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AN ANALYSIS OF THE EFFECT OF AEROBIC EXERCISE VERSUS YOGA IN YOUNG ADULTS ON PARAMETERS OF HEART RATE VARIABILITY (HRV)

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Abstract

Background: Neural factors such as temperature, hormones, etc. are regulated by cardiovascular functions, in which neural factors mainly affect the autonomic-nervous system (ANS), which plays a major role in the maintenance & regulation of cardiac functions.

Aims & Objectives: To analyze of the effect of aerobic exercise versus yoga in young adults on parameters of heart rate variability (HRV)

Methodology: This was a cross-sectional study carried out in a physiology department of a medical college over the six month span in which male & female adults with written & informed consent were involved in the study, so 70 volunteers were enrolled in the Yoga Group (Group A) & 70 volunteers in the Aerobic Exercise Group (Group B) during the six months period. Both of them have been regularly trained & adequately exercised for a span of 24 weeks by a yoga instructor & physical trainer. They noticed all the base line parameters. The study of HRV was derived from an ECG unit. The parameters were compared at baseline (by paired t-test) in both groups before & after 24 weeks in Group B & Group A by unpaired t-test & were determined with latest SPSS version software.

Results: The male-female ratio was comparable in both the groups as 2.5 : 1 & 1.9 : 1 groups ($p>0.05$). There was a substantial difference in changes over 12 weeks ($p>0.05$). The high-frequency HRV increased in the yoga community, where the reduction in the exercise group was statistically significant ($p <0.05$) & the decrease in the low frequency HRV & LF/HF ration was statistically significant ($p <0.05$) after 12 weeks of intervention.

Conclusion: From our research, it can be inferred that the Yoga group substantially raises the high frequency HRV & reduces the low frequency HRV, so that the parasympathetic activity is more determined in the Yoga group compared to the aerobic exercise group.

Keyword: HRV, Parasympathetic activity, Yoga, Aerobic exercise, ECG

Introduction

Neural factors such as temperature, hormones, etc. are regulated by cardiovascular functions, in which neural factors mainly affect the autonomic nervous system (ANS), which plays a major role in sustaining & managing cardiac functions, e.g. systolic blood pressure (SBP), diastolic blood pressure (DBP), & heart rate (HR)[1,2,3]. Numerous studies show a close correlation between compromised ANS (e.g. decreased vagal activity or increased sympathetic activity) & sudden & non-sudden cardiac death. The main cause of death for both men & women is cardiovascular disease. In the care, prevention, & recovery of cardiovascular diseases, lifestyle changes are essential factors[4-7]. Yoga is one of the best improvements in lifestyle & an ancient Vedic science that is believed to have originated in India in 5000 BC & is being used in the field of therapeutics. Breath is the complex bridge between body & mind, & Pranayama is one of the most important yogic practices. It involves the practice of particular posture (āsana), guided breathing (Pranayama) etc[8,9,10]. Two components compose the term Pranayama: 'prāna' & 'āyāma'. Prāna means' essential energy 'or' force of life '. Yāma is defined as 'extension' or 'expansion'. The term Pranayama therefore implies' extension or expansion of the dimension of prana '. There are four significant aspects of breathing in the Pranayama rituals, such as (1) Pūraka (inhalation), (2) Recaka (exhalation), (3) Anta' kumbhaka (internal holding of breath), & (4) Bahi' kumbhakaa (external breath retention). Kevala kumbhaka is considered an advanced stage of Pranayama that occurs during high stages of meditation (spontaneous breath retention)[11,12]. In Yoga & its effects on brain waves, structural changes & activation, pulmonary function, chronic disease management such as type 2 diabetes, cerebro-vascular attack recovery, cardiovascular disease prevention & risk factors in general, & coronary heart disease prevention & hypertension management in particular, there are different review papers[13,14,15]. The effect of aerobic exercise versus yoga on heart rate variability (HRV) parameters in young adults has been studied.

Aims & Objectives:

To analyze of the effect of aerobic exercise versus yoga in young adults on parameters of heart rate variability (HRV)

Methodology

This was a cross-sectional study carried out in a physiology department of a Sri Shankaracharya Institute of Medical

Sciences Bhilai over the four month span in which male & female adults with written & informed consent were involved in the study, so 70 volunteers were enrolled in the Yoga Group (Group A) & 70 volunteers in the Aerobic Exercise Group (Group B) during the three month period. Both of them have been regularly trained & adequately exercised for a span of 24 weeks by a yoga instructor & physical trainer. They noticed all the base line parameters. The study of HRV was derived from an ECG unit. The parameters were compared at baseline (by paired t-test) in both groups before & at the end of 12 weeks in Group B & Group A by unpaired t-test determined with SPSS 19 version software.

Result

Table 1: Distribution of the patients as per age & sex

	Group A (n= 70)	Group B (n= 70)	p-value
Average age (Mean ± SD)	36 ± 3.46	37 ± 3.26	
Sex			p>0.05
Male	50	46	
Female	20	24	

In both age groups, the mean age was 36 ± 3.46 & 37 ± 3.26, which was not statistically significant (p> 0.05). In both groups of 2.5: 1 & 1.9 : 1, the ratio of male & female was similar in both groups (p >0.05)

Table 2: Distribution of the study subjects as per the HRV

	Group A (n= 70)		Group B (n= 70)		p-value Group A & E (After 12 Wks)
	Basal	After 12 wks	Basal	After 12 wks	
HF (nu)	52.54 ± 17.32	58.58 ± 9.30*	53.24 ± 12.24	41.19 ± 20.43*	p <0.05
LF (nu)	43.84 ± 15.24	34.24 ± 13.24*	43.24 ± 11.46	54.24 ± 15.43*	p <0.005
LF/HF	1.96 ± 0.43	0.39 ± 0.26*	0.49 ± 0.68	1.82 ± 1.14*	p <0.01
SDNN (ms)	41.68 ± 9.41	48.42 ± 18.46*	54.90 ± 19.43	45.17 ± 16.36*	p >0.05

HF (nu) = high frequency, LF (nu) = low frequency, SDNN (ms) = Standard deviation of NN intervals

Changes over the 12-week duration showed a substantial difference (p >0.05). The high-frequency HRV increased in the yoga community, where the reduction in the exercise group was statistically significant (p <0.05) & the decrease in the low-frequency HRV & LF/HF ration was statistically significant after 12 weeks of intervention (p <0.05).

Discussion

There is growing evidence that physiological & psychological stress disrupts autonomic equilibrium & a wide variety of somatic & mental disorders are associated with prolonged autonomic imbalance. This autonomic imbalance is expressed in heart rate variability (HRV) tests, which have been positively linked to aerobic activity, stress resilience, psychological & physiological flexibility, & have been negatively linked to cardiovascular disease, neuronal atrophy of stress, negative affective states, & responses to maladaptive stress[16-20]. In healthy humans, heart rate (HR) is affected by physical, emotional, & cognitive activities & physiological oscillations that lead to variable variations in beat-to-beat HR is referred to as HRV. The most sensitive & easily accessible markers of autonomic control & vagal behavior are probably HR & HRV[21,22]. High resting HR is a risk factor for cardiac disease, while HRV represents the complex equilibrium resulting from sympathetic & parasympathetic nervous systems co activation, co inhibition or reciprocal activation or inhibition & provides a proxy for the fitness, adaptability, resilience & neural control of the cardiovascular system[23-26]. Several studies report links between yoga & autonomic activity markers such as HR, sensitivity to baro-reflex, resistance to galvanic skin, evoked capacity, focus, cognitive skill, emotional control, & mental resilience. Further studies report that routine practice of yoga improves a wide variety of autonomic dysfunction-related health conditions, such as diabetes with hypertension, anxiety, depression, & pain[27,28,29]. In both age groups, the mean age was 36 ± 3.46 & 37 ± 3.26, which was not statistically important (p >0.05). The male-female ratio was comparable in the 2.5 : 1 & 1.9 : 1 (p>0.05). Improvements with respect to 24 weeks showed a substantial difference (p>0.05). High-frequency HRV increased in the yoga community where the exercise group was statistically significant as it decreased (p <0.05) & the low-frequency HRV & LF/HF ration decreased after 24 weeks of intervention was statistically significant (p <0.05). These results are close to Hua Chu[30]. The yoga group had a significant increase in high-frequency HRV & decreased low-frequency HRV as well as decreased low-frequency HRV. There were also substantially reduced depressive symptoms & perceived stress identified by the yoga community. In the control group, no improvement was found.

Conclusion

It can be concluded from our study that the Yoga group significantly increases the HRV of high frequency & decreases the HRV of Low frequency so it establishes the

parasympathetic activity more in the Yoga group as compared to aerobic exercise group. Yoga, along with pranayama & sun salutations, can be used to decrease weight & improve lung function as a complementary or adjunctive measure in obesity. Future Yoga & aerobic exercise with a broad sample required study. Not many individuals are conscious of these basic exercises. Comparison research on yoga & aerobics are scarcely available. To confirm its effects, further research was required. Yet incorporating this exercise to our everyday routine may be worthwhile.

References

1. Muralikrishnan K, Balakrishnan B, Balasubramanian K, Visnegarawla F. Measurement of the effect of Isha Yoga on cardiac autonomic nervous system using short-term heart rate variability. J Ayurveda Integr Med. 2012; 3:91–6.
2. Chaddha A. Slow breathing and cardiovascular disease. Int J Yoga. 2015; 8: 142–3.
3. Ankad RB, Herur A, Patil S, Shashikala GV, Chinagudi S. Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals. Heart Views. 2011;12:58–62
1. S. Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals. Heart Views. 2011;12:58–62
4. Singh S, Kyizom T, Singh KP, Tandon OP, Madhu SV. Influence of pranayamas and yoga-asanas on serum insulin, blood glucose and lipid profile in type 2 diabetes. Indian J Clin Biochem. 2008;23:365–8
5. Mooventhan A, Khode V. Effect of Bhramari pranayama and OM chanting on pulmonary function in healthy individuals: A prospective randomized control trial. Int J Yoga. 2014;7: 104–10.
6. Saraswati S. Asana Pranayama Mudra Bandha. Fourth Revised Edition. Munger, Bihar, India: Yoga Publications Trust; 2008
7. Desai R, Tailor A, Bhatt T. Effects of yoga on brain waves and structural activation: A review. Complement Ther Clin Pract. 2015; 21: 112–8.
8. Abel AN, Lloyd LK, Williams JS. The effects of regular yoga practice on pulmonary function in healthy individuals: A literature review. J Altern Complement Med. 2013; 19: 185–90.
9. Desveaux L, Lee A, Goldstein R, Brooks D. Yoga in the management of chronic disease: A systematic review and meta-analysis. Med Care. 2015; 53: 653–61.
10. Innes KE, Selfe TK. Yoga for adults with type 2 diabetes: A systematic review of controlled trials. J Diabetes Res 2016. 2016:6979370.
11. Lynton H, Kligler B, Shiflett S. Yoga in stroke rehabilitation: A systematic review and results of a pilot study. Top Stroke Rehabil. 2007; 14: 1–8.
12. Hartley L, Dyakova M, Holmes J, Clarke A, Lee MS, Ernst E, et al. Yoga for the primary prevention of cardiovascular disease. Cochrane Database Syst Rev. 2014; 5: CD010072.
13. Cramer H, Lauche R, Haller H, Steckhan N, Michalsen A, Dobos G. Effects of yoga on cardiovascular disease risk factors: A systematic review and meta-analysis. Int J Cardiol. 2014; 173: 170–83.
14. Kwong JS, Lau HL, Yeung F, Chau PH, Woo J. Yoga for secondary prevention of coronary heart disease. Cochrane Database Syst Rev. 2015; 6: CD009506.
15. Posadzki P, Cramer H, Kuzdzal A, Lee MS, Ernst E. Yoga for hypertension: A systematic review of randomized clinical trials. Complement Ther Med. 2014; 22: 511–22.
16. Tyagi A, Cohen M. Yoga and hypertension: A systematic review. Altern Ther Health Med. 2014; 20: 32–59.
17. Thayer JF, Ahs F, Fredrikson M, Sollers JJ, 3rd, Wager TD. A meta-analysis of heart rate variability and neuroimaging studies: Implications for heart rate variability as a marker of stress and health. Neurosci Biobehav Rev. 2012; 36: 747–56.
18. Verlinde D, Beckers F, Ramaekers D, Aubert AE. Wavelet decomposition analysis of heart rate variability in aerobic athletes. Auton Neurosci. 2001; 90: 138–41.
19. Oldehinkel AJ, Verhulst FC, Ormel J. Low heart rate: A marker of stress resilience. The TRAILS study. Biol Psychiatry. 2008; 63: 1141–6.
20. Souza GG, Mendonça-de-Souza AC, Barros EM, Coutinho EF, Oliveira L, Mendlowicz MV, et al. Resilience and vagal tone predict cardiac recovery from acute social stress. Stress. 2007; 10: 368–74.
21. Jarczok MN, Jarczok M, Mauss D, Koenig J, Li J, Herr RM, et al. Autonomic nervous system activity and workplace stressors – A systematic review. Neurosci Biobehav Rev. 2013; 37: 1810–23.
22. Porges SW. New York: W. W. Norton; 2011. The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-Regulation.
23. 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. Ann Behav Med. 2009; 37: 141–53.
24. Montano N, Porta A, Cogliati C, Costantino G, Tobaldini E, Casali KR, et al. Heart rate variability explored in the frequency domain: A tool to investigate the link between heart and behavior. Neurosci Biobehav Rev. 2009; 33:71–80.
25. Habib GB. Reappraisal of heart rate as a risk factor in the general population. Eur Heart J Suppl. 1999;1: H2–10.

26. Kelley DE. Skeletal muscle fat oxidation: Timing and flexibility are everything. J Clin Invest. 2005;115: 1699–702.
27. Berntson GG, Bigger JT, Jr, Eckberg DL, Grossman P, Kaufmann PG, Malik M, et al. Heart rate variability: Origins, methods, and interpretive caveats. Psychophysiology. 1997;34: 623–48.
28. Lehrer PM, Woolfolk RL, Sime WE. New York: Guilford Press; 2007. Principles and Practice of Stress Management.
29. Anupama Tyagi and Marc CohenYoga and heart rate variability: A comprehensive review of the literature. Int J Yoga. 2016 Jul-Dec; 9(2): 97–113.
30. Chu, I.-H., Wu, W.-L., Lin, I.-M., Chang, Y.-K., Lin, Y.- J., and Yang, P.-C. Effects of Yoga on Heart Rate Variability and Depressive Symptoms in Women: A Randomized Controlled Trial. The Journal of Alternative and Complementary Medicine. 2017; 23(4), 310–316.