ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 15, Issue 10, 2022

Online - 2455-3891
Print - 0974-2441

Research Article

MEDITATION: A SAVIOUR FOR BALANCING THE AUTONOMIC FUNCTIONS

RACHEL VIDYULLATHA A[1]*, SUBHADRA S[2], LAVANYA D[2]

[1]Department of Physiology, Chalmeda Anand Rao Institute of Medical Sciences, Bommakal, Telangana, India. [2]Department of Physiology, S. V. Medical College, Tirupati, Andhra Pradesh, India. Email: rachellatha@gmail.com

Received: 30 May 2022, Revised and Accepted: 14 July 2022

ABSTRACT

Objective: Stress becomes an inevitable part of our current lifestyle. It has most deleterious effects on each and every system of the body affecting both physical and mental health. By reducing stress and anxiety through yoga and meditation, numerous health benefits can be achieved. Raja Yoga meditation is a simple and scientific technique to elicit physical and mental relaxation response.

Methods: This case–control study was conducted in a tertiary health care center. A total of 100 participants were included in this study among them 50 were meditators who practice Raja Yoga for the past 1 year and 50 were non-meditators. All the subjects were between 31 and 60 years of age. Anthropometric measurements such as height and weight were measured. Heart rate (HR) during deep breathing both minimum and maximum HR was measured using electrophysiography.

Results: Statistical analysis was done using SPSS 21. Statistical analysis was done by t-test (paired and independent sample test). It was found that minimum and maximum HR were higher in non-meditators when compared to meditators and it was highly statistically significant (p=0.000). Deep breathing difference was found to be higher in meditators and it was found to be highly statistically significant (p= 0.000).

Conclusion: Raja Yoga meditation provides significant improvements in physiological cardiorespiratory functions by tilting of autonomic balance from sympathetic to parasympathetic system.

Keywords: Raja Yoga, Heart rate variability, Stress, Meditation.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i10.45376. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Stress becomes inevitable part of current sedentary lifestyle and it is responsible for the emergence of wide variety of diseases such as coronary heart disease, hypertension, and diabetes mellitus [1-3]. Stress causes physiological changes within the body, such as high anaerobic cellular activity, raised cortisol levels, and increased blood pressure (BP) and heart rate (HR) [4]. The physiological balance between sympathetic and parasympathetic is disturbed by stress [5]. The association between stress and autonomic dysfunction is well explained by the past studies [6]. Yoga and meditation are one of the non-pharmacological approaches to relieve stress and strain on long-term basis [7,8]. Raja Yoga meditation as taught in the Brahma Kumaris World Spiritual University is a behavioral intervention which is simple to practice, as no fixed physical postures are to be adopted. It is defined as the highest state of consciousness in which the mind is fully relaxed even when the physical body is engaged in day-to-day work [9]. This simple, but efficient relaxation technique tilts the autonomic response toward parasympathetic one resulting in beneficial effect [10,11]. The present study was conducted to evaluate the effect of Raja Yoga on autonomic functions of heart.

METHODS

This case–control study was conducted in a tertiary health care center after getting ethical clearance from the Institutional Ethical Committee. A total of 100 participants were included in this study among them 50 were meditators who practice Raja Yoga for the past 1 year and 50 were non-meditators. All the subjects were between 31 and 60 years of age. The study population were carefully selected randomly. The meditators were practicing Raja Yoga meditation for more than 1 year who regularly does meditation for 1 h/day at Patanjali Sainath Yoga Centre. A group of people from the same urban area who had never done meditation were included as non-meditators. The institutional ethical committee clearance was obtained. Informed consent and a detailed history were obtained from the subjects.

Anthropometric measurements such as height and weight were measured. HR during deep breathing both minimum and maximum HR was measured. Before recording the above parameters, the subjects were asked to relax physically and mentally for 15 min. All measurements were performed in the Department of Physiology on Electro Physiograph using electrophysiography.

HR variation to deep breathing (deep breathing difference, DBD) [12]

This is a test of parasympathetic function on cardiovascular reflexes, through the vagus nerve.

Test procedure

After a 5 min interval of rest in sitting posture, the subject was instructed to breathe quietly and deeply at a rate of six breaths per minute (5 s in and 5 s out for every breath). An ECG was recorded throughout the period of deep breathing. The onset of inspiration and expiration was marked. The maximum and minimum R-R intervals were measured during expiration and inspiration, respectively, and HR calculated as beats per minute. The difference between the maximum and minimum HRs was calculated after taking three such recordings at an interval of 15 min between each and average of three values was calculated.

A difference of:

- 15 beats or more/min – Taken as normal.
- 11–14 beats/min – As borderline.
- 10 beats or less/min – Was taken as an abnormal response.

The variation of HR with respiration is known as respiratory sinus arrhythmia (RSA). Pulmonary stretch receptors, cardiomechanoreceptors, and baroreceptors contribute to RSA.

HR variation with deep breathing is performed on electro physiograph in sitting posture. Electro physiograph has been configured for use with the ADInstruments PowerLab teaching systems. The HRV module

uses a threshold detector to detect the R component from each raw ECG waveform and generate RR interval data. Beats are automatically distinguished by the software and classified into three groups: Normal, ectopic, or artifact. Statistical analysis was done using SPSS 21. Quantitative data were analyzed by independent t-test.

RESULTS

Table 1 illustrates the frequency distribution of demographic profiles of our subjects. We have around 58% of males and majority of them are in the age group between 41 and 50 years.

Table 2 describes the comparison of autonomic functions in meditators and non-meditators. The deep breathing maximum and minimum HR is lesser in meditators when compared to non-meditators and it was found to be highly statistically significant (p=0.000).

Table 3 depicts the comparison of the effect of autonomic functions among age and gender between meditators and non-meditators. The deep breathing HR maximum and minimum were lower and deep breathing difference was higher in meditators. All these parameters were highly statistically significant (p=0.000). Among meditators, females and older individuals were lower deep breathing HR compared to others.

Table 1: Frequency distribution of demographic profiles between meditators and non-meditators individual

Demographic profile	Non-meditators, n=50	Meditators, n=50	Total, n=100
Gender			
Male	27 (46.55%)	31 (53.45%)	58 (100%)
Female	23 (54.76%)	19 (45.24%)	42 (100%)
Age			
31–40	22 (45.8%)	26 (54.1%)	48 (100%)
41–50	28 (53.8%)	24 (46.1%)	52 (100%)

Table 2: Comparison of autonomic functions in meditators and non-meditators by independent Student's t-test

HR (Beats/min)	Mediators, Mean±SD N=50	Non-mediators, Mean±SD N=50	t value	p value
DB (max HR)	72.48±2.88	84.14±4.21	16.14	0.000***
DB (min HR)	55.66±2.55	71.54±4.30	22.43	0.000***
DBD	16.82±1.30	12.76±1.58	13.98	0.000***

Values are expressed as mean±SD; p value is calculated using independent Student's t-test, *p<0.05, ***p<0.01: Statistically significant, ns: Not significant, DB: Deep breathing, Max HR: Maximum heart rate, Min HR: Minimum heart rate, DBD: Deep breathing difference

DISCUSSION

We have reported that the values of minimum and maximum HR during deep breathing were significantly lower in meditators. The probable reason could be the dominance of parasympathetic over sympathetic system in meditators. The findings of our study were similar to the past studies [13,14]. Gupta *et al*. have reported decreased sympathetic arousal in meditators results in decrease in HR, respiratory rate (RR), and BP [15]. Meditation is believed to gradually reduce the sympathetic dominance resulting in better balance between sympathetic and parasympathetic. This should bring about a hypometabolic state resulting in decreased HR and BP [16]. A regular yogic practice also reduces basal metabolic rate and resting oxygen consumption [17].

The effect of short-term and long-term Raja Yoga meditation on physiological variables such as HR, RR, SBP, and DBP has a significant difference between meditators and non-meditators [18]. Our results are also in accordance with the above finding of HR. Meditation relaxes the whole body and thereby decreases blood vessel tone and peripheral resistance. Sympathetic arousal is expected to be reduced during Raja Yoga practice. Hence, the load on heart due to sympathetic arousal is also minimized resulting in an improvement in cardiovascular parameters. Thus, from our study, we can conclude that there is a better balance in autonomic nervous system in persons practicing Raja Yoga meditation for a long-term duration.

CONCLUSION

Raja Yoga meditation provides significant improvements in physiological cardiorespiratory functions by tilting of autonomic balance from sympathetic in favor of parasympathetic system. Meditation on a regular basis was at a minor risk of developing cardiorespiratory diseases.

ACKNOWLEDGMENT

I am thankful to the mediators' for their voluntary participation in the study. I am thankful to my colleague residents for helping me in my work.

AUTHORS' CONTRIBUTION

The first author has designed the work and critical revision of the manuscript. The second author carried out the investigation and writing original draft. The third author carried out validation, visualization, and editing.

CONFLICTS OF INTEREST

The authors declare that they no conflicts of interest concerning this research article.

Table 3: Comparison of the effect of autonomic functions among age and gender between meditators and non-meditators by independent Student's t-test

Demographic profile	HR (beats/min)	Mediators, Mean±SD N=50	Non-mediators, Mean±SD N=50	t value	p value
Gender					
Male	DB (Max HR)	72.96±2.95	84.0±2.58	12.34	0.000***
	DB (Min HR)	56.06±2.64	71.59±4.06	17.04	0.000***
	DBD	16.89±1.31	12.74±1.76	10.02	0.000***
Female	DB (Max HR)	71.80±2.69	84.30±4.82	10.45	0.000***
	DB (Min HR)	55.09±2.36	71.47±4.65	14.48	0.000***
	DBD	16.71±1.30	12.78±1.38	9.67	0.000***
Age					
31–40	DB (Max HR)	72.75±2.75	85.06±4.13	12.48	0.000***
	DB (Min HR)	55.79±2.04	72.65±4.30	17.60	0.000***
	DBD	16.95±1.33	12.75±1.76	9.59	0.000***
41–50	DB (Max HR)	60.26±3.02	58.66±4.09	10.23	0.000***
	DB (Min HR)	55.53±2.98	70±3.89	14.41	0.000***
	DBD	16.69±1.28	12.76±1.33	10.21	0.000***

Values are expressed as mean±SD; p value calculated using independent Student's –t test, *p<0.05, ***p<0.01: Statistically significant, ns: Not significant, DB: Deep breathing, Max HR: Maximum heart rate, Min HR: Minimum heart rate, DBD: Deep breathing difference

FUNDING AGENCY

Any funds and grants did not support the work.

REFERENCES

1. Allen MT, Bocek CM, Burch AE. Gender differences and the relationships of perceived background stress and psychological distress with cardiovascular responses to laboratory stressors. Int J Psychophysiol 2011;81:209-17. doi: 10.1016/j.ijpsycho.2011.06.013, PMID 21729723
2. Khanna A, Paul M, Sandhu JS. A study to compare the effectiveness of GSR biofeedback training and progressive muscle relaxation training in reducing blood pressure and respiratory rate among highly stressed individuals. Indian J Physiol Pharmacol 2007;51:296-300. PMID 18341229
3. Varvogli L, Darviri C. Stress management techniques: Evidence-based procedures that reduce stress and promote health. Health Sci J 2011;5:74-89.
4. O'Connor TM, O'Halloran DJ, Shanahan F. The stress response and the hypothalamic-pituitary-adrenal axis: From molecule to melancholia. QJM 2000;93:323-33. doi: 10.1093/qjmed/93.6.323, PMID 10873181
5. Selvamurthy W, Sridharan K, Ray US, Tiwary RS, Hegde KS, Radhakrishan U, *et al*. A new physiological approach to control essential hypertension. Indian J Physiol Pharmacol 1998;42:205-13. PMID 10225047
6. Kohli P, Gulati M. Exercise stress testing in women: Going back to the basics. Circulation 2010;122:2570-80. doi: 10.1161/CIRCULATIONAHA.109.914754, PMID 21156655
7. Sahoo JK, Vatve M, Sahoo KD, Patil VV. Effect of specific Yogasanas on cardiovascular autonomic function tests. Pravara Med Rev 2010;5:10-5.
8. Telles S, Nagarathna R, Nagendra HR. Autonomic changes during 'OM' meditation. Indian J Physiol Pharmacol 1995;39:418-20. PMID 8582759
9. Gupta S. World Congress on Clinical and Preventive cardiology Souvenir. Model of Health for 21st Century, Soul Mind Body Medicine: A New Approach to Human Physiology in Health and Disease. Mount Abu: Bramha Kumaris Rajasthan, India; 2006. p. 107-16.
10. Desikachar K, Bragdon L, Bossart C. The yoga of healing: Exploring yoga's holistic model for health and well-being. Int J Yoga Ther 2005;15:17-39. doi: 10.17761/ijyt.15.1.p501l33535230737
11. Vyas R, Raval KV, Dikshit N. Effect of Raja yoga meditation on the lipid profile of post-menopausal women. Indian J Physiol Pharmacol 2008;52:420-4.
12. Ewing DJ, Clarke BF. Diagnosis and management of diabetic autonomic neuropathy. Br Med J (Clin Res Ed) 1982;285:916-8. doi: 10.1136/bmj.285.6346.916, PMID 6811067
13. Bharshankar JR, Bharshankar RN, Deshpande VN, Kaore SB, Gosavi GB. Effect of Yoga on cardiovascular system in subjects above 40 years. Indian J Physiol Pharmacol 2003;47:202-6. PMID 15255625
14. Harinath K, Malhotra AS, Pal K, Prasad R, Kumar R, Kain TC, *et al*. Effect of Hatha yoga and Omkar meditation on cardiorespiratory performance, psychologic profile and melatonin secretion. J Altern Complement Med 2004;10:261-8. doi: 10.1089/107555304323062257, PMID 15165407
15. Gupta S. World Congress on Clinical and Preventive Cardiology. (WCCCP 2006) Souvenir, Model of Health for 21st Century, Soul Mind Body Medicine: A New Approach to Human Physiology in Health and Disease. Abu, Rajasthan, India: Bramha kumaris, Shantivan; 2006. p. 112-31.
16. Patel G. Heart disease and Meditation. 3rd ed. New Delhi: Prajapita Brahma kumaris World Spiritual University; 1993. p. 27-33.
17. Khanam AA, Sachdeva U, Guleria R, Deepak KK. Study of pulmonary and autonomic functions of asthma patients after yoga training. Ind J Physiol Pharmacol 1996;40:318-24. PMID 9055100
18. Sukhsohale ND, Phatak MS. Effect of short-term and long-term Brahma kumaris Raja Yoga meditation on physiological variables. Indian J Physiol Pharmacol 2012;56:388-92.