Comparison between Physical Fitness and Anthropometric Variables of 100m and 400m Male Sprinters

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ABSTRACT

The aim of the study was to examine the difference in selected physical fitness and anthropometrical variables of 100 m and 400 m national level sprinters. The sample consisted of 54 athletes (27 each from 100m and 400m events, who were preparing for various national and international competitions, at various training centres of Sports Authority of India. In addition to 100m and 400m competition performance, selected fitness and anthropometric measurements were taken on each athlete by using standard instruments and techniques. The data were analyzed by using IBM SPSS version 20 and the analysis showed that a significant difference exists between 100 m and 400 m sprinters, with regard to height, 30 m run, 60 m run, 300 m run, SBJ, 10 bounding, and Bench press. A non-significant difference was found, with regard to body weight, fat % and half squat. 100 m sprinters were found to be superior in 30 m, 60 m, SBJ, 10 Bounding, OHBT and Bench press than 400 m sprinters. 400 m sprinters were found taller and superior in speed endurance as compared to 100 m sprinters. The average velocity of 100m sprinters was found to be better in 30m run and 60m run as compared to 400 m sprinters; whereas, 400 m sprinters showed higher velocity in 300 m run as compared to 100 m sprinters.

INTRODUCTION

In Track & Field events, performance is determined by conditional, technique coordination, tactical, constitutional and psychological factors and the importance of various factors varies from event to event (Singh, 1991).

Sprints – races upto 400m – occupy an important place in the Olympics and world track competitions.

Analysis of training of the world's best track sprinters indicate that top performance, in short distance events, are not an outcome of years of intensive training with specific objectives, in order to rise to the top (Schmolinsky1978, Arthur 1981, Bauersfeld 1998).

A high level of fitness tests and certain physical attributes make a successful sprinter. Speed along with acceleration and power is the first attribute. No foot race measures pure speed like the 100-meter dash. This distance is the shortest among Olympic track events and turns in the highest speeds, with world-class runners frequently finishing in less than 10 seconds. Baechle (1994) defines speed as the ability to move the body or body parts through a required range of motion in the fastest possible time. Speed comprises reaction time, acceleration, maximum speed and speed endurance. The 400-m race is unique in that it is both a sprint and an endurance race. It is a deft combination of speed, strength, power and endurance to maximize your

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performance. All sprinting events require supreme efforts, excellent physical fitness, sufficient strength and speed (Tiwari et al, 2012).

Duffield, et al, (2004,2005) conclude energy contributions of the aerobic and anaerobic energy systems for various track running events. Notably, the magnitude of aerobic energy system increases with increasing event distance, and vice versa, for the anaerobic energy system. The contribution of aerobic energy in 100 m, 200 m, 400 m, 800 m, 1500 m and 3000 m event is 21%, 28%, 41%, 60%, 77% and 86%, respectively.

Literature stresses the need for selected specific fitness and body constitutional parameters for achieving high level of performance, in sprinting events.

In this study, an attempt is made to find out the difference between selected fitness and anthropometric parameters of elite 100m and 400 m male sprinters.

METHODOLOGY

The purpose of the study was to highlight the differences on selected fitness and anthropometric variables between 100m and 400m runners. The present study was conducted on twentyseven 100m and twentyseven 400 m male sprinters, preparing for various national and international level competitions. Body height, body weight, body fat%, lean body mass, 30m, 60m, 300m, standing broad jump (SBJ), 10 bounding and Over head backward throw of 4 kg shot (OHBT) tests and procedures were used to assess the selected variables. 100m and 400m performance was recorded during the domestic trials or domestic and international competitions.

Mean, SD and 't' value were computed for the interpretation of abovesaid variables.

RESULT & DISCUSSION

Table -1 : Comparison of Body height between 100m and 400m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	176.156	4.6515	0.895	3.989	2.96*
100 m	27	172.167	5.233	1.007		

**Significant at 0.05 level t(0.05) (52) = 2.01*

Table -2 : Comparison of Body Weight between 100m and 400m runners

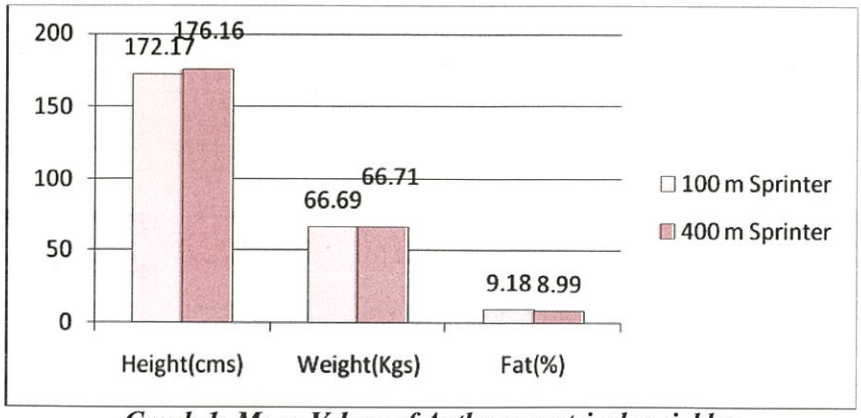
	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	66.707	4.7734	0.919	0.0139	0.01
100 m	27	66.693	5.7715	1.111		

**Significant at 0.05 level t(0.05) (52) = 2.01*

Table -3 : Comparison of Body Fat %t between 100m and 400m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	8.988	1.2784	0.246	-0.195	0.54
100 m	27	9.183	1.3504	0.26		

**Significant at 0.05 level t(0.05) (52) = 2.01*



Graph 1: Mean Values of Anthropometrical variables

Mean scores, SD, SE and t ratio were worked out to find out whether significant difference exists between the 100 and 400 m runners, on body height. The results so obtained are given in Table 1. which, shows significant difference between them as the t value 2.96, at 0.05 level of confidence. It also shows the mean scores of body height as 172.17 and 176.16, for 100 m and 400 m runners respectively. Showing 400 m runners to be taller as compared to 100 m runners. Similar trend was observed in a study on All India Inter University male sprinters (Prabu & Sekarbabu, 2012).

Table-2, comparing 100 m and 400 m runners on the body weight variable, shows non-significant difference between the selected groups as calculated t ratio 0.01 is less than the tabulated value of 2.01, at 0.05 level.

Table 3 shows the mean scores of Fat % as 8.99 and 9.18, for 400 m and 100 m runners respectively, showing no statistically significant difference, between the two groups.

Table-4 : Comparison of 30 meter performance between 100m and 400m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	3.754	0.0498	0.01	0.089	4.61*
100 m	27	3.665	0.0871	0.017		

*Significant at 0.05 level t(0.05) (52) =2.01

Table-5 : Comparison of 60 meter performance between 100m and 400m runners

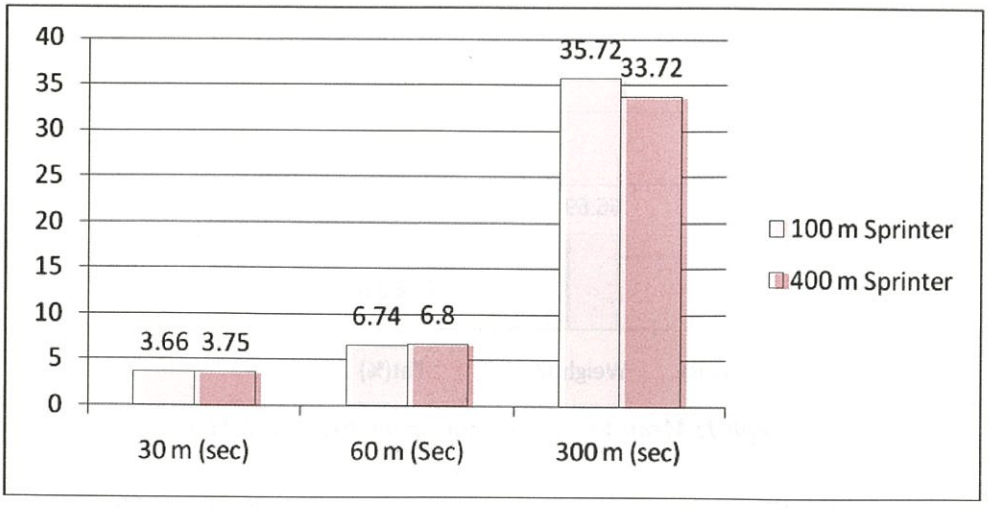
	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	6.802	0.0519	0.01	0.063	3.52*
100 m	27	6.739	0.077	0.015		

*Significant at 0.05 level t(0.05) (52) =2.01

Table-6 : Comparison of 300 meter performance between 100m and 400m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	33.723	0.6581	0.127	-1.999	6.83*
100 m	27	35.722	1.3704	0.264		

*Significant at 0.05 level t(0.05) (52) =2.01



Graph-3: Average velocity during speed tests c. to. c.

The data in Table-4, 5 and 6, comparing 400 m and 100 m runners on 30 m run, 60 m run and 300 m run , show significant difference between the selected groups, with t value 4.61, 3.52 and 6.83 for 30 m run, 60 m run and 300 m run, respectively, at 0.05 level of confidence. Graphical presentation of average velocity indicates that it increases up to 60 m distance and shows a decline in 300 m run. The 100 m runners are better in velocity during 30 m and 60 m run whereas 400 m runners show higher velocity during 300 m run. The reason behind higher velocity achieved by 400 m runners, during 300 m run and 100 m runners during 30 m and 60 m run, may be the specified requirement of events and the training carried out to improve event specific factors. Contribution of aerobic energy system in 100 m and 400 m event is 21% and 41%, respectively, and anaerobic energy system contributes 79% and 59% in 100 m and 400 m events, respectively (Duffield et al, 2004, 2005).

Table-7 : Comparison of standing Broad Jump between 100 m and 400 m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	297.444	11.1505	2.146	-12.741	4.72*
100 m	27	310.185	8.5216	1.64		

*Significant at 0.05 level t(0.05) (52) =2.01

Table-8 : Comparison of 10 Bounding between 100 m and 400 m runners

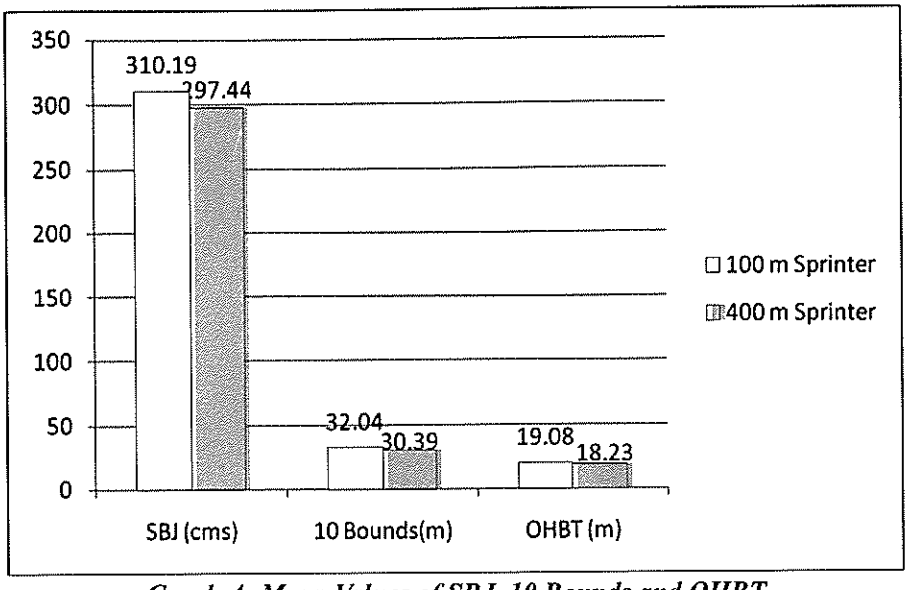
	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	30.394	1.5793	0.304	-1.642	4.59*
100 m	27	32.036	0.9837	0.189		

*Significant at 0.05 level t(0.05) (52) =2.01

Table-9 :Comparison of Overhead Backward Throw between 100 m and 400 m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	18.231	1.1441	0.22	-0.852	-3.06*
100 m	27	19.083	0.8885	0.171		

*Significant at 0.05 level t(0.05) (52) =2.01



Graph-4: Mean Values of SBJ, 10 Bounds and OHBT

The data in Table 7, 8, comparing 400 and 100 m runners on leg strength variable, show significant difference as t value 4.72 and 4.59 for SBJ and 10 bounds, respectively, are found to be greater than tabulated value of 2.01, at 0.05 level of confidence. It indicates that 100 m runners are better in leg power as compared to 400 m runners and higher leg power may the reason for achieving better timing in 30 m and 60 m run as the powerful leg and muscles provide fast acceleration and top speed. The results presented in Table 9 indicate that 400 m runners are better in Overhead backward throw performance showing higher back strength. Tiwari et al (2012) in a study on sprinters reveal that there is no significant difference in explosive strength and maximum leg strength of 100 m and 400 m female sprinters because both events comes under sprinting events and the athletes do approximately same training.

Table-10 : Comparison of Bench Press between 100 m and 400 m runners

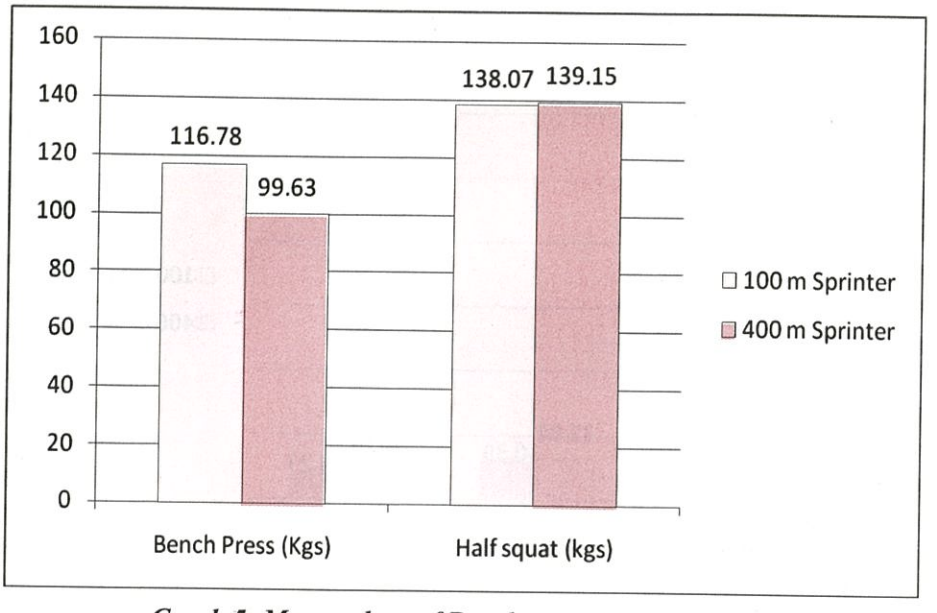
	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	99.63	9.3978	1.809	-17.148	-7.35*
100 m	27	116.778	7.6477	1.472		

*Significant at 0.05 level t(0.05) (52) =2.01

Table-11 : Comparison of Half Squat between 100 m and 400 m runners

	N	Mean	SD	SE Mean	Mean difference	't'
400 m	27	139.148	8.0322	1.546	1.074	0.47
100 m	27	138.074	8.7703	1.688		

*Significant at 0.05 level t(0.05) (52) =2.01



Graph 5: Mean values of Bench press and Half Squat

Mean scores, SD, SE and 't' ratio were worked out to find out whether significant difference existed between the 100 and 400 m runner, in upper and lower body maximum strength. The results so obtained are given in Table 10 and 11.

The data in Table 10 comparing 100 and 400 m runners show significant difference between them as the t value 7.35 was found significant, at 0.05 level of confidence. The mean difference value indicates 100 m runners to be superior in the strength of upper extremities as compared to 400 m runners. Table 11 shows the mean scores of Half squat as 139.148± 8.032 and 138.074±8.77, for 100 and 400 m runners, respectively, showing little and insignificant difference, between the two groups. The obtained t value is 0.47.

CONCLUSIONS

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

1. That 400m sprinters are significantly taller than 100m sprinters.
2. There is no significant difference in body weight, body fat% between 100m and 400m sprinters
3. The 400m sprinters are significantly better in 300m run than 100m sprinters, showing better speed endurance
4. The 100m sprinters are significantly better in strength parameters like

standing Broad jump, 10 bounding, 4 kg overhead backward throw and bench press than 400m sprinters. Whereas, 400 m sprinters showed higher but non-significant difference in half squat test.

5. 100m sprinters are significantly better in 30m run and 60m run as compare to 400m sprinters, showing better acceleration and sprinting speed.
6. The average velocity of 100m sprinters was better in 30m run and 60m run as compared to 400 m sprinters. Whereas 400 m sprinters showed higher velocity in 300 m run as compared to 100 m sprinters.
7. An increase in average velocity from 30 m run to 60 m run and a deterioration from 60 m to 300 m run has been observed in 100 and 400m sprinters.

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