Loveleen Kaur
Ph.D. Research Scholar
Department of Physical
Education Guru Nanak Dev
University, Amritsar, Punjab,
India

Dr. Amandeep Singh
Assistant Professor Department
of Physical Education Guru
Nanak Dev University,
Amritsar, Punjab, India

Relationship of motor fitness parameters with performance among 100m female sprinters

Loveleen Kaur and Dr. Amandeep Singh

Abstract
The study aims to determine the relationship of motor fitness parameters with the performance among 100m female sprinters. 25 university level and state level female 100m sprinters were purposively selected as subjects for this study. The age of the female sprinters was ranged between 18-25 years. The female sprinters were assessed for motor fitness components i.e. muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance flexibility, speed, agility, balance, power and reaction time. Correlation analysis revealed that the power ($p<0.01$) had significant relationship with the performance among 100m female sprinters. All the other motor fitness components i.e. muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance, flexibility, speed, agility, balance and reaction time were not significantly associated with performance among the 100m female sprinters.

Keywords: Motor fitness, sprinters, power, speed, strength

1. Introduction
The performance of players is influenced by many factors such as physical, physiological and psychological variables, technique, tactics, physique, body size, body composition and application of biomechanical principles (Ortega *et al.*, 2008) [7]. No doubt the performance of player influenced by many factors but still motor fitness components is the primary factor among these entire factors (Lidior & Zjv, 2010). Motor fitness is a term that describes an athlete's ability to perform effectively during sports. An athlete's motor fitness is a combination of five different components, each of which is essential for high levels of performance (Davis, 2000) [1]. Motor fitness defined as a readiness or preparedness for performance with special regard for big muscle activity without undue fatigue. It concerns the capacity to move the body efficiently with force over a reasonable length of time. Motor fitness, also termed motor ability, refers to a person's performance abilities as affected by the factors of speed, agility, balance, coordination, and power (Gallahue & Ozmun, 2006) [2]. Optimum physical performance is a combination of all the components of motor fitness (Tancred, 1995). Fitness is a condition in which an individual has sufficient energy to avoid fatigue and enjoy life. It is necessary for elderly people to maintain and improve their physical fitness in order to satisfy healthy, high quality of daily life (Tanaka *et al.*, 2004) [9]. Skill-related physical fitness refers to an individual's athletic ability in sports such as tennis and encompasses skill-related attributes like dynamic balance, power, speed and agility; the health-related aspect is a measure of cardiovascular endurance, muscle strength, endurance and flexibility and body composition (Hopkins & Walker, 1988) [3]. The term motor fitness, while often used synonymously with physical fitness (Kamlesh, 2012) [4]. Motor fitness takes into account efficiency of basic movements and therefore would involve ten components i.e. muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance flexibility, speed, agility, balance, power and reaction time (Nelson and Johnson, 1970) [6]. The present study therefore aims to study the relationship of motor fitness parameters with the performance among 100m female sprinters.

Correspondence
Loveleen Kaur
Ph.D. Research Scholar
Department of Physical
Education Guru Nanak Dev
University, Amritsar, Punjab,
India

2. Methodology

A total twenty five 100m female sprinters of age 18-25 years old were purposively selected to participate in the study. The data have been collected from the university level and state level 100m female sprinters. Data were collected from different athletics training centres of Punjab state. All the subjects were measured for motor fitness parameters like muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance, flexibility, speed, agility, balance, power and reaction time. The table 1 presents various motor fitness variables, tests/equipments used and units of measurements among female sprinters.

Table 1: Tests and measurement units of motor fitness parameters of female sprinters

S. No	Variables	Unit of Measures	Equipment/test used
1	Muscular Leg Strength	Kilogram	Leg and back strength dynamometer
2	Muscular Back strength	Kilogram	Leg and back strength dynamometer
3	Cardiovascular Endurance	(ml/Kg/min)	Cooper test (12 min run and walk test)
4	Muscular Endurance	Count of sit ups in one minute	Sit ups in one min
5	Flexibility	Centimetres	Sit and reach
6	Speed	Seconds	50m dash
7	Agility	Seconds	Shuttle run
8	Balance	Seconds	Bass test for dynamic balance
9	Power	Meters	Standing broad jump
10	Reaction time	Seconds	Nelson hand reaction time test

2.1 Statistical Analysis

Statistical analysis was performed using SPSS version 16.0 for windows (SPSS Inc, Chicago, IL, USA). All descriptive data pertaining to motor fitness parameters were reported as mean, standard deviation, standard error of mean, minimum value and maximum value. Karl Pearson's coefficient of correlation was used to find the relationship between performance and motor fitness parameters among the female sprinters. Significance levels were set at $p<0.05$.

3. Results

Table 2: Descriptive statistics of motor fitness parameters of 100m female sprinters

Variables	Mean	SD	S.E	Maximum	Minimum
Muscular Leg Strength (kg)	120.20	11.45	2.29	138.00	95.00
Muscular Back Strength (kg)	100.88	12.77	2.55	120.00	70.00
Cardiovascular Endurance (ml/kg/min)	34.01	0.76	0.15	35.20	31.18
Muscular Endurance	42.08	7.14	1.42	63.00	31.00
Flexibility (cm)	4.33	1.47	0.29	7.00	1.20
Speed (sec)	7.04	0.78	0.15	9.00	5.77
Agility (sec)	10.09	0.69	0.14	11.22	9.00
Balance (sec)	85.88	5.11	1.02	93.00	74.00
Power (m)	2.34	0.22	0.04	2.79	1.95
Reaction Time (sec)	0.11	0.02	0.003	0.16	0.08

Table 2 depicts the descriptive statistics of various motor fitness parameters of 100m female sprinters. The mean value of muscular leg strength of the female sprinters was 120.20 kg with standard deviation 11.45. The average value of muscular back strength of the female sprinters was 100.88 kg with standard deviation 12.77. The mean value of cardiovascular endurance was 34.01 ml/kg/min with standard deviation 0.76 among the 100m female sprinters. Similarly, the female sprinters had 42.08 (counts per minute) muscular endurance average value with standard deviation 7.14. The mean value of flexibility was 4.33 cm with standard deviation 1.47 among the female sprinters. The average value of speed was 7.04 sec with standard deviation 0.78 among the female sprinters. The mean value of agility was 10.09 sec with standard deviation 0.69 among the female sprinters. Similarly, the average value of balance was 85.88 sec with standard deviation 5.11 among the female sprinters. The average value of power was 2.34 m with standard deviation 0.22 among the female sprinters. The mean value of reaction time was 0.11 sec with standard deviation 0.003 among the female sprinters.

Table 3: Correlation coefficient between motor fitness parameters and performance among 100m female sprinters

Variables	N	Coefficient of correlation (r)	p-value
Muscular Leg Strength (kg)	25	-0.256	0.217
Muscular Back strength (kg)	25	-0.296	0.151
Cardiovascular Endurance (ml/kg/min)	25	0.302	0.142
Muscular Endurance	25	0.054	0.796
Flexibility (cm)	25	0.081	0.700
Speed (sec)	25	0.309	0.133
Agility (sec)	25	0.319	0.120
Balance	25	0.018	0.933
Power (m)	25	0.623**	0.0001
Reaction Time (sec)	25	0.074	0.725

Table 3 reveals the relationship of performance in 100m of the female sprinters with the motor fitness parameters. It was found that performance in 100m sprint was significantly related with power (r=0.623, p=0.0001) among the female

sprinters. However, no significant relationship was observed with performance in 100m of the female sprinters with the other motor fitness parameters viz. muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance, flexibility, speed, agility, balance and reaction time.

4. Discussion
The primary aim of the present study was to find relationship between performance in 100m sprint and motor fitness parameters among female sprinters. The results of the study revealed that the power had significantly positive relationship with the performance in 100m sprint among female sprinters. The results of the present study are in line with Davis (2011) [10], who conducted a study on recreationally trained college men and found relationship between lower body power and sprinting ability. Krzysztof Maćkała *et al.* (2015) [11] conducted study on selected determinants of acceleration in the 100m sprint. They found correlation between the performances of all three horizontal jumps, these results are in line with the present study.

5. Conclusion
The study aims to determine the relationship of motor fitness parameters with the performance among 100m female sprinters. Only power showed significant relationship with the performance among 100m female sprinters. All the other motor fitness components i.e. muscular leg strength, muscular back strength, cardiovascular endurance, muscular endurance, flexibility, speed, agility, balance and reaction time were not significantly associated with performance among the 100m female sprinters.

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