

Effectiveness of Circuit Training on VO₂max in Overweight Young Adults After 4 Weeks

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ABSTRACT

BACKGROUND: Circuit training was found to be effective in cardio-respiratory health, in the present study an attempt is made to see the effect of circuit training on VO₂max in young adults after 4 weeks

AIM: To study the effectiveness of Circuit training on VO₂max in overweight young adults after 4 weeks

OBJECTIVE: To assess the effectiveness of Circuit training on VO₂max in overweight young adults after 4 weeks.

METHOD: A total of 30 participants were selected from Pune based on inclusion and exclusion criteria of the study. Signed informed consent was obtained before the study. Before starting the exercise protocol Queen college step test was performed. After these 10 min warm up exercises were carried out before circuit training. 30 min CT is carried out that includes- knee raise, clap, kick raise, alternating jump lunge, abdominal twist, squats, burpees. After CT 10 min cool down is performed.

OUTCOME MEASURE: PVO₂max (ml/kg/ min) = 65.81 - (0.1847 × pulse rate in beats per minute)

RESULTS: It is found that the mean of pre VO₂max was 47.76447 and post VO₂max was 53.83667 the P < 0.0001 which is considered to be extremely significant.

CONCLUSION: This study says that it is possible to develop cardio-respiratory endurance through a circuit training

program. Circuit training becomes necessary to improve VO₂max.

KEYWORDS: Circuit training, VO₂max, cardio-respiratory, Overweight, Queen college step test.

INTRODUCTION

According to the World Health Organization (WHO), more people die annually from cardiovascular diseases (CVD) than from any other causes.^[1]

Health promotion policies and physical activity programs are designed to improve physical fitness, as cardiovascular endurance and strength are the most important components of physical fitness.^[1]

VO₂ max estimation by step test is one such test and is considered to be a practical field test for assessing individual aerobic fitness.^[5]

VO₂ max is often used as a marker of physical fitness and is considered the best indicator of aerobic fitness.^[5]

In particular, an estimated 1.73 million people died from CVD in 2008, representing 30% of global deaths. Of these 1.73 million deaths, an estimated 7.3 million were due to coronary heart disease.^[2]

Some of the benefits of cardiovascular endurance include an increase in an individual's maximum oxygen consumption (VO₂max), exercise capacity.^[1]

Circuit training can be defined as a combination of resistance-based aerobic

activities with short defined time period to complete each station.

The purpose of this study is to examine the effect of high intensity circuit training regimen, using only body weight as resistance [4]

Circuit training is effective in improving cardiopulmonary parameters by working on maximum oxygen maximum pulmonary ventilation, functional capacity, myocardial strength thereby improving cardiovascular endurance and is also beneficial in reducing excess body fat.[1]

Need of Study

A sedentary lifestyle can lead to overweight, obesity and an increase risk of developing numerous chronic disease circuit training is the total body exercise-a good high energy workout circuit training is different from other forms of exercise circuit training burns more calories within a short session and is also good for cardiovascular endurance.

Very few studies have been done on the effect of circuit training on VO2max in young overweight adults. Hence there was a need to find out the effects of circuit training on VO2max.

To study the effectiveness of circuit training on VO2max in overweight young adults after 4 weeks.

MATERIALS AND METHODS

Research design: Experimental study was conducted.

Sample Population: 30

Source of sampling: Colleges and companies in Pune.

Place of study: physiotherapy OPD, Gyms and home.

Duration of study: 6 months.

Sample size: The sample size was calculated using the formula: $n = N * [Z^2 * p * (1-p) / e^2] / [N - 1 + (Z^2 * p * (1-p) / e^2)]$

Inclusion criteria:

- 1) 1)Subjects of 18–25-year-old
- 2) 2)Gender- Female
- 3) 3)BMI 25-30

- 4) 4)People who have not included themselves in any form of exercises.

Exclusion criteria:

- 1) 1)Recent musculoskeletal injury (soft tissue injury, fractures, deformity etc)
- 2) 2)Neurological disorders.
- 3) 3)History of cardiovascular.
- 4) 4)Pregnancy.

Outcome measure:

PVO_2max (mg/kg/min) = $65.81 - (0.1847 \times$
pulse rate in beats per minute)

Normal VO2 Max values for Women as Measured in ml/kg/min

Age	V poor	Good
13-19	<25.0	35.0-38.9
20-29	<23.6	33.0-36.9

PROCEDURE

The ethical approval for the study was granted from committee PES Modern college of Physiotherapy Pune an ethical approval was granted by an institute visited around the city the subject were selected as per the inclusion and exclusion criteria of the subject and the subject was explained the procedure and consent form was taken from the subject who wish to participate in the study.

Before starting the exercise, protocol Queen college test was performed. The step-up test on the stool of 16.25 inch is performed for 3 min at rate of 22cycles per min set by metronome after completion of this exercise, subject is asked to remain standing and carotid pulse rate is measured from 5 to 20 sec of recovery period. These 15 sec pulse rates is converted into beats per minute and through the equation maximum oxygen consumption is obtained.

After this 10 min warm up exercise was carried out before the commencement of circuit training. The Circuit Training was 30 min followed by cool down exercises for 10 min.

The Circuit Training exercises include the Following:

1. Knee raises Clap.

2. Kick raise.
3. Alternating Jump Lunge.
4. Abdominal twist
5. Squats
6. Burpees.

All the exercises were performed in the sets of 3 and 5 reps.

After the completion of circuit training exercises cool down exercises were performed



Fig no.1: Subject Performing Lunges.



Fig no 2: Subject performing Burpees.

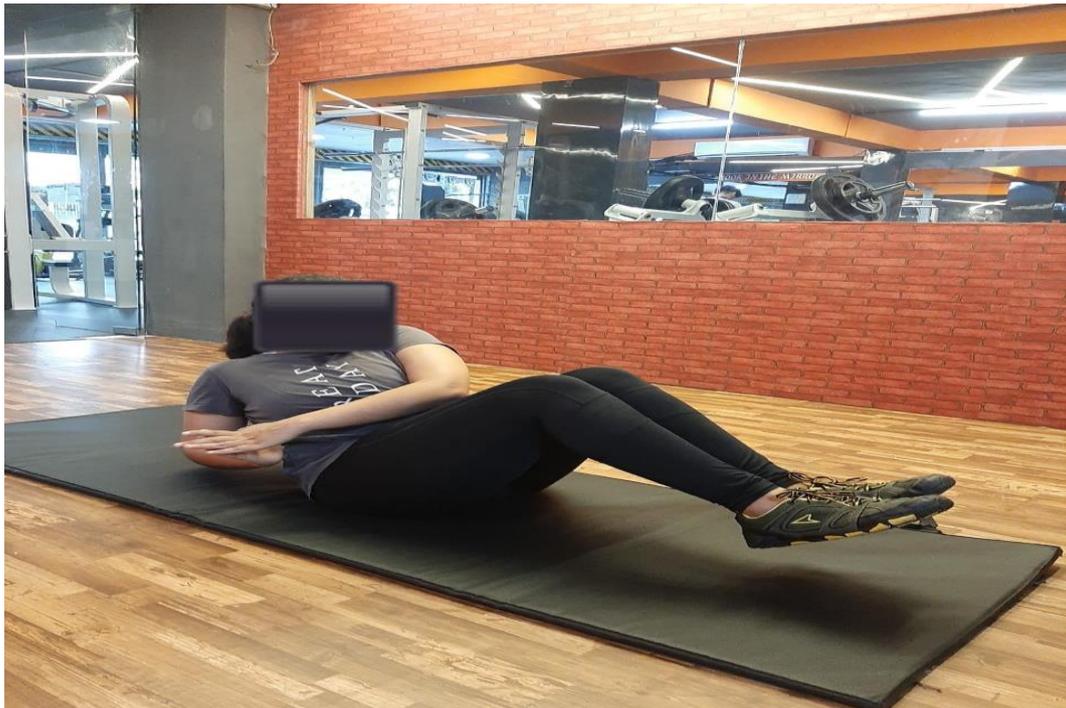


Fig no 3: Subject performing Abdominal twist

RESULTS

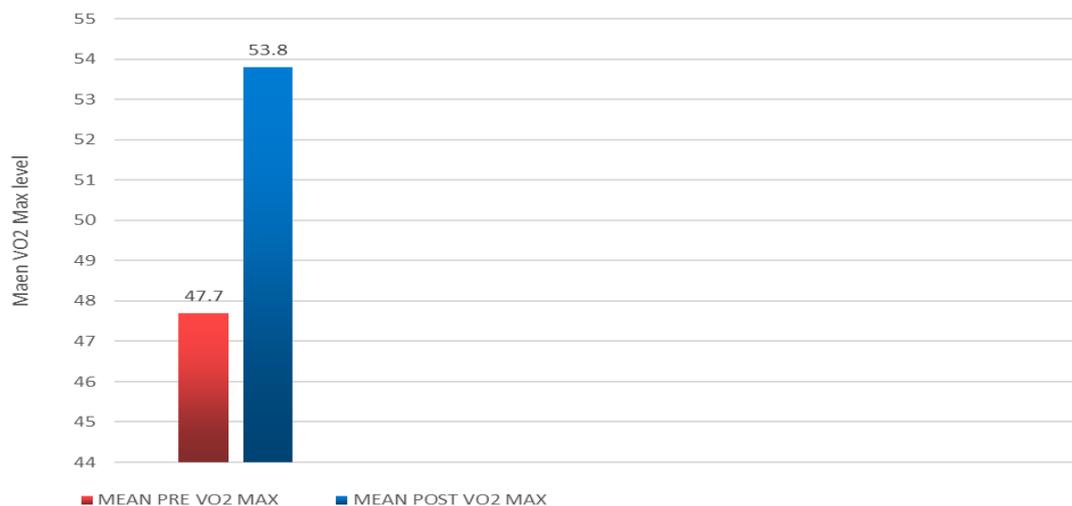
The study was done on the subject which falls in overweight category according to the BMI.

The difference between pre and post were compared and analyzed using paired “t” test

for all the components

In this study we have found that the pre test mean of VO2max was 47.76447 and post test mean of VO2max was 53.83667

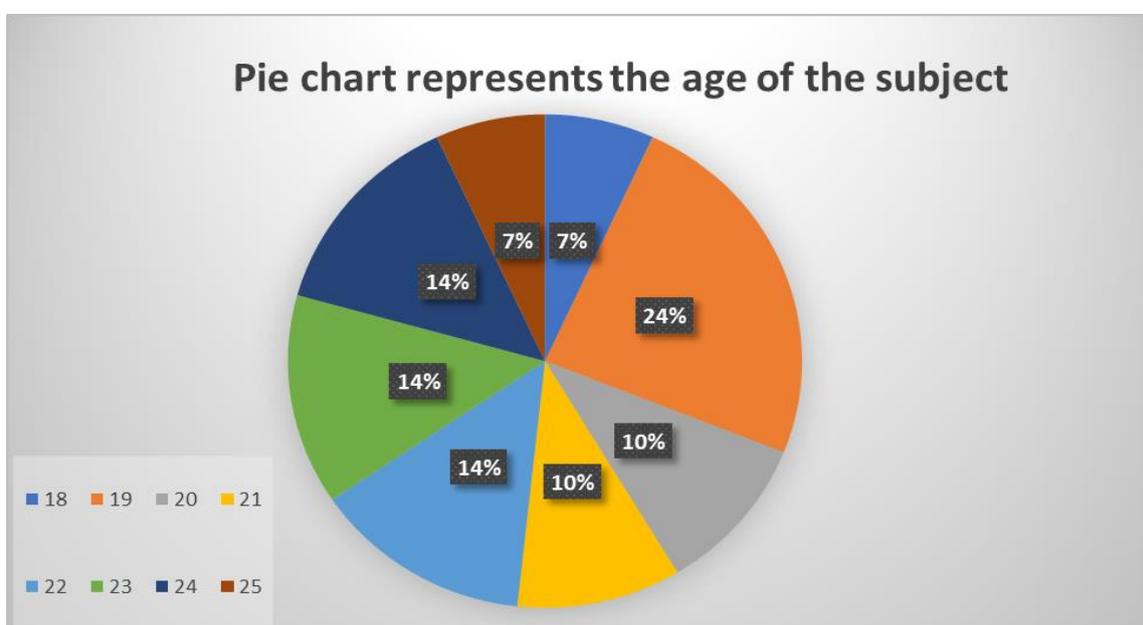
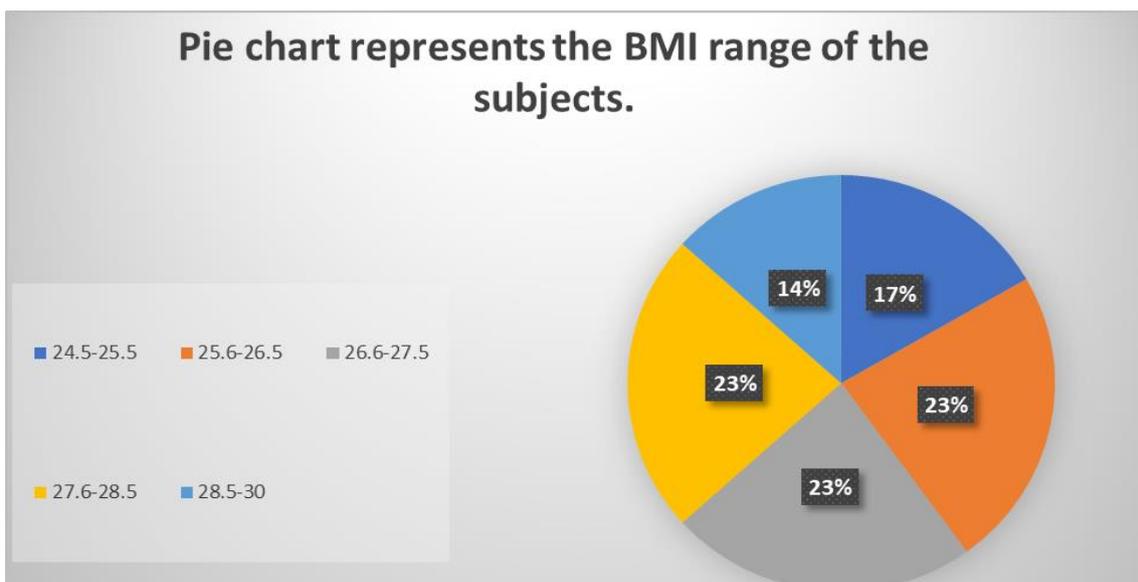
The P value is < 0.0001 which is consider to be extremely significant.



	PRE	POST
MEAN	47.76447	53.83667
SD	1.508263	1.348175

P < 0.0001
t=16.4405

Table Shows effectiveness of circuit training on VO2max in overweight females.



DISCUSSION

The present study was designed to evaluate the effectiveness of a circuit training regimen on VO₂max in overweight young females over a period of four weeks. VO₂max, which measures the maximum amount of oxygen an individual can utilize during intense exercise, serves as a critical indicator of cardio-respiratory fitness and overall aerobic capacity. The study engaged 30 participants aged between 18 and 25 years, all identified as overweight based on established BMI criteria. Over the course of four weeks, the participants undertook a circuit training program, which was

structured to be performed three times a week. This training protocol aimed to enhance both cardiovascular and muscular endurance through a combination of aerobic and resistance exercises. By the end of the intervention, the study found a statistically significant improvement in VO₂max among the participants, signifying that the circuit training protocol effectively contributed to improved cardio-respiratory fitness. This result is particularly noteworthy as it demonstrates the potential of a short-term, structured exercise regimen to yield significant benefits in aerobic fitness among overweight individuals.

The primary objective of the study was to assess whether circuit training could effectively enhance cardiovascular endurance in overweight females, and the findings confirm that it is indeed possible to achieve this improvement within a four-week time frame. The improvement in VO2max highlights the efficacy of circuit training in boosting cardiovascular health, thereby contributing to better overall physical fitness. Additionally, the study noted a slight improvement in the quality of life among participants, as evidenced by self-reported assessments of physical and mental well-being. This enhancement in quality of life suggests that the benefits of circuit training extend beyond physical fitness, potentially influencing aspects such as mood, energy levels, and general life satisfaction. Moreover, the study's outcomes indicate that engaging in circuit training three times a week for four weeks is effective not only for improving but also for maintaining cardio-respiratory health. The program's success in enhancing aerobic fitness is complemented by observable lifestyle modifications in many participants. Following the training, there was an increase in physical activity levels and healthier dietary choices among the participants, reflecting a positive shift in lifestyle habits. This suggests that the circuit training intervention may have broader implications for promoting long-term health and encouraging sustainable changes in behavior. Overall, the study provides robust evidence supporting the use of circuit training as a practical and effective approach to improving cardiovascular endurance and fostering healthier lifestyle habits in overweight young females.

CONCLUSION

The study shows a statistically significant difference in VO2 max following the implementation of a circuit training protocol. This result signifies that it is indeed feasible to enhance cardio-respiratory fitness through a structured circuit training regimen over a defined

period. Specifically, the research highlights the efficacy of a four-week circuit training protocol, conducted three times per week, in achieving notable improvements in VO2 max, a key indicator of cardio-respiratory health.

VO2 max, or maximal oxygen uptake, is a critical measure of an individual's cardiovascular and respiratory system's ability to supply and utilize oxygen during intense physical activity. An increase in VO2 max reflects an improvement in aerobic capacity, which is crucial for overall cardiovascular health and endurance. The study's findings underscore the potential of circuit training to significantly impact this physiological parameter positively.

Circuit training, as a form of exercise, involves performing a series of different exercises in a sequence with minimal rest between them. This training method is designed to target various muscle groups and energy systems simultaneously, leading to improvements in both muscular strength and cardiovascular endurance. The protocol employed in the study consisted of a carefully structured circuit training program, administered over a span of four weeks, with participants engaging in sessions three times a week. The duration and frequency of these sessions were meticulously planned to ensure optimal benefits while minimizing the risk of over training.

The study's results indicate that participants who adhered to the circuit training protocol experienced a statistically significant improvement in their VO2 max. This finding suggests that such a training regimen can effectively enhance cardio-respiratory fitness within a relatively short time frame. The statistical significance of the observed difference implies that the improvements are unlikely to be due to random chance, reinforcing the reliability and validity of the circuit training protocol as an effective method for boosting cardiovascular health.

Moreover, the four-week duration of the circuit training program highlights the potential for achieving meaningful fitness

gains within a relatively brief period. This duration is particularly advantageous for individuals who may have time constraints or are looking for a time-efficient approach to improving their cardio-respiratory health. The protocol's three-times-per-week frequency ensures a balance between providing sufficient training stimulus and allowing adequate recovery, which is essential for optimizing fitness gains and reducing the risk of injury.

In addition to improving VO2 max, circuit training offers several other benefits that contribute to overall cardio-respiratory health. For instance, circuit training can enhance muscular endurance, flexibility, and body composition. The varied exercises included in a typical circuit training session can target different muscle groups, leading to more comprehensive physical conditioning. Furthermore, the high-intensity nature of circuit training can stimulate cardiovascular adaptations that support improved heart and lung function.

The study's findings have important implications for individuals seeking to maintain or improve their cardio-respiratory health. Regular engagement in circuit training, as demonstrated by the research, can be a highly effective strategy for achieving these goals. The protocol's effectiveness in both maintaining and enhancing cardio-respiratory health underscores its potential as a practical and efficient exercise approach.

For those interested in incorporating circuit training into their fitness regimen, it is essential to follow a well-structured program that aligns with their individual fitness levels and goals. The circuit training protocol used in the study was designed to balance intensity and recovery, which is crucial for maximizing the benefits while minimizing the risk of overweight. Individuals should also consider consulting with a fitness professional or healthcare provider to tailor the protocol to their specific needs and ensure safe and effective participation.

Future Scope:

This study can be done on both genders.

This study can be done on different age groups

This study can be done on Obese.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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