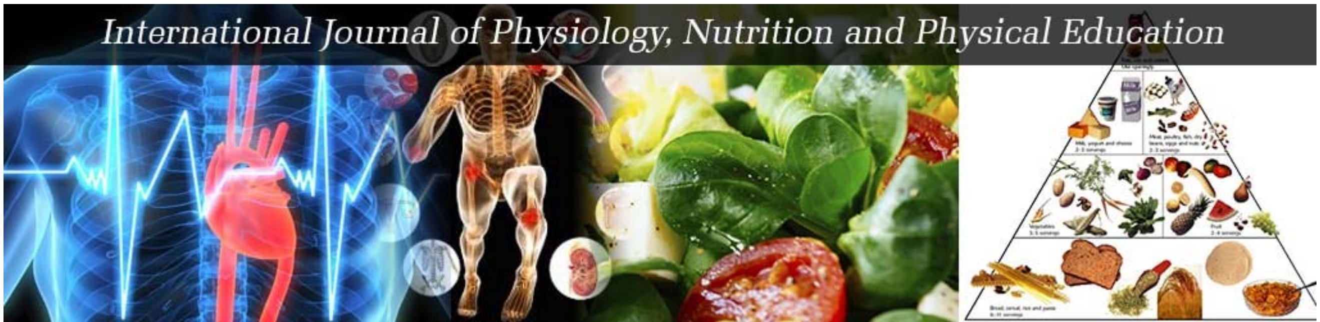

ISSN: 2456-0057
IJPNPE 2017; 2(1): 216-219

www.journalofsports.com
Received: 19-11-2016
Accepted: 20-12-2016

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A comparative effect of static and dynamic core exercises on vital capacity of male physical education students

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Abstract

Purpose: The Purpose of the study was to find out the comparative effect of static and dynamic core exercise training on vital capacity.

Selection of Subjects: For the present study 45 male students from Department of Physical Education, GGV Bilaspur (C.G) were selected randomly as the subjects for the study. The age of the subjects ranged between 20-25 years.

Selection of Variables: The variables selected for the present study were static and dynamic core exercise training as independent variable, vital capacity as dependent variable.

Methodology: For the study pretest – posttest randomized group design, which consists of control group (15 students) and two experimental group's i.e. static and dynamic core exercise group (30 students) were used. The data were collected through the pretest, before training and posttest, after twelve weeks of static and dynamic core exercise training.

Statistical Technique: To find out the comparative effect of static and dynamic core exercise training on vital capacity of the subjects the pretest and post test scores were analyzed by using Descriptive analysis, Analysis of Co-Variance (ANCOVA) and LSD test were used, the data analyzed with the help of SPSS (21.0 version) software and the level of significance was set at 0.05 level of confidence.

Result: The result of the study showed that there was significant difference between pre and posttest (experimental group) of vital capacity. Significant difference was found between adjusted means of dynamic core exercise training and control group ($p < 0.05$).

Conclusion: On the basis of findings of the study it may be considered that dynamic core exercise training could be very much useful method of training for sportsman to improve vital capacity.

Keywords: Dynamic core exercise, Static core exercise, Vital capacity

1. Introduction

In recent years, abdominal muscle training has gained increasing popularity, and exercises like "crunches" or "planks" have become an integral part of both fitness and rehabilitation programs. Abdominal training serves to improve core stability, which is the ability to strengthen the lumbopelvic complex and transfer forces from the upper to the lower limbs of the body while maintaining the spine in a neutral position (Bliss LS, Teeple P., 2005; Willson JD., *et al*., 2005) [6, 22]

The most common traditional exercises and training methods to enhance abdominal strength and stability employ body weight exercises consisting of static or dynamic contractions in various body positions (e.g., supine, lateral), starting with isolated movements and then continuing through with more complex sequences (Bliss LS, Teeple P., 2005; Jeffreys I, 2002) [6, 12] such as crunches, sit-ups, and planks (prone or lateral).

Correct breathing (especially as it involves the respiratory muscles) is vital to abdominal training because respiratory muscles are directly involved during common core stability exercises (DePalo VA, *et al*., 2004; Strongoli LM, Gomez CL & Coast JR., 2010) [8, 20]. DePalo *et al*. found that the diaphragm is actively recruited in many resistance training exercises, including sit-ups. Other studies demonstrated that the respiratory muscles are involved in a variety of activities in which respiration is not primarily involved. Because breathing is one of the most basic patterns directly related to human movement [17], as seen in neonates, inefficient breathing may result in muscular imbalance and motor control alterations that can affect general motor quality.

Vital capacity is strong indicator of lung function which decline due to sedentary lifestyle. A study indicates that men who remained in active lifestyle during the follow up showed 70ml improvement in their forced vital capacity (FVC) whereas the subjects who remained in sedentary lifestyle has 20ml reduction in their forced vital capacity (FVC) (Ahmad Azad *et al*. 2011; Zahra Hojati *et al*. 2013) [2, 9]. Many studies shows that an increase in vital capacity and lung volumes has positive effect on increasing work capacity and power output (Stephanie J. Enright, *et al*. 2011) [2]. The measurement of vital capacity is therefore a frequently used method in modern anthropological investigation and serves as a good indicator of assessing the living condition, abilities, physical and health condition of individual and populations (T. Pavlica, *et al*. 2010) [16].

Objectives of the study

The main objective of the present study was to find out the comparative effect of static and dynamic core exercise training on vital capacity.

Methodology

Selection of Subjects

For the present study, 45 male students from Department of Physical Education, GGV Bilaspu (C.G) were randomly selected as subject. The subjects were divided into three groups. Each group was consisted of 15 students. The age of the subjects ranged from 20-25 years.

Table 1: Distribution of subjects

Group	No. of subjects
Static Group (A)	15
Dynamic Group (B)	15
Control (C)	15

Selection of Variables

Keeping the feasibility criterion in mind, the researcher selected the following variables for the present study:

- Static and Dynamic core exercise training (Independent variables)
- Vital Capacity (Dependent variables)

Criterion Measures

- The Vital capacity (VC) was measured with dry Spirometer and recorded in liters.

Experimental Design

For the study pretest & posttest randomized group design, which consists of one control group (n=15) and two experimental group (n=30) was used. Equal numbers of subjects were assigned randomly to the group. Two groups served as experimental group (static core exercise group and dynamic core exercise group) on which treatment was assigned and the second group served as the control group.

Table 2: Pre Test & Post Test Randomized Group Design

Group (A)	O_1	T_1	O_2
Group (B)	O_1	T_2	O_2
Group (C)	O_1	No Treatment	O_2

Where- O_1 = Pre Observation, O_2= Post Observation and T_1= Plyometric training, T_2= Weight training

Collection of data

Before the administration of static and dynamic core exercise training, the vital capacity test were administered on both the experimental and control groups to collect pretest data. After the completion of 12 weeks of static and dynamic core exercise training again the same tests were conducted to collect the post training data. Necessary instructions were given to the subjects before administration of the tests.

Administration of training

While training static and dynamic core exercises the load was equal uniform to each subject for which volume and intensity were manipulated. It is require closely monitoring the quality of movement of subject by the investigator.

The experimental groups were trained for all the 72 sessions i.e. 36 sessions for static exercise training and 36 sessions for dynamic exercise training. The training session consists of general and specific warming up including stretching, flexibility, co-ordination, footwork, skipping rope and jumping drills for duration of 10-15 min. total duration of training session was 60-90 min. and recovery of 30 sec. after the each set of exercises. After the completion of training cool down exercises and recreational activities were followed for 5-10 min. The training programmes were given six days in a week.

Table 3: Training Schedule

Weeks		**1&2**	**3&4**	**5&6**	**7&8**	**9&10**	**11&12**	**Rest (between the repetitions in sec.)**
Static Core Exercise	**Dynamic Core Exercise (with swiss ball)**	**Repetition x Time (sec.)**						
Elbow Plank	Basic crunch	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Raised Leg Plank	Supine leg curl on the ball	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Raised Arm Plank	Prone Jacknife	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Raised Opposite Arm/Leg Plank	Press Up	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Superman Position	Pike position	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Hip Bridge	Leg Drop	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Supine Leg Lift	Core Ball Transfer	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Supine Bridge Elbow	Lateral Crunch	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Side Bridge on Elbow	Back Extension	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.
Extended Leg Side Bridge	Leg Raises	3 x 30	3x45	3x60	3x75	3x90	3x105	30 sec.

Statistical Procedure

To find out the effect of static and dynamic core exercise Training on vital capacity of the subjects the pretest and post test scores were analyzed by using descriptive statistical and Analysis of Co-Variance (ANCOVA). To test significance of difference among means LSD test was applied. The data analyzed with the help of SPSS (21.0 version) software and the level of significance was set at 0.05 level of confidence.

Result and Findings of the Study

Table 4: Descriptive table of control, static and dynamic group in relation to Vital Capacity (VC)

Group	Test	N	Mean	SD	Std. Error	Min.	Max.
Control	Pre	15	3.4553	.81856	.21135	2.15	4.50
	Post	15	3.7933	.63258	.16333	2.50	4.60
Static	Pre	15	3.5113	.62474	.16131	2.60	4.40
	Post	45	4.2100	.83997	.21688	3.12	5.40
Dynamic	Pre	15	3.3620	.69328	.17900	2.50	4.80
	Post	15	4.4107	.48090	.12417	3.60	5.10

Table 5: Analysis of covariance of the means of the two experimental groups and control group in relation to Vital Capacity

Test	Groups			ANCOVA					
	Control	Static	Dynamic	Source of variance	SS	df	MSS	F	Sig.
Pre -Mean	3.4553	3.6233	3.6167	B	.171	2	.085	.166	.847
				W	21.574	42	.514		
Post - Mean	3.7933	4.2100	4.3640	B	2.975	2	1.487	3.338*	.045
				W	18.717	42	.446		
Adjusted Post- Mean	3.788	4.182	4.443	B	3.256	2	1.628	4.398*	.019
				W	15.179	41	.370		

*Significant at .05 level of confidence, B=between group variance, W= within group variance. $F_{0.05}(2,42)=3.22$, $F_{0.05}(2,41)=3.23$

From the table 5, analysis of co-variance (ANCOVA) indicated that the resultant F-ratio of VC (0.166) was insignificant in case of pre-test means from which it is clear that the pre-test mean does not differ significantly and that the random assignment of subjects to the experimental groups and control group were quite successful. The post-test means of The entire three groups yielded an F-ratio of 3.338 which was significant at .05 level of confidence. The difference between the adjusted post-test means was found significant (F= 4.398) as the Sig. value was lesser than .05 level of significance ($p<0.05$).

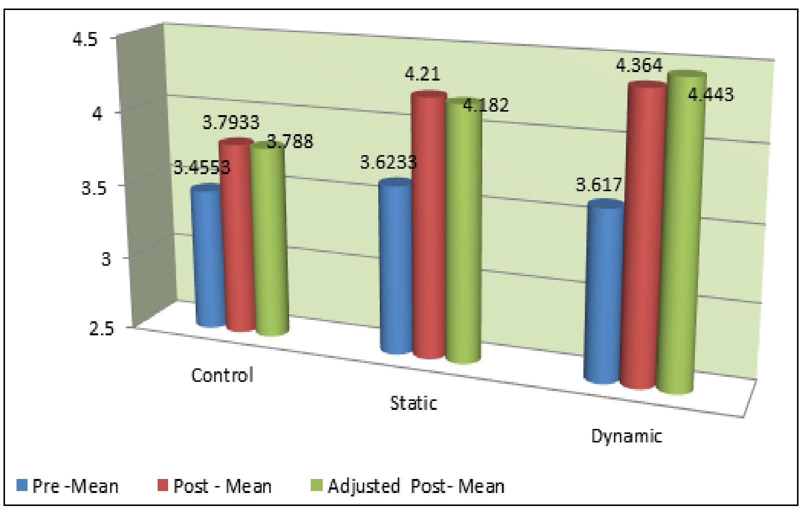
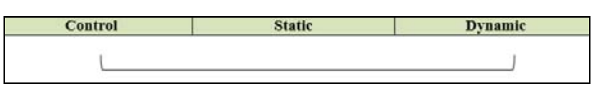


Fig 1: Graphical representation of means values of Pretest, Posttest and Adjusted Posttest of experimental and control groups in relation to Vital Capacity

Table 6: Paired adjusted mean and difference between means for two experimental group and control group in relation to VC

(I) training	(J) training	Mean Difference (I-J)	Std. Error	Sig.
Control	Static	-.394	.222	.084
	Dynamic	-.655*	.223	.005
Static	Control	.394	.222	.084
	Dynamic	-.261	.223	.248
Dynamic	Control	.655*	.223	.005
	Static	.261	.223	.248



" ______ " Shows significant difference

It is evident from Table 6 and Fig. 2 that significant difference was found between adjusted means of dynamic training and control group since the $p< 0.05$.

Discussion of Findings

As reported in previous studies, proper diaphragmatic breathing is directly linked to better functional movement, but combining proper breathing with global stretching postures can produce a greater effect on such functional parameters, as measured on mobility, stability, and whole body pattern tests. Regarding the biomechanical aspects of breathing, the expiration phase promotes active recruitment of the abdominal muscles, contrasting the natural elevation of the rib cage (induced by raising the arms overhead) ; To the contrary, elevating the arms raises the anterior chest wall, makes the thoracolumbar column hyperlordotic, and puts the diaphragm in an oblique position that inhibits its proper function.

When focusing on diaphragmatic breathing, it is important not only to reestablish a correct respiratory pattern but also to ensure lumbar spine stabilization by increasing intraabdominal pressure and activation of the core structures to transfer forces from the center of the body to the lower extremities. To produce an economic breathing pattern, all joints must be centered in a stable position to involve all muscular chains. The head, eyes, and spinal curves should all be aligned with the pelvis and the hips down to the knees and feet. This can be achieved with proper diaphragmatic breathing and adequate muscle tone distribution (as can be trained with EG exercises).

Some studies have reported a positive association between physical activity, physical fitness and lung capacity (Courteix D, Obert P, Lecoq AM, Guenon P, Koch G., 1997) [7]. Cross-sectional studies have reported that regular physical activity and good physical fitness have been related to better pulmonary function (Thomas PS, Cowen ER, Hulands G, Milledge JS., 1989; Rochester DF, Enson Y., 1974) [21, 17]. Jakes *et al*. reported that those who participated in vigorous physical activity showed a slower rate of decline in FEV1 during 3.7years of follow-up (Jakes *et al*, 2002) [11]. Holmen *et al*. found smaller lung capacity (FVC and FEV1) independent of age and height in never smokers with lower levels of physical exercise (Holmen TL, Barrett-Connor E, Clausen J, Holmen J, Bjermer L., 2002) [10].

Conclusions

Within the limitation of the study and the procedure followed seem to permit the following conclusions.

- The practice of static core exercise and dynamic core exercise improved the vital capacity significantly in the experimental group.
- There was significant difference found in vital capacity between dynamic core exercise group and control group.
- It is also concluded on the basis of finding of study that the dynamic core exercise training programme is more effective on vital capacity than the static core exercise training programme.

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