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Comparative study on the Body Physique and Physical Fitness Indexes of Chinese Male University Students and Pakistani Male International Students in China

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ABSTRACT

Background: The body, physique and physical fitness of the university students of two countries would be different because their living environments are different. Therefore, this was arranged to assess the body shape, body function, and physical fitness of Chinese and Pakistani university students who study in China.

Methods: Data was collected from (n = 30) Pakistani and (n = 30) Chinese students. The selected variables were anthropometric measures, physical fitness, and physiological tests. Independent t-test and Pearson of correlation were applied for the statistical analysis.

Results: results depict the Pakistani students were significantly superior to Chinese students in BMI ($P < 0.00$, shoulder length ($P < 0.04$), step test ($P < 0.03$), standing long jump ($P < 0.00$) and significantly inferior in sitting height ($P > 0.05$), heart rate ($P < 0.00$), percentage of fat ($P < 0.00$), sit and reach ($P < 0.00$). There was significant correlation with waist circumference ($P < 0.03$), waist hip ratio (WHR) ($P < 0.00$), and negatively correlated to weight ($P < 0.01$), systolic blood pressure with diastolic blood pressure ($P < 0.00$). Bone mineral density was negatively correlated with heart rate ($P < 0.03$), and body fat ($P < 0.01$).

Conclusion: the higher body size of Pakistani students is genetically affected, and the lesser in body composition and physical fitness is affected by their lack of physical activities. The study provides a layout of a chart to profile the physical status of Pakistani and Chinese university students.

Keywords: Body Mass Index (BMI), University students; physical qualities; body shape.

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INTRODUCTION

The physique influenced is directly by the economy of a country. Body composition is an important content to judge people's physique as the USA and Japan have investigated the body composition of their students in 19century [1]. The term physique relates to three disciplines of another and medicine [2]. Besides hereditary factors, sports training, and nutrition intake [3]. Physique is caused by the difference of race and influenced by the lifestyle, geographical location, age, living habits, food preference, and even ethnic beliefs. It can be changed with the way of physical activities as reported that the heart rate of the Chinese university students is better because of more participation in sports than Pakistani university students [4], and body mass is also affected [5] the sports participation.

University students are an essential cornerstone for the development of society, though receiving education, moral cultivation, and a strong body and perfect personality. Unfortunately, the international health monitoring results show that the overall physical quality of the students has decreased, and the rate of obesity has increased [6].

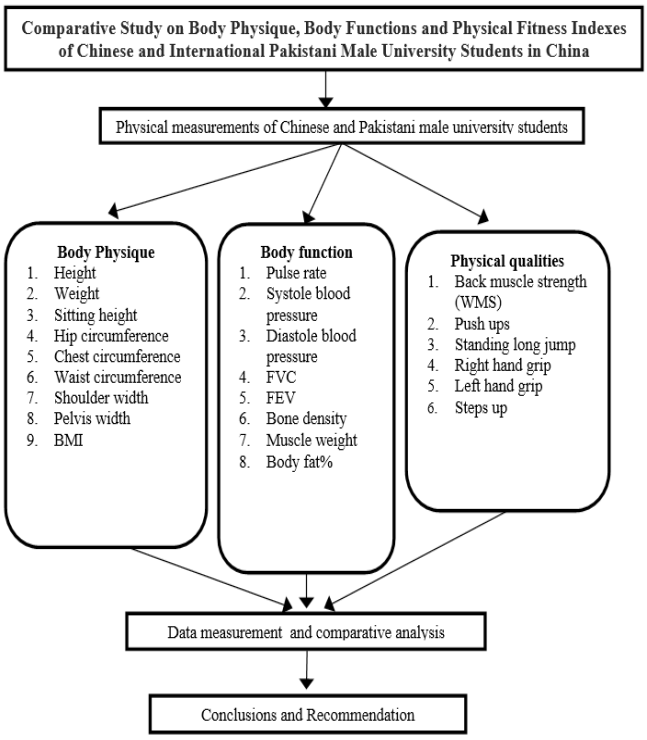
The contributory factors of the poor physique in Pakistani students are environmental changes, urbanization, lifestyle modification, high-density diet consumption, and decreased physical activity [7]. All countries, including Pakistan and China, focus on healthy populations. The political, environmental, educational, and cultural differences between China and Pakistan have created people to grow up in different contexts, thus having a significant and far-reaching impact on physical fitness and health. By comparison, we find a significant difference in physical education models between universities in the two countries; as per the exam WHO, around 26% of women in Pakistan suffer from obesity while just 19% of the men are obese. A report of 2013 exposed that the rate was 28% for men and 38% for women, which is a vast gap between the two genders. Obesity is higher in urban areas, 56% in men and 67% in women compared to rural areas; approximately 3.4 million people died because of obesity [8]. In contrast, Chinese men peaked at 20.0% in 1999 and dropped to 5.56% in 2016 [9].

Pakistani students in China have many opportunities to participate in physical exercise, but lack of effective organization, management, and guidance results in health degradation [10]. Studies have pointed out that Pakistani students' body mass index (BMI) is generally higher than that of the average Chinese university student. So, in this case, how Pakistan students' physical condition in China, what's the difference between China and Pakistan students' constitution, what is the cause of the difference is that we need to be addressed. This research compares Chinese and Pakistani university students in body shape, body function, and physical quality. The paper has explicitly aimed to discover the problems existing in the body constitution and probe the elements that affect the health condition of university students [11].

METHODS & MATERIAL

This study compares the morphological functions and physical fitness of (n = 30 Pakistanis university students in china and (n = 30) Chinese university students. The age of Chinese students was 26.13 ± 1.008 years old, and the Pakistani students were 26.63 ± 1.033 years old. The willingness of data collection was obtained through consent letters by all participants.

Figure 1: Diagram illustrating the search strategy



Physique Measurement

The anthropometric measurement was obtained by following the international standard as suggested [3, 12]. Height measurement was obtained in (cm) refers to the straight-line distance from standing on the horizontal ground to the top of the head. It was measured in light clothes to avoid data accuracy caused by wearing clothes. Bodyweight reflects the horizontal growth of the human body. Weight is usually measured with an electronic weighing device to keep the body upright and away from other objects. Chest circumference (cm) was obtained from large chest volume and substantial chest and back muscles are conducive to improving the respiratory system and circulatory function of the human body and maintaining the normal body shape. Keep your body still and upright, relax, and wrap the tape around your chest. Waist circumference reflects the state of fat accumulation around the waist. Here's how to do it: Keep your feet straight, keep your feet apart (25-30cm), pass a ruler through your navel with one finger (0.5-1cm), and wrap it horizontally around your waist. Hip circumference (CM): Keep relaxed and measure hip level for a week. Sitting height: This is a measure of trunk length. Subjects sit with their feet on the floor, lower back and shoulders against a wall, their eyes looking straight ahead, and distance measured from the height of the floor and box and subtracted from the total distance. Body mass index (BMI): A measure of a person's

obesity, usually expressed as a weight (kg)/ height (m) 2. Shoulder width is used to measure the horizontal distance between two shoulders. Calipers, rulers, or tape measures are the best. Pelvic width: Touch the anterior superior iliac spine on both sides and measure the distance between the lateral margins of the anterior superior iliac spine on both sides.

Measurement of body functions

Bodily functions are measured according to the guideline of [5] to reflect the collaborative work of various systems within the human body. It directly reflects a person's physical health, when the measurement is generally taken heart rate (quiet state), blood pressure and vital capacity, and other main indicators. Heart rate: Refers to the number of beats per minute, reflecting the functional state of the heart and arteries. Measurement method: touch wrist or cervical artery with finger belly for 1 minute, the pulse is 60 times/ minute 80 times/minute when the average person is quiet. Blood pressure: Keeping people's arterial blood pressure stable is important for productive activities and lifestyle. lung capacity: measuring the maximum ventilation capacity. Vital capacity has three basic correlations: volume, time, and flow. Measurements of vital capacity include: 1 second forced expiratory volume (FEV1), maximum forced vital capacity (FVC), maximum air and vital capacity (VC), and inspiratory vital capacity (IVC). Bone mineral density: The bone mineral density test is a simple, non-invasive test that measures bone mineral density or the volume of calcium and minerals in the subject's bone tissue.

Physical Fitness Measurement:

The physical fitness measurements were obtained as guided [2, 4]. A handgrip dynamometer was used to measure handgrip strength. The tested person squeezes the grip once with full strength and reads the value. His/her left and right hand can alternate for 2-3 times and record the maximum value in kg. The handle of the grip was adjusted before exerting force. The sitting forward bend was used to measure the flexibility of the back and legs. Subjects take off their shoes, sit on the floor, knees fully extended, feet shoulder-width apart, feet close to the end of the instrument, subjects' arms parallel, palms down, legs straight, upper torso as far forward as possible. After three times of practice, begin measurement at the fourth time, and record the distance. The legs must be kept straight, the soles of the feet against the bottom of the instrument, and the fingertips touch each line. Push-ups were used to measure the strength and endurance of the upper body muscles. Subjects begin in the prone position, hands under shoulders, arms straight, fingers forward, legs straight and parallel, slightly apart (about 15-20 cm), feet in front of palms support feet, knees straight. The subject bends the elbow and lowers the body until the elbow is at a 90-degree angle, with the upper arms parallel to the floor and then straightening the elbow joint. Push-ups are performed in conjunction with a metronome (or tape, clap, drum) and are performed every three seconds until the subject no longer completes the next movement at the required speed. Record only the number of push-ups completed in the correct form and rhythm. Standing long-jump is a common and easy-to-implement leg explosive power test, which is simple and fast, and it can be completed only by simple measurement. Equipment requirements: the use of tape measures jump distance, in a non-slip floor, land surface is preferred. Explain the test procedure to the subject, check and calibrate the equipment before the test, do warm-up exercises to prevent injury, and the jump line should be marked. The subject will stand behind the designated marking line. Take off with arms swinging back and legs bent; after landing, do not fall back, allow three attempts. Measure distance from marker to heel, jump 3 times, take the value of the longest distance.

Dorsal muscle strength is used to test the stability and strength of the core area, which can important rehabilitative effect on relieving or preventing back pain. Equipment: Isokinetic force meter. Set the dynamometer to zero before starting. The subject's arms drop naturally with both hands holding the center of the bar, palms facing the body, adjust the chain so that the knees are bent about 110 degrees. In this position, the subject's back is slightly forward; the head remains upright, visual forward, and tries to stretch the chain without bending the back. Used to measure cardiovascular endurance. A 50cm bench, stopwatch, and metronome. Subjects are explained the testing process, informed of health risks, and given consent. First demonstrate alternating cadence to the subjects, have them practice and follow the metronome's rhythm, set to 96 beats per minute, and complete three minutes on the stool with left and right feet alternating up and down, maintaining a stable four-beat cycle. After three minutes, sit the subject and remain still. Check the subject's heart rate (preferably with a stethoscope). Measure the subject's heart rate for one minute.

RESULTS

On the tendency of development of student body constitution, every nation presents the same tendency. To understand deeply the body configuration and function index of different nations, I used the mess of information of Chinese and Pakistani male university students and then judge the body morphology and function index between Chinese and Pakistani male students and obtained the difference of body constitution health [12, 13]. Some of the parameters ranging in the Normal Index list among Chinese and Pakistani male students are listed.

Table 1. T-test results between Chinese universities and Pakistani students body morphology

Indicators	Pakistan		Chinese		T	P
	$\bar{x}$	Sv	$\bar{x}$	S		
Height	173.31	5.10	175.79	6.89	-1.58	0.12
Weight	75.25	8.89	71.37	10.19	1.57	0.12
Sitting Height	74.92	3.79	80.05	4.80	-4.58	0.00
Hip circumference	100.95	4.59	98.15	6.33	1.96	0.05
Chest circumference	90.76	4.62	91.58	5.50	-0.62	0.54
Waist circumference	84.79	5.375	82.70	6.36	1.37	0.15
WHR	0.83	0.33	0.84	0.48	-0.11	0.91
BMI	25.24	2.57	22.91	2.21	3.75	0.00
Shoulder width	39.97	3.08	38.41	2.73	2.06	0.04
Pelvis width	29.31	3.77	29.13	3.69	0.19	0.85

ABSI(m11/6kg-2/3)	0.07	0.0040	0.077	0.0037	-2.29	0.03
ABSI Z	-1.117	1.14	-0.43	1.07	-2.38	0.02

P<0.05 was statistically significant

Using the independent sample T-test that BMI $P < 0.00$, shoulder height $P <. 0.04$, sitting height $P <. 0.00$, ABSI value $P <. 0.01$, ABSI Z value of $P <. 0.02$.

Table 2. T-test results between the physical function of Chinese and Pakistani male university students

Indicators	Pakistan		Chinese		T	p
	$\bar{x}$	S	$\bar{x}$	S		
Pulse rate(1/min)	65.70	12.14	78.60	13.43	-3.90	0.000
Systole B.P(mmHg)	120.03	13.12	123.27	11.24	4-1.02	0.310
Diastole B.P(mmHg)	73.97	10.43	77.57	7.89	-1.50	0.310
FVC(1)	3.04	0.65	3.34	0.95	-1.40	0.166
FEV_1(l)	2.71	0.60	3.02	0.93	-1.52	0.133
FEV_1/FVC(%)	89.40	10.32	90.00	9.60	-0.23	0.817
Bone density(straight)	0.34	0.03	0.35	0.03	-0.33	0.74
Bone density T value	1.01	1.014	-0.38	0.77	6.02	0.000
Muscle weight(kg)	51.95	4.67	53.45	6.22	-1.05	0.296
Body fats %	24.52	4.36	18.53	4.24	5.39	0.000

P<0.05 was statistically significant

Table 2 results showed the Pakistani students were significantly higher in bone density were all ($P < 0.00$) and body fats ($P < 0.00$) than the Chinese students.

Table 3. T-test results between Chinese and Pakistani male University students' physical fitness

Indicators	Pakistan		Chinese		T	p
	$\bar{x}$	S	$\bar{x}$	S		
Back muscle strength (kg)	102.67	16.68	108.97	25.05	-1.14	0.256
Push-ups	25.47	11.75	37.97	11.64	-4.13	0.000
Sitting forward bend (cm)	7.58	8.63	15.64	8.12	-3.72	0.000
Standing Long jump (cm)	190.16	14.45	217.56	45.47	-3.14	0.003
Left-hand grip (kg)	41.86	6.57	41.99	7.17	-0.07	0.943
Right-hand grip (kg)	42.80	6.26	45.11	6.23	-1.43	0.158
Steps	64.19	11.21	58.64	7.76	2.22	0.030

P<0.05 was statistically significant

Table 3 showed that the Chinese students were significantly higher in push-ups $P < 0.00$, sitting forward bend $P < 0.00$, standing long jump were $P < 0.00$, and step $P < 0.03$ respectively than the Pakistani students.

Table 4. Comparison of inter-group variance analysis of physical patterns between Chinese and Pakistani university Students (N-60)

	Height	Weight	Sitting Height	Hip	Chest	Waist	WHR	Shoulder	Pelvis	ABSI	ABSI z
Weight	0.58**										
Sitting Height	0.62**	0.22									
Hip Circum	0.40**	0.74**	0.17								
Chest Circum	0.41**	0.68**	0.18	0.59**							
Waist Circum	0.28*	0.73**	0.01	0.73**	0.68**						
WHR	-0.03	0.24	-0.19	-0.02	0.36**	0.63**					
Shoulder width	0.17	0.24	-0.07	0.27*	0.25*	0.35**	0.23				
Pelvis width	0.37**	0.27*	-0.08	0.17	0.33**	0.35**	0.37	0.46			
ABSI	-0.03	-0.031*	0.01	-0.01	0.08	0.28*	0.46**	0.11	0.22		
ABSI z	-0.02	-0.34**	0.02	-0.02	0.02	0.28*	0.43**	0.10	0.19	0.94**	
BMI	-0.002	0.78**	-0.18	0.64**	0.54**	0.72**	0.31*	0.21	0.07	-0.3**	-0.33

P<0.05 was statistically significant

Table 4 showed ABSI is negatively correlated with weight ($P < -0.01$). The correlation between the ABSI z value and the waist-to-hip ratio is significantly correlated ($P < 0.00$), however, the ABSI z value is negatively correlated with BMI ($P < 0.01$).

Table 5. Comparative analysis of body functions variance between Chinese and Pakistani university students

	Pulse Rate	Systolic BP	Diastolic BP	FVC	FEV1	bone density	Bone density	Muscle weight	% Fat
SBP	0.03								
DBP	0.25	0.66**							
FVC	-0.02	-0.01	-0.04						
FEV1	-0.07	0.002	-0.09	0.91**					
Bone density	-0.05	0.15	-0.004	0.006	0.02				
Bone density	-0.28*	-0.03	-0.13	-0.09	-0.13	0.65**			
Muscle weight	0.15	0.09	0.02	0.46	0.43	0.11	0.03		
% of fat	-0.19	-0.04	0.04	0.03	-0.07	-0.05	0.32**	0.03	

Table 5 showed that systolic blood pressure was positively correlated with diastolic blood pressure ($P < 0.00$) and FEV1 was positively correlated with FVC ($P < 0.00$), bone mineral density was positively correlated with body fat ratio ($P < 0.01$). There was a negative correlation between BMD and pulse ($P < -0.03$).

Table 6. Correlation analysis of Physical qualities index of Chinese and Pakistani university students

	Back muscle strength	Push-ups	Sit-in front bend	SLB	LH grip strength	RH grip strength
Push-ups	0.40**					
Sit in front jump	0.10	0.48**				
Standing long jump	-0.12	0.36**	0.49**			
Left- hand-grip strength	0.47**	0.25**	0.36**	0.15		
Right- hand grip strength	0.57**	0.41**	0.38**	0.27*	0.72**	
Steps	0.05	0.02	0.08	-0.07	0.21	0.03

Table 6 showed the lumbar (waist) muscle strength is positively correlated with push-ups ($P < 0.01$), left hand grip strength ($P < 0.00$) and right-hand grip strength ($P < 0.00$). Push-ups and standing long Jump ($P < 0.01$), sitting forward bend ($P < 0.00$) was positively correlated; Sitting forward bend and standing long jump ($P < 0.00$), left hand grip strength ($P < 0.01$) and right-hand grip strength were positively correlated ($P < 0.00$). Standing long jump was positively correlated with the right-hand grip strength ($P < 0.00$).

DISCUSSION

This study is about the body physique, physical functions, and physical fitness of Pakistani and Chinese male university students. According to the results, the Pakistani male university students' BMI (means=25.24kg/m^2) was significantly higher than Chinese male university students' (means=22.91kg/m^2). The WHO classified BMI of >25kg/m^2 in the overweight range, so the Pakistani male university students were overweight which is by already reported study on overweight and BMI by Aneeqa et al. 2020 [14]. Lowry et al, 2000 [15] are reported that 35% of college students in the United States are overweight or obese. This definition is based on studies of Caucasians, who have higher body fat and lower BMI than Caucasians. According to WHO experts the association between BMI and disease in the Asian population is not higher as compared to other populations [16]. Wehigaldeniya et al, 2017 [17] have concluded that higher MBI has negative relation with academic performance in university students. To compare the prevalence of obesity between different races, Wang et al, 2002 [18] have established a good standard of body composition to study the BMI cut-off point for the Asian population. Petursson et al, 2011 [19] have found that waist circumference is more predictive of death risk. A recent WHO report summarized the evidence of waist circumference as a disease risk indicator, that waist circumference, and BMI are highly correlated (r=0.723), and epidemiological risk factors [20].

This study found that there is a significant difference in the z-scores of ABSI between Chinese university male students and Pakistani male international students (P <0.05). Sen et al, 2013 [21] have studied that at the same time, the study found that ABSI can independently predict the risk of new-onset diabetes. At a certain height and weight, relative to surrounding tissues, high ABSI may correspond to a higher proportion of visceral fat, an excessive proportion of visceral fat is related to various potential adverse metabolic changes. According to controlling of age and sex difference in mean ABSI, the body shape index of both countries' university students was in the normal range. Dhana et al, 2016 [22] have reported that ABSI is positively associated with fat mass and negatively associated with fat-free mass. The result from the study has shown that the Pakistani male university students' body function indicators; heart rate:(mean = 65.70) was lower than Chinese male university students (mean =78.60bpm) but there was no significant difference, WHO classified that 60-100bpm heart rate is in the normal range.

Pakistani male university students' systolic blood pressure and diastolic pressure was lower than Chinese male university students, but there was no significant difference, the normal range is 130/90mmHg, so the systolic and diastolic blood pressure rate was in the normal range in these two countries university students. Pascual et al, 2009 [23] have studied, in adults, high blood pressure is associated with several other markers of CV (cardiovascular) risk such as obesity, unhealthy nutrition pattern, and physical inactivity. Lin et al, 2010 [24] have studied, regular physical activity (PA), fitness, and exercise are critically important for the health and well-being of people of all ages. Pakistani male university students' bone mineral density t score (mean = 1.01) was higher than Chinese male university students (means=-0.38) there was a significant difference. The bone mineral density normal range is -1.0. Pakistani male university students' lean muscle was lower than Chinese male university students and Pakistani male university students' body fat percentage was higher than Chinese male university students and there was a significant difference. This meant that Pakistani university students have more fat than Chinese male university students. Chinese male university students FEV1, FVC was higher than Pakistani male university students, but there was no significant difference, this may relate to regular exercise. Lam et al, 1982 [25] found in their research that FEV1 and FVC are positively correlated with the square of the subject's height, which is directly proportional to the height itself. Qin et al, 1997 [26] have reported that the bone mass of Chinese university students will be stable or slightly decreased in the next 15 years. Male bone mineral density is significantly positively correlated with body weight.

The Chinese male university students had a better performance of the body quality indicators; push-ups; sit and reach; standing long jump; back muscle strengths; left-hand grip and right-hand grip than Pakistani male university students but there was a significant difference for sit and reach; push-ups and long jump and there was no significant difference for waist (Lumber) muscle strength; right-hand grip and left-hand grip. Chinese male university students highly participated in sports activities rather than Pakistani male university students. Jiminez, 2018 [27] pointed out in 2018 that push-ups test muscle endurance by comparing the length of time that muscle groups contract and release before fatigue. The Pakistani male university students were well performed than Chinese male university students but there was no significant difference, it may reflect of the geographical background of Pakistani male university students as Pakistan is called a country of hills desert, and forest.

CONCLUSION

The main purpose of this study is to understand the basic situation of the physical health of Chinese and Pakistani university students, to find out the differences between Chinese university students and Pakistani students through sample data, and to find ways to promote the development of physical health level, to improve the physical health of ordinary Chinese male university students and Pakistani male students in China. Physical form, physical function, and physical fitness indicators usually reflect the three major indicators of physical fitness, but also to monitor and improve the physical development of the two countries' physical health and healthy development of the main indicators. The study found that there are differences between Chinese university students and Pakistani university students in terms of body size and physical fitness, which shows that there are some differences in the physical fitness of students in the two countries, through the analysis of the differences between the values of

indicators to find the reasons for the differences, and put forward solutions, which provides a certain reference value for the establishment of standards suitable for Pakistan's standard physical health status.

Future Recommendations

This is the first research on the body shape, body function, and physical function and quality index of Pakistan university students which provides a scientific basis for the establishment of Pakistan National Fitness. The sample size in this study was small, so a larger sample size or more samples can be added in future studies to improve the reliability of data. In this study, only the body shape indicators, body function indicators, and physical fitness indicators of men were tested, and the study of women was not involved. Therefore, female university students can be investigated in future studies. According to this study, Pakistani students in China lack organized and disciplined of physical exercise and it is hoped that relevant departments can strengthen management in this regard, to promote Pak-China relations, conduct enrich extracurricular sports activities and make contributions to the physical health of international students and improve the health standard. Health education sessions should be conducted in institutions regarding nutrition per student's needs. A sedentary lifestyle and the rise of modern technology drastically affected human health. Emphasis should be on promoting physical activity and exercise among the students.

Conflicts of interest - The authors declare that there is no conflict of interest regarding the publication of this paper.

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