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## Level of Physical Fitness Among the Students of the Healthcare Profession- A Cross-Sectional Study.

Deepika Ravichandra<sup>1</sup> Shashwath P Naidu <sup>1</sup>, Senthil Kumar E<sup>2</sup>

<sup>1</sup>Intern, R L Jalappa College of Physiotherapy, Sri Devaraj Urs Academy of Higher Education and Research.

<sup>2</sup>Lecturer, R L Jalappa College of Physiotherapy, Sri Devaraj Urs Academy of Higher Education and Research.

<sup>3</sup>Professor, R L Jalappa College of Physiotherapy, Sri Devaraj Urs Academy of Higher Education and Research.

Corresponding Author Email id: [shashwathspk@gmail.com](mailto:shashwathspk@gmail.com)

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### ABSTRACT:

**Background:** Physical fitness is a crucial determinant of overall health, functional capacity, and disease prevention. Healthcare students, despite being future promoters of health, are often exposed to a sedentary academic lifestyle that may negatively impact their fitness levels. **Objective:** To assess the level of physical fitness among students of various healthcare professions and compare the findings with established normative values. **Methods:** A cross-sectional study was conducted among 200 healthcare students from Sri Devaraj Academy of Higher Education and Research. Participants included students from multiple disciplines such as physiotherapy, medicine, nursing, and allied health care sciences. Physical fitness components assessed included body composition using waist-to-hip ratio (WHR), flexibility using the sit and reach test, cardiorespiratory fitness using Queens College test (VO<sub>2</sub> max), core endurance using McGill core endurance test, muscular strength using the handgrip dynamometer, and dynamic balance using Y-balance test. Data were analysed using descriptive statistics and presented as mean and standard deviation. **Result:** The mean age of participants was 21 ±1 years with nearly equal gender distribution. The average WHR (0.81±0.08) indicated normal body fat distribution. Flexibility scores (25.9±8.23cm) were slightly below normative values. The mean VO<sub>2</sub> max (49.4±12.5 ml/kg/min) suggested good cardiorespiratory fitness. Core endurance levels were moderate across flexor, extensor, and lateral muscle groups. Grip strength was within normal limits for males and females. Dynamic balance scores indicated good neuromuscular control. Gender-based comparison showed higher VO<sub>2</sub> max and grip strength in males, while females demonstrated slightly better anterior core endurance. **Conclusion:** Healthcare students demonstrated an overall moderate to good level of physical fitness, with some deficits in flexibility and muscular endurance. These findings highlight the need for structured physical activity programs to enhance fitness levels, which is essential for both personal health and professional competency in healthcare settings.

### INTRODUCTION:

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The American College of Sports Medicine (ACSM) explains physical fitness as “a set of attributes that people have or achieve that relate to their ability to perform physical activity.”<sup>1</sup> Physical activity promotes general well-being by allowing people to efficiently perform daily activities with vigor, without being overly tired.<sup>2</sup> Physical fitness is typically classified into two broad categories: health-related fitness and skill-related fitness. Body composition, muscular strength, muscular endurance, flexibility, and cardiorespiratory endurance are components of health-related fitness.<sup>1,2</sup> In contrast, skill-related fitness is important for a person’s performance in physical activities and sports and includes balance, coordination, power, speed, agility, and reaction time.<sup>1</sup>

Adequate level of physical fitness not only improves physical capabilities but also supports mental health, confidence, early onset of non-communicable disease and overall quality of life.<sup>1,2,3</sup> Waist-to-Hip Ratio (WHR) is a simple anthropometric tool used to assess the distribution of body fat. It is derived by dividing the waist circumference by the hip circumference. WHR is an important indicator of abdominal body fat; a higher WHR indicates greater visceral fat, which is strongly correlated with non-communicable metabolic and cardiovascular diseases.<sup>4</sup> Muscular strength assessed by handgrip strength is a reliable tool to estimate the overall muscular strength and general health. Grip strength can be measured using a dynamometer and reflects not only upper limb strength but also correlates with total body strength. Reduced grip strength is associated with a higher risk of disability, mortality and chronic conditions such as cardiovascular disease, metabolic disease and sarcopenia.<sup>5,6</sup>

Muscle endurance is the ability of the muscles to sustain contraction over time. Core muscle endurance refers to the ability of the trunk musculature to sustain contractions over time, which is essential for spinal stability and injury prevention.<sup>7</sup> McGill core endurance is a battery of tests that assesses trunk flexors, extensors and the lateral group of muscles. Adequate core endurance is essential for reducing the risk of lower back disorders, especially among healthcare students, due to sustained periods of sitting and standing in classes and clinical postings.<sup>7,8</sup> Flexibility is the ability of a joint to move through a full and free range of motion.<sup>1</sup> The sit and reach test is a field method to assess the flexibility of the lower back and hamstring. The test requires the individual to sit with legs fully extended and reach forward along a measuring scale. The maximum distance reached indicates the individual’s flexibility level. Reduced flexibility is associated with musculoskeletal conditions such as lower back pain.<sup>9,10</sup>

Cardiorespiratory fitness is the ability of the cardiorespiratory and circulatory system to supply oxygen to working muscles during sustained physical activity efficiently.<sup>1</sup> The Queens College step test is a submaximal exercise test that estimates the aerobic capacity as VO<sub>2</sub> max based on recovery of heart rate following stepping exercise at a standardised cadence. High cardiorespiratory fitness is associated with reduced risk of chronic cardiovascular and metabolic disorders.<sup>11</sup>

According to the world health organization (WHO) Global Health Observatory (2022), low physical activity is the fourth biggest risk factor for global mortality, resulting in around 3.2 million deaths per year worldwide.<sup>12</sup> Alarmingly, about 31% of adults-about 1.8 billion people-do not get enough physical activity, and this figure has increased by around 5 percentage points since 2010, with forecasts predicting that it will reach 35% by 2030.<sup>12</sup> WHO emphasizes the critical need to make physical activity a public health priority, especially for students and young adults, which will impact lifelong habits.<sup>12</sup> In addition to lowering healthcare expenses, investing in physical activity also improves population health and well-being by preventing major non communicable diseases (NCDs).<sup>12</sup>

Physical fitness has been demonstrated to improve lipid profiles by lowering triglyceride levels, increasing high-density lipoprotein (HDL) cholesterol levels, decreasing ratio of low density lipoproteins to high density lipoproteins (LDL-HDL), maintaining blood glucose levels and insulin sensitivity, lowering blood pressure, improving body composition by reducing abdominal adiposity, and improving weight control.<sup>13</sup> Physical activity reduces blood coagulation, increases endothelial function, improves coronary blood flow, and strengthens the heart.<sup>14</sup>

The increasing overweight and obesity prevalence is being identified as a major concern worldwide, affecting not just the general public but also those seeking health careers.<sup>15</sup> Regular physical activity is necessary for good health, yet many healthcare students do not meet the recommended amount of physical activity, and weight-related concerns are increasing among the students in medical and allied health fields.<sup>15</sup> Evidence suggests that healthcare students typically engage in sedentary behavior during their studies, which leads to lower physical fitness and

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increased health risk.<sup>16,17</sup> Such events may have a adverse impact on their health and academic performance and readiness for their future roles as healthcare professionals.<sup>17,18</sup>

Healthcare workers are expected to improve healthy lifestyles; students in these disciplines must begin and maintain acceptable physical fitness habits.<sup>19</sup> ACSM offers guidelines for physical activity that support fitness, health and disease prevention.<sup>1</sup> The guidelines suggest that individuals should participate in at least 150 minutes of moderate intensity aerobic activity or 75 minutes of vigorous intensity aerobic activity, or any equivalent mix of two each week.<sup>1</sup> At least weekly two days of Muscle-strengthening activity should be part of the exercise program to target all their major muscle groups.<sup>1</sup> Flexibility exercise component to increase joint range of motion should be performed at least two to three days a week.<sup>1</sup>

The degree of physical fitness among healthcare students has been evaluated in the past, but the majority of these studies have concentrated on only a few professional program students. This study aims to assess multiple components of physical fitness among students of various healthcare professions and compare them against established normative values, in order to give a complete picture of their fitness levels. The inclusive methodology of this study aids in the identification of fitness trends across students of various healthcare programs and facilitates the creation of focused physical activity and health promotion initiatives. This study aims to examine the physical fitness level of healthcare students to promote their health and, by extension, the health of the larger community they will serve.

### METHODOLOGY:

The ethical clearance for the cross-sectional observational study was obtained by Sri Devaraj Urs Academy of Higher Education and Research (SDUAHER/R&D/CRC/RJLCOPT-UG/48/NF/2025-2026). The sample size for the study was estimated using the single population proportion formula  $n = Z^2pq/d^2$ . Assuming a 95% confidence level ( $Z=1.96$ ), an expected prevalence of 50% , and a margin of error of 7%, the minimum required sample size was calculated to be 200 individuals of healthcare profession. The study assessed both male and female students of healthcare professions, including Bachelor of Physiotherapy, Bachelor of Medicine, Bachelor of Surgery (MBBS), Anaesthesia technology, Image technology, Masters of Physiotherapy, nursing, Respiratory care technology, Bachelor of Audiology, Speech and language pathology, Radio diagnostic therapy, Emergency medicine technician, Medical laboratory technician, Cardiac care technology of Sri Devaraj Urs Academy of Higher Education and Research. Students with contraindications for fitness assessment due to known medical conditions, such as cardiopulmonary, endocrine, or musculoskeletal disorders, were excluded from the study.

The components of fitness assessment included the anthropometric measurement of weight, height and WHR (figure 1),<sup>1</sup> flexibility assessment of hamstring and lower back using sit and reach test (figure 2),<sup>9</sup> cardiorespiratory fitness assessment using the Queens College step test,<sup>11,18</sup> core strength was assessed using the McGill core endurance test (Figure 2,4,5),<sup>7,8</sup> dominant side hand grip strength assessment was done using hand held dynamometer (Figure 6),<sup>21</sup> and balance assessment using Y balance test (Figure 7).<sup>22</sup> Each component was performed 3 times, and the best score was recorded for analysis. A break of 30 minutes between each trial was given for the Queens College step test and McGill core endurance test, and a 5-minute break for the grip strength assessment.



Figure 1

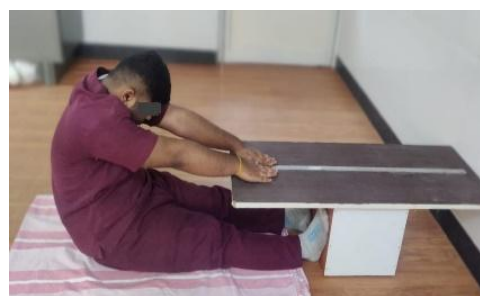


Figure 2

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Figure 3



Figure 6



Figure 4



Figure 5



Figure 7

### STATISTICAL ANALYSIS

The data were statistically analysed using SPSS software 23.0. Demographic characteristics and physical fitness levels of the participants were evaluated using descriptive statistics. To illustrate the central tendency and variability among the study participants, the results were displayed as the mean and standard deviation

### RESULTS

The majority of the students were young adults with an average age of  $21 \pm 1$  years. There were 98 male and 102 female students in the sample, representing a near equal gender distribution. The average height of the participants was  $164 \pm 11.5$  cm, with a body weight of  $59.8 \pm 15.3$  kg. (Table 1). The average WHR was found to be  $0.81 \pm 0.08$ . The mean score of flexibility assessment on the sit and reach test among the students was found to be  $25.9 \pm 8.23$  cm. Cardiorespiratory fitness examination using the Queens College test was used to calculate  $VO_2$  max, the participants showed a mean  $VO_2$  max of  $49.4 \pm 12.5$  ml/kg/min. McGill core endurance test assessed the participants' core endurance; the average flexor endurance time was found to be  $122 \pm 14$  seconds, the average extensor endurance time was  $118 \pm 4$  seconds, and the lateral musculature was assessed by bilateral side plank; participants showed an average lateral endurance time of  $70 \pm 4$  seconds. The right-hand average grip strength on the handheld dynamometer was  $34.2 \pm 12.5$  kg. Balance assessment on the Y balance test showed the right leg's average composite score of  $109 \pm 5\%$ , while the left leg's was  $106 \pm 5\%$ . (Table 2)

Table 1: Demographics of students

Variables	Mean $\pm$ SD
AGE	$21.0 \pm 1$ years
GENDER	MALE = 98 MEMBERS FEMALE = 102 MEMBERS
HEIGHT	$164 \pm 11.5$ [cm]
WEIGHT	$59.8 \pm 15.3$ [kgs]

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Table 2: Level of physical fitness among students of healthcare professions

Fitness parameters	Mean ±SD
WHR	0.81± 0.08
Sit and reach test (cm)	25.9±8.23
Vo2max (ml/kg/min)	49.4 ± 12.1
McGill anterior core endurance (sec)	122 ± 14
McGill posterior core endurance (sec)	118 ± 4
McGill lateral core endurance (sec)	70 ± 4
Y balance right composite score (%)	109 ± 5
Y balance left composite (%)	106 ± 5
Grip Strength R (kgs)	34.2 ± 12.5

Comparison of fitness parameters between the male and female students revealed the average WHR for male students was  $0.82 \pm 0.06$ , while the average for female students was  $0.80 \pm 0.10$ , the mean flexibility score of males ( $28.1 \pm 7.69$  cm) was slightly higher than that of females ( $23.9 \pm 8.24$  cm). Male students' mean VO<sub>2</sub>max was  $59.8 \pm 8.66$  ml/kg/min, while female students' was  $39.4 \pm 3.30$  ml/kg/min. The average anterior core endurance time of males was  $1.11 \pm 0.89$  minutes, while the average for females was  $1.33 \pm 1.83$  minutes, the average extensor endurance for males was  $1.21 \pm 0.50$  minutes, while the average for females was  $1.15 \pm 0.35$  minutes and the side plank mean duration among males was  $0.76 \pm 0.48$  minutes and among females was  $0.65 \pm 0.44$  minutes. Dynamic balance assessment on Y balance test composite score showed, on their right leg, males scored  $110 \pm 6$ , while females scored  $108 \pm 4$ . The left leg measured  $105 \pm 7\%$  for males and  $104 \pm 5\%$  for females. (Table 3)

Table 3: Comparison male and female physical fitness levels for students of healthcare professions

Fitness component	Male Mean ± SD	Female Mean ± SD
WHR	$0.82 \pm 0.06$	$0.80 \pm 0.10$
Sit and reach test (CM)	$28.1 \pm 7.69$	$23.9 \pm 8.24$
Vo2max (ml/kg/min)	$59.8 \pm 8.66$	$39.4 \pm 3$
McGill (sec)	$111 \pm 8$	$133 \pm 1$
McGill (sec)	$121 \pm 5$	$115 \pm 3$
McGill (sec)	$76 \pm 4$	$63 \pm 4$
Y balance right (%)	$110 \pm 6$	$108 \pm 4$
Y balance left (%)	$105 \pm 7$	$104 \pm 5$
Hand Grip right (kgs)	$45.1 \pm 7.40$	$23.8 \pm 6.68$
Hand Grip left (kgs)	$43.8 \pm 7.05$	$22.8 \pm 5.83$

**DISCUSSION:**

The current study, using a range of standardised fitness components, assessed the degree of physical fitness among healthcare profession students. The demographic data showed that young people made up the majority of the participants, suggesting that they were of an active age group and should ideally have good standards for physical fitness. The majority of participants had a waist-to-hip ratio within the normal range ( $<0.90$ ),<sup>4</sup> suggesting a normal body fat distribution and a low risk of cardiovascular disease.<sup>23</sup> The WHR findings of the current study are similar to studies of Büyüksesek et al. (2024).<sup>24</sup> These results imply that, on average, the participants kept their body fat distribution pattern within the normal range. Individuals with healthy body composition are less likely to develop metabolic disorders, as evidenced by the waist-to-hip ratio (WHR) being within the normal range ( $<0.85$  for females and  $<0.90$  for males).<sup>23,25</sup>

The flexibility of the lower back and hamstring was assessed using the sit and reach test. The average performance of the participants on this test showed slightly low flexibility when compared to normative standards, normative data for the sit and reach test for young people is between 27 and 36 cm,<sup>9,26</sup> this could be because of long sitting hours resulting in hamstring tightness. Good flexibility is crucial for maintaining posture and preventing injuries, especially for healthcare students who have to sit for long class hours and handle patients. The VO<sub>2</sub>max was calculated using the Queens College test, which showed good cardiorespiratory endurance among the participants. The level of aerobic capacity among the participants is considered to be a suitable level for young adults according to the ACSM, good aerobic fitness in young people is indicated by readings between 42 and 52 ml/kg/min.<sup>1</sup>

The McGill endurance test was used to assess core endurance. The findings indicated that the students had a moderate level of endurance of trunk lateral stabilisers, extensors, and flexors when compared to normative values. Trunk endurance is essential for spinal stability and to avoid low back pain,<sup>8</sup> which could be a major concern for healthcare students because of prolonged sitting and clinical work. The Y-Balance Test evaluated neuromuscular

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control and dynamic balance, the results of this test showed a good level of dynamic balance in both the right and left limbs among the participants, which is beneficial for functional stability and coordinated movement patterns.<sup>22,27</sup> Lastly, strength was assessed as a measure of grip strength, compared to normative data, adults aged 20 to 29 typically should have a grip strength of between 25 to 30kg for females and 45-50kg for men; in the current study, the male participants were within normal range while females participants had slightly lower grip strength.<sup>28,29</sup>

Overall, the findings show that the physical fitness of healthcare students is moderate to good. Variations in flexibility and endurance were observed, underscoring the significance of incorporating organised physical activity programs into the academic program. Promoting regular exercise, participation in sports, and ergonomic awareness can help them become more physically fit, which is essential for the students' success as healthcare professionals and their personal well-being. The present findings were largely similar to previous studies, with minor variations likely influenced by lifestyle and activity differences among university students.

### **CONCLUSION:**

The majority of participants in the current study had a good level of fitness across all components examined, including muscular strength, flexibility, core stability, cardiovascular endurance, and balance. According to the demographic parameters, the participants appeared to be young adults with a healthy body composition. Healthcare professional jobs often require physical exertion, postural control, or endurance and this study emphasizes the importance of physical fitness for both personal and professional health.

### **LIMITATIONS:**

The study was conducted in a single institution, which therefore reduces generalizability. Factors such as physical activity level, diet, and lifestyle habits were not assessed, which could influence the results. There could be potential selection bias due to voluntary participation, which can affect the strength of the findings.

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