Original article

Immediate Effect of Nadanusandana and Music Therapy on Cognitive Functions among University Students

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Abstract

Background: The purpose of the current study was to examine the immediate impact of two interventions, Naadanusandana, and music therapy, on cognitive functions. University students were instructed to chant certain sounds with awareness during the Naadanusandana intervention, while the music therapy intervention involved listening to Carnatic classical music. Both interventions were tested on the same group of participants to evaluate their immediate effects on cognitive functions with a fading time of seven days. **Aim**: The aim of the study was to evaluate whether Naadanusandhana and music therapy have any immediate effect on cognitive functions among university students. **Materials and Methods**: The study involved 100 university students, consisting of 50 male and 50 female participants, who were randomly assigned to two different interventions - Naadanusandhana and music therapy - using a self-as-control design. The Naadanusandhana intervention was administered first, followed by a 7-day fading period, after which the music therapy intervention was introduced. Cognitive functions were assessed using DLST and SLCT before and immediately after each intervention. **Result:** Based on the results reported, it appears that both Naadanusandana practice and music therapy practice sessions have a positive effect on cognitive performance as measured by SLCT and DLST. For SLCT, Naadanusandana practice showed a greater improvement in total attempted score (14.3%) and reduction in wrong attempt scores (69.2%) compared to music therapy (4.18% and 49.08%, respectively). However, for DLST, both Naadanusandana practice and music therapy showed significant increases in total attempted score (16.73% for Naadanusandana and 10.3% for music therapy) and net score (17.8% for Naadanusandana and 7.9% for music therapy), as well as reductions in wrong attempt scores (109.9% for Naadanusandana and 72.1% for music therapy). **Conclusion**: Both practices have been shown to be effective in improving mental well-being and cognitive function and can be used as non-invasive and non-pharmacological interventions to promote overall health and wellness. But in this particular study, even a single session of naadanusandana and music therapy was found to be effective in enhancing cognitive functions among university students, though it was found that nadanusandana is more effective compared to music therapy. Future research should address the potential long-term combined effects of nadanusandana and music therapy on cognitive functions among university students.

Keywords: Nadanusandana, Carnatic music, Cognitive functions

Introduction

Cognitive impairment is one of the major problems seen among students in today's life (Guskiewicz, K. M.,2005). Post covid impact is seen maximum in the area of cognition. Due to increased screen time and blue light, dealing with online classes, lack of physical activities during the lockdown, stress, and a sedentary way of life, health life variables such as drinking and smoking, and financial instability have a direct and indirect impact on cognition (Kim, 2010). Cognitive abilities are basically how your brain accepts and processes new information as well as retains prior knowledge to help you live a successful life, cognitive functions are associated with the ability to perform cognitive tasks and improve academic performance (alban&alban, 2021). The development of cognitive functions has a massive role in illuminating students' future expectations and being successful because a student having problems pertaining to cognition is expected for low achievement (Malik, M. A. 2019). cognitive function declamation of these students interferes with their academic performance and excellence (Saoji, Apar; Mohanty, et.al 2017). Nadanusandana is a yogic meditative practice (Babu, K. R. 2009) that is based on the idea that sound is an essential aspect of the universe and can be used as a means of achieving spiritual enlightenment this shows its effect on mental peace. In this practice, the sound is not just something that is heard with the ears but is also an energy that can be felt and experienced within the body by chanting (om kara with a combination of Aaa kara, Uuu kara Mmm kara) louder and feeling the resonance of the chant in silence (Jagannathan, A., Hamza, A., et.al) which in turn can boost once cognitive. Music therapy is a non-invasive and non-pharmacological intervention that has been to be effective in improving cognition in a variety of populations. Music therapy involves using music to achieve therapeutic goals, such as improving communication, reducing stress, and promoting relaxation (Foran, L. M. 2009).Music has been shown to activate multiple areas of the brain, including the auditory cortex, the motor cortex, and the limbic system. This increased brain activity can help to improve cognitive function, including memory and attention (Putkinen, V., Nazari-Farsani et.al). Music therapy is divided into active (interactive) and receptive (passive). Participants In the active form musically are engaged and encouraged to create or describe their experiences with music. In the same way, other forms of music therapy involve the participant's simply listening to either live or recorded music (Stanczyk, M. M. 2011). Both nadanusandana and music therapy involve the use of sound to improve mental well-being and cognitive function. In nadanusandana, the focus is on chanting specific sounds to feel their resonance and experience their energy within the body. This can help to calm the mind, reduce stress and anxiety, and improve cognitive function. Similarly, music therapy involves the use of music to achieve therapeutic goals, such as reducing stress and promoting relaxation (Stanczyk, M. M. 2011). with a low dropout rate for the promotion of relaxation and well-being (Warth, M., Keßler, J., et, al) the use of music has been shown to activate multiple areas of the brain, which can help to improve cognitive function, including memory and attention.

Material & Methods

A hundred students of final year B. Com (50 female and 50 male) from vishwachethana degree college were taken as the sample size in this research, students were selected between 18 to 25 years and they were given the intervention of single session of nadanusandhana and a single session of music therapy respectively with 7 days of fading time between each intervention. Individuals suffering from any health issues, those on psychiatric medications, those with visual impairment, and students who were not interested in participation were excluded. subjects were recruited using a convenient sampling method and a single group pre-post, and the self-as-control design was employed.

Intervention

Outcome Measures

Two tools were used to assess the outcome of the intervention:

1. Six-letter cancellation test (SLCT)
2. Digit letter substitution test (DLST)

SLCT: - A repetitive motor response and visual selectivity are needed for the SLCT. A six-letter cancellation test was utilized to measure abilities including focused and selective attention, visual scanning, and the activation and inhibition of quick reflexes. The worksheet for the six-letter cancellation challenge has random alphabets from A to Z arranged in 14 rows and 22 columns. The worksheet was given to each participant. They were instructed to cancel as many target digits as they can in the allotted time. They were instructed to cancel however they want horizontally, vertically, or randomly choose one letter from the row at a time. Each test was completed in 90 seconds using a normal stopwatch after the participants had read the test instructions.

DLST: - Digit Letter Substitution Test, measures the flexibility of mind, visual scanning, attention, and psychomotor speed of information processing. The DLST worksheet has 8 rows and 12 columns of randomly chosen 1–9 digits. The coding page includes instructions for the test, including an example of how to substitute a particular letter for a particular digit from 1 to 9. The subjects were told to choose their letter replacement method, whether horizontally, vertically, or by picking a certain digit randomly from the row one at a time. In the allotted 90 seconds, replace as many target digits as possible (Natu & Agarwal, 1997).

Results

SLCT: Six-letter cancellation test

SLCT Changes after the single session of Naadanusandana practice

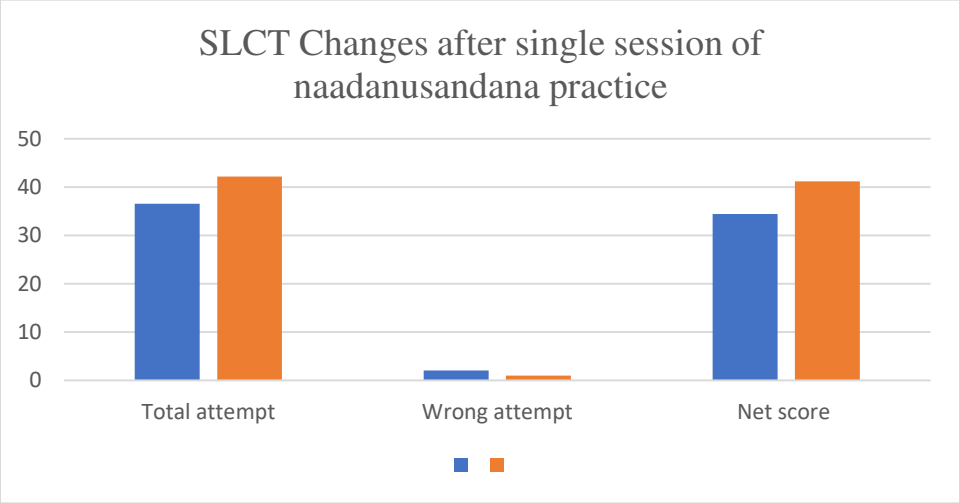
A single session of Naadanusandana practice showed that 14.3% significant increase (P< 0.01) in total attempted score on SLCT. Similarly, there was 17.8% significant increase (P = 0.00) in Net score, and there was 69.2% reduction (P> 0.000) in wrong attempt scores [Table 1].

Table-1: SLCT Changes after the single session of Naadanusandana practice

SLCT scores	Changes after		% change	P- value
	Before	After		
Total attempt	36.54± 8.3	42.2 ±5.56	14.3%	0.01*
Wrong attempt	2.1 ±1.2	1.02 ±0.6	69.2%	0. ***
Net score	34.44 ±5.7	41.18 ±4.51	17.8%	0.00**

*Significant at P<0.05, ** significant at P<0.01, ***significant at P<0.00 (paired sample test and Wilcoxon Signed Ranks Test)

Graph-1: SLCT Changes after the single session of Naadanusandana practice



SLCT Changes after a single session of music therapy practice

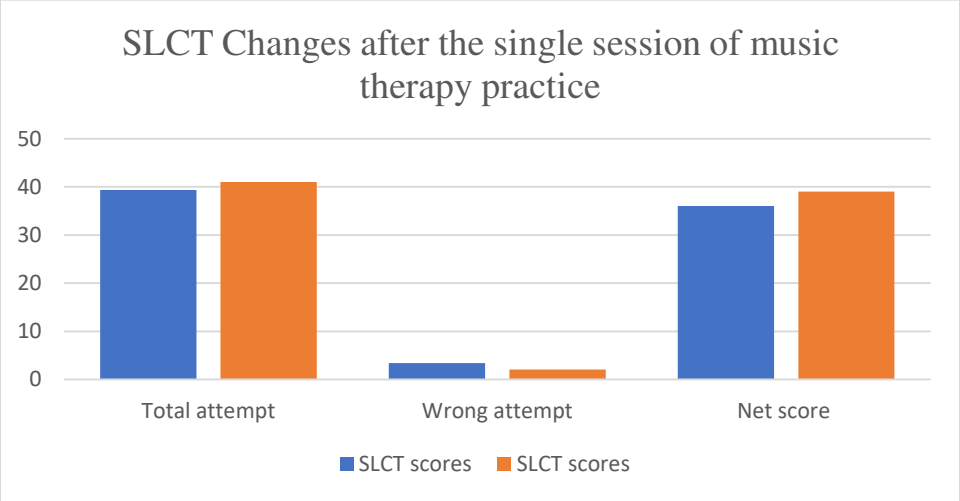
Single session of music therapy practice showed that 4.18% significant increase (P< 0.01) in total attempted score on SLCT. Similarly, there was 7.9% significant increase (P = 0.00) in Net score, and there was 49.08% reduction (P> 0.001) in wrong attempt scores [Table 2].

Table-2: SLCT Changes after the single session of music therapy practice

SLCT scores	Changes after		% change	P- value
	Before	After		
Total attempt	39.34± 9.3	41.02 ±7.56	4.18%	0.01*
Wrong attempt	3.4 ±3.02	2.06 ±1.01	49.08%	0.001**
Net score	36.06 ±7.7	39.04 ±4.51	7.9%	0.01*

*Significant at P<0.05, ** significant at P<0.01, ***significant at P<0.00 (paired sample test and Wilcoxon Signed Ranks Test)

Graph-2: SLCT Changes after the single session of music therapy practice



DLST: Digit letter substitution test

DLST Changes after the single session of Naadanusandana practice

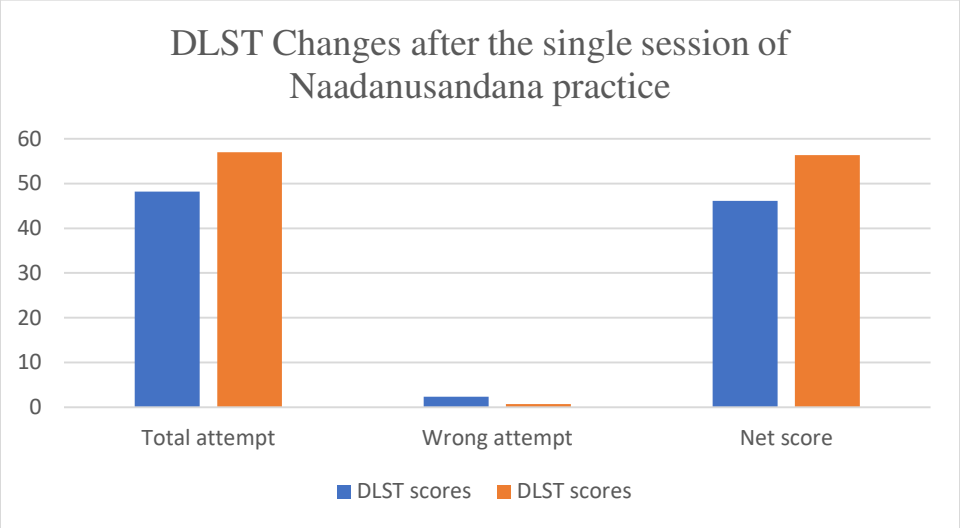
Single session of Naadanusandana practice showed that 16.73% significant increase (P< 0.01) in total attempted score on SLCT. Similarly, there was 19.87% significant increase (P = 0.00) in Net score, and there was 109.9% reduction (P> 0.000) in wrong attempt scores [Table 3].

Table-3: DLST Changes after the single session of Naadanusandana practice

DLST scores	Changes		% change	P- value
	Before	After		
Total attempt	48.2±10.5	57±6.16	16.73%	0.01*
Wrong attempt	2.34 ±0.86	0.68 ±0.14	109.9%	0.000***
Net score	46.14 ±9.43	56.32 ±6.09	19.87%	0.00**

*Significant at P<0.05, ** significant at P<0.01, ***significant at P<0.00 (paired sample test and Wilcoxon Signed Ranks Test)

Graph-3: DLST changes after the single session of Naadanusandana practice



DLST Changes after the single session of Music therapy practice

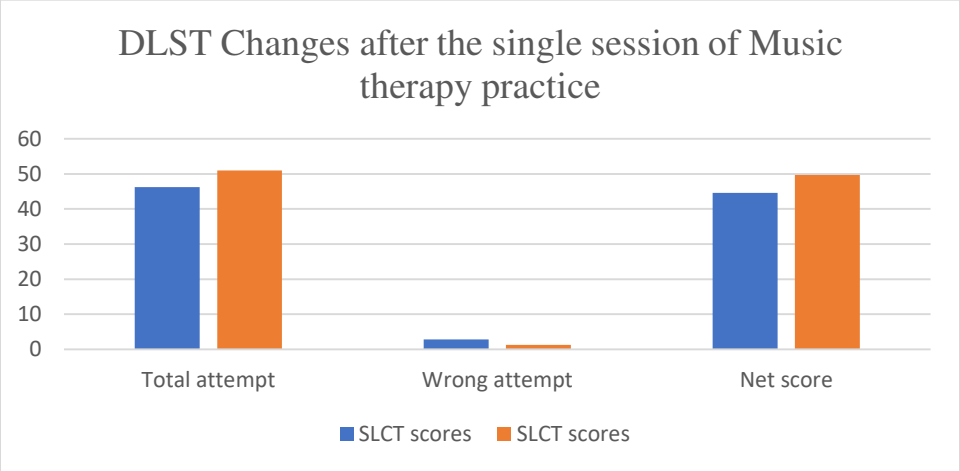
Single session of Music therapy practice showed that 10.3% significant increase (P< 0.05) in total attempted score on SLCT. Similarly, there was 10.75% significant increase (P = 0.00) in Net score, and there was 72.1% reduction (P> 0.000) in wrong attempt scores [Table 4].

Table-4: DLST Changes after the single session of Music therapy practice

SLCT scores	Changes		% change	P- value
	Before	After		
Total attempt	46.2±11.5	51±7.16	10.3%	0.05*
Wrong attempt	2.81 ±0.86	1.32 ±0.67	72.1%	0.000***
Net score	44.61 ±10.13	49.68 ±7.09	10.75%	0.05*

*Significant at P<0.05, ** significant at P<0.01, ***significant at P<0.00 (paired sample test and Wilcoxon Signed Ranks Test)

Graph: 4 - DLST Changes after the single session of Music therapy practice



SLCT & DLST Changes after the single session of Naadanusandana practice.

A single session of Naadanusandana practice showed a 14.3% significant increase (P< 0.01) in total attempted score on SLCT. And Single session of Naadanusandana practice showed that 16.73% significant increase (P< 0.01) in total attempted score on DLST. Similarly, there was 17.8% significant increase (P = 0.00) in Net score and there was 69.2% reduction (P> 0.000) in wrong attempt scores SLCT. And in DLST there was 19.87% significant increase (P = 0.00) in Net score, and there was 109.9% reduction (P> 0.000) in wrong attempt scores.

SLCT & DLST Changes after the single session of music therapy.

A single music therapy practice session showed a 4.18% significant increase (P< 0.01) in total attempted scores on SLCT. And Single session of Music therapy practice showed that 10.3% significant increase (P< 0.05) in total attempted score on DLST. Similarly, there was 7.9% significant increase (P = 0.00) in Net score, and there was 49.08% reduction (P> 0.001) in wrong attempt scores in SLCT. there was 10.75% significant increase (P = 0.00) in Net score, and there was 72.1% reduction (P> 0.000) in wrong attempt scores of DLST.

Though results show that a single session of naadanasandhana and music therapy is found to be effective in enhancing cognitive functions, can be observed from the above-provided data, that the outcome measure of naadanusandhana on cognitive function is greater than that of music therapy when given in the same time period.

Discussion

Based on the existing literature, this is the first study eliciting the effect of a single session of Nadanusandana and music therapy on cognitive functions in university students. We found that a single session of Both Naadanusandana and music therapy was found to be beneficial in enhancing the performance in cognitive tasks that demand sustained attention, concentration, visual scanning, and activation and inhibition of rapid responses, psychomotor speed, mental flexibility, and speed of information processing when we see comparatively Naadanusandana has found to more effective than music therapy. The possible mechanisms involved in enhanced cognitive abilities through Naadanusandana may be attributed to a reduction in anxiety due to chanting (Bhargav et al. 2015). Aakara, Uukara, Makara and Om chanting has also been demonstrated

to deactivate the limbic system, similar to that of vagus nerve stimulation (Kalyani et al. 2011), leading to a parasympathetic shift in the activity of the autonomic nervous system. practices like nadanusandana, music therapy can indeed be a process of reaching mindfulness, but it can also involve other techniques and goals. Mindfulness is a mental state characterized by actively and openly focusing one's attention on the current moment, without being judgmental or distracted. Practices like nadanusandana and music practices aim to cultivate mindfulness to reduce stress, improve focus and cognitive stimulation, and promote overall well-being in individuals. However, both nadanusandana and music cultivate relaxation, developing compassion and insight, or connecting with spiritual or transcendent reality. Different meditation techniques may emphasize different aspects of mindfulness, or use other methods such as visualization, mantra repetition, or body awareness which has an effect on relaxation Ultimately, in turn, has its own effect on cognition, and other faculties of cognitive functions and the practice of nadanusandana and music meditation is a personal journey that can take many forms and serve many purposes. Exploring different techniques and finding what works best for your individual needs and goals is important

Conclusion

Both practices have been shown to be effective in improving mental well-being and cognitive function and can be used as non-invasive and non-pharmacological interventions to promote overall health and wellness. But in this particular study, even a single session of naadanusandana and music therapy was found to be effective in enhancing cognitive functions among university students, though it was found that nadanusandana is more effective compared to music therapy. Future research should address the potential long-term combined effects of nadanusandana and music therapy on cognitive functions among university students.

Reference

1. Babu, K. R. (2009). Hatha-Yoga the Way of Coping with Stress. Health Psychology and Counselling, 71.
2. Bhargav, H., Metri, K., & Dhansoia, V. (2015). Immediate effect of mind sound resonance technique on state anxiety and cognitive functions in patients suffering from generalized anxiety disorder: A selfcontrolled pilot study. International Journal of Yoga, 8, 70.
3. Foran, L. M. (2009). Listening to music: Helping children regulate their emotions and improve learning in the classroom. Educational Horizons, 88(1), 51-58.
4. Guskiewicz, K. M., Marshall, S. W., Bailes, J., McCrea, M., Cantu, R. C., Randolph, C., & Jordan, B. D. (2005). Association between recurrent concussion and late-life cognitive impairment in retired professional football players. Neurosurgery, 57(4), 719-726.
5. Jagannathan, A., Hamza, A., Thirthalli, J., Nagendra, H. R., Nagarathna, R., & Gangadhar, B. N. (2012). Development and feasibility of need-based yoga program for family caregivers of in-patients with schizophrenia in India. International Journal of Yoga, 5(1), 42.
6. Kalyani, B. G., Venkatasubramanian, G., Arasappa, R., Rao, N. P., Kalmady, S. V., Behere, R. V., & Gangadhar, B. N. (2011). Neurohemodynamic correlates of ‘‘OM’’ chanting: A pilot functional magnetic resonance imaging study. International Journal of Yoga, 4, 3–6.
7. Kim, E. J. (2010). Factors influencing cognitive impairment of the elderly residents. Journal of East-West Nursing Research, 16(2), 122-130.
8. Malik, V. K., & Mishra, V. B. R. (2019). Music-A remedy in Psychological Disorders (Manas Vikara). Journal of Ayurveda and Integrated Medical Sciences, 4(06), 131-140.
9. Natu, M. V., & Agarwal, A. K. (1997). Testing of stimulant effects of coffee on the psychomotor performance: An exercise in clinical pharmacology. Indian journal of pharmacology, 29(1), 11

10. Putkinen, V., Nazari-Farsani, S., Seppälä, K., Karjalainen, T., Sun, L., Karlsson, H. K., ... &Nummenmaa, L. (2021). Decoding music-evoked emotions in the auditory and motor cortex. Cerebral Cortex, 31(5), 2549-2560.
11. Saoji, Apar; Mohanty, Sriloy; Vinchurkar, Suhas A. (2017). Effect of a Single Session of a Yogic Meditation Technique on Cognitive Performance in Medical Students: A Randomized Crossover Trial. Journal of Religion and Health, 56(1), 141–148.
12. Stanczyk, M. M. (2011). Music therapy in supportive cancer care. Reports of Practical Oncology & Radiotherapy, 16(5), 170-172.
13. Warth, M., Keßler, J., Hillecke, T. K., &Bardenheuer, H. J. (2015). Music therapy in palliative care: A randomized controlled trial to evaluate effects on relaxation. DeutschesÄrzteblatt International, 112(46), 788.