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RESEARCH ARTICLE

STUDY OF PHYSICAL FITNESS INDEX USING MODIFIED HARVARD STEP TEST IN RELATION WITH BODY MASS INDEX IN PHYSIOTHERAPY STUDENTS

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ABSTRACT

BACKGROUND and OBJECTIVES: The Physical Fitness index measures the physical fitness for Muscular work & the ability to recover from the work. The present study was undertaken to assess the physical fitness index using Modified Harvard Step Test in young adult in the age group of 17 to 24 years with varying degree of physical activities.
METHOD: Cross sectional study was done on 105 physiotherapy students and Physical Fitness Index was measured using Modified Harvard step test.
DATA ANALYSIS: Statistical analysis was done using discriptive analysis and Chi square test.
RESULT: Statistical analysis shows that physical fitness in physiotherapy students is not satisfactory. And there is significant difference in physical fitness index between normal BMI and overweight BMI students**.**
CONCLUSION: Physical fitness of physiotherapy students in Ahmedabad Physiotherapy College is not satisfactory and overweight students are having less physical fitness in compare to normal BMI students.

INTRODUCTION

Physical fitness implies not only the absence of disabling deformity or disease and the capacity to perform a sedentary task efficiently but also a sense of physical well-being and the capacity to deal with emergencies demanding unaccustomed physical effort. Physical activity relates to any movement produced by theindividual's skeletal muscles that results in energy expenditure (Caspersen *et al*., 1985). Physical fitness is a set of attributes a person have or achieved (Caspersen *et al*., 1985), which is linked to the person's capability to do physical activity (Pescatello, 2014). Fitness is divided into health and skill related components, with the health component further consists of cardiorespiratory endurance, muscular endurance, muscular strength, and flexibility (Caspersen *et al*., 1985).

An individual is considered to be fit for a particular task or activity when he can accomplish it with a reasonable degree of efficiency without undue fatigue and with rapid recovery from the effect of exertion. Physiological fitness implies the capacity for skillful performance and rapid recovery (Shashiala and Geetanjali, 2014). Physiological effort is estimated from the magnitude of the heart rate change during exercise and front the rapidity of return of the heart rate to normal following the exercise (Francis, 1987). Physiotherapy students during the course of physiotherapy education is subjected to different kinds of stressors predominantly the pressure of academics leading to the successful completion of the educational course.

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Physical & mental fitness are the key to such a successful outcome. Physical fitness is used in two close meanings: general fitness-a state of health and well-being and specific fitness -a task-oriented definition based on the ability to perform specific aspects of sports or occupations. It is the result of regular exercise, proper diet and nutrition, and proper rest for physical recovery. There has been a decrease in physical activity due to a more sedentary lifestyle. However evolution has not kept pace with automation and humans have not adapted effectively to the sedentary lifestyles. Inadequate physical activity is responsible for approximately 30% of all deaths mainly due to heart disease, diabetes & colon cancer (Powell and Blair, 1994). Rising levels of obesity are also contributing to these diseases. This has reached epidemic proportions in many parts of the developing world and is beginning to affect developing countries like India as well.

Low fitness levels and childhood obesity has been shown to continue into adult-hood, with consequent health morbidity like cardiovascular and metabolic diseases (Velasquez-Mieyer *et al*., 2005). In adolescent, most commonly used measurements for adiposity are body mass index (BMI), waist circumference (WC), and waist height ratio (WHtR). BMI (Freedman *et al*., 2001) (Agirbasli *et al*., 2011) (Kim and Kim, 2010), WC (Lee Davis *et al*., 2009) and WHtR (Goulding A, Taylor, 2010) are strong predictors for cardio-metabolic risk factors. The previous studies that investigated the association between fitness and body composition indices in adolescent (Lee and Arslanian, 2007) (Brunet *et al*., 2007) (Ortega and Tresaco *et al*., 2007) used parameters such as BMI.

Obesity, if present in adolescence leads to obesity in adult life. There is substantial evidence that obesity in childhood lays the metabolic ground work for adult cardiovascular disease (Gidding, 1995). Beginning an active lifestyle could significantly reduce mortality from these events (Paffenberger and Kampert, 1994). Regular physical exercise is known to have beneficial effects even in the untrained person and in diseased states like Diabetes, Obesity &Hypertension. It was therefore thought to evaluate cardiopulmonary efficiency in physiotherapy students to determine the physical efficiency in these students and plan suitable strategies if necessary. There is a need to know the physical fitness level of our future Physiotherapist. They can be sensitized to pursue a healthy life style right from the beginning of their career. The physical fitness index (PFI) measures the physical fitness for muscular work and the ability to recover from the work. The study was undertaken to assess (PFI) using modified Harvard step test

MATERIALS AND METHODS

Study design: Cross sectional study

Study setting: Ahmedabad Physiotherapy College, Bopal, Ahmedabad

Sample size: 105

Sampling: Convenient sampling

Inclusive Criteria:

- Healthy young male & female Physiotherapy students
- Age between 17 to 23 years
- BMI 18-28 kg/m^2

Exclusive Criteria

- Student with Locomotor& Musculoskeletal disability
- History of Cardiovascular disorder
- History of Respiratory disorders
- History of Diabetes mellitus, Hypertension
- History of Major surgery in the recent past
- History of Drug intake
- History of Alcohol & Smoking

Table 1. Profile of subjects

Gender	Number	Age¥	BMI¥
Male	48	20.4±2.24	23.2±4.01
Female	57	20.1±2.79	23.9±4.10

¥: Mean ± SD

Material: Modified Harvard step bench = 33cm height**,** Stop watch**,** Metronome**,** Weight & Height measurement machine PFI was calculated by using following formula.

Physical fitness Index (%) (PFI %) (Edward Fox Charles *et al*., 1973**)**

PFI =Duration of exercise in seconds x 100/ 2(pulse 1+2+3)

Procedure: The Subject was advised to step up on the modified Harvard steps of 33cms height once every two seconds (30 per minute) for 5 minutes, a total of 150 steps. At one, three and five minutes during the test, pulse rate was recorded as

- PR1 (Pulse Rate 1) – 1 min after exercise
- PR2 (Pulse Rate 2) – 3 min after exercise.
- PR3 (Pulse Rate 3) – 5 min after exercise.

Table 2. Physical Fitness Index rating (Edward L. Fox. *et al*., 1973)

PFI Rating	Physical Fitness Index	
	Male	Female
Excellent	>115	>91
Good	103-115	84-91
Fair	91-102	77-83
Poor	<91	<77

According to the inclusion & exclusion criteria subjects were included in study. The subjects were given rest for 5 min in a chair. Resting pulse rate was measured in that resting position. After explanation subjects were told to do modified harvard step test in a rhythmic manner & the data were recorded. The detail procedure of exercise test was explained to the subjects & actual demonstration was given before starting test in order to allay apprehension (Pescatello, 2014).

DATA ANALYSIS: Statistical analysis was done using descriptive analysis and Chi square test

RESULTS

The chi-square is 19.0223. The P-Value is 0.00025. df=3. The result is significant at $p < 0.05$.

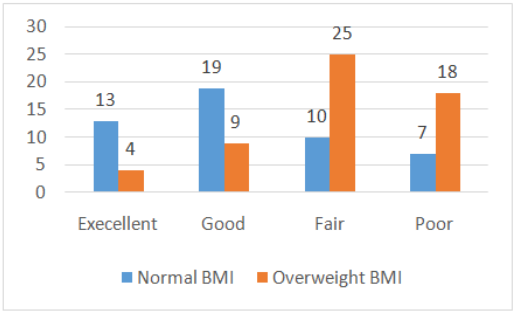

Figure 1. Comparison of PFI score in Normal and Overweight BMI

DISCUSSION

Several studies have established that physical fitness is necessary to carry out daily task. The effect of regular exercise is known to have beneficial effect on health. Importance of physical fitness has been mentioned in the history of mankind including Vedas. Yet, physiology of exercise is a recent advancement and is an open field for research (Wuest and Bucher, 1999). The present study evaluated the physical fitness of young physiotherapist students using modified Harvard step method. This method has four grades of physical fitness based on the scoring obtained after performing step test. This is proven to be a suitable method for assessing physical fitness of Indians (Das and Mahapatra, 1993). The present study showed that fitness of Physiotherapy students is less. In overweight students excellent and good PFI are 7% and 9% respectively which are comparatively less than normal BMI students. In overweight students Fair and poor PFI are 45% and 32% respectively which are more in numbers in compare to normal BMI students.

This study showed that BMI was inversely correlated with fitness level. Our result was similar with findings from other studies (Brunet *et al*., 2007) (Ortega and Tresaco, 2007). This study has clearly established that physical activity is an important determinant and predictor of physical fitness. Pulse rate variability (pre and post exercise) was minimum among subjects who had excellent physical fitness and it was maximum among subjects who had poor physical fitness index. It is important for future Physiotherapist to know their level of present fitness and try to improve it.

Conclusion

- Physical fitness of physiotherapy students in Ahmedabad Physiotherapy College is not satisfactory. This may be due to the sedentary life style and lack of sporting activities & also over emphasis on academic pursuits.
- Regular physical activity is an important determinant of physical fitness.
- Overweightness decreases physical fitness.
- Heart rate variability is less among physically fit individuals.

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