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## Effects of isolated and combined effect of dynamic core stability exercises and aquatic exercises on $VO_2$ max, target heart rate and residual volume among middle aged overweight men

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### Abstract

**Aim of the study:** To determine the effects of isolated and combined effects of dynamic core stability exercises and aquatic exercises on cardio pulmonary and flexibility variables among middle aged overweight men.

**Methodology:** Experimental design with 80 subjects randomly divided into four equal groups with control, experimental group I, II and III. The age group was between 40-60 were selected for this study.

**Variables:**  $VO_2$  max, Target Heart Rate (THR) and Residual volume (RV).

**Result:** In this study the researcher had found that there was an improvement in  $VO_2$  max, target heart rate and residual volume in the Experimental Groups when compared with control group.

**Conclusion:** This study concludes that the improved  $VO_2$ max, target heart rate and residual volume is evident in the experimental groups than the control group.

**Keywords:**  $VO_2$  max, target heart rate, residual volume, core exercises, aquatic exercises

### Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation in the body happens when food supplies are plentiful and lifestyles are sedentary. The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been an increased intake of energy-dense foods that are high in fat; and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization. Excess weight has reached epidemic proportions globally, with more than 2 billion adults being either overweight or obese in 2015. A healthy body requires a minimum amount of fat for proper functioning. But the accumulation of too much storage fat can impair movement, flexibility, and alter the appearance of the body. As per the National Family Health Survey (NFHS-4), in Tamilnadu, 30.6 per cent urban men suffered from overweight and obesity, while the percentage in rural parts was 25.6 per cent.

### Statement of the Problem

The researcher had planned to investigate the changes that occur in the cardio-respiratory system on administering isolated and combined dynamic core stability exercises and aquatic exercises in middle aged overweight men population. The selected subjects were desk bourne workers who work for long hours and had not been into regular exercising and lack flexibility. All the three experimental groups received their respective treatments and one control group didn't receive any treatment. Outcomes were measured for  $VO_2$  max, target heart rate and Residual volume.

**Selection of Variables:**  $VO_2$  max, Target Heart Rate and Residual Volume.

### Experimental Design

The subjects identified for this study were randomly selected and allocated into three

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experimental group and one control group. Pretest and Post test was performed on all the subjects of a total about (n=80) and all the subjects were randomly allocated into four different groups comprising of (n=20) each.

**Training schedules**

The treatment durations lasts for 16 weeks of training and monitoring. Experimental Group – I received dynamic core stability exercises, Experimental Group – II received aquatic exercises, Experimental Group – III received a combination of both Aquatic exercises dynamic core stability exercises and Control Group did not receive any treatment.

**Statistical Techniques**

Analysis of covariance statistical technique was used, to test

the significant difference among the treatment groups. Scheffes Post Hoc Test used to find out the significance of intergroup variables.

**Computation of analysis of covariance**

The following tables illustrate the statistical results of effects of dynamic core stability exercises and aquatic exercises in middle aged overweight men and ordered adjusted means and the difference between the means of the groups under study.

**Computation of analysis of covariance of vo<sub>2</sub> max**

The following tables illustrated the statistical results of the Effects of Dynamic Core stability exercises and Aquatic exercises in Middle aged overweight mensubjects and ordered adjusted means of the groups under study.

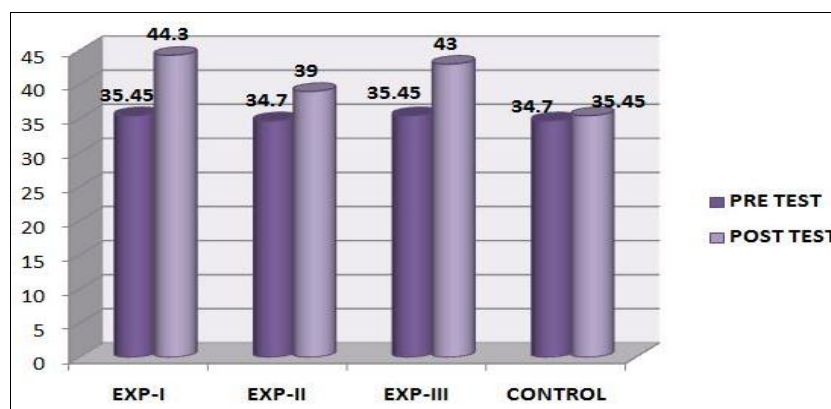
**Table 1:** Computation of analysis of covariance of vo<sub>2</sub> max (Scores in ml/kg/minute)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	35.45	34.7	35.45	34.7	B	11.25	3	3.75	0.34	2.7
					W	838.3	76	11.03		
Post Test	44.3	39	43	35.45	B	968.53	3	322.84	19.30*	2.7
					W	1271.15	76	16.72		
Adjusted	44.00	39.29	42.70	35.74	B	813.712	3	271.23	27.36*	2.7
					W	743.624	75	9.91		
Mean Gain	8.85	4.3	-7.55	0.75						

\*Significant at 0.05 level of confidence for 3and 76 (df) =2.7 and 75(df)=2.7

Table 1 shows analyzed data on VO<sub>2</sub> Max. The Pre Test means of VO<sub>2</sub> Maxwere 35.45 for Experimental Group I, 34.7for Experimental Group II, 35.45 for Experimental Group III and 34.7 for Control Group. The obtained ‘F’ ratio 0.34 was lesser than the table ‘F’ ratio 2.7. Hence, the pre test was not significant at 0.05 level of confidence for degrees of freedom 3 and 76.

The Post Test means of VO<sub>2</sub> Max were 44.3 for Experimental Group I, 39for Experimental Group II, 43 for Experimental Group III and 35.45 for Control Group. The obtained ‘F’ ratio 19.30 was higher than the table ‘F’ ratio 2.7. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 76.



**Fig 1:** Graph showing group comparison of VO<sub>2</sub> Max

The adjusted Post Test means of VO<sub>2</sub> Max were 44 for Experimental Group I, 39.29for Experimental Group II, 42.70 for Experimental Group III and 35.74 for Control Group. The obtained ‘F’ ratio 27.36 was higher than the table ‘F’ ratio 2.72. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 75.Since the results obtained from the analysis of covariance in very good agreement with the earlier results, it is worthwhile to mention that Experimental group I (Dynamic core stability exercises)

and Experimental Group III (combined dynamic core stability exercises and aquatic exercises) is one of the better training methods to improveVO<sub>2</sub> Max.

**Computation of analysis of covariance of target heart rate**

The following tables illustrated the statistical results of the Effects of Dynamic Core stability exercises and Aquatic exercises in Middle aged overweight men subjects and ordered adjusted means of the groups under study.

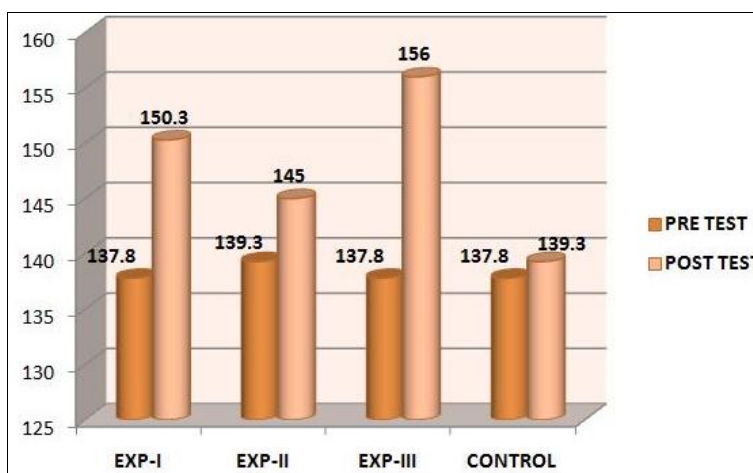
**Table 2:** Computation of analysis of covariance of target heart rate (Scores in Heart beats/minute)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	137.8	139.3	137.8	137.8	B	33.75	3	11.25	1.10	2.7
					W	779.8	76	10.26		
Post Test	150.3	145	156	139.3	B	3069.8	3	1023.26	56.09*	2.7
					W	1386.4	76	18.24		
Adjusted	150.51	144.35	156.21	139.51	B	3160.84	3	1053.61	70.16*	2.7
					W	1126.25	75	15.016		
Mean Gain	12.5	5.7	18.2	1.5						

\*Significant at 0.05 level of confidence for 3and 76 (df) =2.7 and 75(df)=2.7

Table 2 shows analyzed data on Target Heart Rate (THR). The Pre Test means of Target Heart Rate were 137.8 for Experimental Group I, 139.3for Experimental Group II, 137.8 for Experimental Group III and 137.8 for Control Group. The obtained ‘F’ ratio 1.10 was lesser than the table ‘F’ ratio 2.7. Hence, the pre test was not significant at 0.05 level of confidence for degrees of freedom 3 and 76.

The Post Test means of Target Heart Rate were 150.3 for Experimental Group I, 145for Experimental Group II, 156 for Experimental Group III and 139.3 for Control Group. The obtained ‘F’ ratio 56.09 was higher than the table ‘F’ ratio 2.7. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 76.



**Fig 2:** Graph showing group comparison of Target Heart Rate (THR)

The adjusted Post Test means of Target Heart Rate were 150.51 for Experimental Group I, 144.35for Experimental Group II, 156.21 for Experimental Group III and 139.51 for Control Group. The obtained ‘F’ ratio 70.16 was higher than the table ‘F’ ratio 2.7. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 75.Since the results obtained from the analysis of covariance in very good agreement with the earlier results, it is worthwhile to mention that Experimental Group III

(combined dynamic core stability exercises and aquatic exercises) is one of the better training methods to improve Target Heart Rate.

**Computation of analysis of covariance of residual volume**

The following tables illustrated the statistical results of the Effects of Dynamic Core stability exercises and Aquatic exercises in Middle aged overweight men subjects and ordered adjusted means of the groups under study.

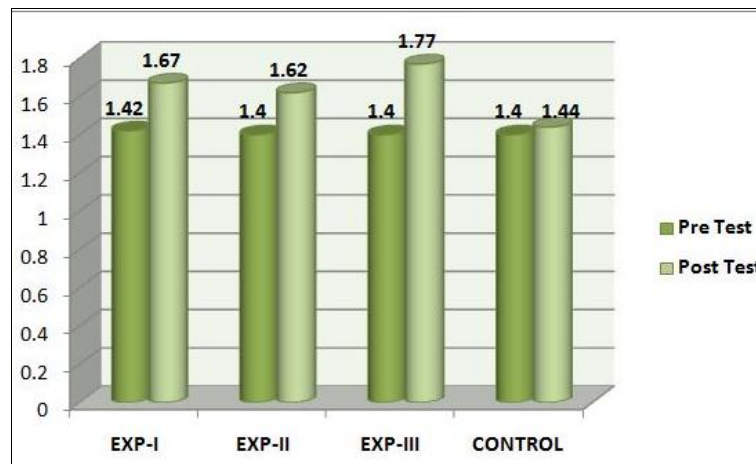
**Table 3:** computation of analysis of covariance of residual volume (Scores in ml)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	1.42	1.40	1.4	1.4	B	0.005	3	0.0017	0.09	2.7
					W	1.54	76	0.020		
Post Test	1.67	1.62	1.77	1.44	B	1.17	3	0.39	23.90*	2.7
					W	1.24	76	0.016		
Adjusted	1.66	1.62	1.77	1.44	B	1.16	3	0.38	25.12*	2.7
					W	1.16	75	0.015		
Mean Gain	0.25	0.22	0.37	0.04						

\*Significant at 0.05 level of confidence for 3 and 76 (df) =2.7 and 75 (df)=2.7

Table 3 shows analyzed data on Residual Volume (RV). The Pre Test means of Residual Volume were 1.42 for Experimental Group I, 1.40for Experimental Group II, 1.4 for Experimental Group III and 1.4 for Control Group. The obtained ‘F’ ratio 0.09 was lesser than the table ‘F’ ratio 2.7. Hence, the pre test was not significant at 0.05 level of confidence for degrees of freedom 3 and 76.

The Post Test means of Residual Volume were 1.67 for Experimental Group I, 1.62for Experimental Group II, 1.77 for Experimental Group III and 1.44 for Control Group. The obtained ‘F’ ratio 23.90 was higher than the table ‘F’ ratio 2.7. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 76.



**Fig 3:** Graph showing group comparison of Residual Volume (RV)

The adjusted Post Test means of Residual Volume were 1.66 for Experimental Group I, 1.62 for Experimental Group II, 1.77 for Experimental Group III and 1.44 for Control Group. The obtained 'F' ratio 25.12 was higher than the table 'F' ratio 2.7. Hence, the post test was significant at 0.05 level of confidence for degrees of freedom 3 and 75. Since the results obtained from the analysis of covariance in very good agreement with the earlier results, it is worthwhile to mention that Experimental Group III (combined dynamic core stability exercises and aquatic exercises) is one of the better training methods to improve Residual Volume.

#### Discussion on findings of $VO_2$ max, target heart rate and residual volume

The findings of Aditya Gosh *et al.*, (2017) <sup>[11]</sup> investigated that the  $VO_2$  max which indicates total body oxygen consumption depends on ventilation and cardiac output. In obesity due to accumulation of fat lungs capacity and ventilation is impaired which affects the  $VO_2$  max. Obesity also limits the cardiovascular endurance with increase in workload. Therefore daily physical activity in early age of life should be promoted for better performance and to increase the endurance.

Syed Yazdanirad *et al.*, (2015) was had conducted a study on the mean heart rate of the participants in the two conditions of hot and moderate physical activity and very hot and light physical activity and it was found that the mean heart rate was higher in participants who were overweight than those with normal weight. Thus, the risk of heat strain is more in overweight subjects than normal weight subjects. Given the fact that heart rate is considered as one of the physiological parameters for evaluating heat strain.

Stephen W Littleton *et al.*, (2017) <sup>[12]</sup> had found obesity can cause hypoxemia by decreasing lung volumes to where there is closure of lung units during normal breathing. We wanted to determine the lung volume measurements that are associated with hypoxemia in obese patients, and explore how we could use these measurements to identify them. In obese patients without cardiopulmonary disease, oxygen levels decrease as BMI increases. This effect is associated with the obesity-related reduction in ERV and is independent of hypoventilation.

From these analyses, it is found that the results obtained from the experimental groups had a significant improvement in  $VO_2$  max, Target heart rate and Residual volume. These effects had been obtained as the subjects performed their prescribed exercises and other activities as per the protocol of their original group of study. It is interesting to note from the

obtained results that value of  $VO_2$  Max from Experimental Group I had greater reduction as well Experimental Group III is also significant in modulating the  $VO_2$  max from its lower level to higher level. Control group did not showed much improvement as it had not received any form of exercises.

#### Results

Within the limitations of the study, the following conclusions were drawn:

1. Experimental groups showed significantly greater increase on  $VO_2$  Max, Target Heart Rate and Residual Volume than that control group at the end of sixteen week period of treatment.
2. Experimental group III showed significantly greater increase on  $VO_2$  Max, Target Heart Rate and Residual Volume than that of Experimental group I & Experimental Group II at the end of sixteen week period of treatment.

#### Conclusion

It is concluded that that the  $VO_2$  Max, Target Heart Rate and Residual Volume has improved after giving 16 weeks of training period. Hence the study showed better improvement and it can be more effective in the overweight middle aged subjects by administering dynamic core stability exercises and aquatic exercises for a period of sixteen weeks.

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