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Comparative analysis of anthropometric profiles among sprinters, middle distance and long distance runners

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Abstract

The study aimed to evaluate the anthropometric characteristics of sprinters, middle-distance runners, and long-distance runners, involving a total of 180 participants (60 in each group) selected from various stadiums in the Delhi region. Anthropometric measurements were taken following appropriate procedures. The data analysis encompassed descriptive statistics and an analysis of variance (F-Test). Significance was determined by applying the least significant difference (Post-hoc Test) when the F-ratio was significant. The results of the Analysis of Variance (F-Test) indicated that thigh circumference and calf circumference exhibited statistically significant differences at the 0.05 significance level among the anthropometric variables. However and body mass index did not show statistically significant differences.

Keywords: Anthropometric, sprinters, middle-distance runners, long-distance runners.

Introduction

Anthropometry is a branch of ergonomics that deals specifically with the measurement of people, particularly with measurements of body size, shape, strength and working capacity (Pheasant ST, 1998) [7]. This measurement data is used to describe or paint a picture of the user population for a particular measure of the body. By applying anthropometry, we attempt to design the working environment around the person, rather than placing constraints on them because they have to adapt to what is provided. If anthropometric factors are taken into consideration when products are designed, the outcome is likely to be increased acceptability, improved ease and efficiency of use, and therefore greater operational safety and cost effectiveness. When considering the design and use of equipment, the term 'average person' is often referred to and used. However, very few people would actually fit such a pattern. The body is made up anthropometrically of several functional parts, such as sitting height, forward grip reach, waist height and head circumference. Height is often used as a design criterion, but a 'tall' person can either have a long or short body and long or short legs. Thus, although many people will fit average garments (using clothing as an example), and garments can be sized to increase the probability of a reasonable fit, the efficiency of the garment or ensemble may be compromised, especially when free movement is further influenced by, for example, wearing breathing apparatus and a harness. When products are designed around the 'average person', many of the population are excluded from using them, since they fall well outside of this average. Physical anthropometry refers to the measurement of living human beings from the purpose of understanding human physical variation in various measurement aspects. In today's modern world, anthropometry plays a prominent role in all areas i.e. industry, in clothing designs, ergonomics, and architecture, where measure data about the distribution of body dimensions in the population are used to customize products. Changing lifestyles, nutrition and work out composition of population lead to great changes in the distribution of body dimension (Example Obesity epidemic) and require regular updating of anthropometric data measurement collection.

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Statement of the problem
Comparative analysis of Anthropometric profiles among sprinters, middle distance and long distance runners

Objectives of the study

The scholar took the study with the following objectives/purposes to justify the problem of the study

- To investigate the comparison among anthropometric variables of sprinters.
- To find out the comparison among anthropometric variables of middle distance runners.
- To analyse the comparison among anthropometric variables of long distance runners.

Hypotheses of the study

H₁: With respect to Anthropometric variables (BMI, Thigh and Calf Circumference) Sprinters were significantly different as compared to Middle and Long-Distance Runners. The difference in the above variables may be significantly different between Middle and Long-Distance Runners.

Limitations of the study

1. Certain factors such as the diet, healthy habit, style of daily living, heredity, mood state of the subjects, which might had effect on the result of the study, could not be controlled.
2. Age gap between selected subject was considered as a limitation of the study but contrary to it some factors like training age, tactics, experiences and body type etc. can affect the performance of the players

Findings

Table 1: Descriptive statistics of BMI of sprinters, middle distance runners and long-distance runner

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
BMI Sprinters	60	20.644	1.137	0.146	20.351	20.938
Middle Distance Runner	60	20.357	1.167	0.150	20.056	20.659
Long Distance Runner	60	20.370	0.694	0.089	20.191	20.550

Table 1 reveals the descriptive analysis of BMI of Sprinters, Middle Distance Runners and Long-Distance Runners. The mean and standard deviation values of BMI for Sprinters,

Selection of Subjects

To serve the purpose of the study 180 male athletes (Tracker) and age range from 17 to 25 years. 60 sprinters, 60 middle distance and 60 long-distance runners. They were drawn randomly from different parts (stadiums) of Delhi.

Due permission was sought from the stadium, authorities before collection of necessary data pertaining selected variables.

Level of significance

For testing the significance of difference in all the selected variables among Sprinters, Middle Distance Runners and Long Distance Runners the level of significance chosen was 0.05 level of confidence, which was considered adequate for the purpose of the study.

Selection of variables

The variables selected in the study were as follows:

S. No.	Variable	Test	Unit of Measurement
1	Body Mass Index (BMI)	Weight/Height ²	Kg/m ²
2	Thigh Circumference	measuring tape	Centimetres
3	Calf circumference	measuring tape	Centimetres

For testing the significance of difference in the selected variables among groups F-test was applied. The level of significance chosen was 0.05 level of confidence, which was considered adequate for the purpose of the study.

Middle Distance Runners and Long Distance Runners are M= 20.644, S.D = 1.137, M=20.357, S.D = 1.167, M= 20.370, S.D= 0.694, respectively

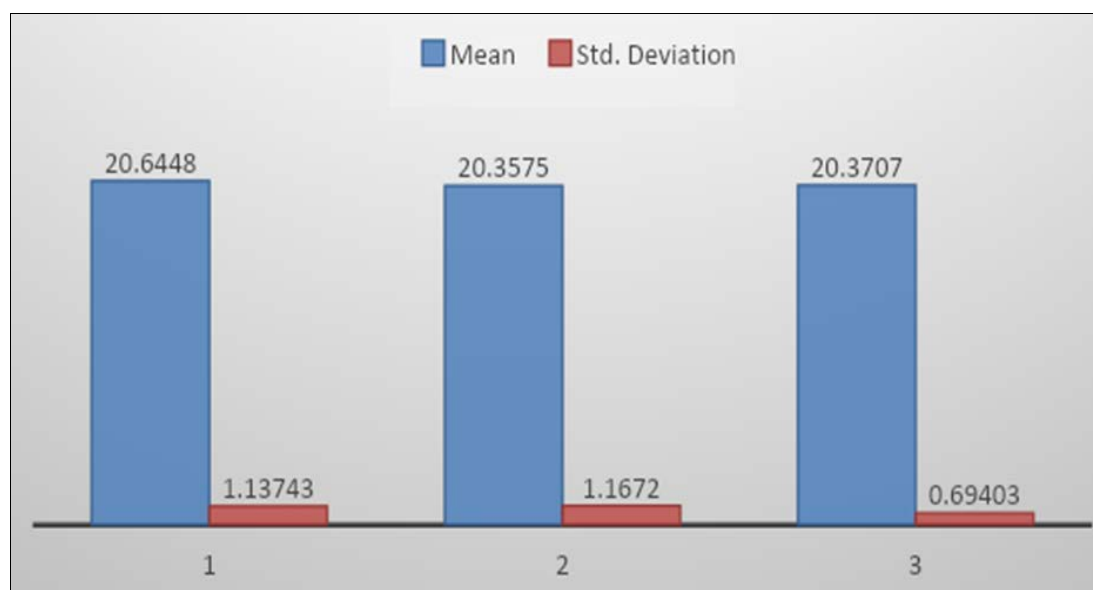


Fig 1: The means and standard deviation in respect of sprinters, middle distance runner, and long distance runner with regard to BMI are graphically presented

Table 2: Analysis of variance for BMI in respect of sprinters, middle distance runners and long distance runners

		Sum of Squares	DF	Mean Square	F	Sig.
BMI	Between Groups	3.158	2	1.579	1.510*	.224
	Within Groups	185.129	177	1.046		
	Total	188.287	179			

*Not significant at 0.05 level

The analysis of data in the above table clearly shows that the confidence with 2 and 177 degrees of freedom. F value of 1.510 is statistically not significant at 0.05 level of

Descriptive statistics of thigh circumference of sprinters, middle distance runners and long-distance runners

Thigh Circumference		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
						Sprinters	60
Middle Distance Runner	60	45.316	2.871	0.370	44.574	46.058	
Long Distance Runner	60	45.216	1.832	0.236	44.743	45.690	

The above table reveals the descriptive analysis of thigh circumference of sprinters, middle distance runners and long-distance runners. The mean and standard deviation values of

thigh circumference for sprinters, middle distance and long distance runners are M = 46.725, S.D = 3.335, M = 45.316, S.D = 2.871, M = 45.216, S.D = 1.832 respectively.

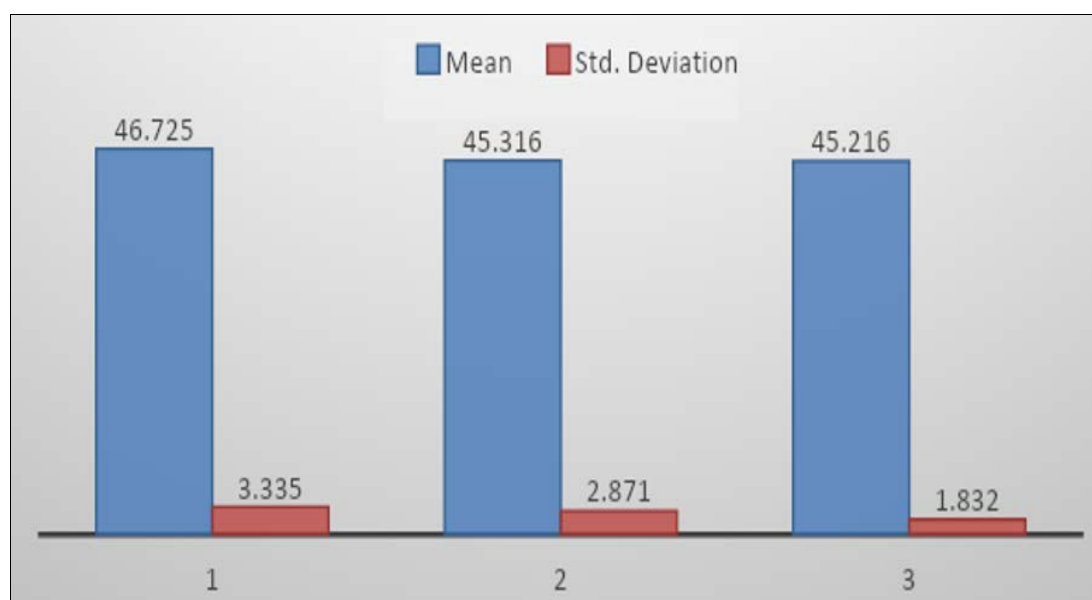


Fig 2: The means and standard deviation in respect of sprinters, middle distance runner, and long distance runner with regard to thigh circumference are graphically presented

Table 3: Analysis of variance for thigh circumference of in respect of sprinters, middle distance runners and long-distance runners

		Sum of Squares	DF	Mean Square	F	Sig.
Thigh Circumference	Between Groups	85.369	2	42.685	5.635	.004
	Within Groups	1340.879	177	7.576		
	Total	1426.249	179			

*Significant at 0.05 level

The analysis of data in the above table clearly shows that the F value of 5.635 is statistically significant at 0.05 level of confidence with 2 and 177 degrees of freedom. In order to ascertain the superiority of different groups i.e. Sprinters, middle distance runners and long distance runners with respect to thigh circumference, post-hoc test i.e. Least Significant Difference (LSD) Method was used and analysis of data pertaining to this is presented in the following Table.

Table 4: Post hoc test (Multiple Comparisons using LSD) in the case of thigh circumference with respect to sprinters, middle distance runners and long distance runners

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	95% Confidence Interval	
				Lower Bound	Upper Bound
				Thigh Circumference	Sprinters
Long Distance Runner	1.508*	0.516	2.500		
Middle Distance Runner	Sprinters	-1.408*	-2.400		-0.416
	Long Distance Runner	0.100	-0.891		1.091
Long Distance Runner	Sprinters	-1.508*	-2.500		-0.516
	Middle Distance Runner	-0.100	-1.091		0.891

*Significant at 0.05 level

Table 4 clearly shows that thigh circumference with respect to Sprinters is significantly higher as compared to middle distance and long-distance runners. The above table further

reveals that with respect to the same variable middle-distance runners and long-distance runners do not significantly differ from each other.

Descriptive statistics of calf circumference of sprinters, middle distance runners and long-distance runners

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Calf Circumference	Sprinters	60	33.775	2.118	0.273	33.227	34.322
	Middle Distance Runner	60	33.383	2.372	0.306	32.770	33.996
	Long Distance Runner	60	32.983	1.567	0.202	32.578	33.388

The above table clearly reveals the descriptive analysis of calf circumference of sprinters, middle distance runners and long-distance runner. The mean and standard deviation values of

calf circumference for sprinters, middle distance runners and long distance runners are M = 33.775, S.D = 2.118, M = 33.383, S.D = 2.372, M = 32.983, S.D = 1.567 respectively

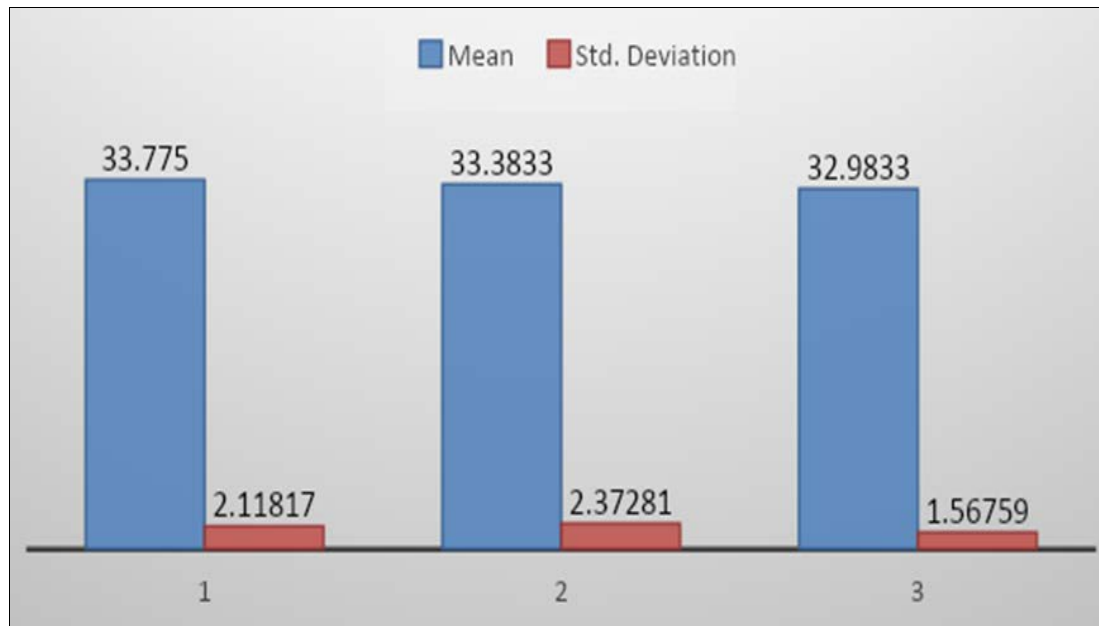


Fig 3: The means and standard deviation in respect of sprinters, middle distance runners and long-distance runners with regard to calf circumference are graphically presented

Table 5: Analysis of variance for calf circumference of in respect of sprinters, middle distance runners and long distance runners

		Sum of Squares	DF	Mean Square	F	Sig.
Calf Circumference	Between Groups	18.803	2	9.401	2.243	.109
	Within Groups	741.879	177	4.191		
	Total	760.682	179			

*Significant at 0.05 level

The analysis of data in the above table clearly shows that the F value of 2.243 is statistically significant at 0.05 level of confidence with 2 and 177 degrees of freedom.

In order to ascertain the superiority of different groups i.e. Sprinters, Middle Distance Runners and Long Distance

Runners with respect to Calf Circumference, post-hoc test i.e. Least Significant Difference (LSD) Method was used and analysis of data pertaining to this is presented in the following table.

Table 6: Post hoc test (Multiple Comparisons using LSD) in the case of calf circumference with respect to sprinters, middle distance runners and long-distance runners

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	95% Confidence Interval	
				Lower Bound	Upper Bound
Calf Circumference	Sprinters	Middle Distance Runner	0.391	-0.346	1.129
		Long Distance Runner	0.791*	0.054	1.529
	Middle Distance Runner	Sprinters	-0.391	-1.129	0.346
		Long Distance Runner	0.400	-0.337	1.137
	Long Distance Runner	Sprinters	-0.791*	-1.529	-0.0540
		Middle Distance Runner	-0.400	-1.137	.3376

*Significant at 0.05 level

Table 6 clearly shows that calf circumference with respect to sprinters is significantly higher as compared to long distance runners.

The above table further reveals that with respect to the same variable sprinters and middle-distance runners and middle distance and long-distance runners do not significantly differ from each other.

Discussion of Findings

The analysis of data employing Analysis of Variance (F-test) clearly reveals that with respect to anthropometric variables thigh circumference and calf circumference the obtained F values are statistically significant at 0.05 levels. In respect of Body Mass Index the values of F are statistically not significant. The above findings appear to be generally all right because sports persons are gifted individuals and in respect of anthropometric variables there is bound to be difference because sprints, middle distance and long-distance events require different anthropometric characteristics.

Technically 100meter sprint can be divided into three phases i.e., first phase of 40 m, second phase i.e., 40 m to 60 m and the last phase that is 60 to 100 m. In the first phase short sprinters have advantage because they have short strides and as a result, they are able to accelerate fast but in the second and third phases tall sprinters have an advantage because by this time the sprinters have accelerated and they have attained maximum velocity and tall sprinters cover the distance faster because of long strides. Sprinters have more muscle mass as compared to good distance runners because sprinting requires more explosive strength. Sprinters also need to generate lot of force quickly whereas long distance runners need to maintain steady pace for quite some time. In view of the fact that Sprinters have higher percentage of fast twitch muscle fibres and they help in generating fast powerful contractions and on the other hand long distance runners have slower twitch fibres and they support endurance workouts.

In respect of BMI the F value has not been found to be significant and hence in respect of these two variable further applications of post-hoc test was not done. As a researcher I strongly feel that these two variables need to be further researched by selecting athletes of higher standard so as to come to a definite decision.

Conclusion

In conclusion, the analysis using analysis of variance (F-Test) has yielded significant results for anthropometric variables such as thigh circumference and calf circumference, indicating clear differences among sprinters, middle-distance runners, and long-distance runners in these aspects. This finding aligns with the expectations, as the distinct demands of these events naturally lead to variations in athletes' physical characteristic. Overall, this study underscores the importance of considering athletes' anthropometric characteristics in training and selection processes, recognizing that these traits play a significant role in their performance outcomes. Further research can contribute to a more comprehensive understanding of the relationship between BMI and athletic performance, potentially informing training and talent identification strategies in track and field sports.

References

1. Chan D. Fitness Testing Assignment, Basketball. The sport Supplement. Copyright 2010 Bio Med Sci Direct Publications IJBMR -All rights reserved; c1999.
2. Devinder KK. Test Measurement and Evaluation, SSS

publication, New Delhi; c2012. p. 382.

3. M Subbanna N, Dr. Saroja M. Comparative analysis of selected anthropometric and psychological parameters among sprinters, middle distance and long distance runners of University women athletes. International Journal of Physical Education Sports Management and Yogic Sciences Year. 2015;5(4):12-17. Print ISSN: 2231-1394. Online ISSN: 2278-795X
4. Miranda REEPC, Hanna A, Pauli JR, Enrico P, Adelino S. Effects of 10-week soccer training program on anthropometric, psychological, technical skills and specific performance parameters in youth soccer players. Science & Sports. 2013;28:81-87. DOI: 10.1016/j.scispo.2012.02.005.
5. Pantelis N, Gonzalez C, Padulo J, Johnny. The effect of age on positional differences in anthropometry, body composition, physique and anaerobic power of elite basketball players. Sport Sciences for Health. EPUB ahead of Print; c2014. DOI: 10.1007/s11332-014-0198-5.
6. Sehgal N. Comparison of Psychological and Kin anthropometric variable of female handball players at state and national level competitions, Asian Journal of Multidimensional Research. 2013;2:8. ISSN: 2278-4853
7. Pheasant ST. Anthropometrics. In Ergonomics, Work and Health; c1998.