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Association of Body Mass Index with Physical Fitness Variables Among Undergraduate Allied Health Students

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[1,3]Conception and design, Collection and assembly of data, [2-4]Analysis and interpretation of the data, [2,5]Critical revision of the article for important intellectual content, Statistical expertise [1-5] Final approval and guarantor of the article.

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A B S T R A C T

Background: The ability of the body to perform effectively and efficiently, enjoy leisure activities, stay healthy, fend off sickness, and handle emergency circumstances is known as physical fitness

Objective: To evaluate physical fitness and its association with BMI among undergraduate students of allied health sciences.

Methodology: This cross-sectional study with analytical design was carried out at Imran Idrees Institute of Rehabilitation Sciences, Sialkot from May to October 2022. The sample was raised using convenient sampling technique. The data was collected from 154 undergraduate students of allied health students aged 19-26 years. Clinical tests were used to evaluate physical fitness namely Harvard step test, pushups test, wall squat test, flexible test and toe touch. SPSS Version 16 was used for data analysis.

Results: The results of this study indicated that the mean age of the participants was 19.70±1.97 and the mean BMI was 23.70±3.48. Out of total,77(50%)participants had normal weight, overweight was (n=6,39%) Underweight 17(11%).Harvard step test showed 80(51.9%) of the recruited participants had poor physical fitness, below average were 40(26%), average 23(14.9%), good 6(3.9%). Chi-square test showed a strong association between BMI and physical fitness variables (Harvard step p=0.00, left shoulder flexibility p=0.0006, right shoulder flexibility p=0.01,pushups p=0.00,wall squat p=0.00) computed as p< 0.05.

Conclusion: It was concluded in this study that was associated with physical fitness and its variables among allied health students

Keywords: Harvard Test, Physical Fitness, Strength

Introduction

The ability of the body to perform effectively and efficiently, enjoy leisure activities, stay healthy, fend off sickness, and handle emergency circumstances is known as physical fitness.[1] physical fitness was to encourage students to actively engage in physical activity, form a regular exercise habit, and enhance their level of physical and mental well-being. Obesity, cardiovascular disease, skeletal health, and mental health outcomes all have a relationship with physical fitness levels.[2] There were strong evidence that physical fitness and the activities that influence it can lower the risk of illness and premature mortality. Additionally, physical fitness can enhance cognitive functioning and increase one's capacity for relaxation, which is frequently a nourishing social understanding.[3] According to the World Health Organization (WHO), the leading contributor to death and disability is a decline in physical activity.[4] Federal physical activity guidelines advise adults to engage in at least 150–300 minutes of moderate-intensity aerobic activity, 75–150 minutes of vigorous-intensity aerobic activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity each week in order to achieve significant health benefits.[5] Adopting and maintaining an active lifestyle is influenced by several variables, including socioeconomic level, environmental circumstances, health state, and cultural influences.[6] Physical fitness is a

collection of qualities that are either performance- or health-related, or both. Therefore, it is necessary for everyone to maintain a healthy body and mind, not only athletes, in order to boost performance. A person who is physically fit has their body's systems operating at their peak potential, especially their circulatory, pulmonary, and musculoskeletal systems. The human body will feel a demand for extra oxygen during physical exercise, which will cause an increase in heart rate, the activation of the sympathetic nervous system, as well as an increase in breathing rate.[6] Physical fitness has been widely measured by Harvard step test. The Harvard Step Test, a type of cardiorespiratory endurance test that gauges fitness and the capacity to recover from strenuous exercise used in this study. The Harvard Step Test involves walking up and down on a platform for three to five minutes. Any movement of the body that is caused by skeletal muscles and energy expenditure is considered to be physical activity. Regular exercise has a cardio protective effect on health in youth and as people age. Physical fitness is said to contain five components aerobic capacity, muscle strength, muscular endurance, flexibility, and body composition are the first four factors. Therefore, when one's physical fitness is evaluated, one is actually evaluating how well each of these systems is functioning. Because of this, physical fitness is now considered to be one of the most important health indicators and a reliable predictor of illness and mortality from cardiovascular disease (CVD) and other causes.[1]

The primary objective was to determine the students' level of fitness and to evaluate the association between BMI and variables of physical fitness tests. This research will assist students in enhancing their degree of physical fitness to that demanded by their profession. They would learn about their degree of physical fitness. After carefully examining the data, students were able to estimate the amount of fitness improvement that was necessary.

Methodology

This was Analytical cross-sectional study conducted at Imran idrees institute of Sialkot from 6-May- 2022 to 7-oct-2022 with ethical approval IIIRS/DPT/PRI/IRB-466 from institutional review board. The inclusion criteria was followed. Before data was collected, a brief description of the students' fitness level was given. Using a random sampling procedure, both male and female students were chosen at random. The sample size was 154 with a confidence level of 95% and an error margin of 5% (population estimated in Allied Health sciences Sialkot was 300). The Sample size was calculated using the formula: n= (Z2 × P×(1-P)/ e2, where Z= Confidence level (Z=1.95 for 95% CI), P=expected true proportion and e=desired precision (0.05 for 5%).(6) The Students of undergraduate level in physical therapy took part in this study. Male and female were selected with an age limitation of 19 to 26 years. The research did not include any student with genetic disease and who had undergone surgery to reduce their range of motion and who had sustained any trauma lasting at least six months. Before obtaining data, the study's purpose was first explained to the students. The information that the responders gave was kept private. Data from female students was collected while keeping in mind their moral standards, under the guidance of a senior female physiotherapist. The students were assured about the confidentiality of their share data. Strength was assessed individually for the lower and upper limbs using the wall squat test and the push-up test. BMI was calculated using the subjects' weights as measured by a weight machine and their height as measured by an inch tape and converted to meters square.[7]

Table I: demographic Profile of Participants.

	Category	Frequency (%)
Age of the participant	18-20	66 (42.9%)
	21-23	41 (26.6%)
	24-26	47 (30.5%)
Gender	Female	153(99.3%)
	Male	1(0.64%)
Body Mass Index	Under weight	17 (11%)
	Normal	77 (50%)
	Over weight	60 (39%)
	1st-year	46(29.9%)
YEAR OF STUDY	2nd –year	38(24.7%)
	3rd- year	41 (26.6%)
	4th – year	29(18.8%)
Socioeconomic Status	Lower	68(44%)
	Middle	51(33.1%)
	Upper	35(22.7%)
Residency	Rural	77 (50%)
	Urban	77 (50%)

Results

The mean age of the participant were 19.70 ± 1.97 and who were18-20 years (66)42% and age of the participant 21-23 years (41)26.6% and age of the participant 24-26 (47)30.5%.The results of mean BMI showed that out of the total participant were 23.70±3.48 underweight (17)11% and normal (77)50% and BMI of the over- weight were (60)39% (Table.No.1).

The participants showed the result of Harvard step test grading were poor 80 (51.9%)and participants with low-average (40)26% average (23)14.9% Good (6)3.9% and excellent (5)3.2%.The wall squat test indicated that participants with Excellent were(16)10.4% and above average in physical fitness were(16)10.4% average(37)24% while in below

average(61)39.6% and poor in physical fitness(24)15.6%t in toe-touch showed participants were flexible (77)50% and non-flexible (76)49.4%.pushups indicated very poor (39)25.3% poor were(88)57.1% below average were in physical fitness (24)15.6%,average were(3)1.9% (Table 2)

Table II: Fitness Profile of Participants		
Outcome	**Grading**	**N(%)**
Harvard step test	Poor	80(51.9%)
	Low-average	40(26%)
	Average	23(14.9%)
	Good	6(3.9%)
	Excellent	5(3.2%)
Wall squat test	Excellent	16(10.4%)
	Above average	16(10.4%)
	Average	37(24%)
	Below average	61(39.6%)
	Poor	24(15.6%)
Toe touch	Flexible	77(50%)
	Non-flexible	76(49.4%)
Push-ups	Very poor	39(25.3%)
	Poor	88(57.1%)
	Below average	24(15.6%)
	Average	3(1.9%)
	Above average	0(0%)
	Good	0(0%)
	Excellent	0(0%)
Shoulder flexibility		
Right	**Flexible**	60(39%)
	Non-flexible	94(61%)
Left	**Flexible**	58(37.7%)
	Non-flexible	96(62%)

Table III: Association Between BMI and physical fitness variables.		
	variables	p-value
BMI	Harvard step test	0.00≤0.01
	Left shoulder flexibility	0.006≤0.01
	Right shoulder flexibility	0.001≤0.01
	Toe-touch	0.00≤0.01
	Pushup test	0.00≤0.01
	Wall squat test	0.00≤0.01

Shapiro- Wilcoxon test showed that the data was not normally distributed (0.000) hence rejecting the null hypothesis. The association between BMI and physical fitness variables was evaluated with chi-square test and showed signification association (Harvard step; Toe-Touch, Push-up, wall squat p=0.00, Left shoulder flexibility p=0.0006, Right shoulder flexibility p=0.01) computed as p≤ 0.05. (Table 3)

Discussion

This cross-sectional study was conducted at Imran Idrees Institute of Rehabilitation Sialkot on 154 undergraduate students of physical therapy. The results obtained from this study revealed that there was a significant correlation between physical fitness variables and body mass index Harvard step test(p≤0.05) In contrast a analytical observational study conducted in 2021 in adolescent aged with 14-15 years. Demonstrated that when pearson test(r=0.276,p=0.021) a significant relationship between body mass index and physical fitness variables.[8] Current study showed the result of physical fitness which is significantly associated with BMI. The study concluded that wall squat test (p=0.00≤0.05), flexibility of right shoulder (p≤0.05) and left shoulder were (p≤0.05) showed significant correlation between physical fitness variables. As increase in BMI showed decreased muscular endurance of the participants.

Another cross-sectional study conducted to analyze the relationship between physical fitness and body mass index among children and adolescent 2022 in Xinjiang china with aged 7-18 years and divided the age into two groups (13-15yrs,16-18yrs) and other one was (7-9yrs,10-12yrs) this study showed curvilinear relationship between body mass index and physical fitness in children and adolescents with normal BMI higher physical fitness(R2= 0.001 to 0.182). And range of pearson correlation showed results(0.048 ~ 0.744) this study concluded that Lower performance was seen in kids and teenagers whose BMI was higher of the normal range.[9] This study showed the mean BMI 23.70±3.48 of the participants and classified into underweight=11%, normal=50% and overweight were 39%.

Another study in 2022 conducted on final year students of the Rzeszow University took 100 participants with age 19-23 which were divided in two age groups Group-I with age 19 and group II with age 23 which showed the results of BMI mean to be 10.99±6.0.and mean of the group II were 13.40±8.02.[10] Stress, anxiety and Sedentary behavior in university students that effect the physical and mental health of the students, which were leads to be decreased physical fitness.[11] Physical inactivity in undergraduate students is due to lack of time.

Increased in Body Mass-Index a prominent factor of obesity Failure to limit calorie intake or inadequate energy expenditure are the two main causes of the increase in obesity.[12] Contrasting to this study showed the result of physical fitness which is significantly associated with BMI. The study concluded that wall squat test (p ≤0.05),flexibility of right

shoulder (p≤0.05) and left shoulder were (p≤0.05) showed significant correlation between physical fitness variables. As increase in BMI showed decreased muscular endurance of the participants. Another study conducted in university Nigeria Surabaya in 2020 measured the physical fitness among university students .Took 490 sample size the criteria muscular fitness measured between male and females students showed mean muscular endurance Mean were(51.90±36.63) which showed students had below average in muscular endurance BMI mean(19.36±8.73) and flexibility Mean were (21.30±22.56).[13] Current study showed the significant association between the BMI and physical fitness variables Harvard step test showed (p≤0.05)and pushup test and toe-touch test (p≤0.05) which showed that as the BMI increased physical fitness of the students decreased. In 2019 Another cross sectional study conducted in Brazilin youth to evaluated the correlation of physical fitness results showed that curvilinear relation of BMI and physical fitness. BMI aged group between 10-17 and divided into groups. One- Way ANOVA test used in their study. Mean BMI of girls (21.3±3.7) and boys Mean were(21.6±4.1). pushups test used for muscle endurance Mean of girls pushups(11.6±7.9) boys were(17.3±10.8).[14] Current Study showed the significant relation of physical fitness with BMI. Mean BMI were(23.70±3.48).In 2020 Another study conducted in italian children aged group were 6-11 showed association of physical fitness with BMI sample size divided into two separate groups of girls and boys the increased in BMI with age 6-11 Mean were (+0.05 and +3.3kg per year) in both girls and boys and differed significantly between girls and boys (p<0.001) boys with aged 9-10 years Mean were(+0.48and 0.52kgm^{2}per year) differed significantly between girls and boys (p<0.002) showed with increased in age of the children also increased BMI in both genders and significantly physical fitness of both gender decreased and Flexibility were (+107.1and 100.0% p<0.004) Muscular power of arm were(p<0.024).[15] For physical fitness students even aware of their level of fitness, which is needed to meet professional obligations. The data was collected from single setting. Therefore, additional evaluation is necessary at different physical therapy institutes to determine the level of their physical fitness. Male students can be the subject of future research because more data regarding them have been collected than on females. The study recommends future research for final year students based on the data obtained from third to final-year students

Conclusion

It was concluded in this study that the BMI was associated with physical fitness and its variables.

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