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A study on effectiveness of yoga on sympathetic nervous system of the body

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Abstract
Introduction: Yoga engages the student in the healing process; by playing an active role in their journey toward health, the healing comes from within, instead of from an outside source and a greater sense of autonomy is achieved.
Materials and Methods: This search was conducted to obtain general information regarding yoga's therapeutic effects in the existing literature. Subsequently, a second search was conducted using the following key words or exact phrases, "hatha yoga," "therapeutic effects of yoga," "stress," "anxiety, "depression," "pain," and "chronic disease.
Results: Age (Years) of control and study Group: Mean Age + SD of control Group- 42.36±5.209 Mean Ag SD of study Group - 42.22±5.168 There is no significant variation in age of both Groups.
Conclusion: This scientific study suggest that the practicing of yoga bring about a number of physiological and Biochemical changes in the body and rehabilitates various vital organs and make them functionally more competent to resist the stresses.

Keywords: Effect of yoga, sympathetic, nervous system

Introduction
Yoga is considered to be one of the most important, effective and valuable tool available to overcome various psychological problems. Benson conducted his studies on Transcendental Meditation (TM), where the meditator recites a mantra provided to him or her by the meditation instructor, as well as on Mindfulness meditation, which is a form of meditation that emphasizes the stabilization of attention by acknowledging discursive sensory events as momentary, and observing them without affective reaction or attachment. Benson showed that TM and Mindfulness meditation result in physiological changes indicative of a heightened activation of the parasympathetic nervous system and lowered sympathetic activity, such as decreased oxy- gen consumption and carbon dioxide elimination, lowering of heart and respiratory rates, and a marked decrease in arterial blood lactate concentration (e.g) [1, 2], as well as psychological outcome measures that indicate relaxation are characteristic responses that occur during relaxation, Benson termed the responses that occur during meditation as a relaxation response. Although Benson discovered the relaxation response by investigating TM and Mindfulness, he assumed that it applies to meditation in general and that it is useful to decontextualize different types of meditation from their religious and cultural basis: "to understand the psychophysiological aspects of meditation, it should first be conceptually denuded of its cultural and religious biases" [page 2] [3]. Importantly, the attainment of a relaxation response during meditation has been confirmed by many subsequent studies and consistently reported in the scientific literature (e.g) [4, 7].
Based on Benson's approach, an evolutionary theory was proposed by Young and Taylor [8], where meditation was characterized as a "wakeful hypometabolic state of parasym- pathetic dominance" [page 149] [8]. The hypometabolic state during meditation is a state of deep rest, which is similar to hibernation, but where the practitioner remains awake and vigilant [8, 9]. The state of being awake and vigilant was later termed "tonic alertness," which indicates a state of optimal vigilance where attention is sustained for a prolonged period of time [10]. Numerous studies indicate a strong association between compromised ANS (e.g. decreased vagal activity or increased sympathetic activity) and sudden cardiac and non sudden cardiac death. Lifestyle modifications are also increasingly recognized as important factors in the treatment, prevention and rehabilitation of cardiovascular disorders. One highly popular and currently researched lifestyle modification is yoga.

Regular Yoga practice has been postulated to help in prevention of disease, in particular, to streamline autonomic functions, specifically by modulating vagal efferent [11]. The goal of this review is to show that different types of Buddhist meditation techniques can lead to relaxation or arousal depending on the type of meditation that is practiced. We also plan to show that while some types of meditation gen-erate increased tonic alertness, or vigilance, along with a state of relaxation and parasympathetic activation, other types of meditation lead to increased phasic alertness and generate an immediate and dramatic increase in cognitive performance on visual tasks, consistent with the state of arousal and sympathetic activation. In the following sections, we will first provide an overview of the autonomic system and the manner in which it underlies psychological and physiological states of relaxation and arousal and influences attentional processes that relate to phasic and tonic alertness. We will proceed with a review of scientific studies that demonstrate a relaxation response during Theravada and Mahayana types of meditation, which will be followed by a review of studies that demonstrate tonic alertness during these practices. Lastly, we will review studies that demonstrate an arousal response, as well as phasic alertness, during Vajrayana and Hindu Tantric practices. Everyone experiences stress because of our modern lifestyle which is highly competitive, challenging and with full of tensions [12]. Chronic stress increases sympathetic discharge for a longer time and is characterised by a change in the set point of hypothalamo-pituitary axis activity, leading to immediate effect on heart rate, blood pressure, temperature, respiratory rate, catecholamines and corticosteroids. Thus sympathetic over activity for a longer time is associated with cardiovascular morbidity and mortality [13]. Such situation can be tackled by simple lifestyle modification including diet, exercise, Yoga and relaxation techniques. The first principle is the human body is a holistic entity comprised of various interrelated dimensions inseparable from one another and the health or illness of any one dimension affects the other dimensions. The second principle is individuals and their needs are unique and therefore must be approached in a way that acknowledges this individuality and their practice must be tailored accordingly. The third principle is yoga is self empowering; the student is his or her own healer. Yoga engages the student in the healing process; by playing an active role in their journey toward health, the healing comes from within, instead of from an outside source and a greater sense of autonomy is achieved. The fourth principle is that the quality and state of an individuals mind is crucial to healing. When the individual has a positive mind-state healing happens more quickly, whereas if the mind state is negative, healing may be prolonged

Materials and Methods

Non yoga practitioners were selected randomly among non teaching staff of institute. Then the subject was asked to immerse his hand in cold water maintained at 4-60 C, the BP was recorded at 30 sec intervals in the other arm for a period of 2 minutes.

Blood pressure response to sustained Hand grip exercise Each subject was asked to sit comfortably in a chair. Initially the subject was asked to exert maximal hand grip strength on hand grip dynamometer with dominant hand. Then the subject was asked to exert 30% of maximal hand grip strength for 5 minutes (at least for 3 min) with dominant hand. Diastolic blood pressure was measured in the non- dominant hand at rest and at one minute intervals during hand grip. Women doing daily exercises and having major medical/surgical illnesses were excluded. History, general and physical examinations, anthropometric data, vital data and stress assessment (done by Zung self-rated anxiety scale) of women were noted before & after 16 weeks of yoga training. Statistical analysis was done by paired-t test and values shown in mean±SD. A written informed consent was obtained from the participants after explaining the purpose of the study. The cardiovascular status was assessed by recording resting HR, resting BP, BP response to standing and BP response to handgrip before the start of yoga training and after 3 months of yoga training. On the day of the test, no cigarette, other nicotine containing food products, food or drugs per oral or any other route were permitted for three hours prior to the test. Before recording the above parameters, the procedures were explained to the subject and subject was asked to relax physically and mentally for 30 minutes. The subjects were made to wear loose cloths and under clothings, metallic objects were not allowed to wear. This search was conducted to obtain general information regarding yoga's therapeutic effects in the existing literature. Subsequently, a second search was conducted using the following key words or exact phrases, “hatha yoga,” “therapeutic effects of yoga,” “stress,” “anxiety, “depression,” “pain,” and “chronic disease.” The following criteria were used for including studies in this review: (1) the article had to be peer reviewed, (2) published between the years 1990 and 2009, (3) the intervention had to incorporate some form of yoga and/ or meditation, and (4) effects of yoga on some outcome were measured. In order to select the articles included in this manuscript, several steps were taken. First, the title was read. If the article appeared appropriate to the examination of the therapeutic effects of yoga, it was saved to a folder.

Results

Age (Years) of control and study Group: Mean Age + SD of control Group- 42.36±5.209 Mean Ag SD of study Group-42.22±5.168 There is no significant variation in age of both Groups. [Table 1]. There is no significant variation in age of both Groups.

Table 1: Age (Mean + SD) of control and study Group

Parameter	Control Group	Study Group	Level of significance
Age (Years)	42.36±5.209	42.22±5.168	p= 0.831

Anthropometric measurements of subjects both in study group and control group. Height (cms) of control and study Group: Mean + SD of control Group-165.30±8.321 cms Mean SD of study Group-165.55±8.970 cms There is no significant (p=0.864) difference in the height of the subjects between the study Group and control Group. Weight (Kg) of control and study Group: Mean + SD of control Group-65.81±9.82 Mean SD of study Group - 63.90±5.380 There is no significant (p=0.209) difference in the weight of the subjects between the study Group and control Group. BMI (kg/ m2) of control and study Group: Mean + SD of control Group - 24.88 + 2.61 Mean±SD of study Group - 24.14 + 2.11 There is significant (p=0.014) difference in the BMI of subjects between the study Group and control Group. [Table 2].

Table 2: Anthropometric measurements Mean±SD of control and study group

Parameters	Control Group	Study Group	Level of significance
Height (cms)	165.30±8.321	165.55±8.970	0.864
Weight (kg)	65.81±9.82	63.90±5.380	0.209
BMI (*kg*/m2)	24.88±2.61	22.14±2.11	0.014

Physiological parameters of subjects both in study group and control group. Resting Pulse Rate (beats/min) of control and study Group: Mean±SD of control Group- 73.81±4.489 Mean±SD of study group-71.60±4.281
There is highly significant (p=0.003) decrease in the Resting Pulse Rate of subjects in study Group compared to control Group. Resting Respiratory Rate (cycles/min) of control and study Group: Mean±SD of control Group- 15.02±2.601 Mean±SD of study group - 14.0±2.490 There is a highly significant (p=0.001) **decrease in the Resting Respiratory Rate of subjects in study Group compared to control Group. Resting Systolic Blood Pressure (mm of Hg) of control and study Group: Mean±SD of control Group- 124.42±6.105 Mean SD of study group - 123.01±5.080There is insignificant (p=0.114) decrease in the Resting SBP of subjects in study Group compared to non yogic Group. Resting Diastolic Blood Pressure (mm of Hg) of control and study Group: Mean±SD of control Group- 83.40±5.008 Mean±SD of study group- 81.21±4.103There is highly significant (p=0.004) decrease in the Resting Diastolic Blood Pressure of subjects in study Group compared to control Group.[Table 3].

Table 3: Physiological Parameters (Mean±SD) of subjects in control and study group.

Parameters	Control Group	Study Group	Level of significance
Resting PR (bpm)	73.81±4.489	71.60±4.281	0.003
Resting PR (Cycles/min)	15.02±2.601	14.03±2.490	0.001
Resting SBP (mmofHg)	124.42±6.105	123.01±5.080	0.114
Resting DBP (mmofHg)	83.40±5.008	81.21±4.103	0.004

*$p<0.05$: Significant, ** $p<0.01$: Highly significant, *** $p<0.001$: Very highly significant

Discussion

The cold pressor response which consist of placing the hand into cold water acts as a painful stimulus and has been used to study the autonomic response of different individuals. The afferent fibers for this response are the pain fibers which are stimulated by placing the hand in cold water and the efferent fibers are sympathetic fibers. The response of 15-20 mm Hg increase in systolic BP and diastolic BP by 10 mmHg is considered as normal response to cold pressor test. Sympathetic arousal resulting in increased catecholamines and cortisol levels mediated through the hypothalamic-pituitary- adrenal axis is the effect of increased stress & anxiety [14-15]. Some of the symptoms of stress seen in women include fatigue, head, back, neck and shoulder aches, stomach problems, pain during and after menstrual cycles, feeling of being anxious, isolated, frustrated, irritated and difficulty in concentrating. Subtle discriminations at workplaces, family pressures and society demands add to these stresses in them [16]. Other important mechanisms explain the role of yogic meditation in reducing anxiety are a) during meditation there is decrease in plasma phenylalanine that is associated with altered mental activity and also decrease in plasma cortisol which is an important mediator of stress b) Different yoga poses show an increase in the levels of central inhibitory neurotransmitters Gamma amino butyric acid (GABA) as low GABA levels are associated with higher anxiety [17, 18].
Kurwale *et al.* 2014 [19] and Gawali *et al.* 2013 [14] reported the same findings observed in present study. The yoga practices stimulate and balance all systems of the body. The end result is increased mental clarity, emotional stability and a greater sense of wellbeing [20].

Conclusion

It can be concluded that the regular practice of a set of yoga training blunted the sympathetic drive and lateralised the autonomic function towards parasympathetic control. There were significantly reducing various stress symptoms observed after the therapy. There was also evidence of decreased autonomic arousal and more of physiological relaxation. These results suggest that the selected breathing technique have a marked stimulating effect on parasympathetic nerve system or relaxing effect on sympathetic nervous system. This scientific study suggest that the practicing of yoga bring about a number of physiological and Biochemical changes in the body and rehabilitates various vital organs and make them functionally more competent to resist the stresses.

References

1. Benson H, Rosner BA, Marzetta BR, Klemchuk HP. Decreased blood pressure in borderline hypertensive subjects who practiced meditation, Journal of Chronic Diseases. 1974;27(3):163–169.
2. Wallace RK, Benson H. The physiology of meditation, Scientific American. 1972;226(2):84-90,
3. Kutz I, Borysenko JZ, Benson H. Meditation and psychotherapy: a rationale for the integration of dynamic psychotherapy, the relaxation response, and mindfulness med- itation, The American Journal of Psychiatry 1985;142(1):1-8,
4. Chiesa A, Serretti A. Mindfulness-based stress reduc-tion for stress management in healthy people: a review and meta-analysis, The Journal of Alternative and Complementary Medicine. 2009;15(5):593-600,.
5. Chiesa A, Serretti A. A systematic review of neuro-biological and clinical features of mindfulness meditations, Psychological Medicine. 2010;40(8):1239-1252.
6. Zeidan F, Martucci KT, Kraft R, McHaffie JG, Coghill RC. Neural correlates of mindfulness meditation-related anxiety relief, Scandinavica. 2014;9:751-759,
7. Ivanovski B, Malhi GS. The psychological and neuro-physiological concomitants of mindfulness forms of medita- tion, Acta Neuropsychiatrica, 2007;19(2):76–91
8. Young JDE, Taylor E. Meditation as a voluntary hypometabolic state of biological estivation, News in Physiolog- ical Sciences. 1998;13(3):149-153,
9. Jevning R, Wallace RK, Beidebach M. The physiology

of meditation: a review. A wakeful hypometabolic integrated response, Neuroscience & Biobehavioral Reviews. 1992;16(3):415-424,
10. Petersen SE, Posner MI. The attention system of the human brain: 20 years after, Annual Review of Neuroscience. 2012;35:73-89,.
11. Muralikrishnan K, Balakrishnan B, Balasubramanian K, Vishnegarawla F. Measurement of the effect of Isha yoga on cardiac autonomic nervous system using short term heart rate variability. J Ayurveda Integr Med. 2012;3(2):91-96.
12. Raichur RN, Kulkarni SB, Rahul RR, Aruna GB, Sridevi RR, Effect of meditation training on pulmonary function tests, Rec Res Sci Tech. 2010;2(11):11-16.
13. Pal GK, Velkumary S, Madanmohan. Effect of short-term practice of breathing exercises on autonomic functions in normal human volunteers, Indian J Med Res. 2004;120:115-121.
14. Gawali S, Dhule S. Effect of yoga on anxiety levels in working women. International Journal of Science and Research 2013;2(12):143-5.
15. Gopal A, Mondal S, Gandhi A, Arora S, Bhattacharyyee J. Effect of integrated yoga practices on immune responses in examination stress- A Preliminary study. Integrat J Yoga. 2011;4:26–32.
16. Rajasekhar D, Sasikala B. An impact of stress management on employed women. Language in India. 2013;13:4.
17. Chakrabarti BK, Ghosh HN, Sahana SN. Physiological changes during Meditation. In: Ghosh HN, editor. Human Physiology, 2nd ed. Calcutta: New Book Stall; c1984. p. 1236-1244.
18. Best CH, Taylor NB. Physiology and Applications in Therapy and Rehabilitation. In: Brobeck JR, editor. Best & Taylor‟s Physiological basis of Medical Practice, 13thed. Haryana: Wolters Kluwer (India) Pvt. Ltd.; c2012. P.1217-1230.
19. Kurwale M, Gadkari J. Effect of yogic training on physiological variables in working women. Indian physiol pharmacol. 2014;58(3):306-10.
20. Jain AK. Physiology of Yoga. In: Jain AK, editor. Textbook of Physiology, 4thed. New Delhi: Avichal Publishing Company; c2009. p. 498-511.