

A CASE STUDY ON THE EFFECT OF STAIR CLIMBING AS A FITNESS TOOL

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Abstract : This case study has been undertaken to investigate the effect of stair-climbing as a fitness tool in improving the cardio-vascular and muscular endurance in a 6 weeks time period. VO₂Max and Squat test are used as the outcome measures for cardio-vascular and muscular endurance respectively. During the training period of 6 weeks, the client was instructed to use the stair-case for a period of 6 weeks 5 days per week with a frequency of 2 rounds of ascend and 2 rounds of descend with 5 flights of stairs per day. the client had to climb 120 steps to reach the fifth floor. After the training period the VO₂ Max was estimated for cardio-vascular endurance and Squat test for lower limb muscular endurance.

Conclusion: Cardio-Vascular and Muscular endurance was improved with six weeks of stair climbing.

Keywords: Fitness Tool, Elevator, Stair Climbing, 2.4km Run test, Squat Test, Cardio-Vascular Endurance, Muscular Endurance, VO₂ Max, Physical Fitness, Strengthening, Training.

1.1 INTRODUCTION:

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality and morbidity (6% of deaths globally)¹. Moreover, physical inactivity is estimated to be the main cause for approximately 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischemic heart disease burden².

The term "physical activity" should not be mistaken with "exercise". Exercise, is a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective³. Physical activity includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, and recreational activities.

Climbing stairs is one of the best exercises when it comes to pure fat burn, strengthening the lower body, toning the lower body muscles like gluteus, thighs, calves, losing inches from abdominals. Along with these benefits, it is the immense good it does for the lungs and **Cardio-Vascular System**⁴.

2.1 A CASE REPORT: Informed consent was signed by the client for the screening, training, and the publication of this case. This case involved a 25 year old male medical student. He had a history of sedentary lifestyle and he usually prefers using the lift or the elevator even to climb a single floor; He has a very busy schedule with college and has not been able to maintain an exercise schedule or a fitness routine. The client was unable to allocate special time for any normal exercise or to go to any fitness studios. The client reported that he feels his muscular endurance was reduced as he finds really hard to climb stairs or to walk long distances. Patient also reported that he feels "out of his breath" while climbing stairs or walking long distances. Activities of daily living was compromised to the extent that he uses his vehicle to commute even short distances. The client was worried that his fitness level (cardio-vascular endurance and muscular endurance) was reduced.

The client approached me, addressing his above mentioned problem. Client's History was taken and from the personal history I found that he was a teetotaler and a non-smoker. Using PAR-Q, patient's physical

activity readiness and other medical risks were screened and ruled out.

Following screening; two Pre-Training tests were taken to record his cardio-vascular endurance and his muscular endurance;

- 2.4 Km run test⁶ for cardio-vascular endurance and Squat test for to test his lower limb muscular endurance. Cases' VO₂max results came out to be 35.0 ml/kg/min which is poor Vo₂ max normative value as per cooper institute of aerobics dallas⁷, for his age group people.
- Squat test for his lower limb muscular endurance came out to be 28 reps which is a poor normative value⁸ for a age group between 25 to 34 yrs.

3.1 Outcome measures:

- VO₂ MAX: To measure the cardio-vascular endurance by using 2.4 km run test⁹.

The subject warms up for 10 minutes. The assistant gives the command “GO”, starts the stopwatch and the subject commences the test. The assistant keeps the subject informed of the time at the end of each lap and the number of laps remaining to complete the test. The assistant records the time taken for the subject to run 2.4km. The recorded time is used to analyze the subjects performance.

using the following formula the VO₂ Max was calculated

- $VO_2 \text{ max} = 85.95 - (3.079 \times \text{Run Time [minutes]}) \{ \pm 2.24-2.91 \text{ ml/kg/min} \}^5$.
- Squat Test: To measure the lower limb muscular endurance¹⁰.

The subject warms up for 10 minutes. The subject stands in front of a chair, facing away from it, with their feet shoulder width apart. The subject squats down lightly touching the chair with their backside before standing back up and repeats this sequence of movements until they are unable to continue.

The assistant counts and records the number of successfully completed squats.

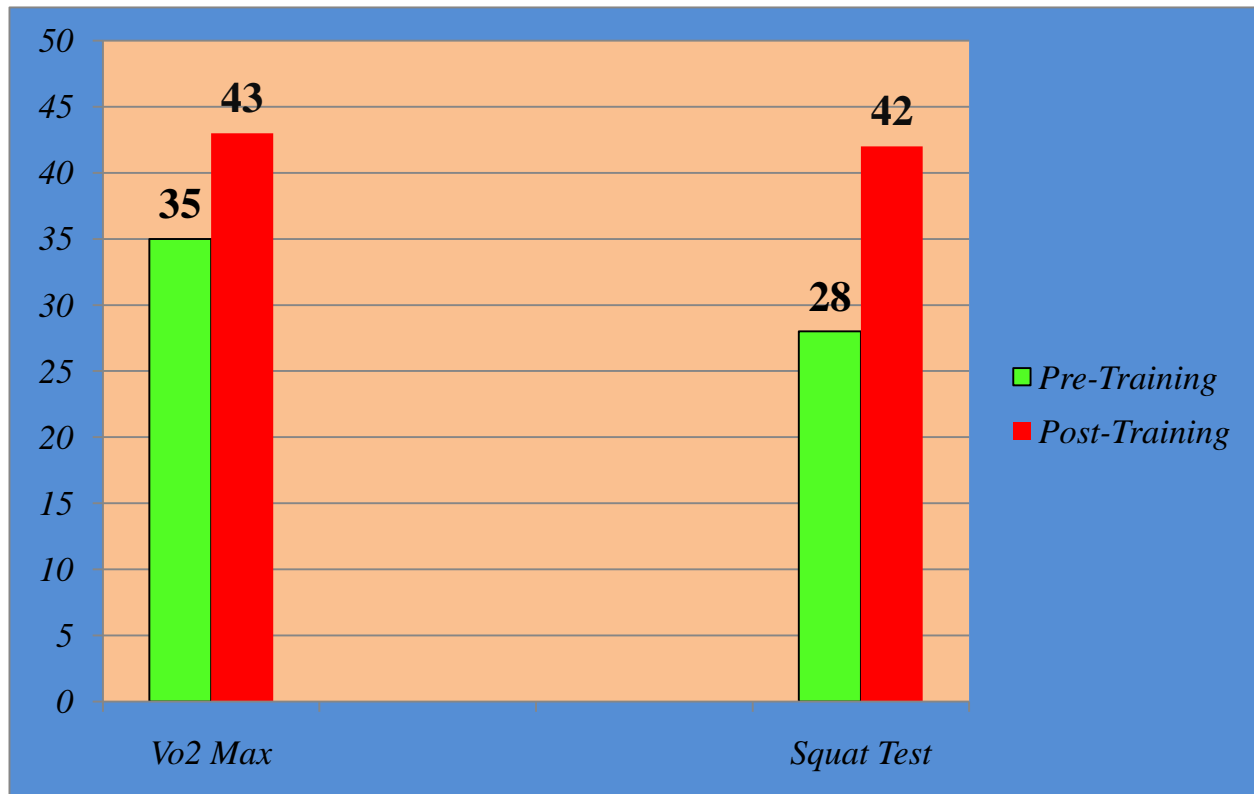
4.1 Training protocol:

The client was asked to climb stairs instead of elevator to reach his college which was on the fifth floor for which he was required to climb 120 stairs.

The client was instructed to use the stair-case for a period of 6 weeks 5 days per week with a frequency of 2 rounds of ascend and 2 rounds of descend with 5 flights of stairs per day.

The patient was reviewed after 6 week with this regimen. The test results showed an increase in VO₂ max value from 35.0 ml/kg/min to 43.0 ml/kg/min. In Squat test from 28 reps to 42 reps on squat test.

Chart 1: This chart shows the pre and post test values of Vo2max and Squat Test.



5.1 Results:

Table 1: This table represent the pre and post test values of outcome measures which was used in this study

Outcome measures	Vo2 max	Squat Test
Pre test value	35.0 ml/kg/min	28 reps
Post test value	43.0 ml/kg/min	42 reps

This results shows the significant changes after the 6 weeks of training. The Vo2max volume and muscular endurance was Increased significantly as mentioned above.

6.1 Discussion:

The data from this study suggests that stair-climbing training exercises may improve the cardio-vascular endurance and lower limb muscular endurance. There are several possible explanations for this. First, as Boreham CA et al proposed that a short-term stair-climbing program can confer considerable cardio-vascular health benefits on previously sedentary young women, lending credence to the potential public health benefits of this form of exercise. Relative to the insignificant changes in the control group, the stair-climbing group displayed a rise in HDL cholesterol concentration over the course of the program. HR during the stair-climbing test were also reduced, as was blood lactate¹¹. Oladapo Michael Olagbegi¹⁴ et al too in his study proposed that Forward and backward stair climbing protocols are effective for improving the dynamic strength of the hamstring and quadriceps muscles of apparently healthy young adults¹⁴. So

from these studies and this case study as well, we could see that even a small bout of stair climbing would yield significant health benefits.

Nutrition or the diet is a part which was not taken into account of this study because as mentioned in the introduction, client had a busy schedule to concentrate on diet and a scheduled plan, so should also the diet taken into account then we might see significant results in the BMI too. Since sedentary lifestyle might eventually result in obesity; It will be good to consider the dieting part in the future studies. From this study we see that in a time like this when people couldn't care for their health due to the lack of time, even a short bout of stair-climbing regularly, kept as a part of daily commutation which doesn't require scheduled time or equipments could keep a person healthy without worrying about the time spent of fitness training. This study is NOT a replacement for a regular fitness programme rather a ready to use FITNESS TOOL for those of whom, time is a hindrance factor for their regular exercise programme.

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