10.5958/2320-608X.2019.00150.1

Heart Rate Variability Changes during Sahaja Yoga Meditation

Madhur S Rai[1], Yashoda R Kattimani[2], Sandeep U Rai[3], RS Inamdar[4]

[1]Assistant Professor, Department of Physiology, [2]Associate Professor Department of Physiology, [3]Professor and Unit Head, Department of Medicine, [4]Professor and Head, Department of Physiology, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Abstract

Background & Objectives: Yoga and meditation is now widely accepted world wide as an effective tool to combat stress. Heart Rate Variability (HRV) is a noninvasive tool to measure sympathetic and parasympathetic function of the autonomic nervous system. Yoga, by modulating stress, has shown to decrease the activity of sympathetic component of autonomic nervous system and enhance parasympathetic component. Only few studies have compared HRV at baseline with HRV during or after single session of yoga. Thus, this study was undertaken with the objectives to compare HRV changes of Sahaja Yoga Meditators in resting state with their Meditation state and to compare these changes with HRV changes in the control group in resting and meditation mimicking state.

Method: A prospective randomized controlled study was conducted. The study group comprised of 30 randomly selected long term Sahaja yoga mediators and a control group of 30 subjects with no prior practice of any kind of meditation. HRV was recorded in both the groups in normal resting state, during meditation (yoga group) and with eyes closed (mimicking meditation in control group).

Results: Study showed decrease in LF (sympathetic activity) increase in HF (parasympathetic activity) and decrease in LF/HF ratio thus implying a more relaxed, parasympathetic dominant state, in the yoga group during meditation.

Conclusion: The study shows Sahaja Yoga meditation leads to a parasympathetic dominant (relaxed) state and thus can be used as an effective mind body technique to combat stress.

Keywords: *Heart Rate Variability (HRV), Non-Yoga group, Sahaja Yoga Meditation, Yoga group.*

Introduction

In recent times, stress related disorders are found to be on the rise. Most diseases, whether they are psychological, psychosomatic or metabolic disorders are now thought to have stress as an etiological factor. Yoga and meditation is now widely accepted and being increasingly used as an effective tool to combat stress. Beneficial health effects of meditation are often attributed to positive changes in autonomic nervous system, manifesting as reduced heart rate, respiratory rate, reduced oxygen uptake and reduced plasma circulating catecholamine levels [1] and recently as changes in HRV and assist with a wide range of stress-related disorders.

Heart Rate Variability (HRV) is recognized as an independent inverse marker of cardiovascular risk. [2]Power spectrum analysis of HRV, assesses the short term autonomic cardiovascular control systems in subjects with sinus rhythm. Low Frequency (LF 0.04-0.15Hz) determines mixed sympathetic-parasympathetic activity and baro-receptor control. High frequency (HF 0.15-0.4Hz) is linked to parasympathetic dependent activity. Their ratio LF/HF represents the sympatho-vagal balance. [3]

Heart Rate Variability is considered a measure of neuro-cardiac function that reflects heart brain interactions and Autonomic Nervous System. An optimal level of HRV reflects healthy function, adaptability and resilience within an individual. [4] Too much instability indicates arrhythmias or nervous system disturbance,

too little variation indicates inadequate functioning in various levels of self regulatory control systems. Heart rate and HRV rhythm are affected both by sympathetic and parasympathetic stimulation. However with sympathetic stimulation there is a slow response, a 5-10 seconds delay whereas parasympathetic stimulation is instantaneous.

Sahaja yoga Meditation is a modern modification of an ancient knowledge that helps every individual with every background to achieve a state of thoughtless awareness with mental silence and complete inner peace, via activation of parasympathetic-limbic pathways (Harrison et al., 2004). [5] It has shown to decrease autonomic activity in meditators[6, 7, 8] compared to controls. Changes in Physiological parameters that were noted included a reduction in heart rate, respiratory rate, systolic blood pressure and reduction of urinary vanillyl mandelic acid (VMA), a break down product of stress hormone Adrenalin and an increase of Galvanic Skin Resistance, [6] all of which reflected a de-stressed state.

Electro-physiological (EEG) studies comparing the brain activation of Sahaja Yoga meditation practitioners have shown specific brain activation patterns indicating a relaxed state of mind & subjective feelings of happiness along with better interconnectivity amongst different brain regions. [9] Randomized trials on SY Meditation using active control groups have demonstrated significant improvements in depressive mood and work stress in workers. [10]In other similar studies, on SY Meditation, positive effects have been shown in depression & anxiety[11], in enhanced Quality of life [12] and on improving Psychological health. [13] In fact, the same physiological effects achieved with Sahaja Yoga Meditation in healthy individuals, could also be seen in patients with bronchial asthma, [14] hypertension, [15] epilepsy, [16] attention deficit hyperactivity disorder in children[17] and Stress. [18]

The characteristic physiological change achieved by SYM is the relaxation response. According to ancient yogic philosophy, it is hypothesized that during meditation there is activation of the subtle energy (kundalini), which actualizes in limbic system of the brain. The limbic system is connected with hypothalamus and through this route it exerts its effect on autonomic nervous system. The release of various hormones in response to stress is modulated by the limbic system-HPA axis. Modulation of Stress can in turn lead to improvement in numerous life style diseases, like diabetes, hypertension, etc.

Material and Method

The study was conducted in the Clinical Laboratory of Physiology department, MGM Medical College, Kamothe, Navi Mumbai during the period June 2015 to December 2016. Ethical clearance from Institutional Ethical Committee was obtained prior to the commencement of the study. The subjects were explained the study protocol and the right to terminate during the course of study. Written informed consent was taken.

Inclusion Criteria:

1. Men and non-pregnant women aged 25-70 years, those who were practicing Sahaja Yoga meditation for more than 5 years.
2. Those subjects willing to give consent and comply with study protocol.
3. Subjects had to be non-smokers, non-alcoholic, able to read, write and understand English.

Exclusion Criteria:

1. Individuals who were not willing to give consent, who were smokers or alcoholic.
2. Patients on medication (treatment for CVS diseases) known to alter HRV, in a significant way.
3. For control group, those practicing any other form of meditation, Tai Chi, etc.

Methodology: Prior to the study, baseline data was collected from all the participants. Their demographic profile, name, age, sex, height, weight was recorded.

Recording of HRV: The subject was then made to sit comfortably. The probe of the peripheral pulse analyzer was clipped to the subject's right hand index finger. The probe was connected to the Anu-Photorheograph, which was connected to a desktop computer having software for HRV (Variability Analyzer) and subject's recordings resting condition were obtained.

After the recordings in normal resting state, the subject was then asked to start meditation and he/she had to signal by tapping his/her finger on chair when they felt they have reached a deep meditative state. HRV recordings were started, after the subject signaled by tapping. With similar procedure, 30 subjects of Sahaja Yoga group were investigated.

After the recordings for mediators group, HRV was recorded for all the controls in normal resting state and

Heart rate in healthy humans is influenced by physical, emotional and cognitive activities.[21] HRV reflects the dynamic balance arising from co activation or co-inhibition of the sympathetic and parasympathetic nervous systems.[22] In healthy individuals, acute increase in HF-HRV generally occurs in meditation[23] although individual differences in direction of change have been reported. [24] Consistent with these reports we found that 70% of Sahaja yoga participants showed increased HF-HRV in our study.

A comprehensive review of the literature of Yoga and heart rate variability suggests that yoga can affect cardiac autonomic regulation with increased HRV and vagal dominance during yoga practices. Of these studies, four reported reduced LFn. u. and increased HFn. u.[24,25] A recent study reported increase in both frequency and time domains[8] whereas another study of coronary heart disease patients reported a marginal increase in absolute power of HF-HRV after 16 weeks of meditation compared to control group that received health education.

The present study shows reduced mean R-R interval of 0.7397 against Non yoga group R-R interval of 0.7577; also there is reduction in mean R-R interval during Sahaja yoga meditation (0.7743) as compared to control group with eyes closed (0.7577). This is consistent with the findings of Nesvold et all [26] who studied HRV during nondirective meditation.

There is increase in total power, decrease in LF i.e. sympathetic activity, increase in HF i.e. parasympathetic activity and decrease in LF/HF ratio with a p value of 0.0010502 (statistically highly significant), implying a more relaxed state and enhanced parasympathetic modulation of HRV in yoga during meditation. These findings are similar to various studies on HRV done during meditation. [7, 27]

Elevated HF-HRV is associated with greater cognitive performance, [28] better regulation of effect during daily stress, better modulation of emotional expression and defensive reactions, better attention regulation, effective impulse control[29] and behavioral regulation.

The association between HF-HRV and self regulation is supported by the evidence that the brain structures that regulate autonomic balance overlap with the networks that serve executive, social, effective attention and motivational behaviors. [27] Higher HF-HRV indicate enhanced emotional and attention regulation abilities.[30]

Studies have shown that Sahaja yoga meditation modulates one's ability to modulate stress and maybe one of the reasons for more robust sympatho vagal balance, as reflected by HRV measures. The present study shows Sahaja Yoga meditation leads to a parasympathetic dominant (relaxed) state and thus can be a useful technique to combat stress. More rigorous studies with detailed reporting of yoga and meditation practices are required to conclusively determine the effect of yoga and meditation on HRV.

Conflict of Interest: Nil

Source of Funding: Self

References

1. Benson H, Beary J F, Carol MP.. The Relaxation Response. *Psychiatry*1974; 37 (1): 37-46.
2. Tsuji H, Larson MG, Venditti FJ Jr, Manders ES, Evans JC, Feldman CL, et al.. Impact of Reduced Heart Rate Variability on risk for cardiac events. The Framingham Heart Study. *Circulation* 1996 Dec 1; 94 (11): 2850-2855
3. Akselrod S, Gordon D, Ubel FA, Shannon DC, BargerAC, Cohen RJ. Power Spectrum Analysis of Heart Rate Fluctuation: A Quantitative probe of beat-to-beat Cardio-vascular Control. *Science* 1981; 213 (4504): 213-222.
4. Singer DH. High heart rate variability, marker of healthy longevity. Am J Cardiol. 2010; 106 (6):910.
5. Harrison LJ, Manocha R, Rubia K.. Sahaja Yoga Meditation as a family treatment programme for children with attention deficit-hyperactivity disorder. Clinical Child Psychology and Psychiatry, 2004; 9 (4):479-497.
6. Rai UC, Sethi S, Singh S. Some effects of Sahaja Yoga and its role in the prevention of stress disorders. Journal of International Medical Sciences. 1988; 19-23.
7. Rai MS, Kattimani YR, Rai SU. Effect of Sahaja yoga Meditation on Heart Rate Variability. MGM Journal of Medical Sciences 2016; 3 (3):126-130.
8. Yunati MS, Deshp VK, Yuwanate AH.. Dynamics of heart rate induced by Sahaja yoga meditation in healthy normal subjects above 40 years. *Natl J Physiol Pharm Pharmacol* 2014; 4 (1): 80-85.
9. Aftanas LI, Golocheikine SA.. Linear and non-linear concomitants of Altered state of consciousness during meditation: high resolution

EEG investigation. *International Journal of Psychophysiology* 2002 (a); *45 (1-2)*: 158-1158.

10. Manocha R, Black D, Sarris J, Stough C.. A Randomized, Controlled Trial of Meditation for Work Stress, Anxiety and Depressed Mood in Full-Time Workers. Evidence Based *Complementary and Alternative Medicine* 2011; Article ID 960583, 8 pages.
11. Aftanas L, Golosheykin S.. Impact of Regular Meditation practice on EEG activity at Rest and during Evoked Negative Emotions. *International Journal of Neuroscience* 2005; *115 (6): 893.*
12. Chung S, Brooks MM, Rai M, Balk JL, MD, Rai S.. Effect of Sahaja Yoga Meditation on Quality of Life, Anxiety and Blood Pressure Control. *The Journal Of Alternative And Complementary Medicine* 2012; 18 (6): 589-596.
13. Khalsa SB.. Yoga as a Therapeutic intervention: A Bibliometric analysis of published research studies. Indian Journal Physiol Pharmacol. 2004; 48:269-285
14. Manocha R, Marks G B, Kenchington P, Peters D, Salome CM.. Sahaja Yoga in the Management of Moderate to Severe Asthma: A Randomized Controlled trial. Thorax 2002; 57 (2): 110-115.
15. Chugh D.. The Effects of Sahaja Yoga in Bronchial Asthma and Essential Hypertension. New Delhi Medicos 1997; 13 (5):46-47.
16. Panjwani U, Selvamurthy W, Singh SH, Gupta HL, Thakur L, Rai UC.. Effect of Sahaja yoga practice on Seizure Control and EEG changes in patients of Epilepsy. *Indian J Med Res 1996*; 103:165-72.
17. Harrison LJ, Manocha R, Rubia K.. Sahaja Yoga Meditation as a family treatment programme for children with Attention Deficit-Hyperactivity disorder. *Clinical Child Psychology and Psychiatry* 2004; 9 (4): 479-497.
18. Panjwani U, Gupta HL, Singh SH, Rai U.. Effect of Sahaja yoga practice on stress management in patients of Epilepsy. *Indian J Physiol Pharmacol 1995*; 39 (2):111-6.
19. Tyagi A, Cohen M.. Yoga and Hypertension: A systematic review. Alternative Therapy Health Med 2014; 20:32-59.
20. Innes KE, Bourguignon C, Taylor AG.. Risk indices associated with the Insulin Resistance Syndrome, Cardiovascular Disease and possible protection with Yoga: A systematic Review. J Am Board Fam Pract 2005; 18:491-519.
21. Thayer JF, Hansen AL, Saus-Rose E, Johnsen BH.. Heart Rate Variability, Prefrontal Neural function, and Cognitive performance: The Neurovisceral Integration Perspective on Self-regulation, Adaptation, and Health. Annals of Behavioral Medicine 2009; 37:141-53.
22. Berntson GG, Bigger JT Jr., Eckberg DL, Grossman P, Kaufmann PG, Malik M, et al.. Heart rate variability: Origins, method, and interpretive caveats. Psychophysiology 1997; 34:623-48.
23. Telles S, Raghavendra BR, Naveen KV, Manjunath NK, Kumar S, Subramanya P.. Changes in Autonomic Variables following Two Meditative states described in Yoga Texts. J Altern Complement Med. 2013; 19:35-42.
24. Vempati RP, Telles S.. Yoga-based Guided Relaxation reduces Sympathetic Activity judged from Baseline levels. Psychol Rep. 2002; 90:487-494
25. Markil N, Whitehurst M, Jacobs PL, Zoeller RF.. Yoga Nidra Relaxation increases Heart Rate Variability and is Unaffected by a Prior bout of Hatha yoga. J Altern Complement Med. N Y N 2012; 18:953-8.
26. Nesvold A, Fagerland MW, Davanger S, Ellingsen Ø, Solberg EE, Holen A, Sevre K, Atar D.. Increased heart rate variability during nondirective meditation. Eur J Prev Cardiol. 2012 Aug; 19 (4):773-80.
27. Peng CK, Henry IC, Mietus JE, Hausdorff JM, Khalsa G, Benson H, Goldberger AL.. Heart rate dynamics during three forms of meditation. Int J Cardiol. 2004 May; 95 (1):19-27.
28. Hansen AL, Johnsen BH, Sollers JJ, Stenvik K, Thayer JF.. Heart Rate Variability and its relation to Prefrontal Cognitive function: The Effects of Training and Detraining. Eur. J. Appl. Physiol. 2004; 93: 263-272.
29. Allen MT, Matthews KA, Kenyon K L.. The Relationships of Resting Baroreflex Sensitivity, Heart Rate Variability and Measures of Impulse Control in Children and Adolescents. Int. J. Psychophysiol. 2000; 37:185-194.
30. Appelhans B M, Luecken LJ.. Heart Rate Variability as an Index of Regulated Emotional Responding. Rev. Gen. Psychol. 2006; 10:229-240.