in children following early childhood music education. <i>Musicae Scientia</i> .	63 children, Single group pre-post study	Cognitive inhibitory control in children	Childhood Music Education	Analysis of the relation times (RT) data on the Simon task revealed a significant group $\times$ congruency interaction, such that musically trained children showed a reduced magnitude of the congruency effect (RTs on incongruent trials – RTs on congruent trials) compared to non-musicians	Music training seems to be associated with enhanced cognitive inhibitory control in well-matched samples.
3.	Ingo Roden, Dietmar Grube, Stephan Bongard. 2014. Does music training enhance	50 children, Longitudinal Study Design	Working memory performance	45 minutes of weekly instrumental music training	Results indicated a superior developmental course in children with music training compared to the control group	Children receiving music training benefit specifically in those aspects of cognitive

	working memory performance? Findings from a quasi-experimental longitudinal study. Psychology of Music					functioning that are strongly related to auditory information processing.
4.	A Blythe LaGasse, MT-BC, Rachel C B Manning, MS, OTR/L, Jewel E Crasta, William J Gavin, Patricia L Davies. 2019. Assessing the Impact of Music Therapy on Sensory Gating and Attention in Children With Autism: A Pilot and Feasibility Study. Journal of music therapy.	7 high functioning Autistic children aging 5-12 yrs. Pilot and feasibility study.	Sensory Gating and Attention	35-min individual music therapy attention protocol delivered by a board-certified music therapist ten times over 5 weeks	Feasibility measures indicated that measures of brain responsivity could be used to determine attentional differences between children with ASD and typical children.	Initial outcome data for brain responses and behavior indicated positive trends for the impact of music therapy on selective attention skills.
5.	V Pasiali, AB LaGasse, SL Penn. 2014. The effect of musical attention control training (MACT) on attention skills of adolescents with neurodevelopmental delays: A pilot study. Journal of music therapy	9 high functioning adolescents with neurodevelopmental delays. Single group pre-test/post-test study.	Attention Skills	Musical Attention Control Training (MACT) intervention delivered by a board-certified music therapist eight times over 6 weeks in a school setting.	Data analysis showed positive trends and improvements on measures of attentional control/switching and selective attention.	More research on the use of music therapy attention training in high-functioning adolescents with neurodevelopmental disabilities is warranted.

6.	VK, K., & Chaube, N. 2020. Effectiveness of Vedic chanting on cognitive impairments in an ADHD child: A case study. American psychological Association.	One 6years old ADHD Child. Pre-post study.	Sustained and divided attention, concentration, short-term verbal and working memory, overactivity, and aggression	Vedic Chanting – Gayatri Mantra	Results showed better effectiveness of Gayatri mantra in cognitive functioning such as sustained and divided attention, concentration, short-term verbal and working memory, overactivity, and aggression as compared to computerized training.	It is concluded that the Gayatri mantra as a nonpharmacological intervention may improve cognitive functioning in ADHD children and produce better results.
7.	Shambo Samrat Samajdar Shatavisa Mukherjee. 2021. Effect of Gayatri Mantra Chanting on Attention, Memory, Anxiety and Mental State in Young Athletes: A Prospective Study. International journal of current research in physiology and pharmacology.	45 athletes. A Prospective Study	Attention, Memory, Anxiety and Mental State	Gayatri Mantra Chanting	Subjects with GM chanting showed significant improvement in attention and memory domain. Less failed attempts and prompt response to audio and visual stimuli for multiple choice apparatus was noted for the GM group. Sustained visual attention, scanning without distraction and better concentration are required for the digit cancellation test. Marked improvements in both state and trait anxiety was noted for the GM chanters. Improved mental state was observed for both meditating group compared with the control.	Gayatri Mantra Chanting has positive impact on Attention, Memory, Anxiety and Mental State in Young Athletes
8.	Uttam Kumar, Anshita Singh & Prakash Paddakanya. 2021. Extensive long-term	Professional Hindu pandits (priests/scholars) trained in	Correlation of long-term verbal	Vedic Chanting	Results revealed an increased grey matter (GM) and white matter (WM) in the midbrain, pons, thalamus, parahippocampus, and orbitofrontal regions in pandits. The whole-	Findings, collectively, provide unique information regarding the association between

	verbal memory training is associated with brain plasticity. Scientific Reports. Natures Portfolio.	reciting Vedas and other forms of Hindu scriptures. Two group Pre-post study.	memory training with brain plasticity		brain corelation analysis using length of post-training teaching duration showed significant correlation with the left angular gyrus. We also found increased gyrification in the insula, supplementary motor area, medial frontal areas, and increased cortical thickness (CT) in the right temporal pole and caudate regions of the brain	crucial memory regions in the brain and long-term practice of oral recitation of scriptures from memory with the proper diction that also involved controlled breathing.
9.	P Sahare, A Kotnala. 2020. Psycho-spiritual approach to develop protective factors in juvenile delinquents: An overview. Indian Journal of Health and Wellbeing	-	Resilience and conscience in delinquent juvenile		-	This research suggests that spiritual techniques such as meditation and gayatri mantra, merging up with cognitive approach are affective in fostering the protective factors such as resilience and conscience in delinquent juveniles by improving their spiritual understanding about life.
10	Malhotra Varun*, Garg Rinku, Dhar Usha, Goel Neera, Tripathy Yogesh, JaanIram, Goyal Sachit, Arora Sumit. 2014. Mantra, music and reaction times: A study of its applied aspects. International Journal of Medical Research & Health Sciences	30 healthy subjects. Pre-Post design.	Reaction Time	Listening to Gayatri Mantra	The reaction times decreased significantly p<0.001.	Listening to music at work area reduces distractions, helps increase concentration and delays fatigue. It can be used to heal tinnitus, as an educational tool to develop children with special needs, Alzheimers disease, to improve motor skills in Parkinsonism and help alleviate pain after

						surgery.
11	Amritharekha P. Nayak, Vishrutha K.V., Vineetha K. Ramdas Nayak. 2020. Effect of Indian classical music microtones on sleep quality and memory in young adults. International journal of Bio-medical Science.	148 healthy volunteers aging between 18 - 21years.	Sleep, Memory	Raag Chikitsa (Music Therapy) – Raag Darbari	There was a significant improvement in memory after exposure to ‘Raag Darbari’. PSQI score decreased significantly in subjects who preferred classical music. There was a significant improvement of word recall after 15 minutes, paired associated word recall and story recall in them as well.	The results help to safely state that sleep quality and memory improves with music therapy.
12	AD Deshmukh, AA Sarvaiya, R Seethalaxmi and Ajita S. Nayak. 2009. Effect of Indian classical music on quality of sleep, in depressed patients: A randomized controlled trial. Nordic Journal of Music Therapy	Fifty individuals diagnosed with Major Depressive Disorder. RCT.	Quality of Sleep	Indian Classical Music	Both PSQI and MADRS scores improved with music.	We conclude that music is comparable to hypnotic medication in improving quality of sleep, in depressed patients and can thus act as a useful adjunct in the management of depression.
13	Ashmita Mohan & Elizabeth Thomas. 2020. Effect of background music and the cultural preference to music on adolescents’ task performance. International Journal of	34 Adolescents. Pre-Post design.	Task performance through verbal ability test.	Indian Classical Raga – Raag Shanmukhpriya	The results indicate that a strong positive effect is achieved on task performance when background music	Positive effect is achieved on task performance when background music especially one that identifies with the participants’ cultural background.

	Adolescence and Youth					
14	Egenti, N. T., Ede, M. O., Nwokenna, E. N., Oforka, T., Nwokeoma, B. N., Mezieobi, D. I., ... & Victor-Aigbodion, V. (2019). Randomized controlled evaluation of the effect of music therapy with cognitive-behavioral therapy on social anxiety symptoms	155 school going adolescents. RCT.	Social anxiety	Music therapy with cognitive behaviour therapy	Social anxiety significantly decreased in the treatment group over time, whereas the waitlist control group showed no significant changes in social anxiety	The study concludes that use of music therapy with cognitive-behavioral therapy is significant in reducing social anxiety among schooling adolescents.
15	Bong, S. H., Won, G. H., & Choi, T. Y. (2021). Effects of Cognitive-Behavioral Therapy Based Music Therapy in Korean Adolescents with Smartphone and Internet Addiction. <i>Psychiatry Investigation</i> , 18(2), 110.	155 internet addiction adolescents in Korea. Pre-post design.	Symptoms of smartphone/internet addiction and psychiatric comorbidities. State Anxiety Trait Adolescent Self-Report and Impulsiveness.	Music therapy with cognitive behaviour therapy	State and trait anxiety as well as Impulsiveness reduced in the intervention group	Combined MT and CBT could therefore be an effective treatment of smartphone or internet addiction along with behavioral disorders such as anxiety and impulsivity.

16	Pérez-Eizaguirre, M., Dorado, A., Rodríguez-Brioso, M., & Privado, J. (2021). Efficacy of music therapy in the treatment of anxiety among children at social risk and those have committed child to parent violence. <i>Psychology of Music</i> , 0305735621996024.	11 teenagers with parent to child violence history. 2 groups: Group 1 with child to parent violence history and group 2-social risk.	State anxiety and trait anxiety.	Music Therapy	There was significant reduction in state anxiety levels among participants who had used Child to Parent Violence whereas trait anxiety levels were more significantly reduced among participants at social risk.	The study suggests that music therapy can be effectively used to reduce anxiety levels among teenagers who are socially vulnerable and may have a significant impact on the reduction of this disorder, depending on the anxiety level.
17	Ter Bogt, T. F., Vieno, A., Doornwaard, S. M., Pastore, M., & Van den Eijnden, R. J. (2017). "You're not alone": Music as a source of consolation among adolescents and young adults. <i>Psychology of Music</i> , 45(2), 155-171.	1040 adolescents. Survey study.	-	-	69% subjects reported that they certainly use music as a source of consolation.	The study concluded that children use music as consolation during their daily sorrows and stress.
18	Nizar, N., Aravind, A. C., Biswas, R., Nair, A. S., Venu, S. N., & Diwakar, S. (2021). Electroencephalography Measurements and	20 healthy volunteers. 2 group pre post study.	Electroencephalography measurements of analysis of	Indian Classical Music	Results show varying patterns of gamma-alpha, alpha-beta-gamma and theta-gamma switching in response to happy music, sad music and other auditory stimuli specific among musicians and non-musicians	The activated regions may be correlated to differential processing of cognitive behaviours such as language processing, learning

	<p>Analysis of Cortical Activations Among Musicians and Non-musicians for Happy and Sad Indian Classical Music. In <i>Cybernetics, Cognition and Machine Learning Applications</i> (pp. 161-168). Springer, Singapore.</p>		cortical activation			skills and memory retention
19	<p>Kunikullaya, K. U., Muradi, V., Kunnivil, R., Goturu, J., Prakash, V. S., &amp; Murthy, N. S. (2021). Gender-based comparison of salivary stress marker among healthy individuals after intervention with three melodic scales of Indian music– Exploration with a pretest-posttest design. <i>National Journal of Physiology, Pharmacy and Pharmacology</i>, 11(2),</p>		Salivary stress markers	Indian classical music intervention – Hindustani Raags like Ahir Bhairava, Kaunsi Kanada, Bheempalai	All three ragas reduced SAA level	Passive listening to Indian raagas has therapeutic effect as alternative or combined therapy for stress and anxiety

	160-168.					
20	Achar, A., Talwar, B., Kumar, A., & Addanki, P. S. (2021). Effect of Traditional Raga Therapy on Depression, Anxiety, and Stress Level in Preoperative Patients Undergoing Cataract Surgeries. <i>MAMC Journal of Medical Sciences</i> , 7(3), 251	30 preoperative patients for cataract surgery.	Anxiety and stress	Raga therapy (Raag bhairavi)	There was a significant decrease in depression anxiety and stress levels followed by raga therapy.	Raga therapy significantly impacts the stress and anxiety levels in preoperative patients. This study suggests strong need of implementing Indian raga therapy in management of mental health issues in patients.
21	Kar, S. K., Ganguly, T., Roy, S. S., & Goswami, A. (2015). Effect of Indian classical music (Raga therapy) on fentanyl, vecuronium, propofol requirements and cortisol levels in cardiopulmonary bypass. <i>J Anesth Crit Care Open Access</i> , 2(2), 00047.	34 patients undergoing cardiopulmonary bypass	Fentanyl, Vecuronium, Propofol Requirements and Cortisol levels	Indian classical music therapy	Results showed that Fentanyl, Propofol and Vecuronium requirement in the Music group were reduced by 30% and 25 % and 25% respectively, which were statistically significant	Indian classical music therapy effectively reduced the intra operative stress and reduced the requirement of drugs
22	Sharma, S., Sasidharan, A., Marigowda, V., Vijay, M., Sharma, S., Mukundan, C. S., ... & Masthi, N. R. (2021).	21 healthy participants. Randomised controlled cross-over study	Anxiety	Varying Music (VM): instrumental music with incremental variations in tempo	VM induces a 'controlled-mind wandering	Selection of music has remarkable influence on stress-management

	Indian classical music with incremental variation in tempo and octave promotes better anxiety reduction and controlled mind wandering—A randomised controlled EEG study. <i>EXPLORE</i> , 17(2), 115-121.			and octave Stable music (SM): instrumental music without such variations		
23	Deka, S., Tiwari, P., & Tripathi, K. M. (2021). Raga todi intervention on state anxiety level in female young adults during COVID-19. <i>Materials Today:Proceedings</i> . <a href="https://doi.org/10.1016/j.matpr.2021.12.181">https://doi.org/10.1016/j.matpr.2021.12.181</a>	30 young females. Pre-Post control trial.	Anxiety	Raag Todi (Indian classical Raga)	Results showed that listening to Raag Todi is negatively related to state anxiety.	The study concluded that listening to raga todi could be useful in reducing the state anxiety level provoked by a stressful life event