International Journal of Physical Education, Sports and Health 2016; 3(1): 269-271

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 4.69
IJPESH 2016; 3(1): 269-271

www.kheljournal.com
Received: 28-11-2015
Accepted: 30-12-2015

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Isolated and combined effect of yogic practice and aerobic training on cardiac parasympathetic function (E: I ratio) variable

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Abstract
The objective of present study was to examine the isolated and combined effect of yogic practice and aerobic training on cardiac parasympathetic function (E: I ratio) variable of adolescent boys in Puducherry. Total 60 subjects completed this prospective randomized study with 15 in the yoga group that were matched with the same number of subjects in the aerobic, combined training and control groups. E: I ratio variable was determined at the beginning (baseline) and after the twelve weeks training intervals. The difference in the mean E: I ratio value of each group was tested for the significance of difference by ANCOVA test. The E: I ratio variable in the all three experimental groups was markedly improved compared with control group (P>0.05). The results have shown the significant improvement in E: I ratio, since calculated F (=8.98*) ≥ tab F.05 (2, 42) (= 4.14). Adjusted F ratio value (30.39*) was significantly higher than the table value. The finding of study suggests that the twelve weeks of isolated and combined yogic practice and aerobic training have significantly improvement on E: I ratio variable. In all cases 0.05 levels has been fixed to test the significance.

Keywords: Yoga, Aerobic, E: I ratio, adolescent.

Introduction
Life will not be fulfilled effectively if physical activities are not carried out regularly by an individual. The story of evolution throws some light on the nature and types of activities which are to be fit for day-to-day existence and to meet the occasional emergencies that arise. Whatever may the emergency that trust itself on individuals the human beings have to readjust and carry on. Participation in daily physical activities is vital for proper growth and maintenance of good health. Exercise is a form of physiological stimulation of the body. In this sense, exercise can be considered as any form of physical activity "involving movement, maintenance of posture or expression of force by muscles. The performance of exercise requires the response of a number of functions within the body.

The truthful stand for the word yoga is 'to yoke'. This deals that uniting of self-spirit with the universal sprit, or God. The origin of word yoga is from the roots of Sanskrit word 'Yuj' which means to unite, to attach, to yoke, and to focus on thoughts within self. According to Patanjali, yoga is way of yoking of all the powers of body, the mind, the emotion which enables one to look at life in all its aspect evenly. Aerobic exercise is exercise that involves or improves oxygen consumption by the body. The word aerobic means "with oxygen". Use of oxygen in the body's metabolic or energy-generating process to perform the work by muscles is referred as aerobics.

Participation in physical activity is a vital factor to decrease the cardiovascular indexes of individual. Regular practice of physical exercise and the development of the aerobic conditioning have supplementary and autonomous health benefits. Heart rate is directly customized by the activity of the autonomic nervous system, specifically through the sympathetic and parasympathetic activities. Autonomic dysfunction management, in patients with refractory epilepsy, is done through yoga therapy. Yoga combined with anti-hypertensive drugs is effective in reducing blood pressure in resting condition and increasing parasympathetic reactivity. It is also found to normalize cardiovascular autonomic function in hypertensive patients. Highly aerobic conditioned individuals have an inferior resting heart rate and a larger parasympathetic activity or lesser sympathetic activity.

Materials and Methods

Selection of the Subjects

The reason to conduct the study was to locate about the isolated and combined effect of yogic practices and aerobic exercise on E: I ratio variable. Sixty adolescence school boys were selected from New Modern Higher Secondary School, Muthialpet, and Puducherry. The chronological age of the selected subjects ranged from fourteen to seventeen years. The subjects were from different family background and homogeneous in their academic activities.

Experimental Design and Variable Testing

The participating subjects (N=60) were randomly distributed in four equal groups with fifteen in each group. Experimental group I was assigned with yoga practice, experimental group II with aerobic exercises, experimental Group III with combination of yoga practice & aerobic exercises. Prior to starting the training baseline tests of the E: I ratio variable was conducted for all the 60 subjects. The post test was measured after the experimental period of twelve weeks of respective training. The subjects were given 12 weeks respective training for five days per week. Training duration was 45 minutes in the evening session from Monday to Friday.

Cardiac Parasympathetic Function (E:I ratio) was measured by the ratio of maximum and minimum heart rate during a period of slow and steady deep breathing. The subject was connected to the ECG machine in sitting posture. After that he was instructed to breathe deeply and steadily at a rate of six breathe per minute. The maximum and minimum R-R interval for each cycle was measured and the ratio of the maximum R-R interval and minimum R-R interval was obtained and recorded as score.

The data collected from the four groups on the E: I ratio variable was statistically treated by Analysis of covariance (ANCOVA) to find out significant difference among the four groups. Scheffe's Post Hoc test was used to clarify the difference between adjusted pair wise means when F ratio was significant. The level of significance was fixed at 0.05 level of confidence. All the statistical calculation was carried out using Statistical Package for Social Sciences (SPSS 16.0).

Table 1: Analysis Of Covariance For Pre Test And Post Test Data On E: I Ratio

	Yoga	Aerobic	Combine	Control	Source of variance	Sum of square	df	Mean Square	'F' ratio
Pre-test Mean	1.38	1.35	1.33	1.34	B:	0.017	3	0.006	0.76
S.D.	0.07	0.08	0.09	0.10	W:	0.43	56	0.008	
Post-test Mean	1.50	1.45	1.47	1.35	B:	0.18	3	0.06	8.98*
S.D.	0.08	0.08	0.09	0.08	W:	0.38	56	0.007	
Adjusted Post-test Mean	1.47	1.45	1.48	1.35	B:	0.14	3	0.048	30.39*
					W:	0.09	55	0.002	

* Significant at 0.05 level.

Required table value at 0.05 and 0.01 level of confidence for 3 & 56 d.f. are 2.77 and 4.14 respectively.

It is observed from table - III that the pre-test means on E: I ratio of the three experimental groups and control group are 1.38, 1.35, 1.33 and 1.34 respectively. The obtained 'F' ratio value 0.76 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degrees of freedom at 0.05 level of confidence. This reveals that there is no significant difference among the four groups on E: I ratio before the commencement of the experimental training. It is inferred that the selection of the subjects for the four groups are successful.

The post-test means on E:I ratio of the three experimental groups and control group are 1.50, 1.45, 1.47 and 1.35 respectively. The obtained 'F' ratio value 8.98 for the post test data is greater than the required table value 2.77 for 3 & 56 degrees of freedom at 0.05 levels of confidence. It discloses that there is a significant difference among the three experimental groups and control group on E: I ratio after the experimental training.

The adjusted post-test means on E: I ratio of three experimental groups and control group are 1.47, 1.45, 1.48 and 1.35 respectively. The obtained 'F' ratio value of 30.39 for the adjusted post test data is greater than the required table value 2.77 for 3 & 56 degrees of freedom at 0.05 level of confidence. It reveals that there is significant changes on E: I ratio as a result of the experimental training and therefore the hypothesis has been accepted.

Table 2: Scheffe's Post Hoc Test On Adjusted Mean Differences of E: I Ratio

Yoga	Aerobic	Combined	Control	Mean differences	Required C.I.
1.47	1.45	-	-	0.02	0.06
1.47	-	1.48	-	0.01	
1.47	-	-	1.36	0.11*	
-	1.45	1.48	-	0.03	
-	1.45	-	1.36	0.09*	
-	-	1.48	1.36	0.12*	

The confidence interval required for confidence at 0.05 level is 0.06

Since significant differences are recorded, the Scheffe's Post hoc test is used to find out the paired means significant difference. The obtained results are presented in Table IV.

Table VIII shows that the Scheffe's post-hoc method of testing the significance for the differences between the paired means of E: I ratio. The mean differences between the yoga practice and control group is 0.11, the aerobic training and control group the difference is 0.09, the combined group and control group is 0.12, and it is found to be significant at 0.05 level of confidence. The mean differences among the experimental groups are not significant. Results indicate that the combined practice group had a better improvement when compared to the aerobic group, yogic group and control group.

The mean differences in yogic practice group, aerobic group, combined group and control group are presented through line diagram for better understanding of the results of this study in figure one.

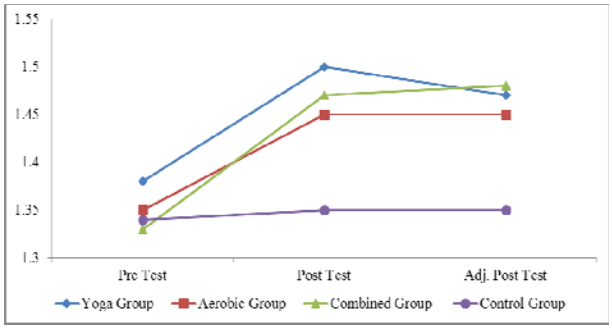

Fig 1: The Pre Test, Post Test and Adjusted Post Test Mean Values of Experimental Groups and Control Group on E:I ratio

Discussion

The result of the study indicates that E:I ratio variable improves significantly for three experimental groups when compare to control group, after twelve weeks of isolated and combined experimental training of yoga and aerobics. Among the all experimental training groups combined training has better training effect to improve the E: I ratio than aerobic and yoga training groups. There was no significant difference found in paired means among the experimental training groups. It is inferred from the result of the present study that independent variable has significant improvement on experimental groups due to their respective training programmes.

Conclusion

Findings of study conclude that the autonomic function variable such as E:I ratio has enhanced significantly due to twelve weeks of isolated and combined training of yogic practice and aerobic training. Cardiac parasympathetic function of adolescent is obviously affected by regular participation in physical activity especially yoga and aerobic type of physical activities.

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