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Somatotype profile of the state level cricketers of Tripura

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Abstract
Background of the study: The introduction of Twenty-20 cricket being a shorter version, the physical demand of the game have increased manyfold subjecting players of all body types to strain due to the structure of the game and the distinct roles of batsmen, bowlers, and all-rounders-roles usually filled by tall, athletic professional cricket players.
Purpose: The aims of the study was to compare the somatotype between State-level cricketers of Tripura with their various specializations.
Methods: For the purpose of the study, a total of 60 male cricket players who were selected for the U-19 state camp of Tripura State were chosen as subjects. The age range of the subjects was 16-19 years. The subject has been distributed 20 each for batsmen, bowler and All-rounder. Anthropometric data were collected from the selected players in two different shifts during their practice session. The descriptive statistics and One-way ANCOVA were employed to analyzed the data.
Results: The results revealed that the U-19 Batsmen leaned toward an Ectomorphic Mesomorph build, while U-19 Bowlers displayed a Mesomorphic Ectomorph somatotype. All-rounders fell in line with Ectomorphic Mesomorphy. Notably, BMI varied significantly between bowlers and all-rounders, emphasizing distinct physical profiles. Comparing bowlers and all-rounders together revealed marked differences in traits like Mesomorphy and Ectomorphy. However, there were no significant variations in Endomorphy attributes among batsmen, bowlers, and all-rounders, indicating similarity in this aspect across player roles.
Conclusion: These findings elucidate the nuanced physical distinctions among U-19 cricketers, contributing valuable insights into their somatotype profiles based on specific playing roles.

Keywords: BMI, ectomorph, mesomorph, endomorph, skinfold

Introduction
Anthropometry is the measurement of surface dimensions, body weight and height, and dimensions of body segments. The measuring of the human body using certain physical standards is known as a somatotype. The three primary components of the human body - endomorph (fatness), mesomorph (muscularity), and ectomorph (linearity) - and their different contributions to the morphological condition of the body are explored. There is a general consensus that certain physical characteristics are essential for performing at the highest level in a specific sport given the vast diversity of physical structures. Somatotype is the quantification of the human body through some specific physical measurements. It deals with the morphological state of the human physique according to the relative contribution of three fundamental elements; endomorph (fattiness), mesomorph (muscularity), and ectomorph (linearity). With a numerous variety of physical structures, it is a global consideration that specific physical characteristics played an important role in performing at the highest level in a specific sport (Teodor, TÓTH. *et al.*, 2014) [28]. In addition to other criteria like physiological and physical fitness, psychological aspects, abilities, etc., a sportsperson's body composition and somatotype play a considerable impact on their ability to compete in sports (Adhikari *et al.* 2014) [1]. A person's physical appearance can take on a variety of forms and hues depending on their body composition and the type of muscle mass they have, which is defined as the proportion of fat, water, and muscle in their body.

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Body size, or the physical size of the body as measured by its volume, mass, length, and surface area, can also be portrayed by body composition. Body somatotype grouping, which has been established as a method of assessing human body morphology, describes how the body's composition and muscle mass relate to body size. The study of the dynamics of the formation of a certain shape of the human body under the impact of various rigorous deliberate training procedures and competitive periods includes investigations of somatotypes in top athletes. It is commonly recognized that an athlete's anthropometric profile may reveal if they are qualified to compete at the highest level in a certain sport (Gutnik B, *et al.* 2015) [4]. It is commonly known that some physical traits seem to be linked to success in athletics and other forms of physical performance. Analysing anthropometric traits has a significant impact on sports in terms of creating and maintaining a training schedule as well as nutrition. Somatotyping provides greater scientific guidance for periodizing dietary applications and exercise programs (Adhikari *et al.* 2014) [1]. An athlete's ability to perform at their peak level must be based on their physical development and dietary needs, and these anthropometric and morphological syndromes are sensitive indicators of this.

Cricket is a year-round, field-based team activity that has rigorous scheduling and calls for extended periods of practice and preparation. In the final 10 years of the 20th century, Australia's cricket team was the greatest in the world, and they credited their success to their physiques and levels of fitness. The introduction of the Twenty-20 has enhanced the physical demands of cricket. Different body types are put under stress by the physical requirements, which vary based on the game's structure and the character's job. Professional cricketers tend to have tall, athletic bodies, with obvious physical differences among batsmen, bowlers, and all-rounders. Cricket players' morphological characteristics, physical characteristics, skills, mental characteristics, stamina, and body types all contribute to their performance, much as in other competitive sports. The assessment of high-profile athletes' morphological traits can be a crucial component in linking body composition to athletic performance (Gutnik B *et al.* 2015) [4].

There was less scientific information about cricket players about somatotypes from an Indian perspective, especially in Tripura. Keeping in mind this gap, this study is focused on drawing out the Somatotype of state-level cricketers of Tripura according to their specialization. Therefore, an attempt has been made to identify the somatotype of the state-level cricketers of Tripura and also to compare the somatotype between State-level cricketers of Tripura with their various specializations.

Methodology
For the purpose of the study, a total of 60 male cricket players who were selected for the U-19 state camp of Tripura State were chosen as subjects. The age range of the subjects was 16-19 years. Further the subject has been distributed 20 each (batsmen, bowler and All-rounder). The subjects included school and college students as well as people from various socioeconomic backgrounds. The exam technique was thoroughly described to the subjects at the meeting. Each individual willingly consented to work with the researcher. Throughout the research, the subject was discovered to be extremely eager and cooperative.

Collection of data
At Maharaja Bir Bikram Stadium, Tripura, during their coaching and training sessions for the U-19 Cricket state camp, the data on the chosen variables was gathered. The researcher individually visited with the involved coaches before the actual data collection in order to solicit their complete participation. For the purpose of gathering some anthropometric data, two practice sessions-one in the morning and one in the afternoon-have been chosen. Data were gathered for research, and a total of 60 participants were chosen at random. Each person was fixed for around 10 minutes.

Table 1: Criterion measure

SL. No	Variables	Unit of measurements	Equipment
1	Body mass	Kilograms	Weighting machine
2	Height	Centimeters	Stadiometer
	(Skinfold measurements)		
3	Biceps	Mili meters	Skinfold caliper
4	Triceps	Mili meters	Skinfold caliper
5	Sub-scapula	Mili meters	Skinfold calliper
6	Supra-Spinale	Mili meters	Skinfold caliper
7	Medial calf	Mili meters	Skinfold caliper
	(Girth)		
8	Medial calf girth	Centimeters	Anthropometric measuring tape
9	Upper arm flex girth	Centimeters	Anthropometric measuring tape
10	Bi-epicondylar Humerus	Centimeters	Sliding caliper
11	Bi-epicondylar Femur	Centimeters	Sliding caliper

Statistical Analysis: Following data collection, the researcher provided statistical analysis for computation, calculation, and study analysis. Calculations include the mean, standard deviation, one-way ANOVA, and post hoc test.

Results and Discussion
The results of the different statistical analysis on the data of batsman, bowler, and all-rounder are discussed below:

Table 2: Mean, SD, and p-values of batsman, bowler, and all-rounder

Different Specializations	Mean	SD	P-Value
Batsman	20.16	2.44	
Bowler	19.22	1.83	0.000182
All-rounder	22.94	3.60	

Significant at p-value <0.05

Table 2 revealed that the mean and SD of the height of the batsmen group was 20.16±2.44 kg, that of the bowlers was 19.22±1.83 kg, and that of the all-rounders was 22.94±3.60 kg. It showed that there was a significant difference between the specialized groups by using analysis of variance (one-way ANOVA). The level of significance was set at p<0.05.
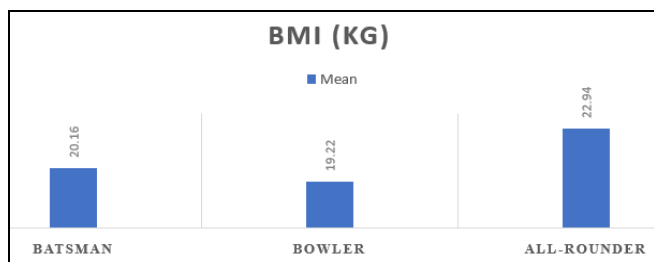

Fig 1: Graphical representations of BMI mean values of the Cricketers according to their specializations.

Table 3: Post Hoc Test (Bonferroni)

Different Specialization	P-Value	Remarks
Batsman vs Bowler	0.17480593	Not Significant
Batsman vs All-rounder	0.00699469	Not Significant
Bowler vs All-rounder	0.00020068	Significant

Table No.3 reveals that there was a significant difference between the Bowler and All-Rounder group. The level of significance was set at p<0.05/3= p<0.016667.

Somatotype characteristics of the state-level cricketers of Tripura in different specializations

Table 4: Mean and SD values of the batsman, bowler, and all-rounder

Different Specialization	Somatotype Characteristics					
	Endomorphy		Mesomorphy		Ectomorphy	
	M	SD	M	SD	M	SD
Batsman	2.11	1.25	3.89	1.13	3.58	1.28
Bowler	2.83	1.08	3.385	0.64	3.94	0.94
All-rounder	2.20	0.66	4.57	1.26	2.51	1.55

The distribution of somatotype traits such as Endomorphy, mesomorphy, and ectomorphy was shown in table no 4. The Endomorphy mean variable of the batsman was 2.11 and SD was 1.25, bowler group was 2.83 and SD 1.08, and for the all-rounder group the mean was 2.20 and SD was 0.66 Another observation on Mesomorphy, the Batsman mean variable was 3.89 and SD was 1.13, for the bowler group the mean was 3.38 and SD was 0.64 and the mean of the all-rounder group was 4.57 and SD was 1.26. Ectomorphy served as this table's final parameter. The mean and SD of the Batsman was 3.58 and 1.28, 3.94 and 0.94 for the bowler group and all-rounder was 2.51 and 1.55.

Table 5: Number of batsman, bowlers, and all-rounders in each of the somatotype category

Batsman	Bowler	All-rounder
Ectomorphic Mesomorph	Ectomorphic Mesomorph	Ectomorphic Mesomorph
7	7	3
Endomorphic Mesomorph		Endomorphic Mesomorph
2		10
Mesomorphic Ectomorph	Mesomorphic Ectomorph	Mesomorphic Ectomorph
10	13	6
Mesomorph Ectomorph		Endomorph Ectomorph
10		1

Table 5, Illustrates the number of batsmen, bowlers, and all-rounder in the somatotype category.

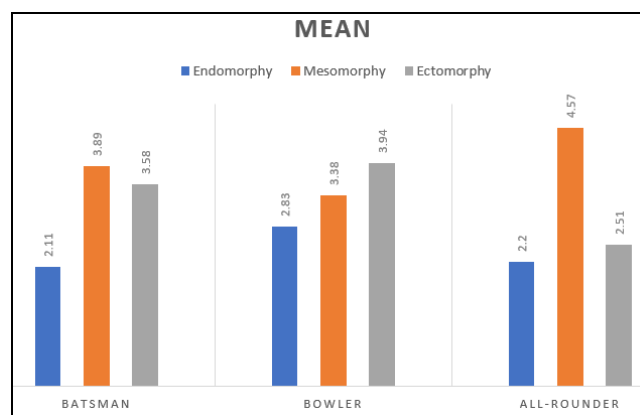**Fig 2:** Graphical representation of mean of Endomorphy, mesomorphy and ectomorphy according to the specializations in cricket
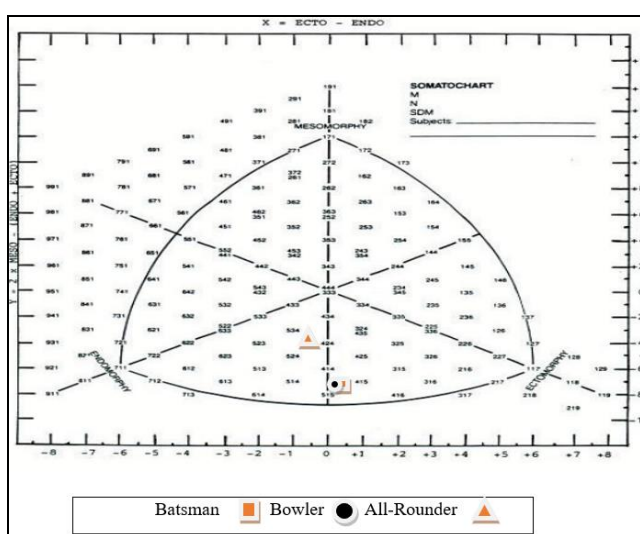

Fig 3: Graphical representation of somatotype of different specialization in cricket

Fig 3 illustrates the Somatotype plotting of the Batsman (2.11-3.89-3.58), the Bowlers (2.8-3.3-3.9), and the all-rounders (2.2-4.5-2.5). The overall characteristics of cricketers represent the average plotting in the Somatochart with fewer Endomorphic characteristics. All of them possess mesomorphic Ectomorph and Ectomorphic Mesomorph physique.

Table 6: ANOVA table of Endomorph, Mesomorph, and Ectomorph

Different Specialization	ANOVA					
	Endomorphy		Mesomorphy		Ectomorphy	
	F	P-Value	F	P-Value	F	P-Value
Batsman						
Bowler	2.894169	0.063516	6.489663	0.002889	6.74764	0.002344
All-rounder						

Table No.6 reveals that there was no significant difference between the batsman, bowler, and all-rounder in the Endomorphic Component. But there is significant difference has been displayed in Mesomoprhy and Ectomorphy among the three specialized groups by using analysis of variance (one-way ANOVA). The level of significance was set at p<0.05.

Table 7: Post Hoc Test for Mesomorphy

Different Specialization	P-Value	Remarks
Batsman vs Bowler	0.319463437	Not Significant
Batsman vs All-rounder	0.022189963	Not Significant
Bowler vs All-rounder	0.001100702	Significant

Table No.7 reveals that there was a significant difference between the Bowler and All-Rounder group. The level of significance was set at p<0.05/3= p<0.016667.

Table 8: Post Hoc Test for Ectomorphy

Different Specialization	P-Value	Remarks
Batsman vs Bowler	0.3194634	Not significant
Batsman vs All-rounder	0.02219	Not significant
Bowler vs All-rounder	0.0011007	Significant

Table No. 8 reveals that there was a significant difference between the Bowler and All-Rounder group. The level of significance was set at p<0.05/3= p<0.016667.

Cricket is an endurance sport that is practiced all year round. The players' need to be physically fit is therefore paramount. It is generally known that anthropometric examination of several sports has revealed that optimum performance seems to have clear physical prerequisites (Koley 2011) [14]. The mean and SD values of BMI were found 20.16±2.44 for the batsman, 19.22±1.83 for the bowler, and the all-rounder 22.94±3.60. By using variance one-way ANOVA, the p-value of the height of the cricketers was 0.00018. The significance was set at p<0.05. It was found that there was a significant difference between the three specializations. From the Post hoc test significant difference was found between the bowler and the all-rounder. The significant level for the Post hoc test was set at p<0.016. It is found that the bowler and all-rounder groups have a significant difference in BMI. The average BMI of the U-19 state-level cricketers is normal weight. These findings were very similar to those results obtained by (Muhammad Tayyab Jamee 2019) the mean value of BMI of cricket, football, and hockey athletes was (22.49±3.25). The function is connected to anthropometry or physical appearance. Depending on the training and activity in that sport, the physiological systems adapt in various ways. For instance, marathon runners' physiological adaptations differ from those of their badminton counterparts. The anthropometry, structure, and somatotype traits of a badminton player and a marathon runner are also different The somatotype characteristics represent the bodily shape, size, and proportion of human beings. This study was done on 60 Subjects where 20=Batsmen, 20=Bowler and 20=All-rounder. The mean and SD values of Endomorphy, mesomorphy, and Ectomorphy of Batsman were 2.11±1.25, 3.89±1.13, and 3.58±1.28, for bowlers 2.83±1.08, 3.38±0.64, and 3.94±0.94, and for the all-rounder group was 2.205±0.66, 4.575±1.26, and 2.51±1.55. Regarding the Somatotype characteristics it was found that 7 of the Batsman had an Ectomorphic Mesomorph physique, 2 had Endomorphic Mesomorph, 10 had Mesomorphic Ectomorph and 1 had a Mesomorph Ectomorph body type. For the Bowler Groups, 13 have the Mesomorphic Ectomorph, and 7 Ectomorphic Mesomorph. In the All-Rounder group, 10 of the allrounder had Endomorphic Mesomorph body type, 6 had Mesomorphic Ectomorph, 3 had Ectomorphic Mesomorphic and 1 had Endomorph Ectomorph body type.

In this study, the mesomorphic ectomorph body type is prominently observed within the batsman group, exhibiting the highest number of individuals with this body type. This may be because Ectomorphs frequently excel in agility and speed, which is advantageous for quick footwork at the crease and running between the wickets. Mesomorph may be strong enough to make powerful shots. The batter has the most mesomorphic elements, which may be for better balance, power, and strength to enable them to score as many runs and boundaries as possible (Biswas A, 2020) [2].

The study of Somatotypes in athletes has shown that the bowlers have the highest number of Mesomorphic Ectomorph physiques in their group. Fast bowlers, who rely on explosive power and speed, often possess mesomorphic traits with strong upper bodies. The Australian fast bowlers exhibited a somatotype profile of 2.4- 5.2-2.4 reflecting a meso-ectomorphic physique (Stuelcken *et al.*, 2007) [18]. And the All-rounder group has the highest average of Endomorphic Mesomorph Physique. This might be because the greater number of all-rounders used to bowl spin in the all-rounder group. State-level players' use of fast and spin bowlers varied. The physical composition of the spinner and the medium-pace bowler differed noticeably from one another (Lamani *et al.* 2016) [6]. There are no discernible changes in the current Tripura U-19 state-level cricketers in endomorphic attributes. These findings also supported the observations (Biswas. A 2020) [2] on district-level cricketers of West Bengal. Although the All-rounder dominated in the Mesomorphic components compared to batsmen and bowlers, but are lower than the other two groups in the Ectomorphic attributes. There was a significant difference between the specialization groups in Cricket i.e., batsman, bowler, and all-rounder in the Mesomorphy and Ectomorphy attributes. Moreover, the somatotype of the sports persons depends on ethnicity and racial characteristics besides the training adaptations and even a review has been published on ethnicity and success in cricket.

Conclusion
This study investigated the somatotype characteristics among U-19 cricketers in Tripura, categorizing them as batsmen, bowlers, and all-rounders. The findings revealed distinctive somatotypes for each group: U-19 Batsmen predominantly exhibited an Ectomorphic Mesomorph build, while U-19 Bowlers were identified with a Mesomorphic Ectomorph somatotype. The U-19 all-rounders, meanwhile, showcased characteristics aligning with Ectomorphic Mesomorphy. Moreover, the study highlighted significant variations in height, weight, and BMI between bowlers and all-rounders, indicating distinct physical profiles within these player categories. Interestingly, when comparing bowlers and all-rounders as a collective group, noticeable differences were observed in traits like Mesomorphy and Ectomorphy. However, there were no statistically significant variations found among batsmen, bowlers, and all-rounders concerning Endomorphy attributes, suggesting similarity in this aspect across these player roles.

Conflict of Interest
There is no conflict of interest.

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