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Protocol

Immediate effects of bandha hasta utthanasana on cerebral hemodynamics in healthy individuals: a protocol for randomized controlled trial

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ABSTRACT

Background: Functional near-infrared spectroscopy (fNIRS) is a tool to measure variations in cerebral hemodynamics. The study investigates the physiological changes in cerebral blood flow before, during, and after the practice of bantha hasta utthanasana among healthy participants.
Methods: The proposed study is a hospital-based randomized controlled trial comparing bantha hasta utthanasana with the control group. A total of 60 participants will be randomly divided into an intervention group (n=30) and a control group (n=30) as per inclusion and exclusion criteria. The intervention group will practice bantha hasta utthanasana for 10 minutes. The control group will be instructed to sit for 10 minutes. Functional near-infrared spectroscopy will be performed before (5 minutes), during (10 minutes), and after (5 minutes) the practice in both groups.
Conclusions: This study protocol aims to investigate whether the practice of bandha hasta utthanasana can enhance cerebral hemodynamics. The research seeks to determine if this simple practice can be used to manage individuals with cerebral hemodynamic impairment and potentially prevent such issues in the future.
Trial Registration: CTRI/2023/10/059039.

Keywords: Yoga, Functional near-infrared spectroscopy, Cerebral hemodynamics

INTRODUCTION

The non-invasive, portable, and lightweight neuroimaging technique known as functional near-infrared spectroscopy (fNIRS) analyses cortical brain activity.[1] To measure variations in blood flow oxygenation (oxygenated (ΔHbO) and deoxygenated hemoglobin (ΔHbR), brought on by cerebral activation, fNIRS uses optical fibers to emit near-infrared light into a region of the brain.[2] Before reaching neural tissue, light in the near-infrared (NIR) spectrum at various wavelengths passes through the scalp and various layers of the head. Depending on the level of oxygen saturation in the tissue, hemoglobin absorbs NIR light differently. The modified Beer-Lambert law is used to determine ΔHbO and ΔHbR after nonabsorbed light scatter components are identified. Local hemodynamics are altered by neural activity, resulting in an increase in HbO concentration in the active region and a decrease in HbR concentration. Cognitive processes can be affected by baseline hemoglobin concentrations in the prefrontal cortex.[3,4]

The term "Yoga" denotes a group of physical, mental, and spiritual practices originating in ancient India. Yoga has content of ethics (yama and niyama), physical postures and exercises (asanas), breathing techniques (pranayama), and meditation practices, which aim to cultivate awareness; unite the mind, body, and spirit, alleviate suffering; and ultimately obtain profound states of consciousness.[5] Meditation practices include sensory withdrawal (pratyahara), concentration (dharana), meditation (dhyana), and a deep level of concentration (or absorption) described as self-transcendence (samadhi) it has been explained differently in many texts according to the various schools of yoga practice.[6-9]

In Asana one of the standing postures is called bandha hasta utthanasana. Yoga is not only involved in postural changes but also voluntary regulation of breathing.[10] This modulates the changes in depth and rate of breathing and influences the function of the brain.[11] Yoga people had an increased concentration of HbO at the prefrontal cortex (PFC) compared to the non-yoga group, similarly, the concentration of dHb was less in the yoga group compared to non-yoga.[12] Several studies show that Frontal hemodynamic responses to the high-frequency yoga breathing method Kapalabhati (KB) were evaluated between 18 schizophrenia patients and 18 healthy people in a study to assess their effects on frontal hemodynamics in schizophrenia.[13] Healthy individuals show significantly greater activation and schizophrenia patients show relative hypo-activation of bilateral PFCs during KB. However, no study examines the impact of bandha hasta utthanasana practice on cerebral hemodynamics in healthy individuals.

METHODS

Study design

A randomized control study design will be adopted. Subjects will be randomly allocated to the study and control group. Institutional ethical committee (IEC) approval has been taken, vide letter number (RES/IEC-GYNMC/2022/148). The clinical registration: CTRI/2023/10/059039. The study protocol will be explained to the participants and a signed consent form will be obtained from each subject. The study group will be advised to practice bandha hasta utthanasan, whereas the control group will be made to sit quietly for 10 minutes (only one session). Assessment of cerebral hemodynamics will be taken before and immediately after the intervention for both groups.

Intervention

All the subject of the study group undergoes yoga intervention (Bandha Hasta Utthanasana) be asked to stand erect with their feet together and their arms by the sides. And asked to Relax the whole body and balance the body weight equally on both feet. After that ask to cross the wrists in front of the body. Inhale slowly raising the arms above the head, keeping the wrist crossed at the same time bend the head slightly backward and look up at the hands and exhale while spreading them out to the sides, form a straight line at shoulder level, hold the position, inhale while re-crossing the wrist above the head, and exhale while lower the arms in the starting position. Repeat the process 5 times for 10 minutes.[14] Subjects will not receive any intervention. The subjects will be asked to sit in any comfortable posture for 10 minutes.

Randomization and blinding

Participants will be randomly divided (1:1 ratio) into two groups using simple random methods with the use of computerized randomization allocation concealment will be done using the sequentially numbered opaque sealed envelope (SNOSE) technique. Participants and investigators will not be blinded in this study.

Selection of participants

Inclusion criteria

Participants both male and female with age groups between 18-49 years, and subjects who are willing to give their consent will be involved in this study.

Exclusion criteria

Participants with thrombosis, psychiatric illness, systemic illness, surgical history, and injuries will be excluded from this study.

Statistical analysis

All the data sets will be assessed for normality using Kolmogorov-Smirnov. Paired sample t-tests (data that were normally distributed) and Wilcoxon signed rank tests (data that were not normally distributed) will be used for group analysis. Statistical analysis will be performed using the statistical package for social science (SPSS), version 16.0.

Outcome variables

Primary outcome

Assessment of cerebral hemodynamics will be done before and after the intervention by using fNIRS device LLC, Potomac, MD (model:2000s-v1.2, biopic system manufactured at United States) is a continuous wave device that measures the changes in cerebral blood flow, and the fNIRS sensor pad, equipped with 4 light emitters and 10 fixed photodetectors, measures changes in oxyhemoglobin HbO_2, reduced hemoglobin HbR, and total hemoglobin HbT concentration in a soundproof, dark room. The head cap is worn throughout the session, and continuous recordings are taken before (5 minutes), during (10 minutes), and after the practice (5 minutes).

Secondary outcome

Blood pressure will be measured before and after the practicing bandha hasta utthanasana as well as in control with a digital blood pressure monitor.

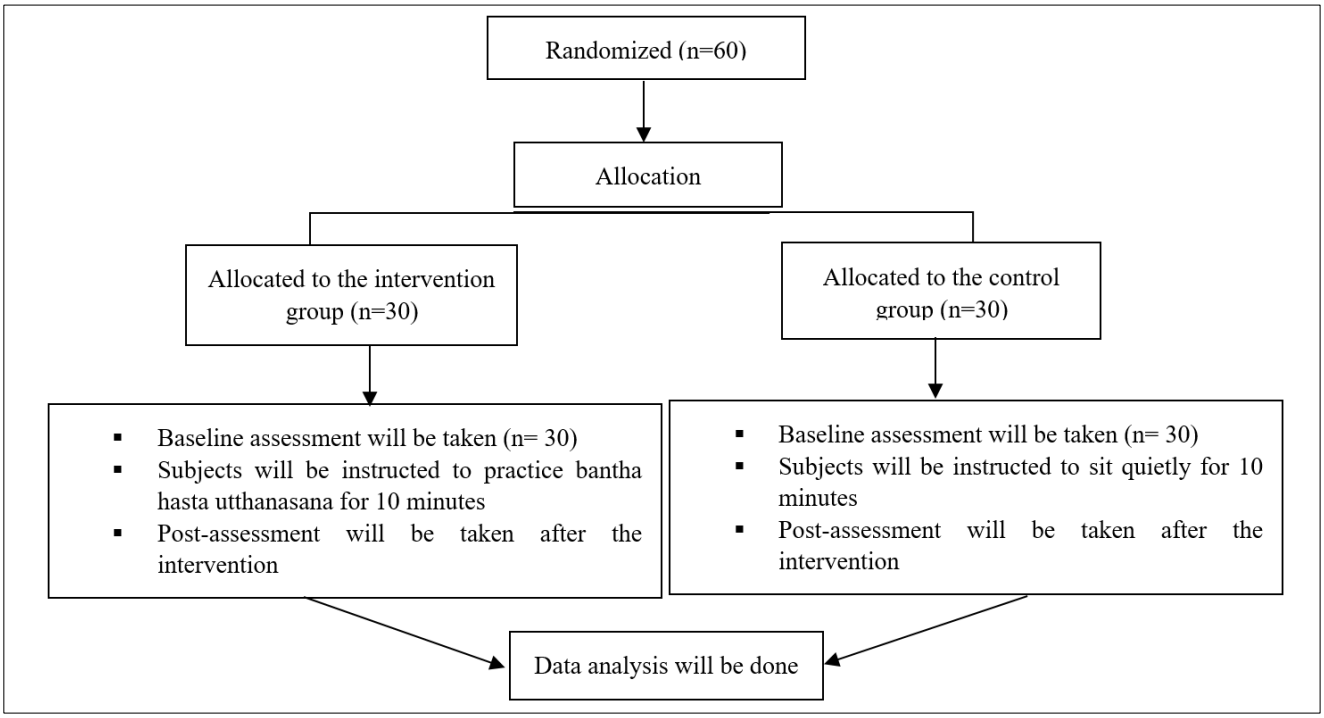

Figure 1: Trail profile.

DISCUSSION

The positive effects of yoga on the frontal brain have been reported. Regular yoga practice increases the blood supply to the prefrontal cortex.[6] However, no convincing evidence was reported for the effect of bantha hasta uthhanasana on frontal hemodynamics. In addition, the practice of bandha hasta uthhanasana helps to increase the blood supply to the brain.[14] There are various asanas in yoga like sirashasana, sarvangasana, and vipareeta karni which would increase blood supply to the brain. Still, these asanas require regular continuous practice and cannot practiced by beginners. However, though bandha hasta utthanasana is a simple practice, it is also reported to increase blood supply to the brain it does not require earlier practice and it can be practiced by people with certain illnesses like hypertension, lumbar spondylitis, migraine, thrombosis, chronic constipation, atherosclerosis, there is lack of studies on this practice on cerebral hemodynamics.[14] Yoga may be a helpful complementary therapy for individuals with cerebral hemodynamic impairment.[15] This study findings might suggest that yoga could be recommended as a complementary and integrative therapy for effectively managing cerebral hemodynamic impairment.

CONCLUSION

The present study findings will provide high-quality clinical evidence on the efficacy of the bantha hasta uthhanasana on cerebral hemodynamics in healthy individuals. If the observations of this study ascertain the improvement in cerebral hemodynamics, it could be recommended as an adjuvant therapy for better care and management for patients with cerebral hemodynamic impairment.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Herold F, Wiegel P, Scholkmann F, Müller NG. Applications of Functional Near-Infrared Spectroscopy (fNIRS) Neuroimaging in Exercise–Cognition Science: A Systematic, Methodology-Focused Review. J Clin Med. 2018;7(12):466.
2. Pinti P, Tachtsidis I, Hamilton A, Hirsch J, Aichelburg C, Gilbert S, et al. The present and future use of functional near-infrared spectroscopy (fNIRS) for cognitive neuroscience. Ann N Y Acad Sci. 2020;1464(1):5-29.
3. Zolubak M, Paszkiel S, editors. EEG Analysis and Neurofeedback Therapy of Concentration Problems in Mother and Child. Springer. 2021.
4. Dybvik H, Steinert M. Real-world fNIRS brain activity measurements during Ashtanga Vinyasa yoga. Brain Sci. 2021;11(6):742.
5. Padmavathi R, Kumar AP, Dhamodhini KS, Venugopal V, Silambanan S, Maheshkumar K, et al. Role of yoga in stress management and implications in major depression disorder. J Ayurveda Integr Med. 2023;14(5):100767.

6. Telles S, Gupta RK, Singh N, Balkrishna A. A functional near-infrared spectroscopy study of high-frequency yoga breathing compared to breath awareness. Med Sci Monit Basic Res. 2016;22:58.
7. Sekar L, Niva WJ, Maheshkumar K. Effect of Mahamantra Chanting on Autonomic and Cognitive Functions-An Interventional Study. J Clin Diagnost Res. 2019;13(5).
8. Niva WJ, Sekar L, Manikandan A, Maheshkumar K, Ganesan T, Shriraam V, et al. Mahamantra chanting as an effective intervention for stress reduction among nursing professionals—A randomized controlled study. Adv Integ Med. 2021;8(1):27-32.
9. Rajagopalan A, Kuppusamy M, Gandhi TS. Meditation Alleviates Psychological Distress and Sleep Quality in COVID-19 Patients during Home Isolation. J Young Pharm. 2022;14(4):441-3.
10. Naveen Kumar M, Thanalakshmi J, Kannan R, Maheshkumar K, Allu AR, Vijayalakshmi B. The immediate effect of sheethali and sheethkari pranayama on blood pressure and cardiovascular changes among hypertensive patients. Int J Res Pharm Sci. 2018;9(4):1249-52.
11. Jagadeesan T, Choudhary AK, Loganathan S, Rajendran K, Allu AR, Kuppusamy M. Yoga practice (Sheetali Pranayama) on cognition in patients with hypertension: A randomized controlled study. Integr Med Res. 2021;10(3).
12. Jiang D, Liu Z, Sun G. The effect of yoga meditation practice on young adults' inhibitory control: an fNIRS study. Front Hum Neurosci. 2021;15:725233.
13. Bhargav H, Bn G, Raghuram N. Frontal hemodynamic responses to high frequency yoga breathing in schizophrenia: a functional near-infrared spectroscopy study. Front Psychiatr. 2014;5:83432.
14. Saraswati SS. Asana Pranayama Mudra Bandha Munger, Bihar, India: Yoga publicationn trust, Ganga Darshan, Munger, Bihar, India. 2002;557.
15. Schmid AA, Fruhauf CA, Sharp JL, Van Puymbroeck M, Bair MJ, Portz JD. Yoga for people with chronic pain in a community-based setting: A feasibility and pilot RCT. J Evid-based Integr Med. 2019;24:2515690X19863763.

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