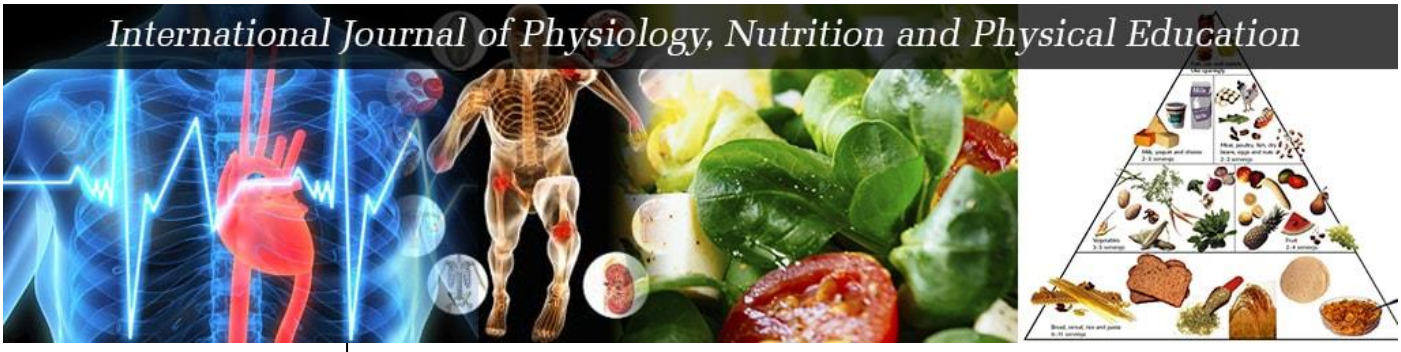

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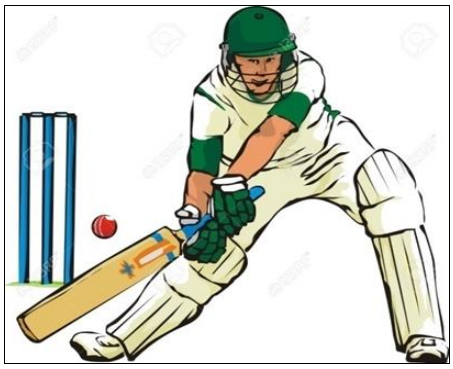
A study of morphological of junior and senior cricket players and specific motor fitness of bowlers and batsman of Goa

Chandu G Lamani and Dr. Pratap Singh Tiwari

Abstract
The main purpose of the present study was to compare the Somato body type profile of Junior and senior cricket players of Goa and Specific Motor fitness of Batsman and bowlers of Goa, who are actively participating state and national tournaments. Do the three Somatotype components of junior cricketers differ from those of senior cricketers? Also the specific motor fitness variables differ from batsman with bowlers. All the cricketers had competed at least at the state level and national level. For the morphological Somato body type purpose of the study a total of 100 cricketers were examined 100 subjects were divided in to Four Groups Under-14 (N=14), under -16 (N=19), Under-18 and Seniors Above the age 18 below 23 years of age. For the specific game related motor fitness variables 50 samples were recruited and they were equally divided in each age category group for the purpose of the study. 18 anthropometrical and 03 specific motor fitness variables were measured and recorded. To find out the difference among the group in Somato body type for Hypotheses each of the three Somatotype components of u-14, u-16, u-18 and senior cricketer were subjected to analysis of independent variance. Following significant omnibus F-ratio, post-hoc, Scheffe's test was administered to locate significant difference between means. For specific motor fitness variable descriptive analyzes was carried out and 0.05 was set for significance level. The author found that there was difference in Somato Body type characteristics and specific motor fitness variables among junior and senior cricketers of Goa. The results of the present study for junior and senior cricketers were not as conclusive as for the senior cricketers and batsman with bowlers. One of the reasons, why many of the morphological a profile and specific motor fitness variables different from each other was that, the junior cricketers were still maturing and senior cricketers were already matured. In the present study sample size of young cricketers was very small. Therefore, it is recommended to replicate such an investigation with larger sample size.

Keywords: morphology, anthropometrical, somato body type, specific motor fitness, junior & senior cricket players, Goa state

Introduction



Success in Cricket, like in any other competitive sport, depends on various factors, including fitness, skill and the morphological characteristics of the players. The success of teams in provincial, international or other competitions depends on a suitable combination of these

components. Cricket is a sport in which fitness and Body types is traditionally not thought of as very important. The importance of fitness in any sport cannot be underlined. The fitter you are the better you'll play. But Cricket is one such sport which tests your game skills, mental strength, stamina physical endurance and body type as well. The success in the 1990s and 2000s of the world beating Australian team has been attributed to their professionalism, and in part to the way they addressed their fitness and body types. The other test playing nations have rightfully put more emphasis on fitness and on specific body types recently and are reaping the benefits. With the introduction of One day cricket and more recently T/20, the game has gone through major changes and the physical demand made on cricketer's body have also increased dramatically. Depending upon the version of the game played and role played by the player in the team, the importance of fitness and Body types will vary, the fitness requirements of a Fast bowler will be greater and also different than of an opening batsman, and one day cricket will be more demanding than a test match. With modern cricket, players can be expected to tour for up to eleven months of the year; therefore, physical fitness is increasingly important. The only study that focused specifically on the calorific energy demand of cricketers was performed in 1955, and its validity in representing the demands of modern players would seem problematic.

Factors contributing to success in sports

Success in Sports, like in any other competitive sport, depends on various factors, including fitness, skill and the morphological characteristics of the players. The success of teams in provincial, international or other competitions depends on a suitable combination of these components.

Morphological characteristics

In terms of morphological characteristics, success in most sports requires a unique combination of height, weight, body type and muscularity to meet the physical demands of a sport. Further contends that at top Olympic level it is vital to have the optimum physical attributes for medal success. Physical build, in terms of muscle mass and physical body size, are important determinants of success at the higher levels of sports participation. Having a significant amount of body fat will have a negative impact on performance as a result of carrying excess weight. Excessive body fat will negatively affect speed and also increase thermal stress as a result of increased body surface area and metabolically inactive tissue. Personal experience as fitness trainer and coach reveal that athletes who carry excess weight perform exercises more slowly, do less, and appear to sweat more profusely than their leaner counterparts. According to Health line (2011) they may be more prone to injury when performing difficult skills than the athlete with a more optimal body composition.

Physical fitness

According to there is differences in the physical build of athletes playing different sports and different positions within the same sport and therefore certain morphological types are better suited to the biomechanical demands of certain sports and playing positions in these sports. These observations are evident in games where in defensive positions players are bigger and more muscular, while in offensive positions they are quicker, more agile, may have to cover greater distances and are consequently lighter. This also applies to cricket. The first batsman for example, must have quick reflexes and footwork, wicket keeper good glove work and strong decision - making ability. The throw doesn't have to be strong but it must be accurate, and pure speed is not as important as agility.

Purpose of the study

The main purpose of the present study was to describe the morphological profile of Junior and senior cricketers of Goa, and specific motor fitness of Bowlers and batsman of Goa who are actively participating state and national tournaments. Since the term morphology is a very broad concept, specific hypothesis involving some of Somatotype profile were formulated and in specific motor fitness also.

Statement of the problem

The purpose of the study was to identify the morphological characteristics and physical fitness level of junior and senior cricketers of Goa.

1. Do the three Somatotype components of junior cricketers differ from those of senior cricketers?
2. Do the specific motor fitness variables of batsman differ from those of bowlers?

Significance of the study

It was hoped that data generated and interpreted in the present study will help the coaches, Physical education teachers, sports scientists, in following ways:

1. Enables to select Athletes for coaching
2. Predictions of Successful performance
3. To help / enable coaches to identify deficiencies and to overcome through compensatory training
4. The information collected can be used for monitoring the training programme as well as counseling, providing information about the choice between spin bowler, fast bowler, batsman and wicket keeper.
5. The author also assumes that this study will help the Goan cricket to improve the standard of cricket in the state.

Methodology – samples

A total of 150 cricketers were examined, 100 for morphological parameters and 50 for Specific motor fitness variables. All the cricketers had competed at the state level and national level. For the morphological difference purpose 100 subjects were divided in to four groups U-14, U-16, U-18 and seniors above the age of 18 but below the age of 22 years. And in Specific motor fitness variables 50 samples were equally divided in to two (2) different groups Batsman and Bowlers and their age ranged between 16 years to 22 years. The number of samples for morphological purpose numbers means and standard deviation of each age group is furnished in the table 1 as follows. Total numbers of samples for specific motor fitness purpose described in tables no II. Entire anthropometrical tests were administered and recorded at Birla institute of Technology and Science College Gym and specific motor fitness test at BITS cricket ground. The subjects were measured from 6.00 AM to 8.30 AM. The following anthropometric, body composition and specific motor fitness measures were obtained during two different testing sessions. The measurements were all recorded in metric system. Necessary content was obtained from Goa Cricket Association and the coaches to test their players and obtain data. Standard BCCI NCA procedures were followed for taking 18 anthropometric and 03 specific motor fitness measurements from each cricketer.

Table 1: Number and age ($\overline{X} \pm Sd$) of under 14 years, under 16 years, under 18 years and senior cricketers in the morphological stud

Age Group	Numbers	Age ($\overline{X} \pm Sd$)
Under-14	14	13.059 ± 0.8322
Under-16	19	15.262 ± 0.6136
Under-18	17	16.65 ± 0.51
Seniors	50	21.21 ± 1.71
Total	100	18.16 ± 3.46

Table 2: Classification of group and numbers in each group of specific motor fitness study

Bowlers	Batsman	Total
N=25	N=25	50

Table 3: List of anthropometrical n= (18) and specific motor fitness variables n-03, measured and recorded for the study

Anthropometrical tests	Scale
Standing Height (Stature)	CM
Sitting Height (Leg length)	CM
Weight in KG (Body mass)	KG
Sum of Skinfold at six (6) sites	
Sub scapular	MM
Abdominal	MM
Supraspinale	MM
Triceps	MM
Mid-thigh	MM
Medial calf	MM
Width Tests	
Biacromial width	MM
Biilliocristal,width	MM
Biepicondylar Humears Width	MM
Biepicondylar Femur Width	MM
Arm span	MM
Hand span	MM
Girth Tests	
Tense arm Girth	CM
Relaxed forearm girth	CM
Calf Girth	CM
Specific Motor Fitness Tests	
20 meter Dash	In seconds (Timings)
40 meter Dash	In seconds (Timings
Run- a-three	In seconds (Timings

Data transformation and derived variables

The three Somatotype components were computed by using absolute values of anthropometric measures such as skin folds (triceps, sub scapular, suprailiac, and medial calf), and bone widths (Biepicondylar Humerus and femur) and muscular girth (tensed arm, forearm and calf).

List of variables, which were derived by using certain formulas

1. **Somato type components**
   a) Endomorphy was obtained by finding sum of skin fold triceps, Sub scapular, and Supraspinale skin fold (X) using the following formula.
   Endomorphy = 0.1451 x -0.00068 X^2 + 0.000014 X^3 – 0.7182
   b) Mesomorphy component was obtained from the following equation.
   c) Mesomorphy = 0.858 (E) + 0.601 (K) + 0.188 (A) + 0.161(C) - 0.131 (H) + 4.5

Where E = Humerus breadth (cm);
K = Femur Breadth (cm);
A = Corrected arm girth:
Arm girth (cm) – triceps sf / 10) (mm);
C = Corrected Calf Girth:
Calf girth (cm) – (Medial Calf sf /10) (mm); and
H = Height (cm);

d) Ectomorphy component is obtained from the reciprocal of the Pondural Index X (RPI, or height divided by the cube root of weight):
R.P.I. = h/ (w^3) or h (w-0.333)
If RPI is greater than 40.75,
Ectomorphy = 0.732 RPI – 28.58
If RPI is equal t or less than 40.75 and greater than 38.25,
Ectomorphy = 0.463 RPI – 17.63
If RPI is equal to or less than 3825, a minimal Ectomorphy rating of 0.1 is assigned.

Statistical analyzes

Hypotheses each of the three Somatotype components of u-14, u-16, u-18 and senior cricketer were subjected to analysis of independent variance. Following significant omnibus F-ratio, post-hoc, Scheffe's test was administered to locate significant difference between means. For Specific motor fitness variables Mean and Standard Deviation was computed. Comparison was made on the basis of activity i.e. Batsman and bowlers, to compare the group T test was done. Testing the hypothesis the Level of confidence was set at.05 Level of significance. Entire data was analyzed by using the SPSS (Statistical Package for Social Sciences) version 21.0.

Results & findings of the study

The hypotheses in this section are tested by independent analysis variance (ANOVA). For the purpose of analysis grouping variables were cricketer's under-14, under-16, under-18 and seniors. Each of the Somatotype components namely Endomorphy, Mesomorphy and Ectomorphy were entered as dependent variables. Following significant omnibus F-test, Post HOC analysis was conducted. The results are furnished in the following sections.

Furnished in the table 4 are the mean and standard deviation ($\overline{X} \pm Sd$) of Endomorphy, Mesomorphy, and Ectomorphy for under-14, under-16, under-18, senior cricketers. It may be noted that senior and Under-18 cricketers are more Endomorphic, while Under-16 year's cricketers are balanced Mesomorphy with Endomorphy and Ectomorphy being almost equal.

Table 4: Mean and standard deviation of endomorphy mesomorphy and ectomorphy of four age group cricketers

Group	Endomorphy	Mesomorphy	Ectomorphy
Under-14 (N=14)	3.66 ± 1.66	2.77 ± 1.44	2.82 ± 1.65
Under -16 (N=19)	3.60 ± 1.86	1.98 ± 1.25	3.62 ± 1.04
Under -18 (N=17)	5.22 ± 1.54	2.73 ± 0.90	3.18 ± 1.20
Seniors - (N=50)	5.25 ± 1.36	3.37 ± 1.33	2.38 ± 1.21

The analysis of Endomorphy for this four age group resulted in a significant F ratio indicating that these four groups are significantly different in Endomorphy (Table-4).

Table 5: Summary of analysis of variance of endomorphy of the four age group cricketers

	Sum of Square	df	Mean Square	F
Between Group	57.981	3	19.327	8.240*
Within Group	225.173	96	2.346	
Total	283.155	99		

α =p<0.05-

In the Scheffe Post-hoc analysis indicated that under-14, Under-16 years, are significantly less endomorphic than senior cricketers and Under-16 years cricketers are significantly less endomorphic compared to Under-18 years age group cricketers (Fig-1.)

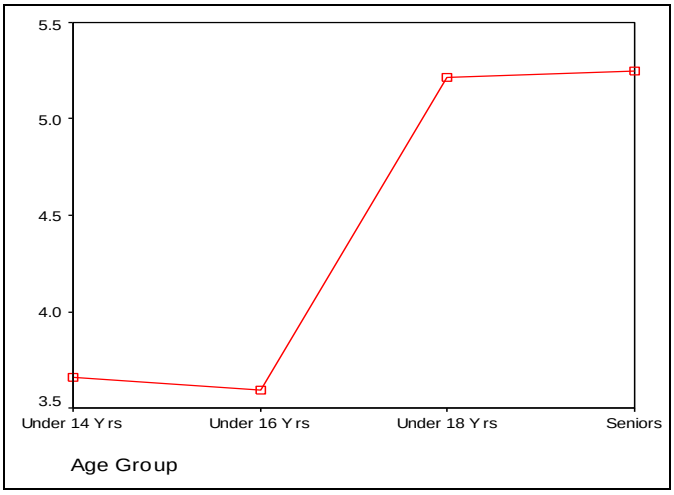


Fig 1: Differences of endomorphic components in junior and senior cricketers

The first hypothesis which stated that the Endomorphic component of junior cricketers would be significantly smaller than that of senior cricketers was supported by the analysis (Table-5).

Table 6: Mean Difference in Endomorphy Component among the Four Age Group Cricketers

	U-14	U-16	U-18	Seniors
U-14		0.0657	1.5580	1.5886*
U-16			1.62238*	1.6544*
U-18				0.031
Senior				

* p<0.05

The analysis variance of mesomorphic component for the four age group cricketers resulted in a significant F-ratio (Table-6) indicating significant differences in mesomorphic components among the four groups.

Table 7: Summary of analysis of variance of mesomorphy of the four age group cricketers

	Sum of Square	df	Mean Square	F
Between Group	27.883	3	9.294	5.794*
Within Group	153.993	96	1.604	
Total	181.876	99		

α =p<0.05

Scheffe's Post-hoc test indicates that the only difference in Mesomorphy between Under-16 cricketers and senior cricketers is significant. Under-16 age group cricketers are significantly less mesomorphic than senior cricketers (Table-8). Though under-14 years and under-18 year's age group cricketers are less mesomorphic than senior cricketers, the difference did not reach significant level (Fig-2).

Table 8: Mean differences in mesomorphic component among the four age group cricketers

	U-14	U-16	U-18	Seniors
U-14		.7839	3.5714	0.6063
U-16			.7482	1.3902*
U-18				0.6420
Senior				

* p<0.05

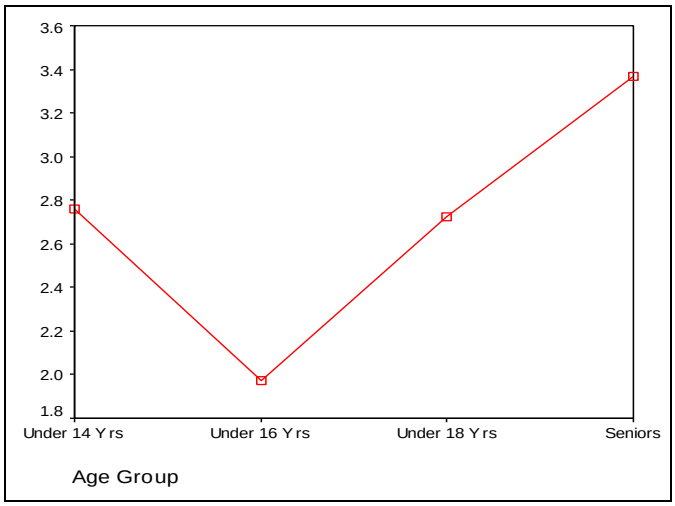


Fig 2: Differences in mesomorphic components among junior and senior cricketers

The second hypothesis, which stated that the mesomorphic component of junior cricketers would be significantly smaller than that of senior cricketers, was partially accepted. As was observed in the case of Endomorphy and Mesomorphy the analysis variance of Ectomorphy component also resulted in a significant F-ratio (Table-9).

Table 9: Summary of analysis of variance of ectomorphy of the four age group cricketers

	Sum of Square	df	Mean Square	F
Between Group	23.786	3	7.929	5.106*
Within Group	149.063	96	1.553	
Total	172.850	99		

α =p<0.05

The Scheffe post-hoc test again indicated that under-16 year age cricketers are significantly more Ectomoprhic than senior cricketers. Though under-14, under-18 age group cricketers are more Ectomorphy than senior cricketers the difference did not reach significant level (Table-10).

The third hypothesis which stated that the Ectomorphy component of junior cricketer's would be significantly greater than that of senior cricketer was partially accepted (Fig-3).

Table 10: Mean difference in ectomorphy component among the four age group cricketers

	U-14	U-16	U-18	Seniors
U-14		.7926	.3605	.4393
U-16			.4321	1.2318*
U-18				.7998
Senior				

* p<0.05

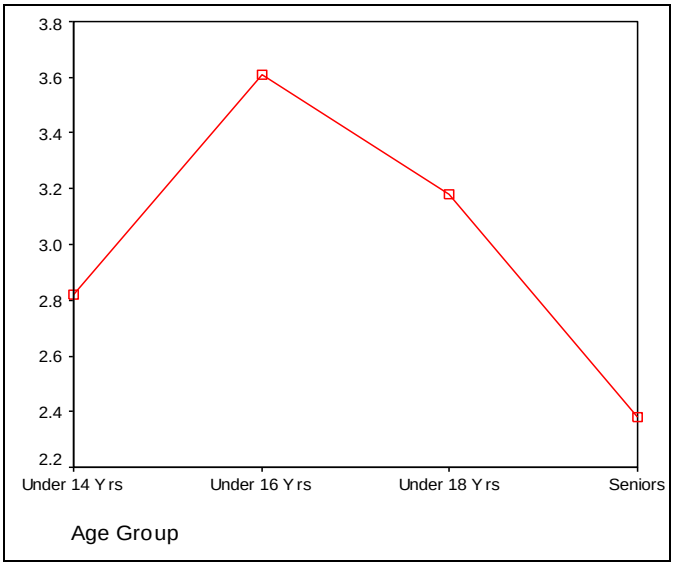


Fig 3: Differences in ectomorphy components among junior and senior cricketers

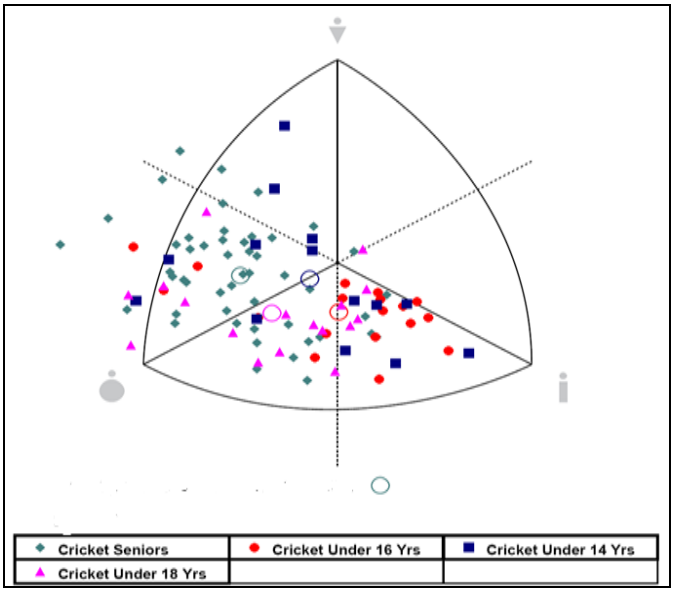


Fig 4: Somatoplot of all cricketers (Combined) specific motor fitness results among the junior and senior cricket players of Goa

Results and findings on specific motor fitness variables of batsman and bowlers of Goa

Table 11: Mean and standard deviation table of batsmen and bowlers of Goa state cricket team

Variable	Specialization of the player	N	Mean	Std. Deviation
20 Meter Dash in Sec	Batsman	25	3.1232	.17693
	Bowler	25	3.1392	.14333
40 Meter Dash in Sec	Batsman	25	5.4344	.24383
	Bowler	25	5.2978	.29916
Run-a-Three 3 in Sec	Batsman	25	9.7728	.40052
	Bowler	25	9.2854	1.96133

Table no: 11, describes that mean and standard deviation of batsmen and bowlers in 20 meters Dash, 40 meters Dash and Run-a-three. It reveals Batsman have better timings then bowlers in 20 and 40 meter dash and in run-a-three running ability Bowlers are having better score compared to Batsmen. So to investigate the significant different, further data was subjected to independent sample t-test.

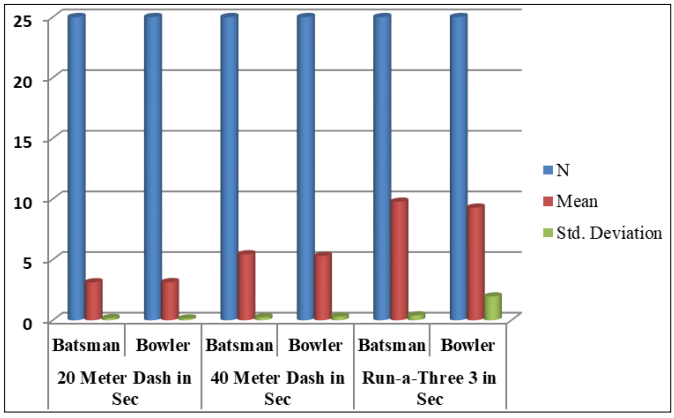


Fig 5: Mean and standard deviation table of batsmen and bowlers of Goa state cricket team in 20 meter dash, 40 meter dash, and run-a-three.

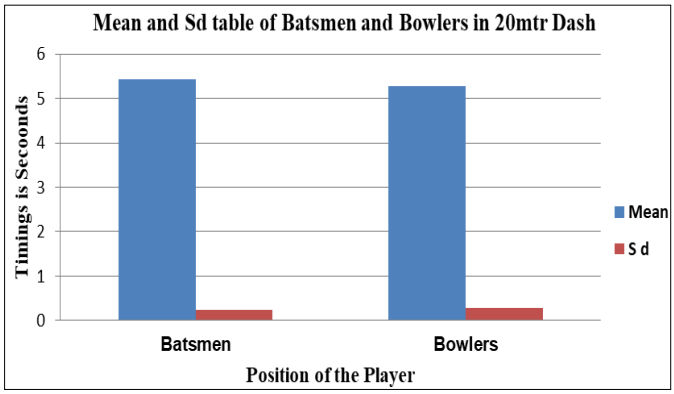


Fig 6: Mean and standard deviation of bowlers and batsman of Goa in 20 meter Dash

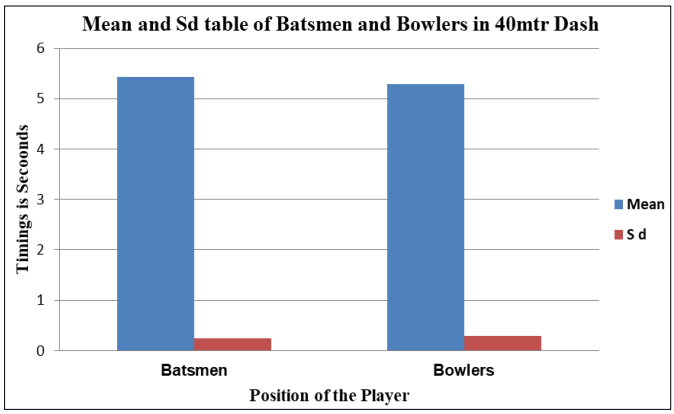


Fig 7: Mean and standard deviation of batsman and bowlers of Goa in 40 meter dash

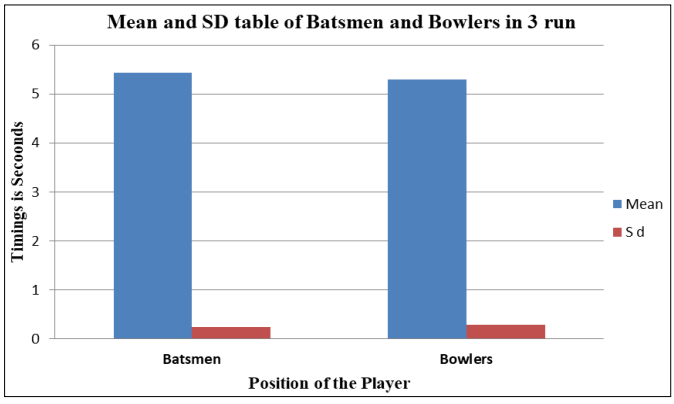


Fig 8: Mean and standard deviation of batsman and bowlers of Goa in run-a-three

Table 12: Furnished in the table-3 is t-test score for 20 meter dash, 40 meter dash and run-a-three variables of batsman and bowlers of Goa.

Variables		T	df	Sig.(2 tailed)
20 Meter Dash	Equal variances assumed	-.497	98	.620
	Equal variances not assumed	-.497	93.952	.620
40 Meter Dash in Sec	Equal variances assumed	2.503	98	.014*
	Equal variances not assumed	2.503	94.169	.014
Run-a-three	Equal variances assumed	1.722	98	.088
	Equal variances not assumed	1.722	53.080	.091

*=$\alpha \leq 0.05$

- Table no 12: independent sample t-test reveals that although there is mean difference in Batsmen and Bowler in 20 meters dash but their mean difference is not at significant level. So from t-test we can conclude that although Batsmen are having better mean timings than Bowlers in 20 meters Dash but failed to reach the significance level. It suggests that Batsman have slight edge in 20 meter dash over bowlers.
- The independent sample t-test reveals that there is significant mean difference in 40 meters Dash among batsman and bowlers of Goa state team, that Batsman are significantly better compare to bowlers. So from this we can conclude that Batsman 40 meters sprinting ability is significantly better than the Bowlers.
- In Run-a-three there is no significant difference among batsman and bowlers of Goa, Bowler's having edge over batsman in run-a-three ability but failed to reach the significance level.

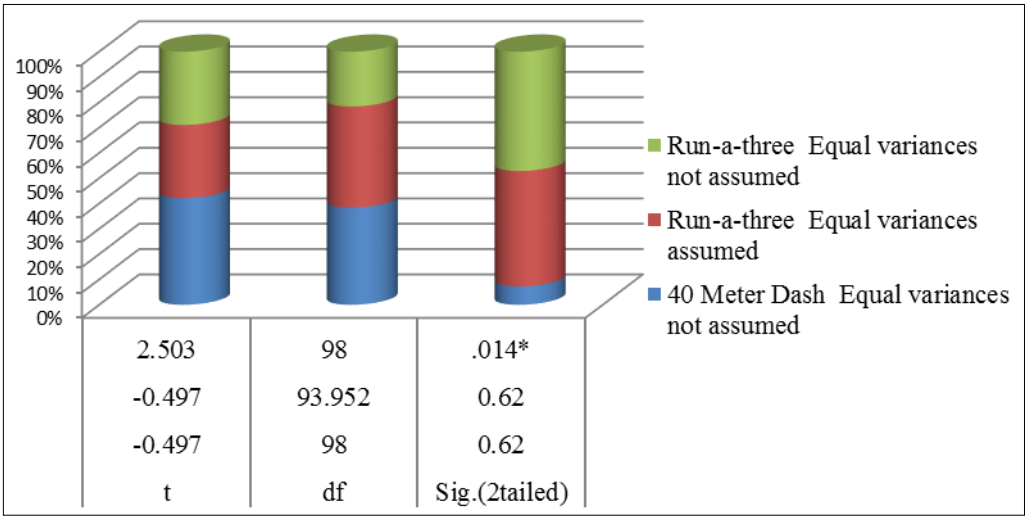


Fig 9: Bar chart of "T" test of batsman and bowlers of Goa

Discussion on morphological differences (Somato-type)

The author found that there was difference in morphological level among junior and senior cricketers of Goa. Most of the game related skills, anthropometrical and physical motor abilities change during the developmental years of young sportsman. These changes can be due to the physiological changes a young sportsman under goes during his or her development year (8-18 years). Talent identification is done at young age. But successful sport participants at all level of sport and competition have certain unique characteristics and these characteristics include anthropometric profile ability.

The results of the present study for junior and senior cricketers were not as conclusive as for the senior cricketers. One of the reasons, why many of the morphological a profile of junior cricketers failed to reach the significance level was that, the junior cricketers were still maturing and senior cricketers were already matured.

- The age category for junior cricketer was under 18 years of age and for senior cricketers it was above 18 but below the age of 22. The reason implies that the morphological and motor fitness profile of junior cricketers change as they advance maturation ally.
- The second reason for the lack of difference may be that junior cricketers competed at lower level that that of senior cricketers in other words the junior cricketers were less accomplished than the senior cricketers in the present study, and therefore the morphological profiles of junior cricketers were not as pronounced.
- The third reason is that of competition of junior cricketers also meant that the intensity of their training was less compared to the senior cricketers.

Therefore, these may be factors which may have contributed in discriminating these two groups. Level of maturation, accomplished and training intensity of senior cricketers have made them to stand one step ahead of junior cricketers of Goa.

Discussion on specific motor fitness differences

The study analyzed the relationship between general 20, 40 meter dash and Specific test Run-a-three in experienced cricketers of Goa,

- In 20 meter dash batsman having better mean timing then Bowlers but it failed to reach the significance level, it may because the 20 meter test is a linear sprint and the 20 meter sprint resembling the shorter distance (17.68) covered to complete a quick single.
- In 40 meter dash batsman having significantly better mean timing then Bowlers reason may be as all play the same standard of cricket and the training module may be the same as compared to both categories
- In Run-a-three Bowlers are having better mean timing

compared to Batsman but failed to reach the significance level may be because run-a-three is speed cum change of direction test, the use of bat to shorten the effective sprint distance required in the cricket-specific tests, and the impact the bat had on the starting position used for the sprints, discernibly emphasizes the need for specific speed testing in cricket

Conclusion - somatotype profiles

The Somatotype analysis revealed that the cricketers of Goa at all ages are slightly endomorphic either Meso-endomorphic or endomorphic. Further it was observed at age of 16 the mesomorphic component reduced to the lowest level as a result of which the Ectomorphy component increased while the endomorphic component remained steady. The variation, it was concluded, is perhaps due to the linear growth of boys between the ages of 14 to 18 years. As the boys grew or matured it was observed that this mesomorphic component as-well-as endomorphic component steadily increased. This paved the way for final somatotypical profile of senior cricketers which was Meso-endomorphic. It was also interesting to note that the Ectomorphy component increased at the age of 16 years and reduced gradually then onwards. However one should be careful in making such judgments since the data was obtained from independent samples and was not a growth study. Based on the present paper, two hypotheses are proposed for future research. In the first case, the following question should be considered: "is it the athlete who chooses the sport or vice versa?" meaning, whether the anthropometric characteristics and their assessment are necessary to examine and foresee the talent and the athlete's performance in each sport. The second hypothesis concerns the question, "if the athlete's body type affects the athletic ability regardless of the training stimulus?

Conclusion on specific motor fitness

The results of the specific motor fitness of Batsman and bowlers were not as conclusive, Due to rapid ongoing development of cricket in regards to the shorter formats, namely T/20 and One-day Cricket running (Speed) has become a fundamental physiological characteristic of the modern-day- player. As a result it is essential that general test like 20 and 40 meter dash can be used for monitoring and talent identification purposes need to replicate the demands of the sport as closely as possible and it is recommended Run-a-three should be fundamental tests in any physiological assessment of cricket players. Also based on the present paper, some hypotheses are proposed for future research. In the first case, the following question should be considered: as relationship of body type and cricket specific skill, and body suited for different positional roles in the team sports.

Recommendation for future research work

Extensive research have been undertaken in several sports disciplines to identify morphological, anthropometrical and Fitness characteristics of young cricket players which enables coaches to identify promising talent in their respective sports disciplines. However, no research is traceable which identify morphological and Fitness characteristics of young cricketers. Therefore it is recommended to undertake research which might identify the morphological and fitness profiles of young cricketers from normal population or other sporting population.

- In the present study sample size of young cricketers was very small. Therefore, it is recommended to replicate such an investigation with larger sample size.
- Within each sports disciplines the demands placed on various specialists differs. Therefore Investigation of Morphological, Motor Fitness profiles of cricketers specializing in bowling, batting, and wicket keeping is recommended.
- The present investigation involved cricketers at state level. The Fitness profile at national and international level may be accentuated for various reasons. Therefore an investigation involving cricketers of national and international repute may be undertaken.

Recommendation for coaches and administrators

- Therefore it is recommended that either training regime be made demanding or select candidates with Body type and Fitness Profiles.
- Based on the research findings involving young children in sports, identify talented cricketers at early age and coach them right.
- It is recommended that coaches based on their knowledge of body type and Motor Fitness profile required for various departments of the game of cricket

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