Original article:

Influence of gender and height on physical fitness index in young adult Indian population.

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Abstract:

Background: Physiology of exercise is a recent advancement and is an open field for research. Harvard step test is good measurement of fitness and a person's ability to recover after a strenuous exercise Therefore, in the present study we intended to determine influence of gender and height on physical fitness index.

Methods: A cross-sectional study was conducted on 60 healthy subjects (30 male and 30 female) aged between 17 to 20 years and physical fitness score was calucated by using Modified Hardward Step Test in which the step height was 41.91 cm. Based on height, the subjets were divided in 2 groups 1) Subjects having height >165cm and 2) Subjects having height ≤165cm. The physical fitness index calculated among both groups. Mean fitness score was also compared between male and female subjects.

Results: Study shows that there is significant higher physical fitness Index in males than females. There is statistical high physical fitness score in subjects having height >165 cm than those subjects having height ≤ 165 cm.

Conclusion: The height of subjects was found to be positively and significantly correlated to the PFI score and hence, although for Indian context the step height has been reduced from the original 20 inch (50.8 cm) to 16.5 inch (41.91 cm), this height of the step may not be applicable uniformly to the entire Indian population. HST for people with less height may prove to be a test of local endurance of the legs, rather than a test of cardio-respiratory fitness.

Key Words: Hardward step test (HST), Modified Hardward step test, Physical fitness index (PFI).

Introduction:

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.[1] Physical fitness is defined as ability to carry out daily tasks with vigour and alertness without undue fatigue, with ample energy to enjoy leisure time pursuits, to meet unusual situations and unforeseen emergencies.[2] Physical inactivity is a risk factor for cardiovascular diseases.

The Harvard step test (HST) was introduced by Brouha et al.[3] HST has become well known to study cardiovascular fitness by American Alliance for Health Physical Education Research and Dance (AAHPERD) who recommended this level to study health related physical fitness programme in youth[4]. The Harvard step test is a type of cardiac stress test for detecting and diagnosing cardiovascular diseases. It is also a good measurement of fitness and a person's ability to recover after a strenuous exercise. The more

quickly the heart rate returns to resting, the better shape the person is. It is a kind of cardiovascular endurance test. It comprises stepping up and down a step that is 20 inches (50.8 cm) high at a rate of 30 times/min. [5]

In original Hardward step test step height is 20 inch, but it is not suitable for Indian height that is relatively shorter, so modification of Hardward step test is required. [5,6] Number of Modified HST's had been recommended by a number of workers either by lowering step height or frequency of up-down per min or by altering duration of exercise instead of maximum period of 5 min and classify of score to categorize the physical fitness index (PFI). Several modified versions of the original Harvard step test exist; an example is the Tecumseh step test and the Sharkey step test was developed in the 1970s for use by the United States Forest Service at the University of Montana in Missoula. The standard 50.8 cm step of the HST is tailored to western anthropometrics and is rather high for the average Indian whose height is relatively less. Therefore the height of the step is lower (41.91 cm) in the modified HST.

The aim of present study is therefore planned to study Physical fitness index (PFI) in both male and female students with modified HST and also see the influence of height on Physical fitness index (PFI).

Material and method:

This study was conducted on 60 healthy adults in the age group of 17-20 years, after obtaining permission of ethics committee of the institute. Students with a history of any cardiovascular disorder, diabetes mellitus, hypertension, bronchial asthma, alcoholism, smoking, major surgery or locomotor, and musculoskeletal abnormalities were excluded from the study. The detailed procedure was explained as well as demonstrated to the students. The following anthropometric measurements were made on the subjects prior to the commencement of the test: (1) the height in centimetres was measured with subjects standing without their shoes. (2) The weight in kilograms was recorded using a standardized weighing machine.

All the subjects were familiarized with Modified Hardward step test. The procedure of this method is that subject took rest for 30 minutes prior to test after which the resting pulse was noted. Than the subject was asked to perform the exercise of ascending and descending Harvard step of 41.91 cm height, 30 times per min for 5 min. If the subject was dyspneic, felt exhausted or felt pain in chest or legs during the exercise, he was asked to discontinue the exercise immediately. Time is noted with the help of stopwatch. At the end of test ask the subject to sit immediately on chair count the pulse and record it during 1 to 1-1 /2 min, 2 to 2/-1 /2 min and 3 to 3/-1 /2 min intervals. Total of these three reading is called recovery pulse. Convert the duration of exercise in seconds and Physical fitness index is calculated as follows.

Physical Fitness Index = (100 x test duration in seconds) divided by (2 x sum of heart beats in the recovery periods)

Depending upon the score, Physical fitness index is graded as Excellent (>90), Good (80-89), High average (65-79) and Low average (55-64) and poor (< 55).

Statistical Analysis: Unpaired t' test of Microsoft excel 2007 was used to comparison of two groups. P value less than 0.05 was considered as significant

Results:

With Modified Hardward step test, 60 healthy subjects (30 male and 30 female) of 17 to 20 years of age participated in the study and physical fitness score calculated. Table-1 shows mean value of age (18.35±0.52) , height (166.27±8.64) ,weight (57.54±9.53) and physical fitness score (65.04±

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16.38). Table 2 shows significant high physical fitness score among male subjects 73.4±14.8 than female subjects (55.8±12.8). We divided subjects into 2 groups according to height 1) Subjects having height >165 cm and 2) Subjects having height ≤165cm, than physical fitness score was calculated among both groups. Statistically high physical fitness score was found in subjects having height >165 cm than those subjects having height ≤ 165 cm.

Table 1: Mean and Standard deviation of Age, Height and Weight and physical fitness index score:

Parameter	Mean ± SD
Age	18.35±0.52
Weight	57.54±9.53
Height	166.27±8.64
Physical fitness score	65.04± 16.38

Table 2: Physical fitness score among male and female subjects:

Parameters	Male subjects	Female subjects	
Number of subjects	30	30	
Age	18.5±0.57	18.2±0.43	
Weight	61.5±8.09	53.2±9.26	
Height	172.43±5.29	160.44±7.02	
Physical fitness score	73.4±14.8	55.8±12.8	P –value < 0.05 (Significant)

Table 3: Physical fitness score among subjects having Height ≤ 165 cm and subjects having height > 165 cm

Parameter	Height of subject ≤ 165 cm	Height of subject >165 cm	
Number of subject	29	31	
Physical fitness index	54.67 ± 11.4	74.78 ±14.1	P –value < 0.05 (Significant)

Discussion:

This modified HST in which the step height is 41.91 cm, is found to be suitable for Indian men and women. All 60 subjects (30 male and 30 female) participated in the study. All the subjects performed the exercise of ascending and descending Modified Harvard step 30 times per min for 5 min and than physical fitness index calculated. The finding in the present study suggests that there is significant higher physical fitness index in males than females (Table 2). The purpose of this study was to determine whether the height of the subject has any effect on the fitness index score using the modified HST. We divided subjects into 2 groups according to height 1) Subjects having height > 165cm, 2) Subjects

having height ≤165cm, than physical fitness score calculated among both groups. There is statistical high physical fitness score in subjects having height >165 cm than those subjects having height ≤ 165 cm. Our finding correlated with finding of Dr.K Ranjith Babu el al who studied [7] that there was significant difference in physical fitness index or Harvard index in male and female medical students. The reason suggested was that male is generally more aggressive and accepts challenge more than female.[8] The lower mean values of PFI in the females compared with males can thus be attributable to their lower body weight and height.

Sharma et al [9] studied that the height of subjects positively and significantly correlated to the fitness score and also to the duration of exercise. The mean fitness scores of subjects with height ≥1.66 m were significantly higher than mean scores of subjects with height <1.66 m. The shorter duration of effort and the lower score in short subjects may be due to muscle fatigue rather than cardio-respiratory impairment. Considering that the step height is standard, taller people are at an advantage as it will take less energy to climb up onto the step while the lower height of short people hinder the comfortable lifting up and lowering of their legs during the stepping process. This leads to the onset of premature fatigue in their legs. Hence, although for Indian context, the step height has been reduced from the original 20 inch to 16.5 inch, this height of the step may not be applicable uniformly to the entire Indian population. HST for people with less height may prove to be a test of local endurance of the legs, rather than a test of cardio-respiratory fitness. The height of subjects may influence the validation of the HST and introduce error of measurement. In earlier studies also, leg length has been considered as a factor which might influence the PFI. [4,10,11,12]Also there is significant difference in height and weight in males than females so PFI affects by body size as evidenced in positive co-relation between PFI with height and weight[6] . A similar observation was earlier made on male college students.[4,13]

Conclusion:

The height of subjects was found to be positively and significantly correlated to the PFI score and hence, although for Indian context the step height has been reduced from the original 20 inch to 16.5 inch, this height of the step may not be applicable uniformly to the entire Indian population. HST for people with less height may prove to be a test of local endurance of the legs, rather than a test of cardio-respiratory fitness. The height of subjects may influence the validation of the HST and introduce error of measurement. Further studies are required to verify that the shorter duration of effort and the lower score in short healthy subjects is due to muscle fatigue or due to cardio-respiratory impairment. The higher the fitness of an individual, less is the increase in heart rate and faster is the recovery

. Regular physical exercise is known to have beneficial effects even in the untrained person and in diseased states like Diabetes, Obesity &Hypertension

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