Original Research Article

A study of effect of aerobic exercise versus yoga on heart rate variability (HRV) parameters in young adults

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Abstract

Background: Cardiovascular functions are controlled by neural factors as well as others such as temperature, hormones, etc., Of these, neural factors primarily concern the autonomic nervous system (ANS), which plays a major role in maintaining and regulating cardiac functions **Aims and Objectives:** To Study the Effect of Aerobic Exercise versus Yoga on Heart Rate Variability (HRV) Parameters in Young Adults. **Methodology:** This was a cross-sectional study carried out in the department of Physiology of a tertiary health care centre during the three month period in this the adults male and female with written and informed consent were enrolled into study so during the three month period 35 volunteers were enrolled to Yoga Group (Group Y) and 35 volunteers into the Aerobic Exercise group (Group E). All of them trained and proper practice consistently over the period by Yoga teacher and Physical trainer given over a period of 12 weeks. All the base line parameters were noted. HRV analysis was derived by ECG machine. The parameters were compared in both group at baseline (by paired t-test) and after 12 weeks and in Group E and Group Y at the end of 12 weeks was by unpaired t-test calculated by SPSS 19 version software. **Results:** significant ($p>0.05$). The ratio of male and female was comparable in both the groups 2.5:1 and 1.91:1 was comparable in both the groups ($p>0.05$) .The changes with respect to 12 weeks showed significant difference ($p>0.05$). The high-frequency HRV increased in Yoga group where as it was decreased Exercise group was statistically significant ($P<0.05$) and the decreased Low frequency HRV and LF/HF ration after 12 weeks intervention was statistically significant ($P<0.05$) **Conclusion:** It can be concluded from our study that the Yoga group significantly increases the HRV of high frequency and decreases the HRV of Low frequency so it establishes the parasympathetic activity more in the Yoga group as compared to aerobic exercise group .

Key Word: HRV, Parasympathetic activity, Yoga, Aerobic exercise, ECG.

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INTRODUCTION

Cardiovascular functions are controlled by neural factors as well as others such as temperature, hormones, etc., Of these, neural factors primarily concern the autonomic nervous system (ANS), which plays a major role in maintaining and regulating cardiac functions, e.g., systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR). Imbalances in these lead to cardiovascular disorders such as hypertension, ischemia, infarction, etc., Numerous studies indicate a strong association between compromised ANS (e.g., decreased vagal activity or increased sympathetic activity) and sudden and non-sudden cardiac death[1] Cardiovascular disease is the leading cause of death for both men and

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women.[2] Lifestyle modifications are important factors in the treatment, prevention, and rehabilitation of cardiovascular disorders.[1] Yoga is one of the best lifestyle modifications and an ancient *vedic* science thought to have originated in India in 5000 BC which is being applied in the field of therapeutics.[3,4] It includes practice of specific posture (*āsana*), regulated breathing (*Prāṇāyāma)* etc., Breath is the dynamic bridge between body and mind and *Prāṇāyāma* is one of the most important yogic practices.[5] The word *Prāṇāyāma* is comprised of two components: '*prāṇa*' and '*āyāma*'. *Prāṇa* means 'vital energy' or 'life force'. *Āyāma* is defined as 'extension' or 'expansion'. Thus, the word *Prāṇāyāma* means 'extension or expansion of the dimension of *prāṇa*'. In the *Prāṇāyāma* practices, there are four important aspects of breathing such as (1) *Pūraka* (inhalation), (2) *Recaka* (exhalation), (3) *Antaḥ kumbhaka* (internal breath retention), and (4) *Bahiḥ kumbhaka* (external breath retention). An advanced stage of *Prāṇāyāma*which occurs during high states of meditation is called as *kevala kumbhaka* (spontaneous breath retention).[6] There are various review articles in Yoga and its effects on brain waves, structural changes and activation,[7] pulmonary function,[8] management of chronic diseases[9] type 2 diabetes,[10] cerebrovascular attack rehabilitation,[11] cardiovascular disease prevention[12] and its risk factors in general[13] and prevention of coronary heart disease[14] and the management of hypertension[15,16] in specific. So we have studied Effect of Aerobic Exercise versus Yoga on Heart Rate Variability (HRV) Parameters in Young Adults

METHODOLOGY

This was a cross-sectional study carried out in the department of Physiology of a tertiary health care centre during the three month period in this the adults male and female with written and informed consent were enrolled into study so during the three month period 35 volunteers were enrolled to Yoga Group (Group Y) and 35 volunteers into the Aerobic Exercise group (Group E). All of them trained and proper practice consistently over the period by Yoga teacher and Physical trainer given over a period of 12 weeks. All the base line parameters were noted. HRV analysis was derived by ECG machine. The parameters were compared in both group at baseline (by paired t-test) and after 12 weeks and in Group E and Group Y at the end of 12 weeks was by unpaired t-test calculated by SPSS 19 version software.

RESULT

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

	Group Y (n=35)	Group E (n=35)	p-value
Average age (Mean ± SD)	36± 3.23	37± 3.13	**p>0.05**
Sex			
Male	25	23	**p>0.05**
Female	10	12	

The average age in both the age group was 36± 3.23 and 37± 3.13 was not statistically significant (p>0.05). The ratio of male and female was comparable in both the groups 2.5:1 and 1.91:1 was comparable in both the groups (p>0.05)

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

	Group Y (n=35)		Group E (n=35)		p-value Group Y and E (After 12 Wks)
	Basal	After 12 wks	Basal	After 12 wks	
HF (nu)	52.27 ± 17.16	58.29± 9.15*	53.12± 12.12	41.38 ± 20.89 *	P<0.05
LF (nu)	43.42 ± 15.12	34.12± 13.12 *	43.12 ± 11.23	54.12 ± 15.87*	P<0.005
LF/HF	1.53 ± 0.87	0.78 ± 0.53*	0.98± 0.53	1.94 ± 1.28 *	P<0.01
SDNN (ms)	41.34± 9.82	48.21± 18.92 *	54.45 ± 19.89	45.34± 16.78 *	p>0.05

The changes with respect to 12 weeks showed significant difference (p>0.05) . The high-frequency HRV increased in Yoga group where as it was decreased Exercise group was statistically significant (P<0.05) and the decreased Low frequency HRV and LF/HF ration after 12 weeks intervention was statistically significant (P<0.05)

DISCUSSION

There is growing evidence that physiological and psychological stress disrupts autonomic balance and prolonged autonomic imbalance is associated with a wide range of somatic and mental diseases.[17] Such autonomic imbalance is reflected in measures of heart rate variability (HRV), which have been positively associated with aerobic fitness,[18] resilience to stress,[19] and psychological and physiological flexibility[20] and negatively associated with cardiovascular disease,[17] stress neuronal atrophy,[24] negative affective states,[25] and maladaptive stress responses.[17] Heart Rate (HR) in healthy humans is

influenced by physical, emotional, and cognitive activities, and physiological oscillations that lead to variable beat-to-beat fluctuations in HR is known as HRV. HR and HRV are perhaps the most sensitive and easily accessible indicators of autonomic regulation and vagal activity. A high resting HR is a risk factor for cardiac diseasewhile HRV reflects the dynamic balance arising from the coactivation, coinhibition, or reciprocal activation or inhibition of the sympathetic and parasympathetic nervous systems[28] and provides a proxy for the health, adaptability, flexibility, and neural regulation of the cardiovascular system[17,24,29, 26,17,28]Yoga involves a diverse range of mind-body practices such as meditation/relaxation techniques (*dhyana*), breathpractices (pranayama), and physical postures (asana) that aim to integrate the mind and body and bestow the practitioner with physical, mental, intellectual, and spiritual development. Several studies report associations between yoga and markers of autonomic activity such as HR, baroreflex sensitivity, galvanic skin resistance, evoked potentials, attention, cognitive ability, emotional regulation, and mental resilience. Further studies report that regular yoga practice improves a wide range of clinical conditions associated with autonomic dysfunction, such as hypertension diabetes, anxiety, depression, and pain. [29] The average age in both the age group was 36± 3.23 and 37± 3.13 was not statistically significant (p>0.05). The ratio of male and female was comparable in both the groups 2.5:1 and 1.91:1 was comparable in both the groups (p>0.05) The changes with respect to 12 weeks showed significant difference(p>0.05). The high-frequency HRV increased in Yoga group where as it was decreased Exercise group was statistically significant (P<0.05) and the decreased Low frequency HRV and LF/HF ration after 12 weeks intervention was statistically significant (P<0.05) These findings are similar to -Hua Chu [30] they found The yoga group had a significant increase in high-frequency HRV and decreases in low-frequency HRV and low frequency/high frequency ratio after the intervention. The yoga group also reported significantly reduced depressive symptoms and perceived stress. No change was found in the control group.

CONCLUSION

It can be concluded from our study that the Yoga group significantly increases the HRV of high frequency and decreases the HRV of Low frequency so it establishes the parasympathetic activity more in the Yoga group as compared to aerobic exercise group.

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