

Effectiveness of Fartlek Training on Maximum Oxygen Consumption and Resting Heart Rate in Young Obese Males: An Experimental Study

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ABSTRACT

Introduction: Obesity may be defined as abnormal growth of adipose tissue due to an enlargement of fat cell size, increase in fat cell number or combination of both. It is often expressed in terms of BMI. Fartlek connotes speed play, which is a training method that combines continuous training with interval training. Fartlek training has shown to increase or maintain VO₂ max and decrease RHR in athletes hence this study is conducted to see its effectiveness in obese population.

Aim: The aim of the study is to evaluate the effect of Fartlek training on maximum oxygen consumption and on resting heart rate.

Method: The study includes 47 males of class 1 Obesity between the age group of 18 to 25 years. The pre-test was conducted for all the subjects on day 1, immediately after the pre-test, Fartlek training was given for 4 days per week for 4 weeks. Posttest was conducted on next day of end of intervention. Data analysis was done using paired t test.

Outcome measures: Maximum Oxygen Consumption -Queens college step up test, Resting Heart Rate-Azumio instant heart rate monitor.

Result: Result showed that fartlek training was effective both clinically as well as statistically.

Conclusion: The study concluded that there was significant effect of fartlek training on maximum oxygen consumption (p value-0.00) and resting heart rate in young obese males (p value 0.00).

Keywords: Fartlek training, Obesity, Maximum oxygen consumption, resting heart rate, Queens college step up test, Azumio instant heart rate monitor.

INTRODUCTION

Obesity may be defined as an abnormal growth of adipose tissue due to an enlargement of fat cell size or an increase in fat cell number or combination of both¹. Obesity is often expressed in terms of body mass index (BMI) a person weight in (kg) divided by square of persons height (in meters).¹ Prevalence of obesity in India is 2.7% in male population of age 18 plus in year 2016, in Maharashtra it is 15.9% in males as per NFHS and prevalence of abdominal obesity in males is 18.7% according to NFHS.²

Body Mass Index (BMI) is the measure currently used for defining anthropometric height/weight characteristics in adult and is used to assort them in groups. Body Mass Index (BMI) is calculated as weight in kilograms divided by the square of height in meters (kg/m²), according to NHLBI.⁶

Table 1. BMI Asian - pacific classification of Nutritional status

NUTRITIONAL STATUS	BMI (kg/m ²)
UNDERWEIGHT	<18.5
NORMAL RANGE	18.5-22.9
OVERWEIGHT	23-24.9
OBESE-I	25-29.9
OBESE-II	>30

Ref: Lim JU, Lee JH, Kim JS, Hwang YI, Kim TH, Lim SY, et.al. Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. *International journal of chronic obstructive pulmonary disease*. 2017; 12:2465.

Fartlek connotes speed play, is a Swedish term, is a training method that combine continuous training with interval training. Fartlek training can be merely defined as periods of fast running mingled with periods of slower running. It could be walking with sprinting or jogging with sprinting or brisk walking, for beginners it can be walking with jogging.⁸ The fluctuating and uninterrupted nature of exercise places stress on both aerobic and anaerobic systems.⁹

Fartlek running involves changing pace throughout run, fluctuating between fast segments and slow jogs. Advantage of fartlek training is that it doesn't have to be carried on track and can be done on all types of terrains-roads, even hills.⁸ Fartlek training is constructive in improving speed and endurance. Work rest intervals depends on how body feels. Fartlek training can be organized in any way as per subjects' endurance capacity. Unstructured protocol of fartlek training can be given for beginners. Subject performing fartlek training can keep upgrading by accelerating the pace and replacing the firstly used protocol for progression. Aim of Fartlek training is to construct, restore or maintain subjects body condition in return to be well adapted for all kinds of activities.¹⁰ The concept of Fartlek exercise is to run with variations, meaning we could set desired running speed during the protocol in accordance, with the predilection and ability of subjects, for example training begins slowly and then augments as subject continues at short distance.¹²

Maximum oxygen consumption refers to the maximum amount in millilitres that can be consumed in one minute per kilogram of body weight. A fit and healthy young adult male should be able to achieve

a VO₂ Max of about 45.66+8.96 ml/kg/min.¹¹ VO₂ max or oxygen concentration and cardiac function can increase continually if large muscles exercises are performed regularly, such as walking, jogging, cycling, swimming, intermittent running exercises, etc. Maximum oxygen concentration is a measure used to determine the hearts endurance and is a major factor of physical fitness. VO₂ max is maximum ability of lung, heart, and muscle system to absorb oxygen. Several factors affect VO₂ max as age, gender, fitness and exercises. To improve VO₂ max, Fartlek training by walking, jogging and sprinting can be given to improve physical condition. For carrying out training with cardiopulmonary fitness are frequency of 3-5 times each week, the intensity of exercise is at 75 to 85% of the maximum heart rate, for those who are just starting or beginners, start training at a lower intensity for example 60% and continue to gradually increase until approaching proper training intensity and set duration of 20-60 minutes.¹³

Resting coronary heart rate is described as the coronary heart rate whilst someone is awake, in neutrally temperate surroundings and has now no longer passed through any current exertion or stimulation, including pressure or surprise. Resting heart rate is positively associated with mortality. Increased in resting heart rate, result in increased incidence of cardiovascular and non-cardiovascular mortality. Obese people are prone to have increased resting heart rate (RHR), as autonomic responsiveness, has been shown to blunt in obese individuals. This can result in decreased ability in obese to adapt to environment. Resting heart rate (RHR) is influenced by several constitutional and environmental factors, the most important determinants are parasympathetic and sympathetic impact.¹⁵ Quantifying resting heart rate (RHR) can give a measure of load burdened on heart and the state of imbalance between sympathetic and parasympathetic activity. A high amount of body fatness or adiposity is

accountable for releasing a great amount of inflammatory adipokines into blood stream which plays a major role in pathogenesis of many chronic diseases, and also alters sympathetic and parasympathetic activity in humans, which can result in increased resting heart rate.¹⁶

Fartlek training has shown to increase or maintain VO₂ max and decrease RHR in athletes hence the purpose of this study was to find the effect of Fartlek training on maximum oxygen consumption and resting heart rate in young obese males.

The aim of this study was to evaluate the effect of Fartlek training on maximum oxygen consumption and on resting heart rate.

METHODOLOGY

1. Type of study-Experimental study
2. Study Design- Pre and Post Experimental Study
3. Type of sampling- Probability sampling
4. Sample size-47
5. Study Duration- 6 months
6. Study Setting- Undergraduate Colleges, Miraj.

MATERIALS

1. Weighing scale
2. Stadiometer
3. Stopwatch
4. Metronome
5. 16.25 inches step
6. Azumio instant heart rate monitor
7. Consent form

PROCEDURE

- Ethical approval was obtained from the Institutional Ethical Committee.
- Subjects were included based on inclusion and exclusion criteria.
- The procedure was explained to the subjects in the vernacular language.
- Informed consent was obtained from the participants and they voluntarily participated in the study.
- Demographic data was obtained (name, age, gender, Body mass index (BMI), address).

- Pre VO₂max was calculated by Queens College step up test and pre RHR was calculated by Azumios Instant Heart rate monitor.
- Further, subjects were given Fartlek training for 4days per week for 4 weeks and post VO₂max and RHR was calculated.
- Data was formatted in tabular format and were further statistically analysed.

PRE-INTERVENTION TEST

1. VO₂ max calculation

Queen college step up test

- For males Step up and down for 24cycles/min. Use 4 step cadence(up-up-down-down) for 3 min. Heart rate is measured at radial pulse before & after test.
- Formula to calculate VO₂ max is,
- $VO_{2max}(ml/kg/min) = 111.33 - [0.42 \text{ multiplies by heart rate}(bpm)]$
- Before starting the intervention VO₂ max is calculated using above mentioned formula and noted and after completing the intervention for 4 weeks VO₂ max is again calculated using same formula and is noted.

2. Resting heart rate –

Azumio instant heart rate monitor –

- Pre exercise [1st day of exercise early morning after sitting quietly for at least 10 min RHR is taken by using azumio instant heart rate monitor]

Post exercise [Next day after completing 4week protocol RHR to be taken by using Azumio instant heart rate monitor].

FARTLEK TRAINING PROTOCOL-

- Subjects those matching the inclusion criteria with age group of 18 to 25years with obesity.
- Class I ranging from 25 to 29.9 kg/m² BMI were included for the study. The subjects were asked to perform all the prescribed number of repetition and sets as prescribed in the schedule. The details of the work period, number of repetitions and sets are presented below.

Week	Warm Up	Work Period	No. Of Repetitions	Active Recovery Period Between Repetitions	No. Of Sets	Recovery Between Sets	Cool Down
I & II	10 MIN	25	7	120 SEC DECREASE WITH 20 SEC	3	2 MIN	10 MIN
III	10 MIN	25	7	90 SEC DECREASE WITH 15 SEC	3	2 MIN	10 MIN
IV	10 MIN	30	7	120 SEC DECREASE WITH 20 SEC	3	2 ½ MIN	10 MIN

POST INTERVENTION RESTING HEART RATE MONITORING

- After completing 4 weeks protocol of fartlek training next day early morning after resting 10 mins in sitting position and before carrying out any strenuous activity RHR was taken using AZUMIO Instant Heart Rate Monitor and was compared with pre-exercise RHR.

VO2 MAX

By using Queens college step test vo2 max was calculated and then was compared with pre-exercise Vo2 max.

Statistical analysis

Data analysis was done using Ms-Excel and Minitab version 13. Pre and post intervention values of maximum oxygen consumption and resting heart rate in young obese males class I were analysed using Paired t test.

RESULTS

Data analysis was done using Ms-Excel and Minitab version 13. Pre and post intervention values of maximum oxygen consumption and resting heart rate in young obese males class I were analysed using Paired t test.

Variable	Test	N	Mean	SD	t value	p value
VO2 Max	Pre Test	47	34.22	3.21	14.99	0.000
	Post Test	47	42.35	5.45		

The pretest average was 34.22 with standard deviation of 3.21. The posttest average was 42.35 with standard deviation of 5.45. The test statistics value of the paired t test was 14.99 with p value 0.00. The p value less than 0.05, hence reject the null hypothesis.

Hence, this study concludes that, fartlek training was effective to improve

maximum oxygen consumption among young obese males class I.

Variable	Groups	N	Mean	SD	t value	p value
RHR	Pre Test	47	98.08	5.07	19.23	0.00
	Post Test	47	90.72	5.19		

The pretest average was 98.08 with standard deviation of 5.07. The posttest average was 90.72 with standard deviation of 5.19. The test statistics value of the paired t test was 19.23 with p value 0.00. The p value less than 0.05, hence reject the null hypothesis.

Concludes that, fartlek training to reduce Resting Heart Rate (RHR) among young obese males class I was effective.

RESULT FROM ANALYSIS

The final analysis proves that effect of Fartlek training is significant clinically as well as statistically on maximum oxygen consumption and resting heart rate.

The mean value of VO2 max and RHR manifested changes post intervention and higher values are recorded for post intervention outcome and the standard deviation shows the limited consistency with post intervention value which is more than p value.

Based on the result of test analysis there is significant statistical reliable difference between pre and post intervention values with p value less than 5% significance level (i.e. $0.00 < 0.05$) in the study and hence it proves the improvement in health outcome post intervention.

This affirm that Fartlek training is reliable in terms of rehabilitation.

DISCUSSION

The study aims to evaluate effectiveness of fartlek training on maximum oxygen consumption and resting heart rate in young obese males. Subjects

included in the study had similar baseline values of height, weight, age and BMI. This study was performed on 47 subjects with age group of 18-25 years young obese males having BMI of 25-29.9kg/m² according to Asia pacific BMI classification. Pre vo₂ max was assessed using queen's college step test and pre resting heart rate was assessed using Azumio instant heart rate monitor, further fartlek training was designated for 4 days per week for 4 weeks and posttest was done by using queens college step test for vo₂ max and Azumio instant heart rate monitor for RHR. The results of the study exhibited that at the end of 4 weeks the vo₂max and RHR of the participants were seen to be statistically significant.

Obesity is an epidemic disease and also it is the fifth leading risk of global death and is also a key risk factor in developing chronic and non- communicable diseases including cardiovascular disease.

As per the previous studies obesity leads to decrease the endurance leading to have negative impact on cardiovascular endurance, and hence leads to reduce fitness due to inert load created by body fat. Excessive amount of body fat exerts an unfavorable burden as well as has hindering action towards cardiac function particularly during exertional exercise. VO₂ max is a measure of functional limit of cardiorespiratory system and is also valid index of maximal exercise capacity. VO₂ max is one of the indices of an individual's cardiorespiratory health to move oxygen to running muscles. Loss of weight during weight reduction program in obese, increased their VO₂max due to withdrawal of fat induced inhibitory action towards oxygen utilization by body musculature. Overweight people have expanded sympathetic nerve firing charge than regular subjects. Blood pressure is increased in overweight population and high amount of adiposity is accountable for releasing a large amount of inflammatory adipokines into blood streams which play a major role in pathogenesis of many chronic diseases, and

also alters sympathetic and parasympathetic activity in humans which result in increased resting heart rate.

Studies done by PRABHA SETTY et al was designed to evaluate cardiorespiratory fitness in terms of VO₂max in young healthy males and to correlate between obesity and cardiorespiratory fitness. Sixty young healthy male subjects in age group of 18 to 22 years were included in this study group. BMI was measured, VO₂max was predicted following the protocol of Treadmill jogging test (TMJ). The result suggested that the reduced cardiac performance was during progressive work rate exercise in obese individuals. Greater the BMI, more severe will be the functional impairment, suggesting excessive amount of body fat on cardiorespiratory functions and oxygen uptake by working muscles.

Studies performed via way of means by Avijtt Das, Hiralal Adhikary designed to discover the comparative impact of 3 styles of cardio schooling on decided physiological variables of tribal boys. To achieve purpose of the study 120 school male students were selected as subject at random from high school in Bankura district of West Bengal and age ranged of the subject is between 14 to 16 years. The subject was divided into four group namely Control Group(A), Continuous Group(B), Fartlek Training Group(C)and Interval Training Group(D) and all the group underwent for training as mentioned above except group A. Physiological variables selected for the study was cardio respiratory endurance and resting heart rate. The training was given for period of twelve weeks. The data were collected before and after the training. The acquired data have been analyzed via way by means of Analysis of Covariance (ANCOVA). The stage of vast became constant at 0.05 levels. Tukey's post hoc test became implemented to decide the vast variations among the paired adjusted means. The result of the study showed that there was a significant difference between the paired adjusted

means. The result of the study showed that there was significant improvement found in cardiorespiratory endurance and resting heart rate among experimental group when compared with control group.

Furthermore, study done by T. Arun Prassanna, K. Vaithianathan aimed to decide the impact of non-stop run, trade tempo run and fartlek schooling on Resting coronary heart rate amongst male athletes of Alagappa college affiliated colleges. The research involved a random subject selection of fifty athletes with age ranging from 17-25 years and had 5 equally divided groups A, B, C, D, and E with 10 athletes each. The groups endured the training activities for twelve weeks, thrice a week whereas control group remained with no activities. The data procured in prior and after the training programme was examined with the application of ANCOVA and the fixation of level of significance at 0.05. Scheffe's test was applied at the significance of F ratio in order to evaluate differences that occur significantly between the paired means. The study revealed that selected physiological variable of the combined group with the three endurance trainings outperformed the control group.

Fartlek Training involves the fluctuation of force indicated by necessity of the individual. It involves the fluctuation of pace during the run, switching between quick and slow runs that are more unordered. Fartlek conditioning lets oneself to inspect his/her ability and aerobic capacity levels. It also encourages oneself to train longer and hard by anaerobic threshold levels, main distinguishing character of Fartlek training from other training program is that participant can work out by altering the intensity levels hence this stresses both the aerobic and anaerobic pathways and so it shows to have significant effect in improving maximum oxygen consumption and decreasing resting heart rate. Fartlek training has got advantage over other training programmes that it does not require any equipment setup as it can be carried out as one wishes due to its versatility and as

ones BMI increases subject can't perform fast running and sprinting, so fartlek remains a very best alternative for such obese population. Hence it was concluded that Fartlek training exemplified significant improvements on one's maximum oxygen consumption and resting heart rate and hence it can be incorporated clinically as well. Further, research can be carried out in other population like healthy elder population, with broader margin of age with large population.

Further, research can be done to compare between male and female population for any difference.

CONCLUSION AND LIMITATION

According to the findings of the study it was statistically analysed that Fartlek training improved the maximum oxygen consumption and decreased the elevated resting heart rate and thus it was concluded that there was a significant effect of fartlek training on maximum oxygen consumption and resting heart rate in young obese males.

The Limitations of the study were that only young obese males were included. Age group was limited between 18 to 25. Obese class I were only included. BMI was not taken into the consideration after intervention as it was not the objective of the study. Other factors like weight, fat mass by using fat analyser were also not taken into the consideration.

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