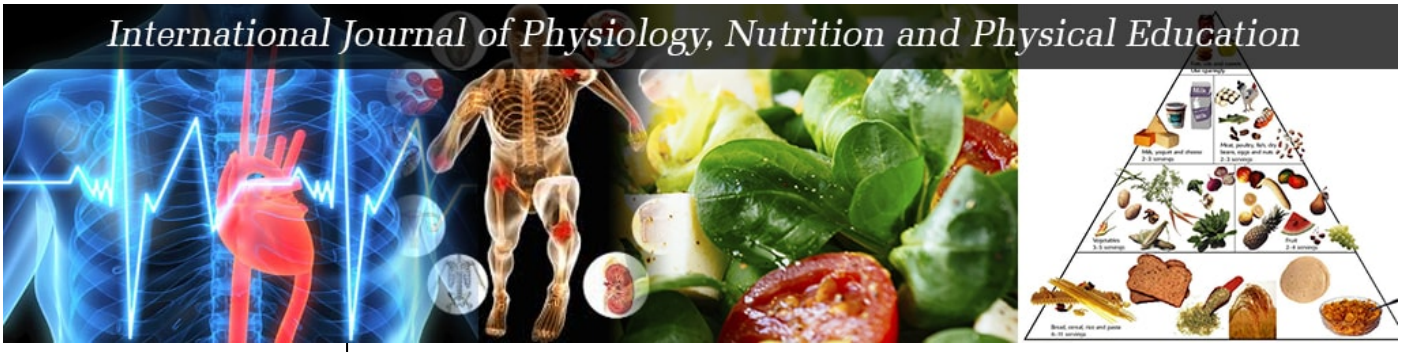

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Effects of isolated and combined effect of dynamic core stability exercises and aquatic exercises on forced vital capacity, forced expiratory volume and flexibility among middle aged overweight men

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Abstract
Aim of the study: This study determines the effects of isolated and combined effects of dynamic core stability exercises and aquatic exercises on 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: Forced Vital Capacity, FEV_1 and Flexibility.
Result: In this study the researcher had found that there was an improvement in Forced Vital Capacity, FEV_1 and Flexibility in the Experimental Groups when compared with control group.
Conclusion: This study concludes that the improved Forced Vital Capacity, FEV_1 and Flexibility is evident in the experimental groups than the control group.

Keywords: Forced Vital Capacity, FEV_1, flexibility, core exercises, aquatic exercises

Introduction
Being overweight is having more body fat than is optimally healthy. Being overweight is especially common where food supplies are plentiful and lifestyles are sedentary. 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 of the hormonal, reproductive, and immune systems, as thermal insulation, as shock absorption for sensitive areas, and as energy for future use. But the accumulation of too much storage fat can impair movement, flexibility, and alter the appearance of the body. Physical exercise is important for maintaining physical fitness and can contribute to maintaining a healthy weight, regulating digestive health, building and maintaining healthy bone density, muscle strength, and joint mobility, promoting physiological well-being, reducing surgical risks, and strengthening the immune system.

Statement of the Problem
The researcher had planned to investigate the changes that occur in the cardio-respiratory system and to measure the flexibility changes 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 Forced Vital Capacity, FEV_1 and Flexibility.

Selection of Variables: Forced Vital Capacity, FEV_1 and Flexibility.

Experimental Design
The subjects identified for this study were randomly selected and allocated into three experimental group and one control group.

Pre test 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 and supplementation

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 forced vital capacity

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 1: Computation of analysis of covariance of forced vital capacity (Scores in liters)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	3.605	3.53	3.63	3.535	B	0.151	3	0.05	0.44	2.7
					W	8.77	76	0.11		
Post Test	4.565	3.995	4.75	3.455	B	20.64	3	6.88	32.30*	2.7
					W	16.19	76	0.21		
Adjusted	4.56	3.99	4.74	3.45	B	20.31	3	6.77	31.36*	2.7
					W	16.19	75	0.21		
Mean Gain	0.96	0.465	1.12	0.08						

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

Table 1 shows analyzed data on Forced Vital Capacity. The Pre Test means of Forced Vital Capacity were 3.605 for Experimental Group I, 3.53 for Experimental Group II, 3.63 for Experimental Group III and 3.535 for Control Group. The obtained 'F' ratio 0.44 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 Forced Vital Capacity were 4.565 for Experimental Group I, 3.995 for Experimental Group II, 4.75 for Experimental Group III and 3.455 for Control Group. The obtained 'F' ratio 32.30 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.

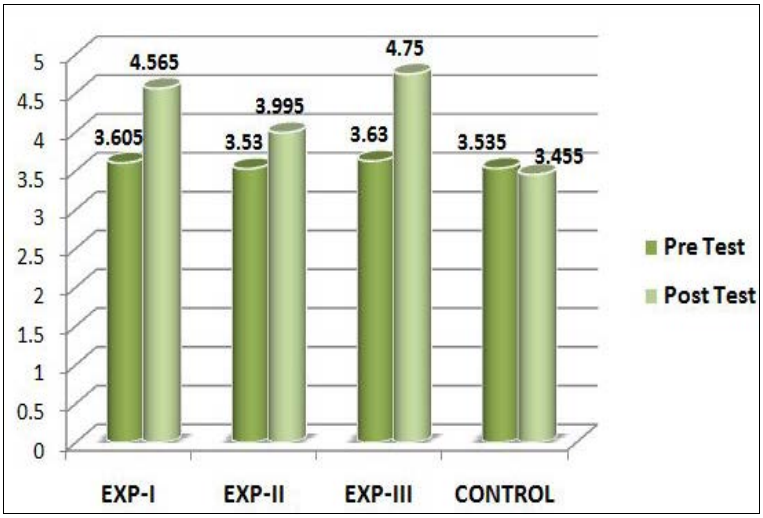

Fig 1: Graph showing group comparison of Forced Vital Capacity

The adjusted Post Test means of Forced Vital Capacity were 4.56 for Experimental Group 1, 3.99 for Experimental Group II, 4.74 for Experimental Group III and 3.45 for Control Group. The obtained 'F' ratio 32.30 was higher than the table 'F' ratio 2.7. Hence, the adjusted 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 forced vital capacity.

Computation of analysis of covariance of forced expiratory volume$_1$

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 forced expiratory volume$_1$ (scores in liters in 1 second)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	2.52	2.545	2.61	2.52	B	0.103	3	0.034	0.29	2.7
					W	9.01	76	0.11		
Post Test	3.365	3.04	3.81	2.46	B	19.37	3	6.45	47.19*	2.7
					W	10.39	76	0.13		
Adjusted	3.378	3.04	3.78	2.46	B	18.50	3	6.16	50.97*	2.7
					W	9.07	75	0.12		
Mean Gain	0.84	0.49	1.2	0.06						

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

Table 2 shows analyzed data on Forced Expiratory Volume$_1$. The Pre Test means of Forced Expiratory Volume$_1$ were 2.52 for Experimental Group I, 2.545 for Experimental Group II, 2.61 for Experimental Group III and 2.52 for Control Group. The obtained 'F' ratio 0.29 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 Forced Expiratory Volume$_1$ were 3.365 for Experimental Group I, 3.04 for Experimental Group II, 3.81 for Experimental Group III and 2.46 for Control Group. The obtained 'F' ratio 47.19 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.

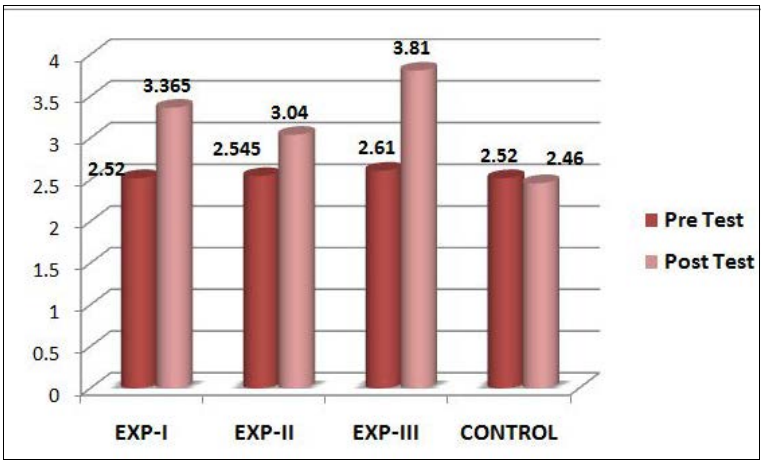

Fig 2: Graph showing group comparison of Forced Expiratory Volume$_1$

The adjusted Post Test means of Forced Expiratory Volume$_1$ were 3.378 for Experimental Group I, 3.04 for Experimental Group 2, 3.78 for Experimental Group III and 2.46 for Control Group. The obtained 'F' ratio 50.97 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 flexibility

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 flexibility (Scores by sit and reach test)

Test	Exp-I	Exp-II	Exp-III	Control	SV	SS	DF	MS	OF	TF
Pre Test	16.85	17	16.45	16.55	B	3.9375	3	1.3125	0.73	2.7
					W	136.45	76	1.79		
Post Test	20.8	22.7	24.25	15.75	B	819.85	3	273.28	127.50*	2.7
					W	162.9	76	2.14		
Adjusted	20.89	22.59	24.19	15.81	B	783.81	3	261.27	136.45*	2.7
					W	143.613	75	1.91		
Mean Gain	3.95	5.7	7.8	0.8						

*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 Flexibility. The Pre Test means of Flexibility were 16.85 for Experimental Group I, 17 for Experimental Group II, 16.45 for Experimental Group III and 16.55 for Control Group. The obtained 'F' ratio 0.73 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 Flexibility were 20.8 for Experimental Group I, 22.7 for Experimental Group II, 24.25 for Experimental Group III and 15.75 for Control Group. The obtained 'F' ratio 127.50 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.

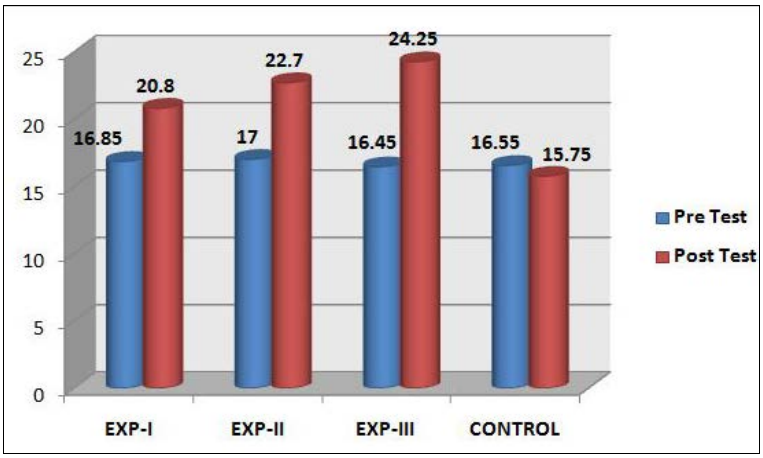

Fig 4: Graph showing group comparison of Flexibility

The adjusted Post Test means of Flexibility were 20.89 for Experimental Group I, 22.59 for Experimental Group II, 24.19 for Experimental Group III and 15.81 for Control Group. The obtained 'F' ratio 136.45 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 forced vital capacity, forced expiratory volume and flexibility

Xugui Sun *et al*., (2015) conducted a cross-sectional study which was designed to collect the routine health screening data for university students in 2013. The height, weight and force vital capacity of students were measured, and BMI was calculated with height and weight, so as to estimate the relationship between force vital capacity and obesity. Based on Working Group on Obesity references in China, obesity has a higher forced vital capacity in both male and female university students.

Mohamed AI Gobhain *et al*., (2012) conducted cross sectional study among volunteers healthy non-smoking adults Subjects. Divided the subjects into two groups according to their BMI. Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), peak expiratory flow rate (PEF) and forced mid-expiratory flow were measured and it was found that there was significant difference in PEF & FEV1 between the two groups (p value < 0.020).

Henrique Silveria Costa (2018) in their study verified the functional differences between eutrophic and overweight groups and identified the independent predictors of functional capacity in overweight individuals. They found that the BMI and body fat percentage were the only independent predictors of functional capacity in overweight volunteers. The results can helpful in the management of overweight people, aiming to prevent musculoskeletal and functional dysfunctions.

From these analyses, it is found that the results obtained from the experimental groups had a significant improvement in Forced Vital Capacity, Forced Expiratory Volume in one second and Flexibility. These effects have been attributed 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 flexibility and FEV1 from Experimental Group III had greater improvement as well Experimental Group II is also significant in modulating the flexibility and FEV1 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 forced vital capacity, forced expiratory volume in 1 second and flexibility that control group at the end of sixteen week period of treatment.
2. Experimental group III showed significantly greater increase on forced vital capacity, forced expiratory volume in 1 second and flexibility 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 forced vital capacity, forced expiratory volume in 1 second and flexibility 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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