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# EFFECT OF INTERVAL TRAINING WITH VARIED INTENSITIES AND DETRAINING IMPACT ON MAXIMUM OXYGEN CONSUMPTION

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**ABSTRACT:**

The purpose of this study was to examine the effect of varied intensities of interval training and detraining impact on maximum oxygen consumption. Sixty subjects were selected and they were divided into four equal groups of fifteen each. The first group performed low intensity interval training, second group performed medium intensity interval training, third group performed high intensity interval training and the fourth group acted as control. After the completion of twelve-weeks of varied intensities of interval training period the subjects of group I, II and III were physically detrained for thirty days. The pre and posttest data on maximum oxygen consumption was statistically analyzed by applying the analysis of covariance (ANCOVA). The data collected during post experimentation and during detraining period were statistically analyzed by using two way (4x4) factorial ANOVA with repeated measures on last factor. Statistical analysis found significant improving in maximum oxygen consumption and significant decline during detraining period.

**KEYWORDS:**

Interval training, Detraining, Maximum oxygen consumption.

## INTRODUCTION

Interval training was originated in Europe as a scientific method of developing speed and endurance in athletes. It is a method of overloading the athlete by the use of aerobic and anaerobic exercises, thus developing a high oxygen debt. A quick recovery of cardiovascular and respiratory systems is sought for and expected. In this method, an athlete runs a prescribed course in a specified time for a prescribed number of times. Fast runs are interspersed with short recovery periods of jogging. The athlete becomes fatigued many times in a single training session, depending on his ability to handle many states of high oxygen debt. Besides developing speed and endurance, interval training has the added advantage of allowing large numbers of athletes to train at the same time (Novich & Taylor, 1983).

Intensity, the qualitative part of work a competitor performs in a given time, is likewise a vital segment of preparing. The more work the competitor performs per unit of time, the higher the power. Power is an element of the quality of the nerve driving forces the competitor utilizes in preparing. The

quality of a boost relies on the heap, pace of execution, and the variety of interims or rest between reiterations. Strong work and focal sensory system contribution through greatest fixation decide the power amid preparing or rivalry. Force changes as indicated by the specifics of the game, on the grounds that the level of power shifts in many games and amusements. It is important to establish and use varying degrees of intensity in training. Several methods are available to measure the strength of the stimuli and thus the intensity (Bomba, 1999).

Detraining is equally important but that has been given considerably less attention by the athletes and the coaches and practically ignored by the research scholars in exercise and sports sciences. Detraining induces a partial or complete loss of training induced adaptations in response to insufficient training stimuli. The influence of detraining on maximum oxygen consumption has received little attention and not completely understood. The aim of the present study was to assess the effect of varied intensities of interval training and detraining impact on maximum oxygen consumption.

## METHODOLOGY

To accomplish the motivation behind the study, sixty male understudies from Acharya Nagarjuna University, Ongole Campus, Andhra Pradesh, India, amid the scholastic year 2015-2016 were chosen as subjects aimlessly. The age of the subjects ran from 18 to 22 years. The chose subjects were arbitrarily doled out to one of the four gatherings. The test bunch I experienced low power interim preparing, exploratory group-II underwent medium intensity interval training, group-III underwent high intensity interval training and group-IV acted as control. The data on maximum oxygen consumption was collected by administering one mile run test. Pretest data were collected prior to the training programme and posttest data were collected immediately after the twelve-weeks of training programme from both the experimental groups and control group. During the detraining period the data were collected once in ten days for 30 days from the experimental and control groups.

## TRAINING PROTOCOL

The exploratory gatherings experienced their particular preparing program three days per week (alternate days) for twelve weeks. The first group performed low intensity interval training, second group performed medium intensity interval training and third group performed high intensity interval training. To fix the training load for the experimental groups the subjects were examined for their exercise heart rate in response to different work bouts, by performing continuous running of two minutes duration for proposed repetitions and sets, alternating with active recovery based on work-rest ratio. The subject's training zone was computed using Karvonen formula and it was fixed at 50%HRmax to 65%HRmax for low intensity interval training, 65%HRmax to 80%HRmax for medium intensity interval training and 80%HRmax to 95%HRmax for high intensity interval training. The work rest ratio of 1:1 between exercises and 1:3 between sets was given. After the completion of twelve-weeks training period the subjects of group I, II and III were physically detrained for thirty days.

## STATISTICAL TECHNIQUE

The information gathered from the four gatherings before and post experimentation on most extreme oxygen utilization was measurably dissected to discover the critical distinction assuming any, by applying the investigation of covariance (ANCOVA). At whatever point the acquired F proportion quality was observed to be critical for balanced posttest implies, the Scheffe's test was connected as post hoc test. The information gathered on post experimentation and during detraining were statistically analyzed by using two way (4 x 4) factorial ANOVA with last factor repeated measures. The simple effect and the Scheffe's test were used as follow up and post hoc test. The analysis of data on maximum oxygen consumption is

presented in table-I to V.

**Table-I: Analysis of Covariance on Maximum Oxygen Consumption**

| | Low Intensity Interval Training | Medium Intensity Interval Training | High Intensity Interval Training | Control Group | S o V | SS | df | MS | 'F' ratio |
|---|---|---|---|---|---|---|---|---|---|
| Adjusted Post test Mean | 2.83 | 3.12 | 3.31 | 2.14 | B | 11.28 | 3 | 3.76 | 106.73* |
| | | | | | W | 4.80 | 55 | 0.08 | |

The required table value for significance at 0.05 level of confidence with degrees of freedom 3 and 55 is 2.77.

The result of the study shows that, significant differences exist among the adjusted post-test means of experimental and control groups on maximum oxygen consumption. Since, the obtained 'F' ratio value for the adjusted post-test means was found to be significant, the Scheffe's post hoc test was applied, and the results are presented in table-II.

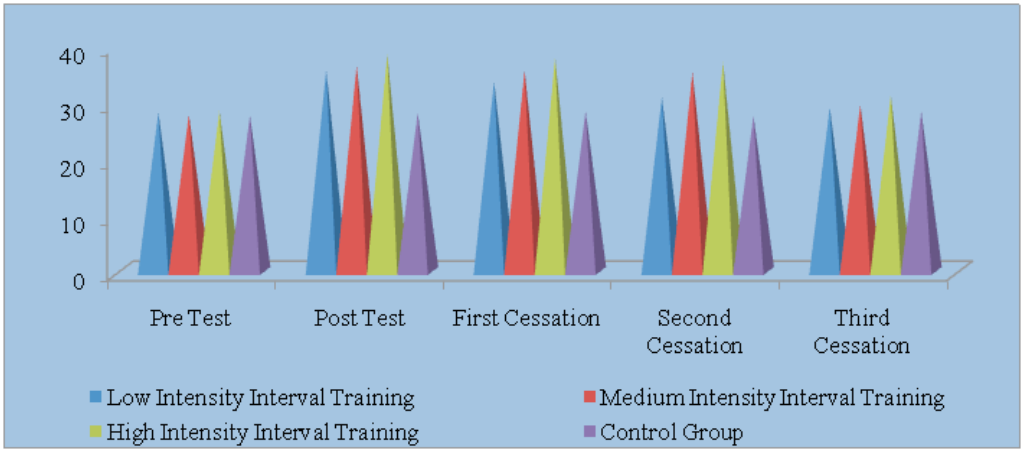
**Table-II: Scheffe's Test for the Differences among Paired Means of Experimental and Control Groups on Maximum Oxygen Consumption**

| Low intensity interval training group | Medium intensity interval training group | High intensity interval training group | Control group | Mean difference | Confidence interval |
|---|---|---|---|---|---|
| 2.83 | 3.12 | | | 0.29* | 0.29 |
| 2.83 | | 3.31 | | 0.48* | 0.29 |
| 2.83 | | | 2.14 | 0.69* | 0.29 |
| | 3.12 | 3.31 | | 0.19* | 0.29 |
| | 3.12 | | 2.14 | 0.98* | 0.29 |
| | | 3.31 | 2.14 | 1.17* | 0.29 |

*Significant at .05 level of confidence

The Scheffe's post hoc test result shows that all the three experimental groups contributed to the significant improvement on maximum oxygen consumption. However, high intensity interval training is better than medium and low intensity interval training in improving maximum oxygen consumption.

**Figure-I: Diagram Showing the Pretest, Posttest, I, II and III Cessation Mean Values on Maximum Oxygen Consumption of Experimental and Control Groups**



To determine the detraining impact on maximum oxygen consumption two-way factorial ANOVA (4x4) with repeated measures on last factor was applied, and the results are presented in table-III.

**Table III: Two Way ANOVA on Maximum Oxygen Consumption of Groups at Four Different Stages of Tests**

| Source of Variance | Sum of Squares | df | Mean Squares | Obtained "F" ratio |
|---|---|---|---|---|
| A factor (Groups) | 11.95 | 3 | 3.98 | 20.46* |
| Group Error | 10.90 | 56 | 0.19 | |
| B factor (Tests) | 20.03 | 3 | 6.67 | 141.74* |
| AB factor (Interaction) (Groups and Tests) | 7.67 | 9 | 0.85 | 18.09* |
| Error | 7.91 | 168 | 0.04 | |

(Table values required for significance at 0.05 level with df 3 and 56 is 2.77; 3 and 168 ; 9 and 168 are 2.66 and 1.94 respectively.)

The obtained 'F' ratio value of Interaction (Groups x Different Tests) is 18.09, which is greater than the table value of 1.94 with df 9 and 168 required for significance at .05 level of confidence. The result of the study shows that significant difference exists among groups at each test and also significant difference between tests for each group on maximum oxygen consumption. Since, the interaction between groups and test was found to be significant, simple effect test was applied as a follow up test.

**Table – IV: Simple Effect Scores of Groups at Four Different Stages of Tests on Maximum Oxygen Consumption**

| Source of Variance | Sum of Squares | df | Mean Squares | Obtained "F" ratio |
|---|---|---|---|---|
| Groups at Post test | 12.08 | 3 | 4.03 | 100.75* |
| Groups at First Cessation | 6.81 | 3 | 2.27 | 56.75* |
| Groups at Second Cessation | 0.68 | 3 | 0.22 | 5.5* |
| Groups at Third Cessation | 0.039 | 3 | 0.013 | 0.32 |
| Tests and Group I | 13.58 | 3 | 4.52 | 113* |
| Tests and Group II | 10.04 | 3 | 3.34 | 83.5* |
| Tests and Group III | 4.06 | 3 | 1.35 | 33.75* |
| Tests and Group IV | 0.018 | 3 | 0.006 | 0.15 |
| Error | 7.91 | 168 | 0.04 | |

*Significant at .05 level of confidence

(Table values required for significance at .05 levels with df 3 and 168 is 2.66.)

The result of the study indicates that significant difference exists between groups during posttest and all three cessation periods on maximum oxygen consumption. The result of the study also indicates that significant difference exists among tests of group-I, tests of group-II and tests of group-III on maximum oxygen consumption. Since, 'F' ratio is found to be significant, the Scheffe's post hoc test was applied and the result obtained for groups at posttest, first, second and third cessation periods shows that significant differences exist among the three groups during posttest and first cessation period. During second and third cessation periods, no significant difference exists between the four groups.

**Table – V: Scheffe's Test for the Differences Between Paired Means of Experimental Groups at Different Stages of Testing on Maximum Oxygen Consumption**

| Groups | Mean Differences | First cessation | Second cessation | Third cessation |
|---|---|---|---|---|
| Low Intensity Interval Training | Post test | 0.22 | 0.48* | 0.67* |
| | First cessation | | 0.26 | 0.45* |
| | Second cessation | | | 0.19 |
| Medium Intensity Interval Training | Post test | 0.20 | 0.84* | 1.03* |
| | First cessation | | 0.64* | 0.83* |
| | Second cessation | | | 0.19 |
| High Intensity Interval Training | Post test | 0.24 | 0.89* | 1.17* |
| | First cessation | | 0.65* | 0.93* |
| | Second cessation | | | 0.28 |

*Significant at .05 level of confidence

The confidence interval required for significance at 0.05 level is 50.70.

From the above table, it is inferred that the maximum oxygen consumption of low, medium and high intensity interval training groups deteriorated significantly during second cessation onwards.

## DISCUSSION

Prevoious studies have examined the possible interference of interval training on maximum oxygen consumption improvements. The results of the present study also showed significant improvement on maximum oxygen consumption due to low, medium and high intensity interval training. During exercise, VO2max increases in direct proportion to the rate of work. A person's VO2max is in part genetically determined; it can be increased through training until the point that the genetically possible maximum is reached. VO2max is considered the best estimate of a person's cardiorespiratory fitness or aerobic power (Jorgensen et al., 1977). Increase in VO2max generally range from 15 to 20 percent following a 6-month training period (Wilmore & Costill, 1994). A six-week training period can result in increases in VO2max in participants undergoing high intensity (Hickson et al., 1981), lower intensity (Cunningham & Cantu, 1990) and endurance training (Carter et al., 1999).

Alcevedo and Goldfarb (1989) suggested that, to produce best performance training intensities have to be equal to those, which will be attempted in the competition. Weltman et al., (1992) arrived at the conclusion that, exercise at lactate threshold, was sufficient for endurance gains within the first 4 months whereas continuing improvement needed higher intensities. To maintain cardio-respiratory endurance, training must be conducted at least three times per week and training intensity should be 70% VO2max (Wilmore & Costill, 1999). These results are conformity with the following findings. Paton and Hopkins (2005) found that 1- and 4-km time trial performance increased could have also been a result of high intensity interval training.

The results of the study also indicated that the maximum oxygen consumption of low, medium and high intensity interval training decreased significantly due to detraining. But the significant decrease started after the second cessation toward the base line. These results of the study are in conformity with the finding of Nageswaran (1997) and Nugroho (2005) that the detraining losses of maximum oxygen consumption are much greater than losses of muscle strength and power. Baechle (1994) revealed that, endurance adaptations are most sensitive to period of inactivity, because of their enzymatic basic, when detraining occurs the physiological function goes back to normal.

## CONCLUSION

The results of the study produced significant improvement on maximum oxygen consumption due to low, medium and high intensity interval training. However, high intensity interval training is better than moderate and low intensity interval training in improving maximum oxygen consumption. It is also observed in the present study that throughout the detraining period, the gradual decline of maximum oxygen consumption for low, medium and high intensity interval training groups is similar. Since, gradual loss of training induced adaptations on maximum oxygen consumption within two weeks of detraining were found, it is suggested that the athlete must resume training within ten days of detraining.

## REFERENCES

1.Alcevedo, EO. & Goldfarb, AH. (1989). "Increased Training Intensity Effects on Plasma Lactate, Ventilatory Threshold, and Endurance", Medicine and Science in Sports and Exercise, 21, pp.563-568.
2.Baechle, TR. (1994). Essentials of Strength Training and Conditioning, pp.143-144.
3.Bompa, Tudor O. (1999). Periodization: Theory and Methodology of Training, p, 81.
4.Cunningham, L.N. and Cantu, R.C. (1990). Acute and chronic effects of exercise using an exercycle in healthy, untrained adults. Physical therapy, 70, p-494-502.
5.Hickson, R. Hagberg, A., Eshari, A., & Hallowoszy, J. (1981). Time course of the adaptive responses of aerobic power and heart rate to training. Medicine and Science in Sports and Exercise, 13, 17-20.
6.Jorgensen CR, Gobel FL, Taylor HL, Wang Y. (1977). Myocardial blood flow and oxygen consumption during exercise. Annals of the New York Academy of Sciences, 301: 213–223.
7.McArdle, WD., Katch, FI., and Katch, VL. (1985). Exercise Physiology: Energy, Nutrition and Human Performance, (2nd ed.), Philadelphia: Lea and Febiger, pp. 347-350.
8.Nageswaran AS., (1997). Effect of interval and continuous running and detraining on maximum oxygen consumption, resting heart rate, respiratory rate and breath holding time. Doctoral Dissertation, Annamalai University.
9.Novich, Max M. and Taylor, Buddy (1983). Training and Conditioning of Athletics, (2nd ed.), Philadelphia: Lea and Febiger, pp. 70-71.
10.Nugroho, MS. (2005). The detraining effects of complete inactivity. Thesis. Yogyakarta State University.
11.Paton, CD., Hopkins, WG., (2005). Combining explosive and high-resistance training improves performance in competitive cyclists. Journal of Strength and Conditioning Research, 19(4), 826-830.
12.Weltman et al., (1992). "Exercise Training at and above the Lactate Threshold of Previously Untrained Women", Int J Sports Med., 13, pp. 257-263.
13.Wilmore, JH., and Costill, DL., (1999). Physiology of Sports and Exercise, Champaign: Human Kinetics.