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# Effect of concurrent training on $Vo_2$ max among school students

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**Abstract**
The purpose of the study was to find out the effect of concurrent training on $VO_2$ Max among school students. To achieve this purpose of the study, thirty school students were selected as subjects who were from the K.P. R. and J. L. Siddhartha High School, Eluru. The selected subjects were aged between 15 to 18 years. They were divided into two equal groups of fifteen each, Group I underwent concurrent training programme and Group II acted as control that did not participate in any special training apart from their regular curricular activities. The subjects were tested on selected criterion variable such as explosive strength prior to and immediately after the training period. The selected criterion variable such as $VO_2$ Max was measuring by 12 minutes run/walk test. The analysis of covariance (ANCOVA) was used to find out the significant differences if any, between the experimental group and control group on selected criterion variable. In the cases, 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate. The result of the present study has revealed that there was a significant difference among the experimental and control group on $VO_2$ Max.

**Keywords:** concurrent training-physiological-$VO_2$ max

## 1. Introduction
The primary objective of sports training is to stress various bodily systems to bring about positive adaptation in order to enhance sporting performance. To achieve this objective, coaches and athletes systematically apply a number of training principles including overload, specificity and progression, organized through what is commonly termed periodisation. The application of these principles involves the manipulation of various programme design variables including choice of exercise, order of training activities/exercises, training intensity (load and repetition), rest periods between sets and activities/exercises and training frequency and volume in order to provide periods of stimulus and recovery, with the successful balance of these factors resulting in positive adaptation.

Whilst the above mentioned training principles are employed for both endurance and strength training regimes, the physiological adaptations for both are notably different due to differences in the application of programme design variables. Endurance training programmes such as those used for running or cycling typically involve the performance of high-repetition, low-resistance exercise continuously over long periods of time (e.g. 1-2 hours). The intention of this type of training is to increase aerobic capacity (maximal oxygen uptake (VO2 max), efficiency and economy) through physiological changes including increased muscle capillary and mitochondrial density and enzyme activity in the respiratory pathway. Due to the low level of resistance utilized, endurance training produces very little change in a muscle's strength capabilities. In contrast, strength training typically involves the performance of high-resistance, low-repetition exercises to produce increases in muscle strength, hypertrophy and motor performance. Associated with these changes are increases in muscle fibre size, a reduction in mitochondrial density, an alteration of the ratio of type II fibres and little or no change in aerobic capacity.

Resistance-training and aerobic exercise both cause muscular and cardiovascular adaptations, which differ depending on various training parameters, including intensity, volume, and frequency, among others. Resistance-training primarily leads to increases in strength, muscle size, rate of force development (RFD) and muscular power. Aerobic exercise primarily leads to increases in maximum oxygen consumption and time-to-exhaustion in incremental or constant-load endurance tests. However, it has been observed on many occasions that performing both resistance-training and aerobic exercise concurrently in a training program appears to lead to inferior gains in most if not all of the main resistance-training adaptations in comparison with a program comprising solely resistance-training. This phenomenon is called "the interference effect". In their meta-analysis the reviewers in fact found that gains in muscular hypertrophy and strength were not significantly different between resistance-training-only and concurrent training groups. However, they found that power was significantly lower in the concurrent training group than in the resistance-training-only. This indicates that power is more sensitive to the interference effect than either strength or hypertrophy. However, the reviewers found that when the results were analyzed by type of endurance exercise and by body part, running was found to lead to an interference effect on lower body strength and hypertrophy while cycling was not.

## 2. Methodology
The purpose of the study was to find out the effect of concurrent training on $VO_2$ Max among school boys. To achieve this purpose of the study, thirty school boys were selected as subjects who were from the K.P. R. and J. L. Siddhartha High School, Eluru. The selected subjects were aged between 15 to 18 years. They were divided into two equal groups of fifteen each, Group I underwent concurrent training programme and Group II acted as control that did not

participate in any special training apart from their regular curricular activities. The experimental group underwent the training programme for three days per week for eight weeks. Among the physiological variable such as $VO_2$ Max was measuring by 12 minutes run/walk test.

**$VO_2$ Max (12 Minutes Run and Walk Test)**

This test requires the athlete to run as far as possible in 12 minutes. The athlete warm up for 10 minutes. The assistant gives the command "GO", starts the stopwatch and the athlete commences the test. The assistant keeps the athlete informed of the remaining time at the end of each lap (400m). The assistant blows the whistle when the 12 minutes has elapsed and records the distance the athlete covered to the nearest 10 meters. For an evaluation of the athlete's performance enter the total distance covered and then 'Calculate' with the formula – (Distance covered - 504.9) ÷ 44.73 = $VO_2$ Max) the individual score was recorded. The data were collected at prior and immediately after the training programme for each criterion variables. Analysis of covariance (ANCOVA) was applied for analyze the data. The 0.05 level was used to test this significance.

## 3. Results

Findings: The mean and standard deviation scores of pretest, posttest and adjusted posttest of $VO_2$ Max on concurrent training and control group are given in table. 'F'ratio test computed in regards to the $VO_2$ Max on concurrent training and control group in the pretest, posttest and adjusted post test are also presented in table.

**Table 1:** Mean Standard Deviation and 'F' Ratio of Concurrent Training and Control Group on $Vo_2$ Max

| | Exp Group | Control Group | Source of Variance | Sum of Squares | Df | Mean Squared | 'F' ratio |
|---|---|---|---|---|---|---|---|
| **Anxiety** | | | | | | | |
| Pre test Mean | 35.82 | 36.13 | Between | 2.54 | 1 | 2.54 | 1.92 |
| S D | 1.01 | 0.97 | Within | 36.96 | 28 | 1.32 | |
| Post test Mean | 43.16 | 37.42 | Between | 91.35 | 1 | 91.35 | 56.39* |
| S D | 1.23 | 0.74 | Within | 45.36 | 28 | 1.62 | |
| Adjusted posttest Mean | 43.14 | 37.40 | Between | 87.03 | 1 | 87.03 | 60.02* |
| | | | Within | 39.15 | 27 | 1.45 | |

The $VO_2$ Max pre means were 35.82 for the concurrent training group and 36.13 for the control group. The resultant 'F' ratio of 1.92 was not significant at .05 levels indicating that the two groups were no significant variation. The post test means were 43.16 for the concurrent training group and 37.42 for the control group. The resultant 'F' ratio of 56.39 at .05 level indicating that it was significant. The difference between the adjusted post-test means of 43.14 for the concurrent training group and 37.40 for the control group yield on 'F' ratio 60.02 which was significant at.05 level.

The result of this study showed that there was a significant difference between concurrent training and control group on $VO_2$ Max.

## 4. Discussion/Conclusions

The findings of the study showed that there was no significant difference between the pretest of $VO_2$ Max.

The findings of the study showed that there was a significant difference between the posttest and adjusted posttest of $VO_2$ Max.

The results of the study have shown there was a significant difference among concurrent training group and control group on $VO_2$ Max reference to the past studies on selected physiological variable such as $VO_2$ Max in accordance with Docherty and Sporer 2000 Wong, and others 2010, Mc Carthy, and others 1995 and Mokkloa, and others 2007.

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