Comparison of Anthropometric Characteristics among All India Inter-University Sprinters

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Abstract

The purpose of the study was to determine the differences on the dependent variables such as Standing height, Sitting height, Upper leg length, Lower leg length, Thigh girth, Calf girth and Ankle girth among the categorical variables of 100m, 200m and 400m sprinters. For the purpose of this study, subjects were selected from the 70th All India Inter-University Athletic Championship held at the Jawaharlal Nehru Stadium in Chennai from 27th to 31st December, 2009. In this athletic championship 1257 male athletes of 133 universities were participated. Out of these athletes, all the 47 male sprinters who have qualified for the semi-finals and finals of 100m, 200m and 400m were selected as subjects. Thus, the present study comprised of 16 sprinters from 100m, 13 sprinters from 200m and 18 sprinters from 400m respectively. The sprinters who have participated in more than one sprinting event were not included in this study. Further, One Way ANOVA was applied followed by Scheffe S' Post Hoc Test if necessary, to find out the differences between the dependent variables among the three groups of Sprinters. The results of the study reveal that 400m sprinters were significantly taller than 100m sprinters and ankle girth was significantly more for 200m sprinters than 100m sprinters. Besides, other dependent variables were taken for this study did not differ significantly among the three categories of sprinters.

Key Words: Anthropometric Characteristics, All India Inter-University and Sprinters.

Introduction

Anthropometry is a technique to measure physical characteristics (body size, shape of specific body parts and proportion) of living beings, including men. Anthropometry has been widely applied in a broad range of disciplines, such as ergonomics and health sciences. Because of its convenience, anthropometry has also been applied to understand physical characteristics of athletes in the field of sports science which targets improvement of athletic performance. Since correct application of anthropometric techniques and interpretation of the information assist management of health status in athletes and also improves their performance, it is important that support staff in the athletic fields, including sports dieticians, share the knowledge associated with anthropometry **(Masaharu and Kagawa, 2008)**. Sprinting is the short distance race which remained important part of competitive play of world's important civilizations. In specific terms, it is not easy or even possible to give a list of qualities necessary for an athlete to become a successful sprinter. However, on the basis of top class sprinters, some of the qualities can be mentioned. Generally an athlete of long height can become an outstanding sprinter easily **(Sharma, N.P., 2005)**.

Purpose of the Study

The purpose of the study was to determine the differences on the dependent variables among the three categorical variables of 100m, 200m and 400m sprinters of the All India Inter-University Athletic Championship.

Hypothesis

It was hypothesized that there would be a significant difference in Standing height, Sitting height, Upper leg length, Lower leg length, Thigh girth, Calf girth and Ankle girth among 100m, 200m and 400m All India Inter-university sprinters.

Review of Related Literature

Baiju, Abhariam, (2011), conducted a study to predict the performance ability of sprinters in relation to selected anthropometric measurements. The anthropometric measurements namely standing height, weight, upper leg length, hip width, shoulder width, and chest width are significantly related to 100mtrs sprint performance. **Abraham, George, (2010)**, stated that the height and weight, six skin folds, two bicondylar breadths (humerus & femur) and two girths (biceps & calf) were measured. The somato-chart indicated that sprinters and middle distance runners are ectomorphic mesomorphs. Among all groups body fat percent is lowest in sprinters. This was reflected in their endomorphic components which is lowest in sprinters. **Dintiman et al., (1997)** concluded that athletes possessing shorter legs have an advantage over athletes with long legs. Athletes with shorter legs would have lower point of inertia so it is easier to move than a long leg.

Van Someren, et al., (2003) stated that superior upper body dimensions and anaerobic capacities distinguish international-level kayakers from national-level athletes and may be used to predict 200-m performance. **Beat, Knechtle, et al., (2007),** indicated that race time was not significantly influenced by the directly measured variables, height, leg length, body mass, average skinfold thicknesses, or circumference of thigh, calf or upper arm. Furthermore, no significant correlation was observed between race time and the calculated variables, BMI, %SM and %BF.

Methodology

The purpose of the study was to determine the differences on the dependent variables such as Standing height, Sitting height, Upper leg length, Lower leg length, Thigh girth, Calf girth and Ankle girth among the three categorical independent variables of 100m, 200m and 400m sprinters.

The subjects were selected from the All India Inter-University Athletic Championship held at the Jawaharlal Nehru Stadium in Chennai from 27th to 31st December, 2009. In this athletic championship 1257 male athletes from 133 universities were participated. Out of these athletes, all the 47 male sprinters who have qualified for the semi-finals and finals of 100m, 200m and 400m were selected as subjects. Thus, the present study comprised of 16 sprinters from

100m, 13 sprinters from 200m and 18 sprinters from 400m respectively. The sprinters who have participated in more than one sprinting event were not included in this study. Further, One Way ANOVA was applied followed by Scheffe S' post hoc test if necessary, to find out the differences between the dependent variables among the three groups of Sprinters (Independent variables).

Results and Discussion

The data collected on Standing height, Sitting height, Upper leg length, Lower leg length, Thigh girth, Calf girth and Ankle girth for 100m, 200m and 400m All India Inter-university sprinters were subjected to one way analysis of variance to determine any significant differences on dependent variable among the three categories of sprinters. Whenever the F ratio was found to be significant Scheffe S' post hoc test was applied to find out significant difference among the paired mean. The results obtained are presented below in Table 1

Table– I
One Way ANOVA for Standing Height, Sitting Height, Upper leg Length and Lower Leg Length among 100m, 200m and 400m All India Inter-University Sprinters

Variables	Sprinters – Groups	Mean	S. D.	N	SS	df	MS	F ratio
Standing Height	100m	170.0313	5.13312	16	358.493	2	179.246	5.704*
	200m	172.2308	5.76128	13	1382.667	44	31.424	
	400m	176.4167	5.88680	18				
Sitting Height	100m	123.8437	3.89752	16	69.079	2	34.539	2.408
	200m	125.1923	3.93456	13	631.198	44	14.345	
	400m	126.6944	3.57746	18				
Upper leg length	100m	45.9063	8.78677	16	167.450	2	83.725	1.052
	200m	49.7692	5.37205	13	3501.987	44	79.591	
	400m	45.3056	10.83993	18				
Lower leg length	100m	42.0937	4.83811	16	59.131	2	29.566	1.500
	200m	43.2308	4.30898	13	867.528	44	19.717	
	400m	44.7222	4.15587	18				

*Significant at 0.05 level with df 2 and 44 is 3.21

Table I shows that the means and standard deviations on Standing height among 100m, 200m and 400m Inter-university sprinters were 170.03 ± 5.13, 172.23 ± 5.76 and 176.42 ± 5.89 respectively. The obtained F ratio 5.70 was greater than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was a significant difference in standing height among three categories of sprinters.

To find out which of the paired mean differences were significant, Scheffe S' post hoc test was applied and the results are presented in Table 2.

Table-II
Scheffe S' Post Hoc Test for Differences Between The Paired Means on Standing Height among 100m, 200m and 400m All India Inter-University Sprinters

100m Sprinters	200m Sprinters	400m Sprinters	Mean Differences	Confidence Interval
170.03	172.23	_	2.20	5.31
170.03	-	176.42	6.39*	4.91
-	172.23	176.42	4.19	5.11

The mean difference on standing height between 100m and 200m sprinters was 2.20 and it was less than the confidence interval of 5.31 required for significance at .05 level of confidence. The mean difference on standing height between 100m and 400m sprinters was 6.39 and it was higher than the confidence interval required for significance at .05 level of confidence. The mean difference between 200m and 400m sprinters on standing height was 4.19 and it was less than the confidence interval required for significant at .05 level of confidence. It is inferred that 400m sprinters were significantly taller than 100m sprinters but there were no significant differences in standing height between 100m and 200m sprinters and 200m and 400m sprinters.

Table I indicates that the means and standard deviations on sitting height among 100m, 200m and 400m Inter-university sprinters were 123.84 ± 3.90, 125.19 ± 3.93 and 126.69 ± 3.58 respectively. The obtained F ratio 2.41 was less than the table value of 4.91 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in sitting height among three categories of sprinters.

The Table I also indicates that the means and standard deviations on upper leg length among 100m, 200m and 400m Inter university sprinters were 45.91 ± 8.79, 49.77 ± 5.37 and 45.31 ± 10.84 respectively. The obtained F ratio1.05 was less than the table value of 5.11 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in upper leg length among the three categories of sprinters.

The Table I further indicates that the means and standard deviations on lower leg length among 100m, 200m and 400m Inter- university sprinters were 42.09 ± 4.84, 43.23 ± 4.31 and 44.72 ± 4.16 respectively. The obtained F ratio 1.50 was less than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in lower leg length among three categories of sprinters.

Table-III
One Way ANOVA for Thigh girth, Calf girth and Ankle girth among 100m, 200m and 400m All India Inter-University Sprinters

Variables	Sprinters Groups	Mean	S. D.	N	SS	df	MS	F ratio
Thigh Girth	100m	55.6875	3.28062	16	3240.263	44	73.642	.917
	200m	52.5769	11.58276	13				
	400m	51.8611	9.29549	18				
Calf Girth	100m	37.3750	2.59808	16	358.422	44	8.146	1.904
	200m	35.6923	3.19856	13				
	400m	35.6389	2.81177	18				
Ankle Girth	100m	23.4375	2.32289	16	315.832	44	7.178	3.922*
	200m	26.1923	3.77789	13				
	400m	25.0833	1.93459	18				

*Significant at 0.05 level with df 2 and 44 is 3.21

Table III shows that the means and standard deviations on thigh girth among 100m, 200m and 400m inter university sprinters were 55.69 ± 3.28, 52.58 ±11.58 and 51.86 ± 9.30 respectively. The obtained F ratio 0.92 was less than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in thigh girth among three categories of sprinters.

Table III also shows that the means and standard deviations on calf girth among 100m, 200m and 400m Inter-university sprinters were 37.38 ± 2.60, 35.69 ± 3.20 and 35.64 ± 2.81 respectively. The obtained F ratio 1.90 was less than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in calf girth among three categories of sprinters.

Table III further shows that the means and standard deviations on ankle girth among 100m, 200m and 400m Inter-university sprinters were 23.44 ± 2.32, 26.19 ± 3.78 and 25.08 ± 1.93 respectively. The obtained F ratio 3.92 was greater than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was a significant difference in ankle girth among three categories of sprinters.

To find out which of the paired mean differences were significant, Scheeffe S' post hoc test was applied and the results are presented in Table 4

Table-IV
Scheffee S' Post Hoc Test for Differences between the Paired Means on Ankle girth among 100 m, 200m and 400m All India Inter-University Sprinters

100m Sprinters	200m sprinters	400m sprinters	Mean Differences	Confidence Interval
23.44	26.19	-	2.75*	2.53
23.44	-	25.08	1.64	2.35
-	26.19	25.08	1.11	2.43

The mean difference on ankle girth between 100m and 200m sprinters was 2.75 and it was higher than the confidence interval of 2.53 required for significance at .05 level of confidence. The mean difference on thigh girth between 100m and 400m sprinters was 1.64 and it was less than the confidence interval of 2.35 required for significance at .05 level of confidence. The mean difference between 200m and 400m sprinters on calf girth was 1.11 and it was less than the confidence interval of 2.43 required for significant at .05 level of confidence. It is inferred that 200m sprinters possessed significantly more ankle girth than 100m sprinters but there were no significant differences in ankle girth between 100m and 400m sprinters and 200m and 400m sprinters.

Discussion on Findings

There are many factors that determine athletes' success in sprint events and the most important are the anatomical, morphological and physiological parameters according to **(Baechle, T.R., 1994); (Crowder, L., McKenna, K. & Plummer, L., 1992); (Dintiman, G., Tellez, T. & Ward, R., 1997); (Jarver, J., 1995); (Tellez, T., 1984)**. Further, **(Hay, J.G., 1993)** has stated that the skill of sprinting is actually depending upon athletes' ability to combine the action of the legs, trunk, and arms so on into a smoothly coordinated whole action. Hence, the following variables have been taken for this study namely, standing height, sitting height, upper leg length and lower leg length, as dependent variables and in addition three categories of sprinters namely 100m, 200m and 400m sprinters as independent variables or categorical variable. It is also stated that greater relative muscle mass in the thighs with strong quadriceps muscles will result in strong driving force for sprinter. The result of the study indicated that the 400m sprinters had significantly taller than 100m sprinters. In this study though there is no significant difference in upper leg length, lower leg length, sitting height, and the standing height was significantly higher for 400m sprinters than 100m sprinters. It is also interesting to note that the trend of the score also shows that the upper leg length, lower leg length and sitting height increased trend as the distance of sprint increases. According to **(Hay, J.G., 1993)** It is also stated that greater relative muscle mass in the thighs with strong quadriceps muscles result in strong driving force. In view of this fact the girth measurement of thigh, calf and ankle were taken into consideration and comparisons were made among three categories of sprinters. The result indicated that there are no significant differences in thigh girth and calf girth among 100m, 200m and 400m sprinters. However, the ankle girth showed that the 200m sprinters had significantly higher girth than 100m sprinters. In the present study only girth measurements were taken into consideration and not the muscle mass of the thigh and calf.

Conclusions

The following conclusions were drawn within the limitation of the present study.

1. 400m sprinters were significantly taller than 100m sprinters.
2. There was no significant difference in standing height between 100m and 200m sprinters and also between 200m and 400m sprinters.

3. There was no significant difference in sitting height, upper leg length and lower leg length among the three categories of sprinters.
4. There was no significant difference in thigh girth and calf girth among three categories of sprinters.
5. The ankle girth was significantly more for 200m sprinters than 100m sprinters.
6. There was no significant difference in ankle girth between 100m and 400m sprinters and also between 200m and 400m sprinters.

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