STAR
Research Journal

Available online at www.starresearchjournal.com (Star International Journal)
PHYSICAL EDUCATION
Star. Phy. Edn 2 (2014)

DEVELOPMENT OF TEST BATTERY FOR ASSESSING THE ATHLETIC POTENTIAL ABILITY OF COLLEGE WOMEN ATHLETE

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Abstract

The purpose of the study was to develop a test battery for assessing the athletic potential ability of college women for 100 metres sprinters. Three hundred and fifty four female college 100 metres sprinters, excluding other athletes such as jumpers, throwers, walkers, middle distance and long distance runners were randomly selected from various colleges of Tamil nadu state, India and their age ranging between 17 and 25 years. The subject had past experience of at least three years in the athletics and those who represented their respective college team were only taken as subjects. Keeping in mind the literature available and the opinion of the experts, the following physical tests in athletics namely speed, strength, power and flexibility were taken for investigation. For the purpose of the study initially, thirty one test items were designed by the investigator and a pilot study was conducted. The data were collected just before the competition period. After analysing the various factors, twenty two test items were finalised by establishing validity, reliability and objectivity. The above said twenty two items were administered and subjected to various statistical analysis namely correlation and factor analysis. The result reveals that there was an inter-relationship between the performances of selected test items. The factor analysis yielded two factors which were named as 'sprinting and upper arm strength ability' and 'strength and power ability.

Key Words: *Athletics, Test battery, Correlation, Factor Analysis.*

INTRODUCTION

Athletics basically individual events except relay races and commonly conducted in track, field and road. Athletics involves running, jumping, throwing and walking competitions. In athletics men and women compete separately and events are conducted both in indoor as well as outdoor. A variety of running events are held on the track which fall into three broad categories namely sprints, middle distance and long distance, depending up on the distance. The athletic events 60m, 100m, 200m and 400m are classified as sprint events. In this classification event such as 100m hurdles, 110m hurdles, 400m hurdles, 4X100m and 4X400m relay races were excluded for various reasons. The development of battery has had a long and productive history. Among the earliest were the Athletic Badge Test presented in 1913 by the Playground and Recreation Association of the USA. These tests were for the sports of Basketball, Tennis and Volleyball. Due to the modern demands of the athletics, there is a need of highly reliable and valid test for athletics potential ability for sprinters. The tests constructed by various experts in the field are bit older and day by day the nature of the event changes its structure. Coaches,

trainers and athletes are continually searching for effective methods of identifying and developing those characteristics in an athletics that may enhance performance level of the sprinters.

The batteries of tests for measuring athletic potential ability exclusive for 100 metres sprint are very few. Moreover very few studies have been done on the synthetic track surfaces. The investigator being an athlete, coach, administrator and official is keen in designing the athletic potential ability tests in athletics exclusive for 100 metres sprint event. Lack of test in 100 metres sprint event for women in India motivated the investigator to take up this study.

METHODOLOGY

Three hundred and fifty four female college 100 metres sprinters, excluding other athletes such as jumpers, throwers, walkers, middle distance and long distance runners were randomly selected from various colleges of Tamil nadu state, India and their age ranging between 17 and 25 years. The subject had past experience of at least three years in the athletics and those who represented their respective college team were only taken as subjects. Keeping in mind the literature available and the opinion of the experts, the following physical tests in athletics namely speed, strength, power and flexibility were taken for investigation. For the purpose of the study initially, thirty one test items were designed by the investigator and a pilot study was conducted. All track tests were conducted only on the synthetic track surface. The data were collected just before the competition period. After analysing the various factors, twenty two test items were finalised by establishing validity, reliability and objectivity. The test items namely 25 metres run, 30 metres run, 40 metres run, 50 metres run, 60 metres run, 70 metres run, 80 metres run, 90 metres run, 100 metres run standing start, 110 metres run, 120 metres run, 150 metres run, medicine ball forward throw, medicine ball backward throw, modified vertical jump, 3 RM test, double leg jump, hopping, frog jump, elevated push-ups, modified sit-ups and sit & forward reach.

The above said twenty two test items were administered to all the subjects selected. The data collected were subjected to various statistical analysis namely correlation and factor analysis. The first statistical analysis was descriptive analysis, Pearson's product moment correlation which was used to find out the inter-relationship among all the test items. In factor analysis the significant factors responsible for variance and dominant were extracted through Principal Component Analysis (Unrotated Factor Loadings and Varimax Rotation). The final solution so obtained was used to identify the different factors. These factors were given an appropriate name depending upon the characteristics of variables contained in it. A test battery was constructed by picking up the variables having higher loading from each factor.

Table-I
Descriptive Analysis of all the Selected Variables

Selected Variables (units)	Range	Minimum	Maximum	Mean	SD (±)
25m run (sec)	0.13	3.88	4.01	3.94	0.04
30 metres run (sec)	0.40	4.31	4.71	4.52	0.13
40 metres run (sec)	0.40	5.48	5.88	5.67	0.13
50 metres run (sec)	0.43	6.67	7.10	6.86	0.13

60 metres run (sec)	0.36	7.63	7.99	7.82	0.12
70 metres run (sec)	0.45	8.00	8.45	8.13	0.20
80 metres run (sec)	0.36	8.88	9.24	9.07	0.12
90 metres run (sec)	0.47	11.52	11.99	11.72	0.18
100 metres run standing start (sec)	0.38	12.62	13.00	12.81	0.13
110 metres run (sec)	0.32	13.75	14.07	13.93	0.10
120 metres run (sec)	0.43	14.78	15.21	15.00	0.15
150 metres run (sec)	1.66	17.33	18.99	17.90	0.70
Medicine ball forward throw (cms)	152.00	555.00	707.00	646.02	59.15
Medicine ball backward throw (cms)	122.00	330.00	452.00	393.51	56.24
Modified vertical jump (cms)	43.00	31.00	74.00	42.74	15.25
3 RM test (Kg)	23.50	7.50	31.00	16.76	5.64
Double leg jump (cms)	260.00	1727.00	1987.00	1808.46	97.27
Hopping (cms)	67.00	1820.00	1887.00	1860.37	28.77
Frog jump (cms)	116.00	1495.00	1611.00	1556.21	53.82
Elevated push-ups (scores)	10.00	19.00	29.00	21.63	3.58
Modified sit-ups (scores)	6.00	15.00	21.00	17.55	2.33
Sit & forward reach (cms)	17.00	25.00	42.00	33.95	4.45

The above table shows the range, minimum, maximum, mean and standard deviation of all the selected variables. The correlation matrix is shown in table - II.

Table - II
Correlation Co-Efficient Matrix of the Selected Variables

--	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22
V1	--																					
V2	0.34**	--																				
V3	0.11*	0.15**	--																			
V4	0.12*	0.17**	0.96**	--																		
V5	0.93**	0.36**	0.12*	0.13**	--																	
V6	0.83**	0.31**	0.11*	0.11*	0.84**	--																
V7	0.79**	0.35**	0.13*	0.13**	0.94**	0.84**	--															
V8	0.96**	0.35**	0.12*	0.12*	0.95**	0.94**	0.88**	--														
V9	0.96**	0.36**	0.12*	0.13*	0.99**	0.86**	0.91**	0.97**	--													
V10	0.76**	0.35**	0.13*	0.14**	0.93**	0.79**	0.99**	0.84**	0.90**	--												
V11	0.96**	0.36**	0.12*	0. 13*	0.99**	0.87**	0.92**	0.97**	0.99**	0.91**	--											
V12	0.80**	0.32**	0.11*	0.11*	0.86**	0.99**	0.89**	0.92**	0.86**	0.85**	0.87**	--										
V13	0.87**	0.34**	0.12*	0.12*	0.92**	0.98**	0.92**	0.96**	0.93**	0.88**	0.94**	0.98**	--									
V14	0.15**	0.06	0.02	0.02	0.16**	0.65**	0.28**	0.36**	0.18**	0.21**	0.20**	0.63**	0.52**	--								

V15	0.54**	0.23**	0.08	0.09	0.63**	0.13*	0.54**	0.42**	0.59**	0.59**	0.59**	0.17**	0.30**	0.64**	--						
V16	0.05	0.09	0.06	0.07	0.02	0.07	0.01	0.06	0.03	0.01	0.03	0.06	0.06	0.09	0.06	--					
V17	0.70**	0.19**	0.05	0.06	0.57**	0.19**	0.30**	0.51**	0.60**	0.31**	0.60**	0.31**	0.57**	0.15**	0.29**	0.54**	--				
V18	0.59**	0.19**	0.06	0.06	0.51**	0.88**	0.51**	0.72**	0.56**	0.43**	0.56**	0.43**	0.57**	0.84**	0.78**	0.87**	0.31**	--			
V19	0.09	0.04	0.02	0.01	0.09	0.60**	0.23**	0.30**	0.12*	0.16**	0.12*	0.16**	0.14**	0.58**	0.46**	0.99**	0.68**	0.84**	--		
V20	0.79**	0.32**	0.11*	0.12*	0.87**	0.48**	0.78**	0.71**	0.84**	0.81**	0.84**	0.81**	0.84**	0.51**	0.62**	0.33**	0.93**	0.04	0.39**	--	
V21	0.13*	0.05	0.01	0.02	0.16**	0.38**	0.03	0.06	0.13*	0.10	0.13*	0.10	0.11*	0.35**	0.22**	0.94*	0.85**	0.71**	0.96**	0.61**	--
V22	0.04	0.01	0.04	0.01	0.06	0.06	0.07	0.05	0.05	0.07	0.05	0.07	0.05	0.06	0.06	0.03	0.02	0.04	0.03	0.04	0.01	--

** Significant at 0.01 level * Significant at 0.05 level

The above table explains the inter-relationship among the selected variables. The correlation matrix obtained for the twenty two variables was used in the Principal Component Analysis. With the help of Principal Component Analysis, all the selected variables were divided into two factors. The unloaded factors obtained were then rotated by Varimax Method to find the final solutions. Rotations of the factors were considered important in order to avoid the overlapping of variables in different factors. The matrix of un-rotated loadings (Principal Component Analysis) is given in table - III.

Table – III
Principal Component Analysis (Un rotated Factor loading)

	PCA (Un rotated Factor loading)	
Item no	**1**	**2**
Eigen value	**11.08**	**5.38**
Percentage variance	**50.37**	**24.29**
Cumulative variance	**50.37**	**74.86**
120 metres run	0.990	0.123
100 metres run standing start	0.987	0.140
90 metres run	0.986	0.048
60 metres run	0.983	0.170
Medicine ball Forward Throw	0.975	0.217
80 metres run	0.944	0.030
25 metres run	0.940	0.151
150 metres run	0.932	0.352
70 metres run	0.926	0.371
110 metres run	0.918	0.098
Elevated push-ups	0.775	0.621
30 metres run	0.397	0.069
50 metres run	0.168	0.035
40 metres run	0.160	0.025
Sit & forward reach	0.070	0.021
Modified sit & reach	0.008	0.999
Frog jump	0.264	0.964
Medicine ball backward throw	0.325	0.945
Vertical jump	0.493	0.856
Double leg jump	0.474	0.726
Hopping	0.658	0.705
3 RM	0.050	0.110

PCA: Principal Component Analysis

The table - III shows the two significant factors that were extracted. The eigen value of the extracted factors were greater than 1.0. With the help of Kaiser's (1959) criteria, only those factors having latent roots greater than one were considered as common factors. Most of the statisticians agree that the un-rotated factors do not generally represent useful scientific constructs, and that rotation is necessary if useful and meaningful constructs were to be identified. In the light of this opinion the un-rotated factor matrix was subjected to two rotations, because of its great popularity and usefulness since the numbers of selected variables were only twenty two. The matrix of rotated factor loading (Varimax Method) is given in table – IV & V.

Table – IV

Factor 1 (one) of Rotated Factor Loadings (Varimax Solution)

Name of the Variables	Factor Loadings
120 metres run	0.998
60 metres run	0.997
100 metres run standing start	0.997
90 metres run	0.971
25 metres run	0.951
80 metres run	0.940
Medicine ball forward throw	0.938
110 metres run	0.923
150 metres run	0.878
70 metres run	0.870
Elevated push-ups	0.850

Table - IV shows that only twelve variables have emerged in factor one. They are 120 metres run which has a loading of 0.998, 60 metres run which has a loading of 0.997, 100 metres run standing start which has a loading of 0.997, 90 metres run which has a loading of 0.977, 25 metres run which has a loading of 0.957, 80 metres run which has a loading of 0.947, medicine ball forward throw which has a loading of 0.938, 110 metres run which has a loading of 0.923, 150 metres run which has a loading of 0.878, 70 metres run which has a loading of 0.870 and elevated push-ups which has a loading of 0.850. This factor indicates the importance of speed and strength, hence the best suited name for this factor could be, ‘sprinting and upper arm strength ability’. In terms of relative contributions, this factor has accounted for 67.0% of the total common factor variance accounted by the two factors. The graphical representation of Factor-1 is shown in Figure - 1.

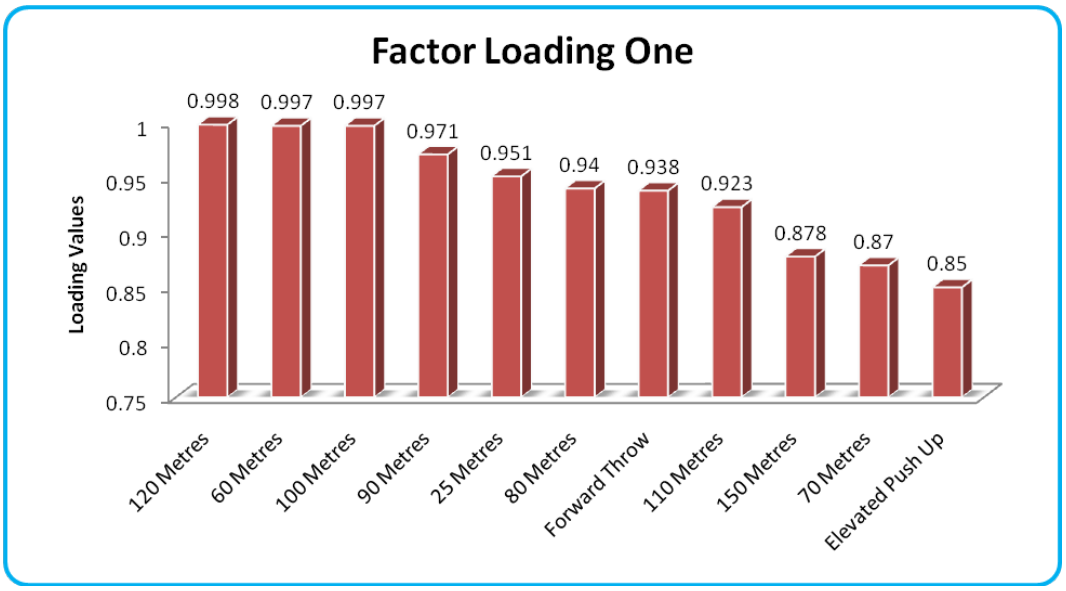

Figure-1. Comparison of Loading Values for Factor 1

Table - V

Factor 2 (two) of Rotated Factor Loadings (Varimax Solution)

Name of the Variables	Factor Loadings
Modified sit-ups	0.992
Frog jump	0.990
Medicine ball backward throw	0.980
Hopping	0.785
Vertical jump	0.784
Double leg jump	0.657

Table - V shows that only two selected variables have emerged in factor two. They are modified sit-ups which has a loading of 0.992, frog jump which has a loading of 0.990, medicine ball backward throw which has a loading of 0.980, hopping which has a loading of 0.785, vertical jump which has a loading of 0.784 and double leg jump which has a loading of 0.657. This factor indicates the importance of strength and power ability of an athlete, hence the best-suited name for this factor would be 'strength and power ability'. In terms of relative contributions, this factor has accounted for 33.0% of the total common factor variance accounted by the two factors. The graphical representation of Factor-2 is shown in Figure - 2.

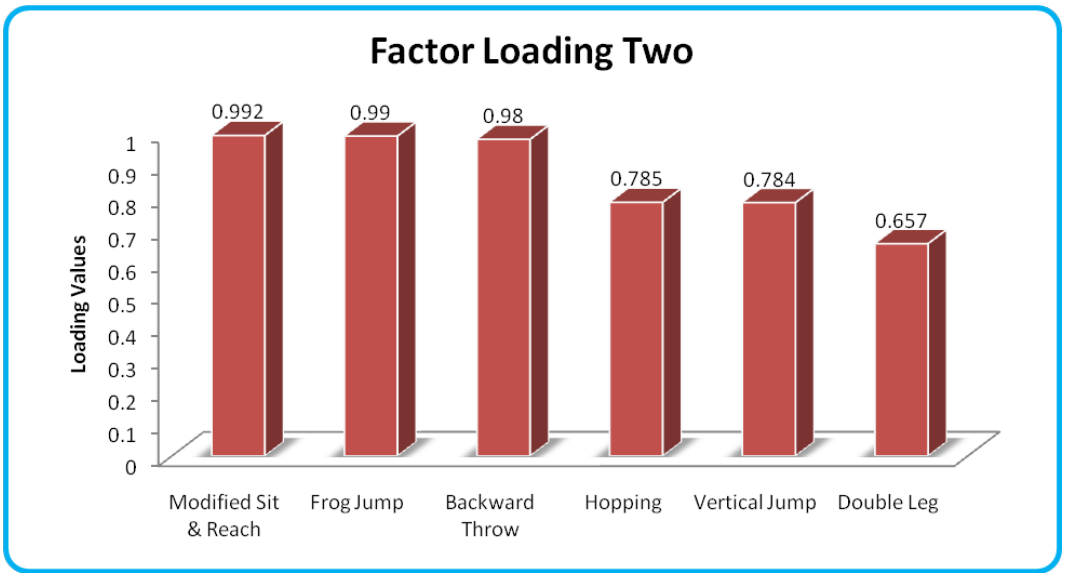

Figure-2 Comparison of Loading Values for Factor 2

CONCLUSION

The prime intention of the researcher was to construct a comprehensive module with limited number of test items and greater level of dependability.

1. The result reveals that there was an inter-relationship between the performances of selected variables.
2. The factor analysis yielded two factors which were named as 'sprinting and upper arm strength ability' and 'strength and power ability'.
3. Seventeen items from the two factors which had high loading were selected to constitute the 'Test battery on athletic potential ability for college women athlete' in the age group of 17 to 25 years. There were 120 metres run, 60 metres run, 100 metres run standing start, 90 metres run, 25 metres run, 80 metres run, medicine ball forward throw, 110 metres run, 150 metres run, 70 metres run, elevated push-ups, modified sit-ups, frog jump, medicine ball backward throw, hopping, modified vertical jump, double leg jump.

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