Wazir Singh Phogat
Ph.D. Research Scholar CDLU,
Sirsa National Chief Athletics
Coach (Youth), SAI NRC,
Sonipat.

Dr. Ravinder Pal Ahlawat
Associate Prof.
Department of Physical
Education, CDLU, Sirsa.

Relationship of Selected Bio-motor Variables to the Performance of 400 Meter Male Sprinters

Wazir Singh Phogat, Dr. Ravinder Pal Ahlawat

Abstract
In the present study the efforts have been made to study the relationship of selected bio-motor variables to the performance of 400 National level 25 male sprinters age ranges from 17 to 25 years from the SAI schemes and National camps. To measure the bio-motor abilities 30meter, 30meter flying, 60meter, 300meters, 500meters, Standing Broad Jump, Standing Triple Jump, 10 bounds, Overhead backward throw (4kg Shot), Sit ups (bent knee for 60 seconds) variables were selected for this study. Pearson's product moment correlation (Zero order) was computed to establish the relationship between the variables to the criterion variable. The Mean and SD values of selected bio-motor variables and performance in 400m sprinters are presented. It has been observed through the findings that 30meter flying, 30 meter standing, 60meter, 300meters, and 500meters have the positive significant correlation with 400m performance at 0.01 levels and 0.05 levels. SBJ (Standing Broad Jump), STJ (Standing Triple Jump), 10 bounds, 4 kg OHBT (Overhead backward throw) and sit-ups (bent knee for 60 seconds) are not significantly correlated with 400 m performance of sprinters. It is suggested that the coaches in their training program should incorporate 30meter flying, 60meter run for its identical nature in sprinting qualities whereas 300 and 500m run included due to their specificity and simulation distances to develop the anaerobic glycolysis energy system which is prerequisite for 400m run.

Keywords: Bio-motor variables, 400m performance

1. Introduction
"Physical abilities play an important role in the performance of the athlete. So during the analysis it is important that the procedures of data collection are valid as well as reliable".
The 400m dash is an endurance sprint incorporated the speed of sprinters and the endurance of half-miler. (Hart, 2000) It is considered 400m race to be one of the most demanding and grueling competitive event. Quercetani, (2005) also claimed that the event is referred as 'killer event' of track and field. Although once classified among middle distance events, the 400 meters is now regarded as a "prolonged sprint", so the ability to distribute one's speed and energies in the most economical manner over the full racing distance is the primary means of achieving success. This term "prolonged sprint" appears to be appropriate, especially when one considers that Michael Johnson's 1999 world record of 43.18 is the equivalent of four consecutive 100m in 10.795 seconds.
The most effective results in this event can be obtained with a training emphasized to develop the complete sprinter, and one who is capable of sprinting up to 400meters. So, the 400meters runners should start like sprinters, run like sprinters, finish like sprinters and hence, train like sprinters. The variety of biomotor abilities like Superior sprinting ability, a very high ability to produce energy via anaerobic glycolysis (Lactic acid System), with the accompanying lactate acidosis, Superior alactate anaerobic capacity, High anaerobic power, Speed endurance, Tempo endurance, Strength endurance, Endurance running, Power speed, Event running (segment running), Speed, strength, Explosive strength and combination of these can be beneficial to become an outstanding quarter miler. Biomotor ability refers to the capacity of an individual that forms a foundation for performing a number of skills and hence "Motor fitness is the final criterion through which all other elements of physical fitness or total fitness are seen and measured in man" (Book 1952). Hence, the law of specificity states that there is a specific response to the specific nature of a training load. This specific response will tend to emphasize one or more of the abilities that make up fitness. These abilities are basic and respond well to training. Since these abilities affect how the body moves they are given the

Correspondence:
Wazir Singh Phogat
Ph.D. Research Scholar CDLU,
Sirsa National Chief Athletics
Coach (Youth), SAI NRC,
Sonipat.

name "biomotor abilities". The biomotor abilities are components of overall physical fitness and an understanding of their inter-relationship allows the coach to plan training more effectively. Depending upon the specific type of activity in sports events, the requirements for endurance, speed/power and strength are also specific (Ikai, 1970). Various studies in this event revealed that biomotor fitness plays a decisive role in performance even if the athlete possesses highly technical skills and physique, superb physical fitness and intended training of an individual eventually help in achieving top performance. So, the importance of biomotor fitness is described in these words that "biomotor fitness and competitive performance go hand in hand with athleticism" Superb fitness level is a pre-requisite in training for competitive Track and Field.

According to Powell (1977), "Scientific method are used to coax every centimeter, every fraction of a second and every ounce of energy out of an athletic who is considered to be almost a machine. Then coaching through constant honing and polishing wears down all knobs and excrescences and makes what often seemed like ordinary abilities into a coordinated, smoothly functioning organism".

2. Significance of the Study
1. The study may be useful to the coaches and physical educationists to know the most important biomotor variables contributing to the performance in 400 meters sprinting.
2. The results of the study may help in formulating appropriate training programs considering the most important variable to be developed for achieving best performance in 400meters sprinting.
3. The results of the study may be helpful in identifying the talents in 400meters event.
4. The study may be useful in setting the targets, both performance and training to achieve the performance goals after stipulated time of training.

3. Methods
A total number of 25 male National level 400m sprinters were selected for this study from the various training centers of Sports authority of India and National camps. To evaluate the biomotor variables the following tests were conducted;- 30meter, 30meter flying, 60meter, 300meters, 500meters, Standing Broad Jump, Standing Triple Jump, 10 bounds, Overhead backward throw (4kg Shot), Sit ups (bent knee for 60 seconds). The Official competition of 400m run performance of the subjects was taken as the criterion variable. Mean, and SD values were calculated and Pearson's product moment correlation was computed to establish the relationship between the biomotor variables to the performance of 400m sprinters.

4. Results and Findings
Analysis of Bio-Motor variables of 400m sprinter male performance, the result revealed on the basis of descriptive analysis and pearson correlation.
As depicted in the table -1, the descriptive result of Bio-motor variables and 400 meter athletes' performance. The descriptive values (Mean ± SD) of bio-motor variables (fitness tests) were measured, where Mean and SD of bio-motor variables at 30 meter fly are 3.13±.06, 30 meter st are 3.82 ± .06, 60 meter are 6.89 ± .08, 300 meter 35.00 ± .74, 500 meter are 65.40 ± 1.20, Standing broad jump are 2.77 ± .09, Standing Triple Jump are 8.33 ± .30, 10 bounds are 27.68 ± 1.62, 4 kg shot OHBT are

16.25 ± 1.27, sit-ups 60 sec are 43.32 ± 3.34, peak lactate are 21.25 ± 1.70, and 400 meter performance are 49.09 ± .86.

Table 1: Descriptive Statistics of bio-motor fitness tests and 400m performance

	Mean	**Std. Deviation**	**N**
30m fly	3.1304	.06072	25
30m st	3.8176	.05861	25
60m	6.8880	.08170	25
300m	34.9988	.73702	25
500m	65.3992	1.19973	25
SBJ	2.7720	.08510	25
STJ	8.3300	.29586	25
10 bounds	27.6780	1.61504	25
4kg OHBT	16.2488	1.26850	25
Situps 60secs	43.3200	3.33816	25
Pea kLactate	21.2520	1.79562	25
400m	49.0892	.85624	25

Product- moment correlation in table no. 2 shows the significant relationship between Bio-motor variables (fitness tests) and 400 meter performance at 0.01 levels and 0.05 levels.

4.1 Relationship between Bio-motor variables and 400 m performance
The variables 30meter flying, 300meters, and 500meters have significant correlation with 400m performance at 0.01 levels and others variables 30 meter st, 60 meters are significantly correlated at 0.05 levels. The significant correlated value are 30meter flying (r= .825, p<0.01), 300meters (r= .921, p<0.01), and 500meters (r= .918, p<0.01) and the variables 30 m st (r= .441, p<0.05) and 60 m (r=.462, p<0.05) , SBJ (Standing Broad Jump), and the rest variables STJ (Standing Triple Jump), 10 bounds, 4 kg OHBT (Overhead backward throw) and sit-ups (bent knee for 60 seconds) were found no significantly correlated with 400 m performance of sprinters.

4.2 Interactive Relationship between Bio-motor variables
Product- moment correlation shows significant relationship between Interactive Bio-motor variables (table no. 2). The positive significant relationship between 30 meters flying with 30 meters st (r= .691, p<0.01), 30 m fly with 60 m (r = .640, p<0.01), 30 m fly with 300m (r = .839, p<0.01), 30 m fly with 500 m (r = .864, p<0.01), 30 m st with 60 meters (r = .642, p<0.01), 30 m st with 300 m (r = 464, p<0.05), 30 m st with 500 m (r = 419, p<0.05), 60 m with 300 m (r = .567, p<0.01), 60 meters with 500 meters (r = .525, p<0.01), 300 meters with 500 meters (r = .956, p<0.01), standing broad jump with standing triple jump (r = .731, p<0.01), standing broad jump with 10 bounds (r = .587, p<0.01), and standing triple jump with 10 bounds (r = .709, p<0.01). The other side negative significant relationship between 60 meters with sit-ups 60 sec (r = -.396, p<0.05).

Table 2: Correlations between bio-motor variables and 400 m performance

30meter st= 30m st, 30meter flying = 30 m fly, 60meter = 60m, 300meters = 300m, 500meters=500m, Standing Broad Jump = SBJ, Standing Triple Jump =STJ, 10 bounds=10 B, Over head backward throw (4kg Shot) = 4kg OHBT, , Peak Lactate = P.L.,

Sit ups (bent knee for 60 seconds) = situps 60sec 400 meter performance = 400m

		30m fly	30m st	60m	300m	500m	SBJ	STJ	10 B	4kg OHBT	Situps 60secs	P. L.	400m
30m fly	r	1											
	P-value												
30m st	r	.691**	1										
	P-value	.000											
60m	r	.640**	.642**	1									
	P-value	.001	.001										
300m	r	.839**	.464*	.567**	1								
	P-value	.000	.020	.003									
500m	r	.864**	.419*	.525**	.956**	1							
	P-value	.000	.037	.007	.000								
SBJ	r	-.258	-.249	-.230	-.266	-.293	1						
	P-value	.213	.230	.268	.198	.155							
STJ	r	-.347	-.311	-.200	-.233	-.265	.731**	1					
	P-value	.090	.130	.337	.263	.200	.000						
10 B	r	-.074	-.229	-.122	-.052	-.036	.587**	.709**	1				
	P-value	.725	.271	.561	.804	.865	.002	.000					
4kg OHBT	r	-.062	-.361	-.326	.198	.136	.186	.389	.312	1			
	P-value	.769	.076	.112	.342	.516	.372	.055	.128				
Situps 60secs	r	-.309	-.181	-.396*	-.280	-.238	-.175	-.157	-.026	-.100	1		
	P-value	.133	.386	.050	.174	.252	.402	.453	.902	.635			
P.L	r	-.605**	-.185	-.434*	-.709**	-.766**	.277	.229	-.115	-.121	.357	1	
	P-value	.001	.375	.030	.000	.000	.180	.271	.583	.565	.080		
400m	r	.825**	.441*	.462*	.921**	.918**	-.294	-.208	.009	.256	-.331	-.677**	1
	P-value	.000	.027	.020	.000	.000	.153	.319	.966	.217	.107	.000	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is Negative significant at the 0.01 level (2-tailed).

*. Correlation is Negative significant at the 0.05 level (2-tailed).

r= Pearson Correlation p-value = Sig. (2-tailed)   N = 25

5. Discussion

It is suggested that the coaches in their training program should incorporate 30meter flying, 60meter run for its identical nature in sprinting qualities whereas 300 and 500m run included due to their specificity and simulation distances to develop the anaerobic glycolysis energy system which is prerequisite for 400m run.

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