

An Investigation of Selected Variables of Indian Track & Field Athletes – A Factor Analysis Approach

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Abstract – The purpose of the study was to identify the selected anthropometric and physical fitness parameters as the selection criteria of Indian track & field athletes through the factorial analysis approach. For this purpose (N=75) male track & fields athletes were randomly selected from five different universities of central region of India. The age of those subjects was ranging from 18 to 23 years. Seven anthropometric parameters were measured namely, Standing Height, Body Weight, Arm Length, Chest Circumference, Leg Length, Thigh Circumference, Calf Circumference. Principal component factor analysis was used for extracting factor scores from the above mentioned selected variables, which would be adopted as an indicator of the performance capability in track & Fields events. Findings revealed two extracted factors, according to the content of their respective items, and were named Anthropometric factor and Girth factor.

Key words: Factor Analysis, Anthropometric Variables, Track & Fields Athletes.

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INTRODUCTION

Elite and world class athletes have different physiques than individuals in the non-athletic population (Tanner JM). A variety of anthropometric and training characteristics have been identified as predictor variables for race performance in endurance and ultra-endurance athletes (Knechtle B, 2014).

Success in sport competitions has been associated with specific anthropometric characteristics, body composition and somatotype (Duncan et.al. 2006). While viewing at the most significant physical fitness components in the track and field athletics, explosive power, anaerobic endurance and agility are essential in the sprinters (Sung & Ko, 2017). The knowledge of anthropometric characteristics is necessary to establish their importance for the success in competitive sport (Viswanathan & Chandrasekaran, 2011). An athlete's anthropometric characteristics represent important prerequisites for successful participation in any given sport (Gualdi-Russo E, Zaccagni L (2001). It can be assumed that an athlete's anthropometric characteristics can in some way influence his/her level of performance (Carter, JEL. Heath BH. 1990).

It is a well-known fact that a general relationship exists between morphology and performance. The performance level of an athlete can not improve unless the coach is fully aware of the athlete's morphological aspects, along with anatomical aspects and body structure and its relations to some functional aspects, including any functional changes and limits of body systems and body response to training loads (Abd El-Fattah, A.A. and M. S. Hasanain, 1997). Selection is a precise choice of athletes during preparation phases through testing their physical, functional, psychological and mental capabilities and measuring their anthropometric characteristics specific to the involved technical activity. Basic criteria of selection include anthropometric measurements, especially during initial phases, so that sports goals can be achieved (Ahmed & Ali, 1999).

METHODOLOGY

Selection of Subjects

A total of 75 male track & fields athletes were randomly selected from five different universities of central region of India. The age of the subject

ranged from 18 to 23 years. Anthropometric variables were selected for the purpose of this study.

Criterion Measures

Standing height was measured with the help of stadiometer in centimeters. Body weight was measured with the help of weighing machine in kilograms, arm length, chest circumference, leg length, thigh circumference; calf girth was measured with the help of gullick tape in centimeters.

Statistical Analysis

Factor analysis technique was employed for all variables to identify the relevant variables for talent in track & fields events which was exploratory in nature. The level of significance chosen was 0.05. The data were analyzed with the help of IBM SPSS software 20th version.

RESULTS AND DISCUSSION

Table 1

Descriptive Statistics of Anthropometric variables of Indian Track & Fields Athletes

Variables	Mean	SD
Height	171.3867	5.96588
Weight	65.8600	8.49852
Arm Length	80.3467	3.62608
Chest Circum	89.8400	6.32250
Leg Length	97.7600	3.71207
Thigh Circum	54.2667	3.91923
Calf Girth	35.9867	2.49049

Table – 1 shows the values of Mean & Standard. Deviation of anthropometric variables of track & field athletes..

Table 2

KMO and Bartlett's Test of Factor Analysis for Anthropometric variables

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.846
Approx. Chi-Square	468.111
Bartlett's Test of Sphericity Df	21
Sig.	.000

The Table 2 shows Kaiser-Meyer-Olkin (KMO) and Bartlett's test. The KMO test measures the sampling adequacy. The KMO value was (.846) which was (p> 0.05). So, it was conclude that the sample was sufficient for applying the factor analysis in the present study. Further, Bartlett's test of sphericity tests the hypothesis that whether the correlation

matrix was an identity matrix or not. As Bartlett's Test of Sphericity was significant, the factor model developed in the present study was appropriate.

Table 3

Total Variance Explained by all the Factors

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.742	67.749	67.749	4.742	67.749	67.749	3.017	43.100	43.100
2	1.028	14.692	82.441	1.028	14.692	82.441	2.754	39.342	82.441
3	.537	7.665	90.107						
4	.288	4.107	94.214						
5	.220	3.140	97.354						
6	.113	1.616	98.970						
7	.072	1.030	100.000						

Extraction Method: Principal Component Analysis.

Table-3 shows the factor extracted and the variance explained by these factors. After applying varimax rotation first factor explained 43.10 %, second factor explained 39.34 % of variability. Thus, all the two factors together explained (82.44 %) of the total variance.

Table 4:

Rotated Component Matrix: Varimax Rotated Solution

	Rotated Component Matrix ^a	
	Component 1	Component 2
Height	.812	.523
Weight	.503	.764
Arm Length	.875	.052
Chest Circum	.348	.832
Leg Length	.879	.302
Thigh Circum	.666	.621
Calf Girth	.034	.852

Table-4 Indicates that the varimax rotated solution about the variable explaining the factor. If the variable have factor loading more than 0.6, it indicates that the factor extract sufficient variance from the variables. Result shows that the five component factors have more than 0.06 loading thus they were considered as factors.

Table-5 shows the two factors extracted namely Anthropometric Factor, Girth Factor. In Factor 1 out of four Anthropometric variable three factors are included i.e., Standing height, arm length, & leg length which were considered as a relevant factor for test item screening in track & field athletes and in Factor-2 out of three Girth factor, two factors are included i.e., calf & chest circumferences.

Table 5 Factors

Factor 1: Growth Factor loadings	
Height	.812
Arm length	.875
Leg length	.879
Factor 2: Girth Factor	
Calf circumference	.852
Chest circumference	.832

Table-6: Test Battery for screening the track & field athletes

Height	.812
Arm length	.875
Leg length	.879
Calf length	.852
Chest circumference	.832

CONCLUSIONS

In the light of these results, the researcher concluded the following distinctive anthropometric variables that can be used as selection indicators for elite Indian track & fields athletes: height, weight, arm length, chest circumference, leg length, thigh circumference, calf circumference. Finally we can conclude as out of 7 items selected in the preliminary phase on the basis of literature review and researchers own understanding, only 5 items were found suitable to be retained in the test battery under the two extracted factors i.e., Anthropometric factor, Girth factor where as weight and thigh circumference where not included in the flexor indicator for the Indian track & field athletes. As we know that the weight of the individual is not to be considered as the standard indicator of talent identification, due to the concept of relative weight. In today scenario athlete needs lean body mass which helps the athlete to generate more power and speed. As we know the adipose tissue increases the body weight increases and hence the boy weight will reduce the motor ability of the individual. Thus it is suggested to the researchers interested in constructing test item for screening of track & field athletes to deal with the 5 items finally extracted from this study.

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