EFFECTIVENESS OF BURPEES EXERCISE ON CARDIOVASCULAR ENDURANCE AND PHYSICAL FITNESS INDEX IN CLASS 1 OBESE UNDERGRADUATE STUDENTS

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Abstract-

Background of the Study: Obesity is one of the major public health problems affecting every region of the globe. Currently, India is facing the double burden of under nutrition as well as over nutrition. There are >135 million obese people found in India.

Objectives: To evaluate the effectiveness of burpees exercise on physical fitness indexand VO2 Max in class 1 obese Undergraduate students.

Methodology:35 samples of undergraduate students male and female of age ranging between 18-25 years of age were considered for the study. Modified Harvard Step Test was used as an outcome measure. Pre and post data collection was collected and data analysis was done.

Results: Paired T test was done to compare pre and post physical fitness index and Vo2 max of which showed P value less than 0.0001 which is considered extremely significant.

Conclusion: The study concluded that the burpees have significant impact on physical fitness index by improving cardiovascular endurance, and Vo2max in class 1 obese undergraduate.

Keywords: burpees exercise, cardiovascular endurance, physical fitness, class 1 obesity ,undergraduate students.

I. INTRODUCTION

Malnutrition is a common cause of obesity, which can have negative metabolic implications. The risk of heart disease and diabetes increases with increase in body mass index (BMI).[2] These diseases ultimately burden the already weak health system of the country. [3] BMI classification according to WHO : <18.5 - underweight, 18.5–24.9 - normal weight, 25–29.9 overweight, and >30 obesity.

Obesity class 1=30.0-34.9 ,class 2= 35.0- 39.9 ,class 3= ≥ 40.0.(ACSM Guidelines).[6]

Cardio-respiratory endurance is an important aspect of health that measures the functioning of heart, lungs and muscles in coordination and also affects the physical and mental activities of an individual.

MODIFIED HARVARD STEP TEST -It is a kind of cardio-respiratory endurance test that measures the fitness and an individual's ability to recover after a hard exercise developed by Brouha et al. in 1943. It consists of 3 to 5 min of stepping up and down using a platform. The rate of 30 steps/min must be continued for 5 min or until fatigue then the heart rate will be counted for 1 to 1.5, 2 to 2.5, and 3 to 3.5 min. [1]

PHYSICAL FITNESS INDEX- It is defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy leisure time pursuits.[6] It can be recorded by cardiopulmonary efficiency test like Physical Fitness Index (PFI %) which is a powerful indicator of cardiopulmonary efficiency. [5]

VO2Max is a respiratory parameter used to measure the fitness of an individual. Maximum Oxygen Consumption capacity is used to assess the cardio-respiratory endurance as it provides the maximum oxygen rate in the muscles that individual utilize during vigorous exercise.[1]

Formula to calculate Vo2max $= 15.3 \times (MHR \div RHR)$

One of the best aerobic exercises you can do at home without any equipment is burpees. It involves toning of all the muscles of the body and helps in burning more calories at a fast pace and the calorie burning effect stays all through the day, even when you are resting.[5]
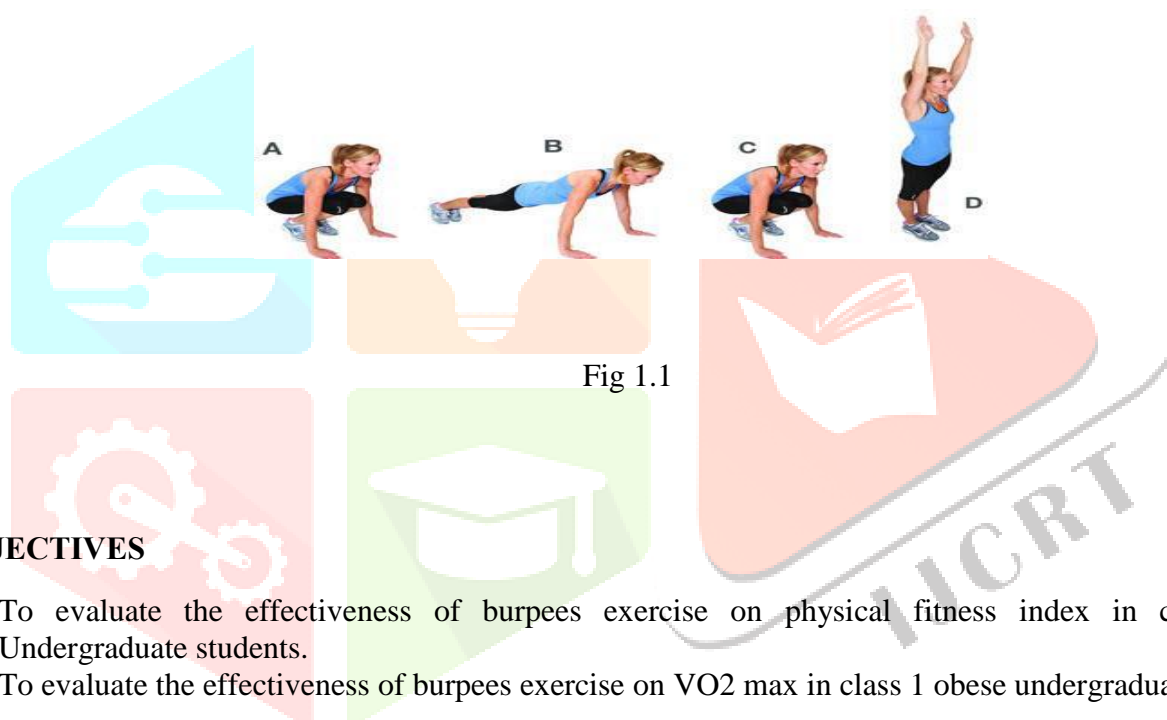

Fig 1.1

II. OBJECTIVES

1. To evaluate the effectiveness of burpees exercise on physical fitness index in class 1 obese Undergraduate students.
2. To evaluate the effectiveness of burpees exercise on VO2 max in class 1 obese undergraduate students.

III. HYPOTHESIS

1. Null hypothesis (H_0) – There will be no significant effect of burpees exercise on VO2 max and PFI IN class 1 obese Undergraduate students .
2. Alternative hypothesis (H_1) – There will be significant effect of burpees exercise on PFI in class 1 obese Undergraduate students.
3. Alternative hypothesis (H_2) -There will be significant effect of burpees exercise on VO2 max in class 1 obese undergraduate students.

IV. MATERILAS AND METHODOLOGY

1. **Study Design**- experimental research design.
2. **Study Settings** - convenient sampling in colleges in and around Pune
3. **Participants** -35,male and female undergraduate students
4. **Study Duration**- 6 months
5. **Intervention duration** –4 months
6. **Materials**- pen, paper, chair, weighing machine., 33cm high stepper/step, pulse oximeter, stop watch
7. **Inclusion Criteria**
   a. Students [male and female] age 18-25years.
   b.   Students having BMI of 30.0 to 34.9 [obesity class -1].
8. **Exclusion Criteria**
   a. Hypertension
   b. Fracture
   c. Anorexia [psychiatric illness]
   d. Post –operative conditions
   e. Neurological diseases -Stroke, Cerebral palsy, Multiple sclerosis
   f. Musculoskeletal diseases - Malunion, Tendinitis, Carpal tunnel syndrome

V. OUTCOME MEASURES

1. Modified Harvard Step Test
2. Physical Fitness Index(PFI)
3. Vo2 max

VI. DATA ANALYSIS AND PROCEDURE

The study included 35 participants both males and females aged 18-25 years old according to inclusion and exclusion criteria.Subjects pre and post cardiovascular fitness was calculated by using PFI and vo2 max. The training was carried out 5days\week for 4 weeks

Ethical clearance was obtained with a presentation of synopsis in front of the ethical committee of PES Modern College of Physiotherapy. Procedure was explained to the subjects, consent was taken from them. Pre and post data collection was collected and data analysis was done. Demographic data ,height ,weight(BMI) was been recorded from data collection .Modified Harvard step test was done to check pre and post PFI and VO2 max.Data Collection was statistically analyzed using Microsoft excel sheet and Graph pad.com. Paired T test has been used to get the difference between pre and post values. The various statistical measures such as Mean, Standard Deviation (SD), test of significance was utilized to analyze the data.

a. Modified Harvard Step Test- Participants were asked to sit quietly for 5 min before the test. The resting heart rate was recorded. After that, the stepping exercise was performed on high step for 30 times/ min, not more than 5 min. After the cessation, the participants were asked to sit quietly on a chair. After 15 seconds the first measurement of the heart rate was taken followed by another after exactly 1 min and again for 2nd and 3rd min. Discontinue the test if- patients feel dysphonic, fatigued, pain in the chest or lower extremities, if   participant could not maintain stepping rate of 30 times/min for 20sec. After completing 5 min exercise the participant was asked to stop. PFI scores were calculated using the formula mentioned below.

b. Calculations - PFI:

Fitness Index = (100 x test duration in seconds) ÷ (2 x sum of heartbeats in the recovery periods).

Table 6.1 PFI

Physical fitness index score	Condition
Up to 54	Poor
Between 55-64	Low average
Between 65-79	High average
Between 80-89	Good
90 and above	Excellent

Figure no- 6.1

Figure no 6.2

c. Vo2max- measurements takes are Resting heart rate (beats/minute)

Maximum heart rate is calculated - Karvonen formula =220-age (beats/minute)

Figure no- 6.3

Table no -.6.2 Intervention

		Week1			Week2			Week3			Week4	
	Set	Rep	rest	set	Rep	rest	Set	rep	rest	set	Rep	rest
		Warm-up			Warm-up			Warm-up			Warm-up	
burpees	10	10	2day	10	12	2day	11	12	2day	12	12	2day
		Cool down			Cool down			Cool down			Cool down	
Daily volume		100			120			132			144	
Weekly volume		500			600			660			720	

Intervention-   Bur-pees Exercise Protocol- Every session started with warm up consisting of joint mobility exercise followed by 10 push ups,5 squats and ,5 spot jumps. At the end of session, 10 minutes of static stretching was administered as cool down.The exercise performed five days (Monday to Friday) per 4 weeks.

Figure no 6.4 - standing, arm at side   Figure no 6.5 -squat and place hand on floor

Figure no 6.6-jump feet back into plank

Figure no 6.7- Drop to push up

Figure no 6.8 - Push up
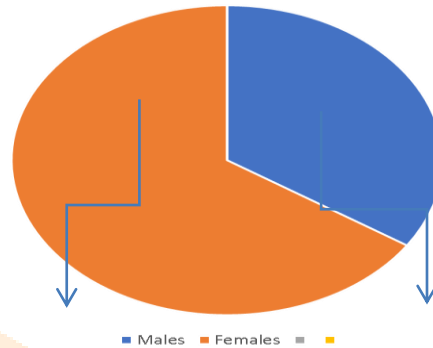

Figure no 6.9 - Jump feet back into squat

Figure no 6.10 - Jump high

VII. RESULTS

The students evaluated 35 subjects out of 12 men and 23 were female with age of 18-25 years. Paired T test was done to compare pre and post physical fitness index and Vo2 max of which showed P value less than 0.0001 which is considered extremely significant.

GENDER DISTRIBUTION
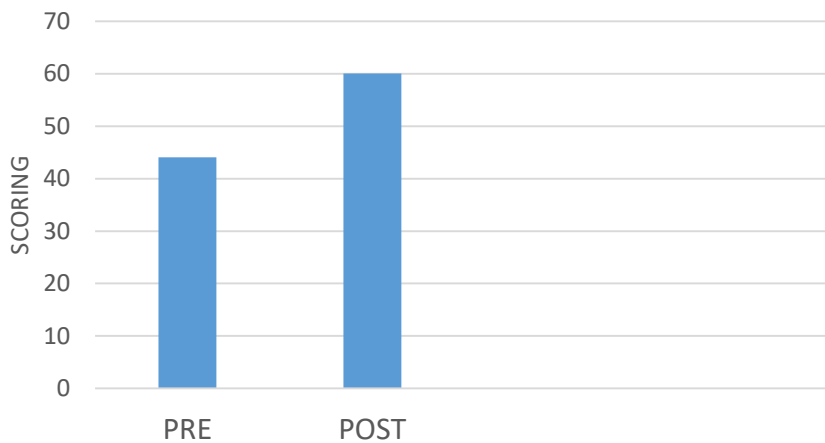
■ Males ■ Females ■ ■

Female =65.72%   Male = 34.28%

Graph no 7.1 - Gender Distribution

Table no 7.1: The comparison of pre and post cardiovascular endurance by using physical

| Parameter	Pre-test		Post-test		T value	P value	Result
Physical fitness index	MEAN	SD	MEAN	SD	36.3940	<0.0001	Extremely significant
	44.09	±10.13	60.09	±10.37			

Graph no 7.2- PHYSICAL FITNESS INDEX (PFI

The result obtained for burpess exercise, the endurance was measured by physical fitness index (Harvard step test) in targeted age group, suggests significance as p value is (<0.0001) and t value was (36.39)

Table no 7.2- The comparison of pre and post Cardiovascular Endurance by using Vo2max

Parameters	Pre-test		Post-test		T value	P value	Result
Vo2max	MEAN	SD	MEAN	SD	23.66	<0.0001	Extremely significant
	33.17	±2.82	41.46	±2.89			
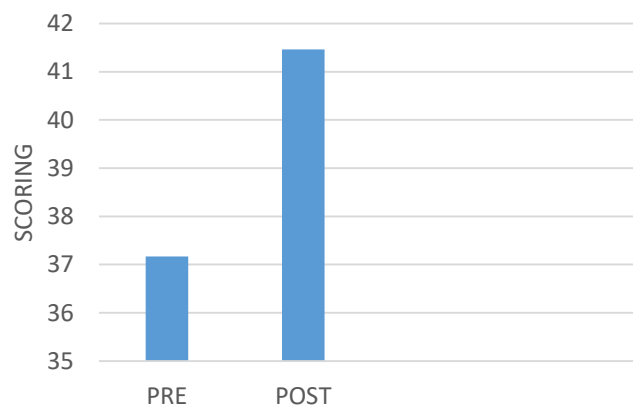
Graph no 7. 3- VO2 MAX pre and post

The result obtained of burpess exercise, the endurance was measured by vo2 max (Harvard step test) in targeted age group, suggests significance as p value is (<0.0001) and t value was (23.66)

VIII. DISCUSSION

The objective of study was to find out effectiveness of Burpees Exercise on PFI and VO2 Max in class 1 obese undergraduate students. Total 35 individuals both males and females participated. The result showed that Burpees exercises have significant effect in increasing cardiovascular endurance. Cardiovascular Endurance: Burpees involve rapid and continuous movements that increase the heart rate and oxygen consumption, leading to improved cardiovascular endurance. This can lead to a further improvement in VO2 max. Increased Cardiac Output: Burpees require a lot of energy, and the body responds by increasing cardiac output, which is the amount of blood pumped by the heart per minute. The increased cardiac output helps to deliver more oxygen to the working muscles, which increases VO2 max. Burpees exercise increases heart rate and breathing rate, which leads to an increase in the amount of oxygen and nutrients that are delivered to the muscles. Burpees have significant impact on PFI by improving cardiovascular endurance, and Vo2max in class 1 obese undergraduate .There is a significant effect of burpees exercise on cardiovascular endurance and physical fitness index.

X. LIMITATIONS

1. Small sample size.
2. Heterogeneity was not maintained in gender as the number of females>male.

XI. FUTURE SCOPE

1. The same protocol can be implemented in different populations.
2. Larger Sample size can be considered for future study.
3. Other age group can be considered.

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