



EVALUATION OF MUSCULOSKELETAL FITNESS AMONG HEALTHY FEMALE PHYSIOTHERAPY STUDENTS: A CROSS-SECTIONAL STUDY

Physiotherapy

Dr. Mansi Ray*	Assistant Professor, School Of Physiotherapy, P P Savani University, Kosamba , Surat, Gujarat. India *Corresponding Author
Dr. Amruta Bakre	Masters Student Msc Applied Neuroscience In Sports And Exercise Paderborn University, Germany.

ABSTRACT

Background: Physiotherapists desire to have a good level of physical fitness to meet their job demands, which require a good amount of strength, endurance, and flexibility. The repetitive manual activities make an individual prone to various work-related musculoskeletal disorders. This requires the maintenance of an individual's musculoskeletal fitness. **Aims and Objectives:** This study measured static and dynamic muscle endurance, muscle strength, muscle power, and flexibility by using various tests among physiotherapy students. The tests taken were the static back extensor test, dynamic push-up test, vertical jump test, back scratch test, V sit and reach test, and handgrip strength test. **Methods and Materials:** This observational study was conducted at Shree Swaminarayan Physiotherapy College, Kadodara. 30 healthy female physiotherapists in the age group of 18–22 years were included and then divided into 3 groups of overweight (A), normal weight (B), and underweight (C) categories of BMI. Static endurance using the static back extender test and dynamic endurance using the dynamic push-up test, muscle strength using the handgrip dynamometer, muscle power using the vertical jump test, flexibility using the back scratch test, and the V sit and reach test were assessed. **Results:** A descriptive analysis was done, and it was found that static muscle endurance, dynamic muscle endurance, muscle explosive power, and muscle flexibility were found to be higher in normal-weight people, lower in underweight people, and lowest in overweight people. Whereas grip muscle strength was highest in overweight people, lower in normal-weight people, and lowest in underweight people. **Conclusion:** This study concluded that handgrip muscle strength is highest in overweight people. Dynamic muscle endurance, muscle explosive power, and muscle flexibility are highest in normal-weight people, lower in underweight people, and lowest in overweight people.

KEYWORDS

muscular fitness, BMI, muscle static endurance, muscle dynamic endurance, muscle power, muscle strength, muscle flexibility.

INTRODUCTION

Musculoskeletal fitness and muscular strength seem to provide unique and important benefits to the prevention and treatment of cardiovascular disease and mortality, in addition to several other health and fitness variables. [1] Physical fitness decreases with increasing age at varying rates, depending on lifestyle and physical health earlier in life. [2] Physical fitness is an important part of human functionality related to health and wellbeing. In a typical definition of health-related physical fitness, many components are measured, such as cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition. [3]

The physical therapist must engage in exercises that call for a significant level of strength, endurance, and flexibility due to the nature of their line of work. To perform the regular professional duties of a physiotherapist, one must be physically fit to a surprisingly high degree. However, the physical fitness of physiotherapy students receives no consideration in the curriculum or academic experience. It is crucial that they comprehend the demands of the profession and their current level of physical fitness as physiotherapy students. The therapist sees patients of different types in hospitals. Patient transfers from beds to wheelchairs and gait training are part of the job. They train patients of diverse shapes and conditions using passive and resistive methods. The physiotherapists work extensively with athletes and sports teams in addition to working in hospitals and clinics. Patients and sportsmen frequently turn to physiotherapists for advice on how to improve their physical fitness through the use of suitable exercises. Physiotherapists can serve as examples of how to live a healthy lifestyle. As a result, they must be physically healthy enough to perform the duties of their jobs.^[4]

As physiotherapy students use manual therapy on a frequent basis for accurate treatment, it is important to check their musculoskeletal fitness. For the same purpose, a dynamic pushup test was used for assessing dynamic muscle endurance, a static back extensor test was used to assess static muscle endurance, a vertical jump test was used for testing muscle explosive power, a back scratch test was used for testing upper limb muscle flexibility, a V sit and reach test was used for assessing lower limb muscle flexibility, and a handgrip strength test was used to assess muscle strength.

Methodology

The students of the Bachelor of Physiotherapy program at Shree Swaminarayan Physiotherapy College of Surat participated in the study. According to the Body Mass Index (BMI), the subjects were

divided into three categories: 10 underweight (A), 10 normal (B), and 10 overweight (C) individuals. A total of 30 students participated in the study, with a mean age of 21. The tests were explained to all individuals, and consent forms were signed. Each test was taken on every individual.

Muscular static endurance was measured by the static back extension (SBE) test. The participants lay face down on a plinth with their anterior superior iliac spine lined with the bench's short side, leaving the upper body in a horizontal position for as long as they could, and the time the participants managed to hold a horizontal position was recorded.

Muscular dynamic endurance was measured by the dynamic push-ups (DPU) test. The participants lay face down on the floor, with their arms alongside their bodies. The test was initiated by the participants touching the sides of their hips, followed by an ordinary push-up. All push-ups where the participants placed one hand over the other while the elbows were extended were counted. The number of repetitions completed in 40 seconds was recorded.

The vertical jump (VJ) test measured explosive power in the lower extremities. The participants were to stand with a foot of their choice alongside the wall. With a piece of chalk, the participants reached up the wall as high as possible, setting a mark on the wall. The distance between the chalk mark set at standing height and that set at peak jumping height was recorded to the nearest cm.

The back scratch (BSC) test measured flexibility in the shoulder joint. The participants were seated, placing one hand on the lower back and moving it up the spine toward their heads. The dominant hand was placed on the participant's neck, moving it down the spine, aiming to place the long fingers of each hand as near each other as possible or to overlap. The gap between the fingertips of the long fingers of both hands was measured to the nearest half-centimeter. The results were recorded as positive numbers as long as the fingers overlapped and as negative numbers if the fingers did not meet or overlap.

The V Sit and Reach (VSR) test measured the flexibility of hamstring muscles. A baseline was marked on the floor, and a measuring tape was placed perpendicular to form a cross. While in a long sitting position, feet were lined up with the baseline, making sure that the heels touched it. The feet were apart. Hands were placed one over the other in front. After three practice attempts at reaching as far as they could on the measuring tape with their hands, the participant held for 2 seconds, and

the reading was marked. If the participant reaches past the baseline, the score is positive, and if they reach behind the line, it is negative.

Muscular strength was measured by a handgrip strength test (HGS) using a handgrip dynamometer. The participants were to sit straight with their arms resting. The dominant hand held the dynamometer. The best of three attempts was recorded to the nearest 1 kilogram (kg).



Figure 1: Static back extensor test



Figure 2: Dynamic push-up test



Figure 3: Vertical jump test



Figure 4: Back scratch test



Figure 5: V Sit and Reach test

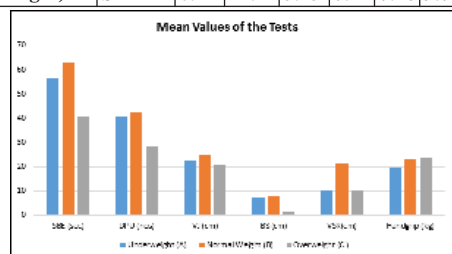


Figure 6: Handgrip strength test

RESULTS:

Table 1: Mean and SD values of all tests in all three categories

		Age	SBE	DPU	VJ	BS	VSR	HGS
Group A (Underweight)	Mean	21	56.8	40.4	22.5	7.2	10.1	19.67
	SD	0	41.35	5.23	4.27	5.07	12.99	1.46
Group B (NormalWeight)	Mean	21	63.1	42.2	25	7.6	21.6	22.87
	SD	0	36.41	4.21	4	3.59	6.48	3.36
Group C (Overweight)	Mean	20.8	40.5	28.2	21	1.3	10	23.42
	SD	0.42	24.2	5.15	7.42	7.18	9.76	5.47



Graph 1: Mean values of all tests in all three categories

The mean and SD of the readings of each test in each category (A, B, and C) were calculated. Descriptive statistical analysis was done for musculoskeletal fitness among 30 female physiotherapy students, with their ages ranging from 18 to 22 years and according to categories of BMI. Static back extensor, dynamic push-up, vertical jump, V sit and reach, and back scratch test values were found to be higher in normal-weight people, lower in underweight people, and lowest in overweight people. This shows that static and dynamic muscle endurance, muscle explosive power, and muscle flexibility were highest in normal-weight individuals and lowest in overweight individuals. Whereas grip muscle strength was highest in overweight people, lower in normal-weight people, and lowest in underweight people.

DISCUSSION

The results display clear weight-related differences on all tests. Higher BMI was associated with lower test scores in all tests except for the handgrip strength test. While most of the students consider their endurance level to be normal to above average, the results of the dynamic push-up test show that most of the students have a poor level of endurance.

Huotari et al. (2009) reported that correlations between self-perceived and measured physical fitness were non-significant. A national Danish study of 3471 females and males (19–72 years) [6] displayed mean HGS scores that were similar to those found in this study. Compared to a regional Norwegian study of 566 adults and the elderly [7], the present study found mean HGS scores by BMI groups that were primarily similar. Males in their 50s displayed markedly lower scores on HGS in the study by Nilsen et al. [8].

An increase in age was associated with lower test scores on all aspects. Muscular strength across the major joints in the body has previously been shown to decrease with increasing age. The age dependency was shown to vary from movement to movement, though most studies report an increasing decline in muscular strength from 40 to 50 years of age. Furthermore, the age-related declines in flexibility, muscular endurance, and explosive power found in this study are supported by previous findings.

The present study, however, is cross-sectional and cannot imply age-related changes or the subsequent cause of differences in scores on the various tests observed between categories. The increased waist circumference scores associated with decreased test scores on BSC for both genders and on sit and reach for males may be explained by the increased fat mass located such that it hinders the range of motion, possibly reflecting females' smaller waist circumference. Furthermore, the high contribution of waist circumference to SBE, DPU, and the explosive power tests is thought to be explained by the weight-bearing characteristics of those musculoskeletal fitness tests. The inverse association between increased scores on BMI and body fat percentage and lower scores on fitness tests has been reported in previously published studies. Fogelholm, Malmberg, and Suni [9] clearly state that functional muscle fitness is impaired in individuals with abdominal obesity and that the decline in musculoskeletal fitness should be given increased attention.

CONCLUSION:

This study concluded that handgrip muscle strength is highest in overweight people. Dynamic muscle endurance, muscle explosive power, and muscle flexibility are highest in normal-weight people, lower in underweight people, and lowest in overweight people.

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