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ORIGINAL ARTICLE

Physical Fitness Profile among Physiotherapy Students across Academic Years -A Cross-sectional study

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Abstract

Background: This study aimed to assess the physical fitness of undergraduate physiotherapy students using standardised physical fitness tests. **Methods:** A cross-sectional study was conducted among 150 physiotherapy students aged 18–25 years. Physical fitness was assessed using Body Mass Index (BMI), Sit-and-Reach Test, Back Scratch Test, Harvard Step Test, and Sit-up Test. **Results:** Most participants (61.3%) had normal BMI. In the Sit-and-Reach Test, 73.7% of males and 85.3% of females demonstrated excellent to super flexibility. In the Back Scratch Test, 89.5% of males and 89.3% of females demonstrated excellent upper limb flexibility. In the Harvard Step Test, 47.4% of males and 47.3% of females demonstrated average to excellent endurance. In the Sit-up Test, 84.2% of males and 44.3% of females demonstrated average to excellent abdominal endurance. **Conclusion:** Most participants had normal BMI and good flexibility, while cardiovascular and abdominal endurance differed between males and females.

INTRODUCTION

Physical fitness is a fundamental indicator of health and functional capacity, defined as the ability to perform daily activities efficiently without undue fatigue while maintaining sufficient energy for leisure and unforeseen physical demands. It encompasses health-related components including cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition, all of which contribute to optimal physical performance and overall well-being[1,2]. Regular physical activity is closely associated with improved

physical fitness and plays a vital role in preventing non-communicable diseases, enhancing mental health, and improving quality of life[6,7,10,11] . Recent evidence also emphasises that maintaining adequate physical fitness during early adulthood contributes to long-term health and reduces the future burden of chronic diseases[4].

University students represent a population vulnerable to declining physical activity because of academic workload, prolonged screen exposure, and sedentary lifestyles. Consequently, many students fail to achieve recommended levels of physical activity, resulting in reduced physical fitness and increased health risks[1,8,15,23]. Physiotherapy students constitute a unique subgroup within the university population because their curriculum and future profession require a higher level of physical fitness. Clinical responsibilities such as patient handling, transfer techniques, exercise demonstration, prolonged standing, and repetitive therapeutic activities demand adequate flexibility, muscular endurance, and cardiovascular fitness[12,17,31]. Inadequate physical fitness may compromise clinical efficiency and increase the risk of work-related musculoskeletal disorders[2,31,32] . Furthermore, physiotherapists are expected to promote healthy lifestyles and physical activity among patients; therefore, maintaining their own fitness is essential for professional credibility and effective patient counselling[16,18].

Previous studies have reported variable levels of physical fitness among university and physiotherapy students across different populations. A systematic review by Kljajevic *et al.* highlighted considerable variation in physical fitness among university students and emphasized the influence of educational systems, lifestyle, and cultural factors on fitness outcomes[15]. Similarly, Multani *et al.*, in a study conducted among physiotherapy students from Punjab and Haryana, reported differences in fitness components across academic years, indicating the need for regular assessment using standardized fitness measures[13]. Despite these findings, limited Indian studies have comprehensively evaluated multiple components of physical fitness, including body composition, flexibility, cardiovascular endurance, and muscular endurance, using standardized field-based assessments among undergraduate physiotherapy students.

Therefore, the present study was undertaken to assess the physical fitness of undergraduate physiotherapy students using standardized physical fitness tests. The findings are expected to provide baseline information regarding their fitness profile and may assist in developing targeted strategies to promote physical fitness and overall well-being among future physiotherapists.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional study was conducted among undergraduate physiotherapy students at DVVPF's College of Physiotherapy, Ahilyanagar, Maharashtra, India, over a period of six months after obtaining approval from the Institutional Ethics Committee. Undergraduate physiotherapy students aged 18–25 years were recruited using a convenience sampling technique. Participation was voluntary, and written informed consent was obtained from all participants before data collection.

Students aged 18–25 years who were willing to participate were included in the study. Students with recent fractures, musculoskeletal injuries, or any condition restricting physical activity, those diagnosed with cardiovascular, severe respiratory, or neurological disorders affecting physical activity, postgraduate physiotherapy students, interns, faculty members, and students absent during the data collection period were excluded.

Outcome Measures

Physical fitness was assessed using standardised field-based fitness tests. Body Mass Index (BMI) was calculated using height and weight measurements. Lower limb flexibility was assessed using the Sit-and-Reach Test, upper limb flexibility using the Back Scratch Test, cardiovascular endurance using the Harvard Step Test, and abdominal muscular endurance using the One-Minute Sit-up Test. Performance in each test was

interpreted according to standardised age- and sex-specific normative values.

Procedure

After obtaining informed consent, demographic information including age, gender, height, weight, Body Mass Index (BMI), limb dominance, blood pressure, and resting heart rate was recorded. All assessments were performed under the supervision of the investigator in the same testing environment. Participants were instructed regarding the procedure of each test, and adequate rest was provided between tests to minimize fatigue.

Sit-and-Reach Test

Lower limb flexibility was assessed using a Wells and Dillon Sit-and-Reach Box. Participants removed their footwear and sat on the floor with both knees fully extended and the soles of the feet placed firmly against the testing box. With both hands placed one over the other and palms facing downward, participants slowly reached forward along the measuring scale without jerky movements and maintained the final position for two seconds. Two trials were performed, and the best score recorded in centimetres was considered for analysis.

Back Scratch Test

Upper limb flexibility was assessed using the Back Scratch Test. Participants performed the test in standing by placing one hand over the shoulder and the opposite hand behind the back, attempting to touch or overlap the middle fingers. The distance between the fingertips was measured using a flexible measuring tape. Two trials were performed on the preferred side, and the best score recorded in centimetres was used for analysis.

Harvard Step Test

Cardiovascular endurance was assessed using the Harvard Step Test. Participants stepped up and down on a standard step bench in an up-up-down-down sequence at a cadence of 24 beats per minute guided by a metronome for 3 minutes. Immediately after completion of the test, participants were seated, and recovery heart rate was recorded for one minute beginning five seconds after completion. Performance was interpreted using standardized age- and sex-specific normative values.

One-Minute Sit-up Test

Abdominal muscular endurance was assessed using the One-Minute Sit-up Test. Participants lay in the crook-lying position with the knees flexed to approximately 90° and feet stabilised by an assistant. With the arms extended forward, participants performed the maximum number of correctly executed sit-ups within one minute. Only correctly performed repetitions were recorded for analysis.

RESULT

A total of 150 undergraduate physiotherapy students were included in the study. All participants completed the physical fitness assessment and were included in the final analysis. The descriptive statistics of the study variables are presented in Table 1. The mean±standard deviation values were 21.29±4.04 kg/m² for BMI, 21.21±6.57 cm for the Sit-and-Reach Test, 0.36±0.98 cm for the Back Scratch Test, 112.40±20.74 beats/min for the Harvard Step Test, and 17.27±6.52 repetitions for the One-Minute Sit-up Test.

Table 1. Mean and standard deviation of physical fitness variable among physiotherapy students.

Discriptive Statistics		
Variables	Mean	SD
BMI	21.2896	4.044455461
Sit and Reach	21.21466667	6.574930899
Back Scratch Test	0.36	0.978150563
Step Test	112.4	20.740972
Sit-up Test	17.26666667	6.518601846

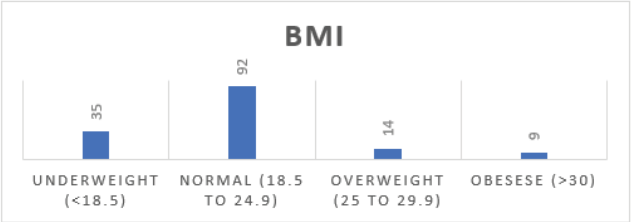
Body Mass Index (BMI) categories of the participants are presented in Table 2. The majority of participants (61.3%) had a normal BMI, followed

by 23.3% who were underweight, 9.3% who were overweight, and 6.0% who were obese.

Table 2. Distribution of participants according to BMI

BMI Categories		
Category	**Frequency**	**Percentage**
Underweight (<18.5)	35	23.33333333
Normal (18.5 to 24.9)	92	61.33333333
Overweight (25 to 29.9)	14	9.333333333
Obesese (>30)	9	6

Graph 1. Distribution of participants according to BMI



Lower limb flexibility was assessed using the Sit-and-Reach Test. Among male participants, 73.7% demonstrated excellent to super flexibility, while 85.3% of female participants demonstrated excellent to super flexibility. Only 2.0% of female participants were classified as average, and no participants were categorized as fair, poor, or very poor (Table 3).

Table 3. Sit and Reach test score among male and female physiotherapy students

Sit and Reach Test – Men		
Category	**Frequency**	**Percentage**
Super (>+27)	1	0.666666667
Excellent (+17 to +27)	13	8.666666667
Good (+6to+16)	5	3.333333333
Average (0 to +5)	0	0
Fair (-8to-1)	0	0
Poor (-20to-9)	0	0
Very Poor (<-9)	0	0

Sit and Reach Test – Women		
Category	**Frequency**	**Percentage**
Super (>+30)	14	9.333333333
Excellent(+21to+30)	49	32.66666667
Good(+11to+20)	65	43.33333333
Average(+1to+10)	3	2
Fair(-7to0)	0	0
Poor(-15 to -8)	0	0
Very Poor(<-8)	0	0

Upper limb flexibility was assessed using the Back Scratch Test. The majority of participants demonstrated excellent upper limb flexibility. Among female participants, 81.7% demonstrated excellent flexibility, while 89.5% of male participants demonstrated excellent flexibility. Only 17.6% of female participants and 10.5% of male participants demonstrated very good flexibility, whereas no participant was classified as average or poor.

Table 4. Back Scratch test score among male and female physiotherapy students

Back Scratch Test Men (cm)		
Interpretation	**Frequency**	**Percentage**
Excellent (0cm)	17	11.33333333
Very Good (0to5)	2	2
Good (5to10)	0	0
Average (10to20)	0	0
Poor (>20)	0	0

Back Scratch Test Women (cm)		
Interpretation	**Frequency**	**Percentage**
Excellent (0cm)	107	71.33333333
Very Good (0to5)	23	15.33333333
Good (5to10)	1	0.666666667
Average (10to20)	0	0
Poor (>20)	0	0

Cardiovascular endurance was assessed using the Harvard Step Test. Among male participants, 47.4% demonstrated average to above-average cardiovascular endurance, while 31.6% were categorised as poor. Among female participants, 55.0% demonstrated average to excellent cardiovascular endurance, whereas 25.0% were classified as poor.

Table 5. Step test score among male and female physiotherapy students

Step Test Men (bpm)		
Category	**19-25 Yrs**	
Sex	**Men**	
	Frequency	**Percentage**
Excellent	0	0
Above Average	5	3.333333333
Average	4	2.666666667
Below Average	4	2.666666667
Poor	6	4

Step Test Women (bpm)		
Category	**19-25 yrs**	
Sex	**Women**	
	Frequency	Percentage
Excellent	14	9.333333333
Above Average	33	22
Average	26	17.33333333
Below Average	33	22
Poor	25	16.66666667

Abdominal muscular endurance was assessed using the One-Minute Sit-up Test. Among male participants, 84.2% demonstrated average to excellent muscular endurance, while 10.5% were classified as poor and 5.3% as very poor. Among female participants, 44.3% demonstrated average to excellent muscular endurance, whereas 21.4% were classified as below average, 6.9% as poor, and 33.6% as very poor

Table 6. Sit-Up test score among male and female physiotherapy students

Sit – Up Test (Men)		
Interpretation	**Frequency**	**Percentage**
Excellent	10	6.666666667
Good	2	1.333333333
Above Average	2	1.333333333
Average	2	1.333333333
Below Average	0	0
Poor	2	1.333333333
Very Poor	1	0.666666667

Sit – Up Test (Women)		
Interpretation	**Frequency**	**Percentage**
Excellent	10	6.666666667
Good	8	5.333333333
Above Average	11	7.333333333
Average	30	20
Below Average	19	12.66666667
Poor	9	6
Very Poor	44	29.33333333

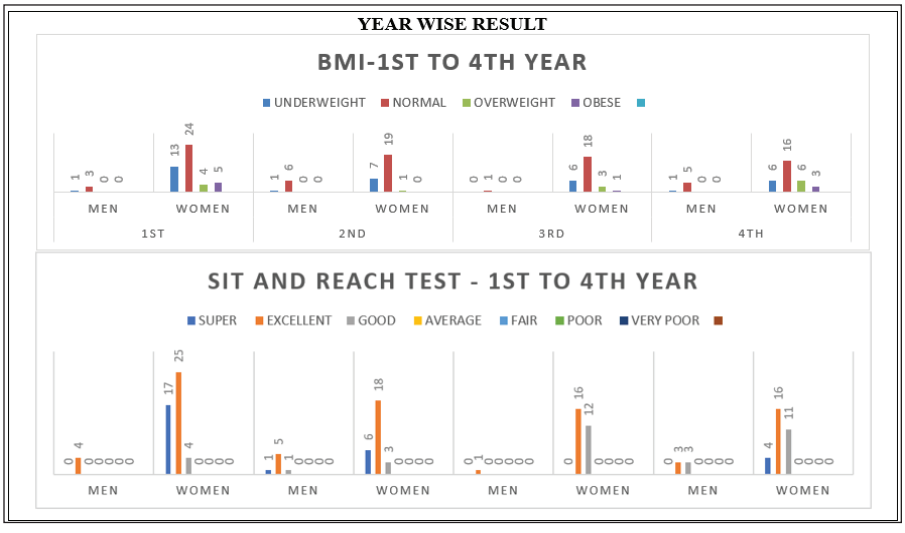


Figure 2. Distribution of BMI and sit and reach according to year and gender.

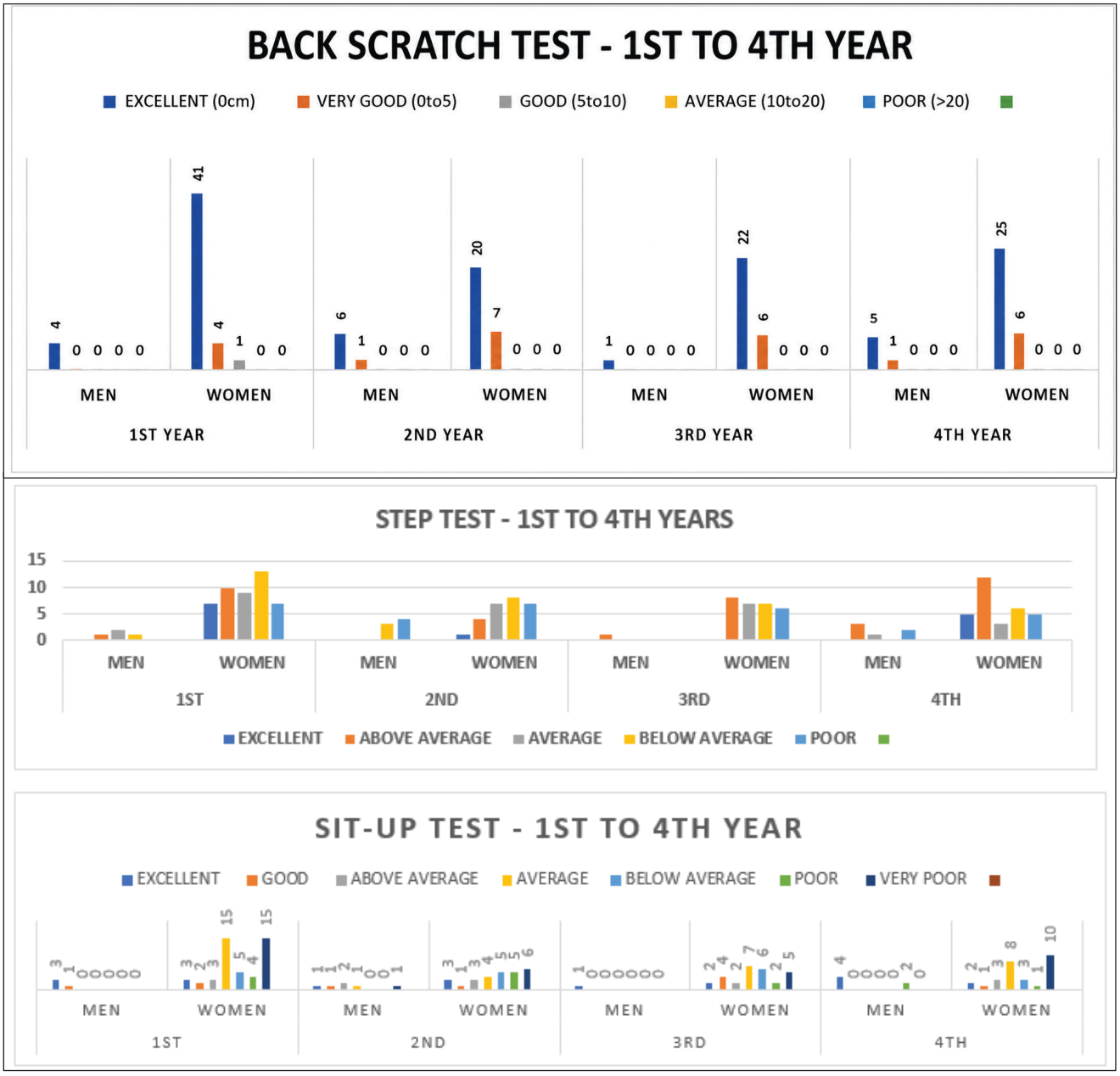


Figure 3. Distribution of back scratch test, step test and sit up test according to year and gender.

DISCUSSION

The present cross-sectional study assessed multiple components of physical fitness among undergraduate physiotherapy students using standardized field-based measures of body composition, flexibility, cardiovascular endurance, and abdominal muscular endurance. Overall, students demonstrated generally satisfactory BMI and flexibility; however, cardiovascular and abdominal muscular endurance showed considerable variability, with notable sex-wise differences. These findings are relevant because physiotherapy practice involves patient handling, transfers, exercise demonstration, manual techniques, and prolonged standing, all of which require adequate physical capacity[1,2].

Most participants had a normal BMI (61.3%), while 23.3% were underweight, 9.3% were overweight, and 6.0% were obese. Although the predominance of normal BMI suggests a generally satisfactory body composition, the coexistence of underweight and excessive body weight reflects variation in the students nutritional and health profiles. Similar variability has been reported among university students and may be influenced by lifestyle, physical activity, and academic demands[15]. Nevertheless, BMI should be interpreted cautiously because it does not differentiate between fat mass and lean muscle mass[19].

Flexibility was the strongest component of fitness in the present sample. In the Sit-and-Reach Test, excellent to super flexibility was observed in 73.7% of males and 85.3% of females, with no participants classified in the fair, poor, or very poor categories. Similarly, 89.5% of males and 89.3% of females demonstrated excellent or very good upper-limb flexibility on the Back Scratch Test. These favourable findings are consistent with previous research among physiotherapy students, including students from Punjab and Haryana[13]. The movement-based nature of physiotherapy education, including exercise demonstration, positioning, and practical training, may contribute to the maintenance of functional flexibility. However, because of the cross-sectional design, a causal effect of physiotherapy training cannot be established.

Cardiovascular endurance was less consistent. On the Harvard Step Test, 47.4% of males demonstrated average to above-average performance, while 31.6% were classified as poor. Among females, 55.0% demonstrated average to excellent performance and 25.0% were classified as poor. The presence of suboptimal endurance in a considerable proportion of students is important because cardiorespiratory fitness is associated with long-term health and morbidity outcomes[4]. Reduced participation in aerobic exercise, prolonged sitting, screen-based academic work, and other sedentary behaviours may contribute to these findings[23,27]. Although physiotherapy students may possess knowledge regarding exercise and health promotion, this knowledge may not consistently translate into regular personal physical activity[15,17].

Abdominal muscular endurance demonstrated a marked sex-wise difference. Average to excellent performance was observed in 84.2% of males compared with 44.3% of females, whereas very poor performance was observed in 33.6% of females and 5.3% of males. These differences may be related to variations in habitual physical activity, participation in strengthening exercise, or physiological factors; however, these variables were not measured and therefore cannot be considered established explanations. The findings indicate that abdominal and general strengthening activities may require particular attention within physiotherapy education.

The differences among fitness components suggest that satisfactory flexibility and body composition do not necessarily indicate adequate overall fitness. Correlation analysis involving BMI, flexibility, cardiovascular endurance, and muscular endurance may clarify whether these components are related within the present sample. Strong associations could support an integrated programme combining aerobic conditioning, resistance training, core strengthening, and flexibility exercises, whereas weak associations would favour individualized strategies targeting specific deficits. Future analyses should report correlation coefficients with confidence intervals and significance values while accounting for potential confounders such as age, sex, physical activity, sedentary behaviour, diet, sleep, and academic workload.

Year-wise differences should be interpreted cautiously because the cross-sectional design does not determine whether fitness changes with academic progression. Observed variation may instead reflect differences in lifestyle, academic workload, clinical exposure, and individual activity levels. Longitudinal studies are required to establish changes throughout physiotherapy education[12].

The findings have implications for both student health and future professional practice. Inadequate fitness may affect the performance of physically demanding clinical tasks and could contribute to work-related musculoskeletal problems[2,31,32]. In addition, healthcare professionals personal activity behaviours may influence their physical activity counselling

practices[16]. Regular fitness screening and structured programmes involving aerobic exercise, strengthening, flexibility training, and reduction of prolonged sedentary behaviour may therefore be beneficial. Systematic reviews also support the use of structured and supportive strategies to improve physical activity among university students[26,9,30].

This study's strengths include the assessment of several fitness domains, the use of standardized field-based procedures, and the inclusion of male and female participants. However, its single-institution setting, convenience sampling, cross-sectional design, lack of assessment of lifestyle and psychosocial factors, and reliance on BMI limit the generalisability and interpretation of the findings. Future multicentre and longitudinal studies should examine the influence of physical activity, nutrition, sleep, sedentary behaviour, academic workload, and psychological factors. Intervention studies should also determine whether fitness programmes improve clinical performance, patient-handling competence, professional efficacy, and work-related musculoskeletal health.

Overall, physiotherapy students in this sample demonstrated favourable flexibility and generally satisfactory BMI, but cardiovascular and abdominal muscular endurance were less consistent. These findings support the integration of regular fitness assessment, individualized exercise planning, and structured physical activity promotion into undergraduate physiotherapy education.

Strengths and Limitations

The present study has several strengths. The use of standardised, field-based fitness assessments allowed comprehensive evaluation of multiple fitness components, including body composition, flexibility, cardiovascular endurance, and muscular endurance, using validated measures. The inclusion of both male and female participants enabled sex-specific analysis of fitness parameters. The study was conducted in a controlled testing environment with standardized procedures, ensuring consistency in data collection.

However, the study has certain limitations. The study was conducted at a single institution using a convenience sampling technique, which may limit the generalizability of the findings to other physiotherapy programmes or geographical regions. The cross-sectional design provides information regarding the current fitness status of participants but does not establish causal relationships or track changes in fitness over time. Additionally, factors that may influence physical fitness, such as physical activity level, dietary habits, sleep patterns, and academic workload, were not assessed in this study, limiting the ability to identify determinants of fitness outcomes. The use of BMI as the sole measure of body composition does not differentiate between fat mass and lean muscle mass, potentially misclassifying individuals with high muscle mass as overweight or obese.

Despite these limitations, the study used standardized physical fitness assessments and included a representative sample of undergraduate physiotherapy students, providing valuable baseline information regarding their physical fitness profile. The findings contribute to the understanding of physical fitness among future physiotherapists and highlight areas requiring improvement.

Recommendations for Future Research

Further multicentre studies with larger sample sizes are recommended to evaluate physical fitness among physiotherapy students from different geographical regions and educational settings. Longitudinal studies are needed to track changes in physical fitness throughout the academic programme and identify factors influencing fitness trajectories. Future research may also investigate factors such as physical activity level, sedentary behaviour, dietary habits, sleep quality, academic workload, and psychological factors to better understand their influence on different components of physical fitness. Additionally, intervention studies examining the effectiveness of structured exercise programmes, fitness education, and health promotion strategies in improving physical fitness among physiotherapy students are warranted. The relationship between physical fitness and clinical performance outcomes, including patient handling competence, work-related injury rates, and professional efficacy, merits further investigation to establish the clinical

relevance of maintaining optimal fitness among physiotherapists.

CONCLUSION

The present study achieved its objectives by assessing the physical fitness of undergraduate physiotherapy students using standardized fitness tests, including Body Mass Index, Sit-and-Reach Test, Back Scratch Test, Harvard Step Test, and One-Minute Sit-up Test. The findings revealed that the majority of participants had a normal Body Mass Index (61.3%) and demonstrated good upper and lower limb flexibility, with most participants achieving excellent to super flexibility scores. However, cardiovascular endurance and abdominal muscular endurance showed substantial variations between male and female students, with a considerable proportion of participants classified as below average or poor, indicating significant scope for improvement in these fitness components.

Among female participants, particularly concerning findings included 33.6% classified as very poor in abdominal muscular endurance and 25.0% classified as poor in cardiovascular endurance. Male participant's demonstrated better muscular endurance but showed 31.6% classified as poor in cardiovascular fitness. These findings highlight the need for targeted interventions to improve endurance components of physical fitness among physiotherapy students, especially considering the physical demands of their future clinical practice.

The presence of underweight (23.3%), overweight (9.3%), and obese (6.0%) participants further underscores the need for comprehensive health promotion strategies addressing both nutritional status and physical activity levels. Physiotherapy educators and curriculum developers should prioritize the integration of regular fitness assessment and structured exercise programmes within the educational framework to enhance overall fitness and functional capacity of physiotherapy students.

This study contributes to the existing body of knowledge by providing baseline data on the physical fitness profile of undergraduate physiotherapy students in Maharashtra, India, which may support future research and the development of fitness promotion strategies within physiotherapy education. Regular assessment of physical fitness and implementation of evidence-based interventions may help enhance the overall health, well-being, and professional competence of future physiotherapists, ultimately benefiting both healthcare practitioners and the patients they serve. The findings emphasize that while physiotherapy students demonstrate satisfactory body composition and flexibility, deliberate efforts are required to improve cardiovascular and muscular endurance to ensure optimal clinical performance and long-term occupational health.

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