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A study on comparison of different somatotype components in relation to speed

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Abstract
The main purpose of the study was to investigate somototype factors as predictors of performance in motor fitness components of male National Level Cyclists. The subjects for the study were 100 male National Level Cyclist. The relationship of each somatotype components viz endomorphy, mesomorphy and ectomorphy, with performance in motor fitness component – speed was established by computing Product Moment Correlation. In order to find the combined effect of various somatotype components, multiple correlation method was also applied. Results of the study suggested that there was a significant difference found between different somototype components in relation to speed. The sequence of performance in there Somototype groups related to speed was (8.31) mesomorphy >(8.54) ectomorphy >(10.01) endomorphy.

Keywords: Somatotype components, ectomorph, mesomorph, endomorph, speed

Introduction
Performance in team sports is traditionally linked with the physical abilities and the technical skills of the players (Giannopolos *et al*., 2017). The somatotype technique is the most complete methodology to assess the physical characterization of both body morphology and composition. This technique also allows determining the body morphology and composition associated with a specific health condition, sports or aesthetic issues. Not only does it allow for the individuals to know himself/herself, but it aids to improve his/her physical condition, especially when it is associated to specific sportive activity and/or performance (Claudio *et al*., 2014) [2]. There are numerous factors, which are responsible for the performance of sportsmen. The physique and body composition including the size, shape and form are known to play a significant role in this regard. The performance of sportsmen in any game or event will also dependent on their suppleness skill training, motivation and on various other factors of physiological and biochemical nature, Age, sex and physical growth have also been noticed to influence a person's capacity for physical activity (Sodhi and Sidhu, 1984) [7]. The concept of somatotyping looks as appealing because it is a classification of total body form that can be expressed as a simple rating. It provides a gestalt impression of human physique but it is not limited by placing individuals into discrete categories. Somatotyping was a genetic term embracing several different methods, all based on Sheldon's concept of three-component rating. It is a quantitative description of the present morphological conformation and composition of the body. It was expressed in three ratings as per Heath and Carter method of somatotype that describes the body as a whole and was a rating of what the body looks like (Ostyn *et al*., 1980) [5]

To understand the relationship of somatotype to physical fitness and personality traits, a study of isolated variables of motor components and personality traits as they are influenced by somatotype would seem to be well justified and hopefully, may assist in the development of a formula relating these aspects of the individual. It was hoped that the material presented in this study would provide a better understanding of the motor fitness and somatotype components that contribute to the development of athletic excellence. The information should find application in physical education programs, early identification and selection of the potential athletic type and perhaps most important by of a deeper and more significant understanding of the nature of human performance.

Methodology

The subjects for the study were male National Level Cyclists. One hundred male subjects were randomly selected, with age ranging from 17 to 30 years. The health records maintained by the department/ Federation, administration were checked by the investigator to ensure that subjects selected were physically and mentally sound to undergo motor fitness tests chosen for this study.

Prior to the testing in different motor fitness components and anthropometric measurements for rating somatotype components, a meeting of all the subjects for this study with their head/ Coaches was convened in which the purpose of the study requirements of testing procedure, demonstration of various motor fitness test items was explained to them in details to make them aware of the actual requirements of the research study. All the subjects agreed voluntarily to cooperate with the scholar in the study and the testing procedure was explained to them. The head / Coaches of concerned departments also exhorted them to put in their best efforts in the interest of the scientific investigation.

Selection of variables

From the scholar's own understanding of the problem and as gleaned through the literature the following dependent and Independent variables were selected.

Dependents variables

The rating for the three-somatotype components, were selected as dependent variables i.e. ectomorphy, mesomorphy and endomorphy. Speed was selected as independent variables under motor fitness.

Reliability of data

The reliability of data was ensured by establishing the instruments reliability, tester reliability, reliability of tests and subject reliability.

Instrument Reliability

To record motor fitness components, the instruments like stop watches, tape, yard stick, two hand coordination apparatus, the sit and reach flexibility measurement instrument and to rate the components of physique, the instruments like skinfold caliper, wall scale, weighing scale, modified sliding caliper and flexible steel tape, used in this study were arranged by scholar from research laboratory of S.M.S. Stadium Jaipur Netaji Subhas National Institute of Sports, Ptiala and Department of Physical Education, University of Rajasthan, Jaipur. The instruments/equipment were supplied by none standard firms and hence their calibration was accepted as accurate enough for the purpose of the study.

Tester reliability

To ensure that the investigator was well acquainted with the techniques of conducting the tests, the investigator had a number of trials/practice sessions with respective experts. The scholar took all the measurements with the assistance of his colleagues, who were all acquainted with the tests and their testing procedures.

Administration of tests and collection of data

Administering the respective tests for the chosen variables collected the data. Before the administration of tests the subjects were given a chance to practice the prescribed tests to make them familiar with the tests and to know exactly what was to be done. The methodology for each apparatus was explained to the subjects prior to the administration of tests. To ensure uniformity in testing conditions, the data was collected for the chosen independent and dependent variables.

Procedure of Ratings for Somatotype Components

From anthropometric variables, ratings for the somatotype components (Ecto, meso and endo) were obtained by using the Heath and Carter somatotype rating method.

Motor Fitness Tests: To measure speed ability subjects were assembled on the 400 m. sinder track of a Swai Mansingh Stadium Jaipur and where they were explained the tests and its procedure. The subjects wore sports kit (T-shirt, shorts and sports shoes) 50 yard starting and finishing line was marked on the eight-lane track. Five subjects were made to run a one-time performance. The subjects were asked to stand on the starting line and to take a standing start. The clapper was clapped after the caution 'ready' was given to the subjects. The starter stood in such a position so that the 'V' of the clapper, (opened clapper) was visible to the timekeepers. As the 'V' closed when the clap was executed, the five time keepers (experienced) at the finish line started the stopwatches. The subjects sprinted as fast as possible across the finishing line accordingly time was recorded. The elapsed time, from the starting signal (clap) until the subject crossed the finish line was recorded to the nearest one tenth of a second as the score.

Statistical techniques applied

The relationship of each somatotype component, viz. endomorphy, mesomorphy and ectomorphy, to performance in different motor ability component was established by a computing Product Moment correlation. In order to find the combined effect of various somatotype components, multiple correlations were applied. To find out the significant difference between three different somatotype components the analysis of variance (ANOVA) was applied at 0.5 level of significance. Further a regression equation was developed to predict somatotype components i.e. endomorphy, mesomorphy and ectomorphy, separately on the bases of motor fitness components. For testing hypothesis, level of significance was set at .05. All the one hundred male subjects (N = 100) were divided in to (35+35+30) three groups on the basis of somatotype components i.e. endomorphy, mesomorphy and ectomorphy.

Somatotype factors as predictors of performance in motor fitness components of male National level cyclists. The collected data were analyzed by using product moment correlation, multiple correlation and regression analysis.

Results

Independent variables i.e. speed of Motor Fitness components was correlated with the criterion variable to find out the extent to which they were related or the extent to which the variability goes with the variability in another.

The coefficient of correlation between motor fitness component-speed and different somatotype factors has been presented in table – 1.

Table: 1: Relationship of Motor Fitness Components-speed to Ectomorphy, mesomorphy and Endomorphy

Variable correlated	Correlation Coefficient(r)		
	Ectomorphy	Mesomorphy	Endomorphy
Speed	-.215*	-318*	.272*

N= 100; * Significant at .05 level of confidence; r. 05(98) = .195

An analysis as shown in table-1 indicated that ectomorphy, mesomorphy and endomorphy had significant correlation to speed i.e. r= .215, -318 and .272 respectively.

To observe significant difference between somatotype components of male National level cyclists in speed, the analysis of variance was adopted for three somatotype components and data pertaining to these have been presented in table-2.

Table 2: Analysis of Variance in speed among endomorphy, mesomorphy and ectomorphy

Source of Variance	df	Sum of Square	Mean sum of square	F-ratio
Between group	2	77.87	38.9	7.97
Within Groups	97	474.270	4.88	

* Significant at .05 level of significance; F .05 (2,97) = 3.09

Above table revealed that there was significant difference in different somatotype components obtained as F-ratio was 7.97 which was higher value that the value (3.09) required for "F" ratio to be significant at .05 level with (2,97) degree of freedom. Since the one-way analysis of variance was found significant where related to speed, the Scheffe's test was applied to find out which of the differences of the means amongst the different somatotype components was statistically significant.

Table 3: Post-hoc test for means of somatotype components in relation to speed.

Somatotype components			M.D.	C.D.
Endomorphy	Mesomorphy	Ectomorphy		
10.01	8.31		1.7*	.75
10.01		8.54	1.47*	.77
	8.31	8.54	.23	.59

* Significant at .05 levels.

Above table clearly revealed that significant difference was found between the means of endomorph and Mesomorph, endomorphy and ectomorphy as the mean difference of above two was greater than their critical differences.

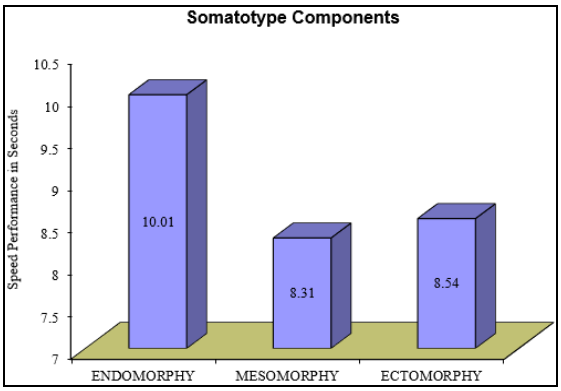

Fig 1: Comparison of Different Somatotype components in Relation to Speed

Insignificant difference was found between the mean of mesomorphy and ectomorphy as the mean difference was less than the critical differences. The sequence of performance in all three groups was (8.31) mesomorphy > (8.51) ectomorphy > (10.01) endomorphy.

Discussion

Sills and Everett (1953) [6] found that mesomorphs were stronger than endomorphs, endomorphs were stronger than ectomorphs, ectomorphs were superior to the endomorphs in speed, agility and endurance, Mesomorph were superior to both endomorphs and ectomorphs in agility, speed and endurance, excess body weight was dividedly a handicap to endomorphs in the performance of physical test, considerations should be given to body types in formulating standards for achievements in strength and motor tests.

Clarke and his co-workers (1961) studied the relationship of the structural and functional aspects of college men by correlating the ratings to the three components of somatotype with the score in Roger's physical fitness index, vertical jump and Brace test of motor ability. It was observed that a real relationship did exist between mesomorphy and Roger's physical fitness index, endomorphy and Vertical jump and ectomorphy and motor ability as measured by the Brace test.

The present study revealed that significant relationship was found in speed with endomorphy, mesomorphy and ectomorphy.

Morton (1967) [4] concluded that the motor ability variables were not significantly related to somatotype assessment. The three motor ability variables showed a consistently significant relationship with the ectomorphy, the variable were standing broad jump, bar push-ups and physical fitness index.

Within the limitation of the present study, a relationship was found significant between Endomorphy with (.272) speed. Relationship was also found significant between mesomorphy with (-.318) speed and for ectomorphy with (-.215) speed.

Significant difference was found between different Somototype components in relation to speed (7.99). The sequence of performance in there Somototype groups related to speed was (8.31) mesomorphy >(8.54) ectomorphy >(10.01) endomorphy.

In the light of the above observation it is concluded and recommended that various motor fitness tests may be constructed which allow for differences in body build. It may not be logical to expect a person with excessive endomorphy component to achieve the same level of success in motor fitness tests like mesomorphy.

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