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RESEARCH ARTICLE

INFLUENCE OF DIFFERENT SCIENTIFIC TRAINING ON PHYSIOLOGICAL VARIABLES OF WORKING MIDDLE AGED WOMEN

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ABSTRACT

The purpose of this investigation was to determine the influence of different scientific training on physiological variables such as Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate of working middle aged women. To achieve the purpose of the study ninety middle aged women were chosen at random from Vethathri Maharishi Trust in Sirumugai. Their age ranged from thirty five to fifty years. They were randomly divided into three equal groups of thirty each; Group I underwent asanas with pranayama practice and group II underwent asanas, pranayama with core training and group III acted as control group. The control group maintained their daily routine activities and no special training was given to them. Training was performed six days per week for 12 weeks. Selected physiological variables such as Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate were assessed before and after the 12 weeks of training by astrand nomogram and heart rate monitor respectively. The collected data were statistically analyzed with't' test to find out the significant improvement between pre and post test of each variable. Analysis of co-variance was applied to find out the significant differences, if any among the group. A significant level of $p=<0.05$ was considered statistically significant for this analysis. Scheffe's post hoc test was used to find out the paired mean significance difference. The result revealed that the twelve weeks of asanas with pranayama practice and asanas, pranayama with core training significantly improved the vo_2 max and reduced the resting pulse rate of middle aged women. Asanas pranayama with core training group significantly produced better results than asanas with pranayama practice.

INTRODUCTION

The most important aim of our lives should be to maintain good health. Many people take their health for granted and abuse their bodies with a sedentary life style, bad diets, medications and high stress factors. Every person, due to genetic weaknesses, is susceptible to certain ailments that if not prevented can lead to serious illnesses. When energy is depleted in the body the organs become weak and they cannot function properly. (Vimala Lalvani, 2003) Yoga acts as a preventive measure to disease by reducing stress level, keeping the internal organs toned and healthy and maintaining a balanced equilibrium between the physical, mental and spiritual level. The emphasis is to unite the system with a combination of breathing techniques, gentle exercise and mind control. This produces a tranquillity that penetrates deep into the mind and soul. It improves the health of the person on all levels. Pranayama breathing exercises and yogic postures play an impressive role in strengthening of respiratory muscles which improve cardio-respiratory efficiency (Asha Yadav *et al.,* 2009).

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Exercise ball or often called as Swiss ball is made of soft elastic which can be used to perform exercises for physical therapy, training and exercise. Swiss ball adds an edge to regular exercises like crunches by increasing the intensity on the core and strengthening the muscles in the abs and back including the rectus abdominis, transverse abdominis, internal/external obliques and the erector spine. Exercise ball makes a person balance himself on it and doing a exercise on it increases the intensity of the exercise. When you sit on the ball the abdominis and legs contract to avoid falling giving a better balance and alignment.

MATERIALS AND METHODS

Selection of subjects

To achieve the purpose of the study among one hundred middle aged women from Vethathri Maharishi Trust in Sirumugai, ninety subjects were selected for this study. The physical characteristic of the subjects are shown in Table 1.

Table 1. Descriptive data of subject's characteristic

Group*	n	Height(cm)	Weight(kg)	Age(y)
Asanas with pranayama practice	30	(145.5 ± 9.50)	(60.5 ± 9.90)	(32.5 ± 4.2)
Asanas, pranayama with core training	30	(146.5 ± 9.40)	(61.5 ± 9.70)	(33.1 ± 4.7)
Control group	30	(145.8 ± 9.30)	(60.9 ± 9.10)	(32.9 ± 4.5)

Experimental design

In this study ninety middle aged women were randomly divided into three equal groups namely, Experimental group I asanas with pranayama practice (n=30), Experimental group II asanas, pranayama with core training (n= 30) and control group III (n= 30). Each group consisted of thirty subjects. The selected subjects were initially tested on the selected variables of Vo_2 max and resting pulse rate. After the completion of the initial test, the subjects belonging to experimental group I and experimental group II were treated with their respective training programme for twelve weeks. The Experimental group I underwent asanas with pranayama practice, experimental group II underwent asanas, pranayama with core training and control group III did not undergone any specific training. After 12 weeks of the training period post test was conducted on the dependent variables of Vo_2 max and resting pulse rate for all the groups.

Selection of variables and tests

The variable measured in this study was Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate. The tests and measurements to measure the outcome of intervention had been described as practical, valid and reliable. Maximum Oxygen Consumption (Vo_2 max) was measured by "Astrand nomogram" and the scores was recorded in ml /kg /min. Resting pulse rate was measured by heart rate monitor and recorded in beats per min.

Asanas Training Schedule

Name of the Asanas	Duration of Asanas in each session*	
Surya Namaskar (12 poses – each pose being maintained for 5 sec without gap)	2 min (2 rounds)	Adding 1 round for every 2 weeks
Standing Asanas		
Vrikshasana	1 min	
Ardhakati Chakrasana	1 min (each side)	
Ardha Chakrasana	30 sec	
Trikonasana	1 min (each side)	
Sitting Asanas		Adding 10 seconds to all the asanas for every 2 weeks
Vajrasana	2 min	
Paschimottanasana	1 min	
Ustrasana	30 sec	
Gomukhasana	2 min (each side)	
Prone Position Asanas		
Makarasana	2 min	
Bhujangasana	2 min	
Salabasana	30 sec	
Dhanurasana	30 sec	
Supine Position Asanas		
Pavanamuktasana	2 min	
Navasana	1 min	
Matsyasana	30 sec	
Sarvangasana	2 min	

Training programme

The experimental group I underwent asanas and pranayama practice and experimental group II underwent asanas, pranayama and core training and control group did not participate in any training programme. In each training session, the training was imparted for a period between 45 and 60 minutes, which included 5 minutes warming up and 5 minutes relaxation procedure after the training programme, for six days per week for a period of twelve weeks.

Pranayama Training Schedule

Name of the Pranayama	Duration of Pranayama in each session*	
Sectional breathing (Three sections)	6min (Each sections 2 min)	Adding 10 sec for each section in every 2 weeks
Kapalapathi	3 min (3 rounds)	Adding 1 round for every 2 weeks
Bhastrika	3 min (3 rounds)	
Anuloma-Viloma	2 min (3 rounds)	
Nadi Shuddhi Pranayama	6 min (6 rounds)	
Surya Bedhana Pranayama	3 min (6 rounds)	
Bhramari Pranayama	3 min (3 rounds)	

Core strength training schedule for twelve weeks

Weeks	Core strength training	Sets x reps	Rest and recovery
1-2 weeks	Ball Squats Pelvic Clocks Ball Crunches Arm Circles Seated Single Leg Raise	3*6	1 minute rest between exercise and 2 minutes rest between sets
3-4 weeks	Bicep Curls Back Extension Leg Stretch Pec Flys	3 *8	
5-6 weeks	Ball Crunch Ball Crunch - Legs Elevated Ball Ab Rollout Ball Push Up - on Knees Ball Hyperextension	3*10	
7-8 weeks	Ball Bridge BallArm-Leg Extension-Alternating Ball Squat - on Wall Ball Hip Abduction Ball Hip Adduction	3*12	
9-10 weeks	Ball Leg Curl Ball Calf Raise Ball Calf Raise - One-Legged Ball Toe Raise	3*14	
11-12 weeks	Seated Single Leg Raise Leg Stretch Ball Push Up - on Knees Ball Squat - on Wall Ball Leg Curl	3*15	

Statistical analyses

To analyze the comparative treatment effects of training't' test was used. To compare the significance of the mean differences among the three groups analysis of co-variance was used, when the F-ratio was significance, scheffe's post-hoc test was used to identify the significant differences between the training groups. To test the significance of the derived results, the alpha level was set at 0.05 level of confidence.

Table 2. Values of dependent 't'-tests for asanas with pranayama practice, asanas, pranayama with core training and control group on vo_2 max and resting pulse rate

Criterion variables		Asanas with pranayama practice	Asanas, pranayama with core training	Control group
VO_2 max	Pre test mean	22.32	22.11	21.63
	Post test mean	24.24	25.90	21.11
't' value		16.68*	22.57*	1.14
Resting pulse rate	Pre test mean	78.10	78.23	77.73
	Post test mean	75.33	74.37	77.43
't' value		10.09*	14.32*	1.20

(Table value required for Significance at 0.05 level of confidence for 't'-value with degrees of freedom 1 and 29 is 2.045)

From the Table- II the dependent't'-value among asanas with pranayama practice, asanas, pranayama with core training and control group on Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate were 16.68, 22.57, 1.14, 10.09,14.32 and 1.20 respectively. Since, the obtained't'-value of experimental groups was greater than the table value of 2.045, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 29.

From the results, it was inferred that, twelve weeks of asanas with pranayama practice and asanas, pranayama with core training produced a significant changes in Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate of working middle aged women. The analysis of covariance on Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate of asanas with pranayama practice and asanas, pranayama with core training and control group have been analyzed and presented in Table -III

From the Table III, the obtained value of 'F'-ratio for Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate, for adjusted post test means were 61.24 and 46.12.The obtained 'F'- ratio of the experimental groups were greater than the table value of 2.70 for the degrees of freedom 2 and 86 required for significant at 0.05 level of confidence. The results of the study indicated that significant differences exist among the adjusted post test means of asanas with pranayama practice and asanas, pranayama with core training on the development of vo_2 max and resting pulse rate.

To determine which of the paired means had a significant difference, Scheffe's post hoc test was applied and the results are presented in Table –IV

Table 3. Analysis of covariance on vo_2 max and resting pulse rate of asanas with pranayama practice, asanas, pranayama with core training and control group

Criterion variables	Adjusted post test means			Source of variance	Degree of freedom	Sum of Square	Mean Square	'F'-ratio
	Asanas with Pranayama	Asanas, Pranayama & core	Control Groups					
Vo_2 max	24.14	26.00	21.46		2	286.48	143.24	61.24*
				B / S				
				W / S	86	201.16	2.34	
Resting pulse rate	75.39	74.30	77.71		2	195.50	97.75	46.12*
				B / S				
				W / S	86	182.29	2.12	

(The table value required for significance at 0.05 levels with confidence degrees of freedom 2 and 86 is 2.70)

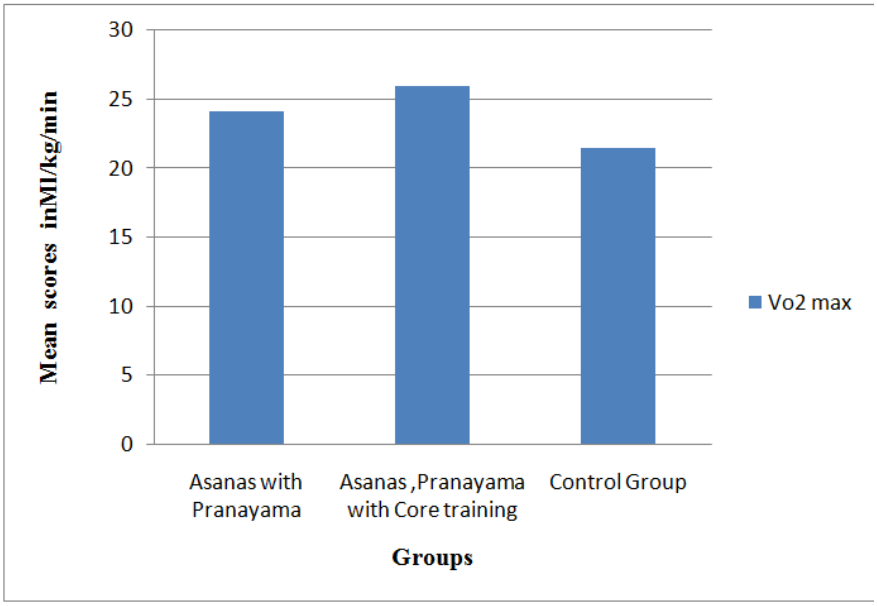

Fig 1. Bar Diagram Showing Vo_2 max of adjusted Post Test Means of Asanas and Pranayama Practice, Asanas Pranayama and Core Training and Control group

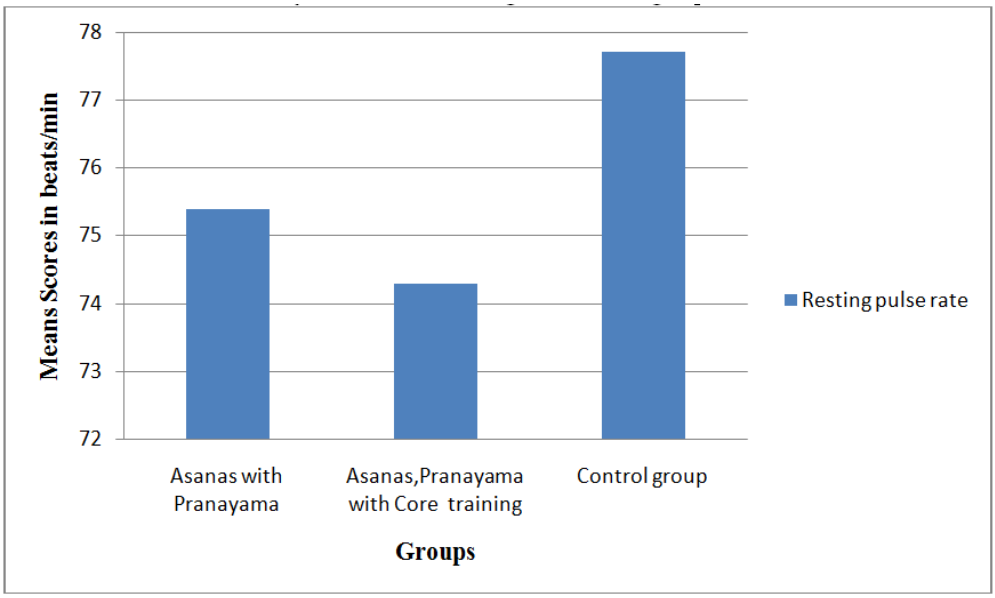

Fig I.1. Bar Diagram Showing resting pulse rate of adjusted Post Test Means of Asanas and Pranayama Practice, Asanas Pranayama and Core Training and Control group

Table 4. Scheffe's post hoc test for the differences between the adjusted post-test means of vo_2 max and resting pulse rate

Criterion variables	Adjusted post test means			Mean Difference	Confidence Interval
	Asanas with Pranayama	Asanas, Pranayama & core	Control Group		
Vo_2 max	24.14	26.00		1.86*	1.12
	24.14		21.46	2.68*	
		26.00	21.46	4.54*	
	75.39	74.30		1.09*	1.07
Resting pulse rate	75.39		77.71	2.32*	
		74.30	77.71	3.41*	

Table IV shows that the mean differences values of Maximum Oxygen Consumption (Vo_2 max) between asanas and pranayama practice and asanas, pranayama with core training, asanas and pranayama practice and control group, asanas, pranayama with core training and control group were 1.86, 2.68 and 4.54 respectively. Resting pulse rate between asanas and pranayama practice and asanas, pranayama with core training, asanas and pranayama practice and control group, asanas, pranayama with core training and control group were (1.09, 2.32 and 3.41) respectively is greater than the confidence interval value (1.12 and1.07) respectively, which was significant at 0.05 level of confidence.

RESULTS

There was a significant increase between pre and post training values in Maximum Oxygen Consumption (Vo_2 max) in the asanas, pranayama with core training group (14.63%), asanas with pranayama practice group (8.60%) and control group (6.50%) similarly there was a significant decrease between pre and post training values in resting pulse rate in the asanas, pranayama with core training group (5.19%), asanas with pranayama practice group (3.68 %) and control group (2.50%). Among the three group's asanas, pranayama with core training group showed higher increase in Maximum Oxygen Consumption (Vo_2 max) and higher decrease in resting pulse rate compared with asana with pranayama practice group and control group of working middle aged women.

DISCUSSION

The present study demonstrated that there was a significant improvement in Maximum Oxygen Consumption (Vo_2 max) 14.63% and 8.60% for asanas, pranayama with core training group and asanas with pranayama practice group. Arnulfo Ramos-Jiminez *et al.* (2010) studies indicated that yoga training increased Vo_2 max and VE max in both middle aged and older groups ($p>0.01$). The present study demonstrated that the resting pulse rate decreased by 5.19% and 3.68 % for asanas, pranayama with core training group and asanas with pranayama practice group. Rajakumar (2010) study indicated that, the yogic practice group showed significant improvement due to 12 weeks training on resting pulse rate, breath holding time and peak flow rate compared to the physical exercise and control group.

Conclusion

In conclusion, Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate can be significantly improved among the working middle aged women using a 12 weeks of asanas, pranayama with core training and asanas with pranayama practice. However the asanas, pranayama with core training

programme significantly improved Maximum Oxygen Consumption (Vo_2 max) and resting pulse rate better than the asanas with pranayama practice of working middle aged women. The findings observed in the present study suggest that along with asanas, pranayama with core training may be added in the practice to increase the Maximum Oxygen Consumption (Vo_2 max) and decrease the resting pulse rate of working middle aged women and it is recommended to carry out a similar type of the study for the old aged people also.

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