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Effect of circuit training and interval training on vital capacity and VO₂ max in women badminton players

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Abstract

The purpose of the study was to find out the influence of circuit training and interval training on Vital capacity and VO₂ Max in women badminton players. To achieve this purpose, Forty five women badminton players were randomly selected subject studying from Annamalai University, India and their age ranges between 20 to 24 years. The selected subjects were divided into two experimental groups and a control group with fifteen subjects in each group. Experimental group I (CTG=15) underwent circuit training, Group II (ITG=15) underwent interval training and Group III served as control group (CG=15). During the training period the two experimental groups' underwent their respective training program for 12 weeks (4 days/ week) and the training programs were given about from 45 to 60 minutes per day. Physiological analyses were done on Vital capacity and VO₂ max to find out the significant effect of after training on women badminton players. The data collected from the three groups before and after the experimental training period were statistically examined to find out the significant improvement using the analysis of covariance (ANCOVA). The significant level of confidence was fixed at 0.05. Hence, it was concluded that circuit training and interval training have significant positive increase on Vital capacity and VO₂ max level.

Keywords: Circuit training, interval training, vital capacity and VO₂ max

Introduction

Physical exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness. It is performed for various reasons including strengthening muscles and the cardiovascular system, honing athletic skills, weight loss or maintenance, as well as for the purpose of enjoyment. (Stampfer, M. J *et al*, 2000) [6].

Vital capacity is the the maximum amount of air that can be inhaled or exhaled from the lung. Vital capacity is equivalent to the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume.

VO₂ max is the maximal oxygen uptake or the maximum volume of oxygen that can be utilized in one minute during maximal or exhaustive exercise. It is measured as milliliters of oxygen used in one minute per kilogram of body weight (ml/kg/min). VO₂ max or maximal oxygen uptake is one factor that can determine an athlete's capacity to perform sustained exercise and is linked to aerobic endurance. A high VO₂ max may indicate an athlete's potential for excellent aerobic endurance. (Costill, D.L. and Wilmore, J.H., 1994) [3].

The factors affecting VO₂ are often divided into supply and demand factors. Supply is the transport of oxygen from the lungs to the mitochondria (including lung diffusion, stroke volume, blood volume, and capillary density of the skeletal muscle) while demand is the rate at which the mitochondria can reduce oxygen in the process of oxidative phosphorylation. (Bassett D.R. Jr & Howley E.T., 2000) [2].

Methodology

Selection of subjects

To achieve for the purpose of this study, Forty five women badminton players were randomly selected subject from studying in Annamalai University, India, and their age ranges between 20 to 24 years.

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Experimental design

The purpose of the present study was to find out the effects of circuit training and interval training on vital capacity and VO₂ max in women badminton players. The selected subjects were divided into two experimental groups and a control group with fifteen subjects in each group. Experimental group I underwent circuit training, Group II underwent interval training, and Group III served as control group. During the training period the two experimental groups' underwent their respective training program for 12 weeks (4 days/ week) and the training programs were given about from 45 to 60 minutes per day.

Training program

The experimental each training group consisted of 45 to 60 minutes sessions divided into five stages: warm-up (5 to 10 minutes); specific training (30 to 40 minutes); warm-down (5 to 10 minutes) and stretching (5 minutes). Circuit Training technique that involves moving from one exercise to another, each exercise working a different muscle group until each muscle has been worked. Interval training involves alternating

high intensity exercise with recovery periods and there are a variety of ways to set up interval workouts.

Testing variables

The vital capacity of the subjects was measured using spirometer and VO₂ max of the subject was measured through conducting Cooper 12 minutes run test.

Statistical analysis

Vital capacity and VO₂ max were assessed before and after 12 weeks of wo experimental training programs. The data collected from the three groups before and after the experimental training period were statistically examined to find out the significant improvement using the analysis of covariance (ANCOVA). The significant the level of confidence was fixed at .05.

Results

Table I shows the mean and 'F' ratio on Vital capacity of Circuit training, Interval training and control group.

Table 1: Ancova of vital capacity between circuit training, interval training and control groups

test	Circuit training group (CTG)	Interval training group (ITG)	Control group (CG)	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	3.27	3.47	3.33	Between	0.31	2	0.16	0.18
S.D.	0.79	0.99	0.98	Within	36	42	0.86	
Post Test								
Mean	4.13	4.33	3.53	Between	5.2	2	2.6	3.79*
S.D.	0.74	0.62	1.06	Within	28.8	42	0.69	
Adjusted Post Test								
Mean	4.12	4.35	3.53	Between	5.39	2	2.69	4*
				Within	27.61	41	0.67	

*Significant at .05 level of confidence.

The table values required for significance at .05 level of confidence for 2 and 42 & 2 and 41 are 3.22 and 3.33 respectively.

Table I show that adjusted post-test mean values of Vital capacity for Circuit training, Interval training and control group were 4.12, 4.35 and 3.53 liters respectively. The

obtained 'F' ratio value 4 for adjusted post-test means on Vital capacity was greater than the table value 3.33 for significance with df 2 and 41 at .05 level of confidence.

The adjusted post test mean values for Circuit training, Interval training and control group on Vital capacity were graphically presented in figure I.

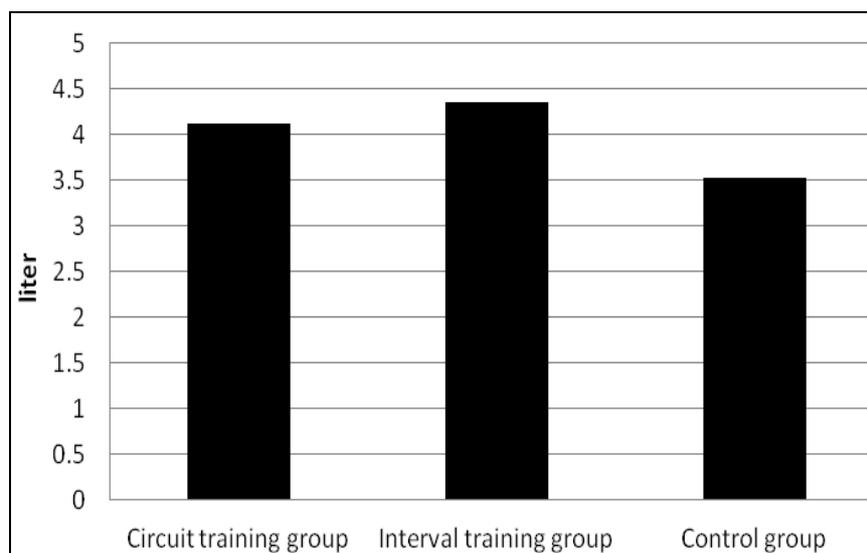


Fig 1: vital capacity

VO₂ Max

Table II shows the mean and 'F' ratio on VO₂ Max of Circuit training, Interval training and control group.

Table 2: Ancova of VO₂ max between circuit training, interval training and control groups

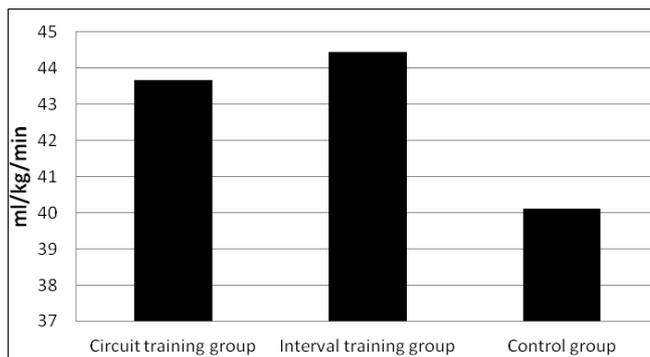
test	Circuit training group (CTG)	Interval training group (ITG)	Control group (CG)	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test								
Mean	40.47	40.73	40.33	Between	1.24	2	0.62	1.31
S.D.	0.52	0.46	0.98	Within	20	42	0.48	
Post Test								
Mean	43.67	44.4	40.13	Between	156.13	2	78.07	144.65*
S.D.	0.82	0.63	0.74	Within	22.67	42	0.54	
Adjusted Post Test								
Mean	43.66	44.43	40.11	Between	152.58	2	76.29	140.31*
				Within	22.29	41	.54	

*Significant at .05 level of confidence.

The table values required for significance at .05 level of confidence for 2 and 42 & 2 and 41 are 3.22 and 3.33 respectively

Table II show that adjusted post-test mean values of VO₂ Max for Circuit training, Interval training and control group were 43.66, 44.43 and 40.11ml/kg/min respectively. The obtained 'F' ratio value 140.31 for adjusted post-test means on VO₂ Max was greater than the table value 3.33 for significance with df 2 and 41 at .05 level of confidence.

The adjusted post test mean values for Circuit training, Interval training and control group on VO₂ Max were graphically presented in figure II.

**Fig 2:** VO₂ Max

Discussion

PA Ades *et al.* (1993) [5] these results suggest that older coronary patients respond to aerobic conditioning with remarkable improvements in submaximal endurance capacity, out of proportion to the more modest increases in VO₂ max. Measurements of serum lactate, respiratory exchange ratio, and ventilation during steady-state exercise document that at an identical absolute work load after conditioning, exercise is performed using aerobic substrate to a greater degree, and ventilatory response to a given work load is lessened.

The present study of exercise and orthotics showed a significant decrease in BP and increase in HRV over the five month study period. John Zhang (2007) [4] was investigate that study the total power reflecting the total autonomic activity was significantly decreased immediately after exercise and after the 20-minute rest period at the end of the exercise session in both the control and experimental groups.

Babalola J.F (2011) [1] was examined the 8 weeks circuit training programme gave the results show that there was significant difference in the pretest-posttest responses of physiological variables measured resting diastolic and systolic blood pressure RDBP & RSBP, resting heart rate RHR and Body Mass Index BMI.

Veli Niinimaa and Roy J. Shephard, (1978) [7] have

demonstrated that Training produced no significant changes in any of the pulmonary variables tested, despite a 10% increase of maximum oxygen intake seen in those members of the group who progressed to intensive training (heart rate 145-155/min). This reflects the fact that oxygen transport depends more on blood transport than on the respiratory system.

Conclusion

The results of the study findings that a 12-week training program have significantly increased of positive improvement on Vital capacity and VO₂ max in women badminton players. There was a significant increased on Vital capacity and VO₂ max due to circuit training and interval training. The results of the current study suggest that both training program is found to be better than control group. Hence, it was concluded that interval training was improves better than circuit training on Vital capacity and VO₂ max level in women badminton players.

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