

## IMPACT OF YOGA AND PHYSICAL EXERCISE ON RESTING HEART RATE AMONG DIABETIC PATIENTS

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DOI: 10.26524/1243

**Abstract:** The purpose of this study was to analyse the impact of yoga and physical exercise on resting heart rate among diabetes patients. Thirty type-2 female diabetic patients (n = 30) from Rajah Muthiah Medical College Hospital, Annamalai University, Tamil Nadu were randomly selected as subjects. The age of the subjects ranged from 35 to 45 years. The subjects divided into three equal groups of ten subjects each (n = 10). In which, group I underwent yogic exercises (YEG), group II underwent physical activities (PAG) for six days per week for sixteen weeks and group III acted as control (CG) who did not undergo any special training programme apart from their regular activities. Resting heart rate was selected as a test variable and assessed before and after the training period. The collected data were statistically analysed by using Analysis of Covariance (ANCOVA) and Scheffe's test was applied as post hoc test to determine the paired mean difference. From the results of the study, it was found that there was a significant reduction ( $p \leq 0.05$ ) in resting heart rate of training groups when compared to control group.

**Key words:** Yogic exercise, physical activity, resting heart rate, type2 diabetes

### Introduction

Yoga is one of the orthodox systems of Indian philosophy. It was collated, coordinated and systematized by Patanjali in his classical work, the yoga sutras, which consists of 185 terse aphorisms. The system of yoga is called because it teaches the means by which the jivatma can be united to, or be in communion with the paramathma, and so secure liberation (moksha). Yoga is a complete science of life that originated in India many thousands of years ago. It is the oldest system of personal development in the world, encompassing body, mind and spirit. Yoga is a practical aid, not a religion. Yoga is an ancient art based on a harmonizing system of development for the body, mind, and spirit. The continued practice of yoga will lead you to a sense of peace and well-being, and also a feeling of being at one with their environment.

The practice of yoga makes the body strong and flexible; it also improves the functioning of the respiratory, circulatory, digestive, and hormonal systems. Yoga brings about emotional stability and clarity of mind [1].

Systematic physical activity develops and maintains physical fitness and overall health. It is often practiced to strengthen muscles and the cardiovascular system, and to improve athletic skills. Frequent and regular physical exercise boosts the immune system, and helps prevent diseases of affluence such as heart disease, cardiovascular disease. Adaptation of the human body to physical exercise can improve the health of internal system and the efficiency of external movements. Such an adaptation to one kind of stress may also prepare the person physically and emotionally to resist other stresses life.

Resting heart rate is the rhythmical dilation of an artery produced by the increased volume of blood through the vessel by the contraction of the heart [2]. Pulse rate is actually the frequency of pressure waves (one minute) propagated along the peripherally arteries [3]. There are some important steps to overall health and well- being that have been shown to also reduce your resting heart rate.  $\text{Max HR} = 208 - (\text{age} \times 0.7)$ . In 40-year-old subjects, both formulas yield the same result (ie. 180 beats per minute). However, the Tanaka equation produces slightly lower limits (than the old formula) in subjects younger than 40, and raises the limit slightly in subjects older than 40 years old. Diabetes mellitus (just called diabetes from now on) occurs when the level of glucose (sugar) in the blood becomes higher than normal. Type-2 diabetes occurs mainly in people aged over 35. The 'first-line' treatment is diet, weight control and physical activity. If the blood glucose level remains high despite these measures, then tablets to reduce the blood glucose level are usually advised. Insulin injections are needed in some cases [4]. Other treatments include reducing blood pressure if it is high, lowering high cholesterol levels and also other measures to reduce the risk of complications. Physical training helps to improve the level of insulin generation and yoga training normalizes the blood sugar level [2].

## Materials and methods

For this purpose only type-2 male diabetes patients from Rajah Muthiah Medical College and Hospital, Annamalai University, were randomly selected as subject. Their age were ranged between 35 and 45 years. The selected thirty subjects were divided into three groups of ten each. Out of which, group I (n = 10) underwent yogic practices, group II (n = 10) underwent physical exercises and group III (n = 10) remained as control. The training programme was carried out for six days per week during morning session only (6 am to 8 am) for sixteen weeks. Resting heart rate was selected as criterion variable and it was measured by using number of score of strokes/minutes. Both experimental groups initially performed thorough warming up exercises. After that group I performed the following yoga exercises. These are the exercises were given, padmasan, bhujangasan, halasan, vajrasan, eka padhasan, parivatasan, oorthavamuga bhujangasan, dhanurasana, shasangasan, veerabhadhrasan, vakhrasan, patchimoththanasan, shalabhasan, trikonasan and padhahasthasan with moderate intensity. Group II performed calisthenics, stretching, sit-ups, push-ups and medicine ball exercises with moderate intensity.

## Data Analysis

Mean and standard deviation were calculated for resting heart rate for each group. And the data were analyzed by using analysis of covariance (ANCOVA). If the „F“ value was found to be significant for adjusted post-test mean, Scheffe’s test was used as post hoc test to determine the significant difference between the paired mean. Statistical significance was set to priority at 0.05 levels.

## Results

**Table I. Analysis of covariance for Resting heart rate of experimental groups and control group**

Test		YEG	PAG	CG	SOV	SS	df	MS	F
Pre test	Mean	77.4	77.79	78.15	B	2.84	2	1.42	0.39
	S.D.	1.96	2.14	1.59	W	98.56	27	3.65	
Post test	Mean	72.23	70.77	78.41	B	328.52	2	164.26	42.79*
	S.D.	1.75	1.97	2.14	W	103.64	27	3.84	
Adjusted Post test	Mean	72.19	70.77	78.45	B	328.56	2	164.28	41.75*
					W	102.31	26	3.93	

\*Significant  $F = (df 1, 27) (0.05) = 3.35$ ;  $(P \leq 0.05)$   $F = (df 1, 26) (0.05) = 3.37$ ;  $(P \leq 0.05)$

The table I showed that the pre test mean values on resting heart rate for yoga exercise group, physical activity group and control group were 77.4, 77.79 and 78.15 respectively. And they obtained „F“ ratio of 0.39 for pre test which was lower than the required table value 3.35 with df 2 and 27 at 0.05 level of confidence. The post test mean values for yoga exercise group physical activity group and control group were 72.23,70.77 and 78.41 respectively .And the obtained „F“ ratio of 42.79 for post test which was higher than the required table value 3.37 with df 2 and 27 at 0.05 level of confidence. The adjusted post test mean values on resting heart rate for yoga exercise group physical activity group and control group were 72.19, 70.77 and 78.45 respectively. The obtained „F“ ratio of 41.75 for adjusted post test which was higher than the required table value 3.37 with df 2 and 26 for significance at 0.05 level of confidence on resting heart rate.

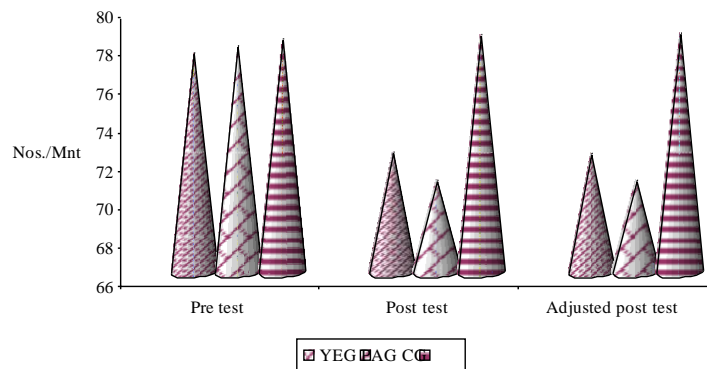
Hence, the results of the study showed that there was a significance difference exists between yoga exercise group, physical activity group and control group on resting heart rate. Further to determine which of the paired means has a significant improvement, Scheffe’s test was applied as post-hoc test. The result of the follow up test was presented in Table II.

**Table II. Scheffe's post hoc test for mean difference between groups of resting heart rate**

YEG	PAG	CG	MD	CI
72.19	70.77		1.42	
72.19		78.45	6.26*	2.30
	70.77	78.45	7.68*	

\*Significant,  $p \leq 0.05$

Table II showed that the adjusted post test mean difference on resting pulse rate between yoga practice group and control group and physical exercise group and control group are 6.26 and 7.68 respectively. These values are higher than the required confidence interval value of 2.30, which shows significant difference at 0.05 level of confidence. The results of the study showed that there was a significant difference between experimental groups and control group. It also showed that there was insignificant difference between two experimental groups. The pre, post and adjusted post test mean values of experimental groups and control group on resting heart rate was graphically represented in the figure 1.



**Figure 1: The pre, post and adjusted post test mean values of experimental groups and control group on resting heart rate**

### Discussion

This study shows that the yogic exercise and physical activity are capable of decreasing heart rate level in men type-2 diabetic patients. Evidence for the benefits of yoga practice includes its effects shown to decrease the diabetes [5-6]. Many previous studies have shown physical exercise is beneficial and decreases diabetes [7-8] in women patients. 9 Innes & Vincent (2007) and Sharma *et al.* (2008) concluded that yogic practice appeared to decrease the diabetes in men and women. Sahay *et al.* (1991) concluded that yoga training normalize

the level of sugar in blood. Thirty minutes per day of vigorous exercise, has sustained beneficial effects on heart rate [10-12]. No previous studies have attempted to compare the responses of resting heart rate to yogic practice and physical exercise in male diabetic patients. There are some studies suggested that yogic practice may also helps to decrease the heart rate [13, 14]. The findings of Indla & Narhare (2011) and Sarang & Tells (2000) revealed that yoga training must reduce the heart rate [15, 16]. Kirsten et al (2003) and Priya et al., (2011) pointed that regular physical training reduces heart rate [17, 18]. Therefore, the present study was designed to determine the yogic exercises and physical activities on resting heart rate of type-2 male diabetic patients

### Conclusion

Any practical application requires careful implementation and individual experimentation. Yoga exercises and physical activity are the some activity to develop or maintain physiological variables and overall health. Prevailing evidence supports the concept that yoga exercise and physical activity can help to decrease the resting heart rate among type -2 diabetic patients. The result of the study indicated that there was significant reduction on resting heart rate levels of male type -2 diabetic patients due to sixteen weeks of yoga practice as well as physical exercise programme.

### References

- [1] Swami Vishnu Devananda (2000), The Sivananda Companion to Yoga, New York: Fireside Book, Simon and Schuster, p. 10.
- [2] Benjamin F Miller (1965), The Modern Encyclopedia. New York: Golden Press.
- [3] Astrand and Keare Rodahe (1970), Text book of work Physiology, New York: Mc Graw Hills Book Co.
- [4] M.M. Gore, Yogic treatment of Diabetes. Yoga- Mimamsa, XXVI (1987) 130–145.
- [5] B. Aljasir, M. Bryson, and B. Al-Shehri, Yoga practice for the management of type II diabetes mellitus in adults: a systematic review, *Evidence-Based Complementary and Alternative Medicine*, 7 (2010) 399-408.
- [6] R. Sharma, N. Gupta, R.L. Bijlani, Effect of yoga based lifestyle intervention on subjective well-being, *Indian Journal of Physiology and Pharmacology*, 52 (2008) 123-131.
- [7] N.J. Snowling, W.G. Hopkins, Effects of Different Modes of Exercise Training on Glucose Control and Risk Factors for Complications in Type 2 Diabetic Patients, *Diabetes Care*, 29 (2006) 2518–2527.
- [8] Ronald J. Sigal, Glen P. Kenny, David H. Wasserman and Carmen Castaneda-Sceppa, Physical Activity/Exercise and Type 2 Diabetes, *Diabetes Care*, 27 (2004) 2518-2539.
- [9] K.E Innes, and H.K. Vincent, The influence of yoga-based programs on risk profiles in adults with type 2 diabetes mellitus: a systematic review, *Evidence-Based Complementary and Alternative Medicine*, 4 (2007) 469–486.
- [10] B.K. Sahay, Yoga and diabetes, *Journal of the Association of Physicians of India*, 34

- (1986) 645-648.
- [11] C.R. Cole, E.H. Blackstone, F.J. Pashkow, C.E. Snader, M.S. Lauer, Heart-rate recovery immediately after exercise as a predictor of mortality, *The New England Journal of Medicine*, 341 (1999) 1351-1357.
  - [12] X. Jouven, J.P. Empana, P.J. Schwartz, Peter J. Schwartz, Michel Desnos, Dominique Courbon and Pierre Ducimetière, Heart-rate profile during exercise as a predictor of sudden death, *The New England Journal of Medicine*, 352 (2005) 1951-1958
  - [13] V.A. Barnes, H.C. Davis, J.B. Murzynowski, F.A. Treiber, Impact of meditation on resting and ambulatory blood pressure and heart rate in youth, *Psychosomatic Medicine*, 66 (2004) 909-914
  - [14] J.R. Bharshankar, R.N. Bharshankar, V.N. Deshpande, S.B. Kaore, G.B. Gosavi, Effect of yoga on cardiovascular system in subjects above 40 years, *Indian Journal of Physiology and Pharmacology*, 47 (2003) 202-206
  - [15] Indla Devasena, Pandurang Narhare, Effect of yoga on heart rate and blood pressure and its clinical significance, *International Journal of Biological and Medical Research*, 2 (2011)750-753.
  - [16] P. Sarang, and S. Telles, Effect of two yoga based relaxation techniques on heart rate variability, *International Journal of Stress Management*, 13 (2006) 460-475.
  - [17] Kirsten L. Rennie, Harry Hemingway, Meena Kumari, Eric Brunner, Marek Malik and Michael Marmot, Effects of Moderate and Vigorous Physical Activity on Heart Rate Variability in a British Study of Civil Servants, *American Journal of Epidemiology*, 158 (2003) 135-143.
  - [18] Bharatha Priya. K, R. Gopinath and George Abraham, "Impact of yogic practices and physical exercises on resting pulse rate among type II diabetes patients", *Research Scholar*, 2 (2012) 224-229.