



“A STUDY OF MORPHOLOGICAL AND MOTOR FITNESS OF JUNIOR AND SENIOR CRICKET PLAYERS OF GOA”

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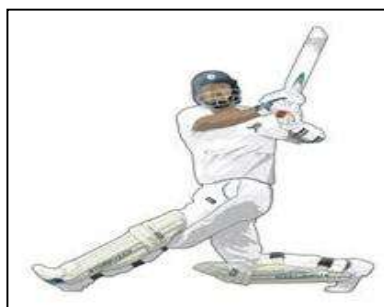
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ABSTRACT

The purpose of the study was to examine the Morphological characteristics and specific motor fitness of Junior and senior cricket players of Goa. For the purpose a total of 80 specific age required cricket players were recruited. For anthropometrical and morphological variables thirty (30) cricket players were selected on base of their age, and were divided in to three (3) different age category, u-16 N=10, u-19 N=10, and senior above 19 years but below 23 years N=10. For selected motor fitness variables only two groups were made junior and senior, total 50 subjects, n=25 of u-19 years and n=25 above 19 years but below the age of 23 years. Eighteen (18) Anthropometrical and nine (9) specific motor fitness test were measured and recorded. Descriptive statistics (mean $\pm$ standard deviation) were calculated from the selected anthropometric variables. One way analysis of variance was applied to compare the three group senior under-16, under-19 and senior and followed by Tukey's post hoc test. Level of significance was set at $P < 0.05$ for all measured variables and for specific motor fitness variables descriptive and 'T' test was done to find out the differences. Entire data was analyzed by using the SPSS (Statistical Package for Social Sciences) version 20.0. It was concluded that results of the study were not as conclusive, since in all the anthropometrical variables senior were significantly better than junior's u-16, and u-19. In Morphological variables Somato body type no significant difference was found statistically among three groups. In Motor fitness variables also only in six (6) variables out of nine variables seniors were superior but failed to reach the significance level. 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

KEY WORDS- Morphology, Anthropometrical, Somato body type, Specific motor fitness, Junior & Senior cricket players, Goa state.



INTRODUCTION

Cricket has developed into an industry allowing many individuals to pursue a career as a professional athlete, However, the majority of participants in cricket never go on to reach the elite sporting level and thus do not become professionals. In recent times, there has been a great debate surrounding the question: Are champions born or made? The theory of deliberate practice proposed by Ericsson implies that athletes (in the general sense) achieve success through several hours of deliberate practice and that any individual, within reason, can achieve

sporting excellence if they train sufficiently under the guidance of sports science and its methods.

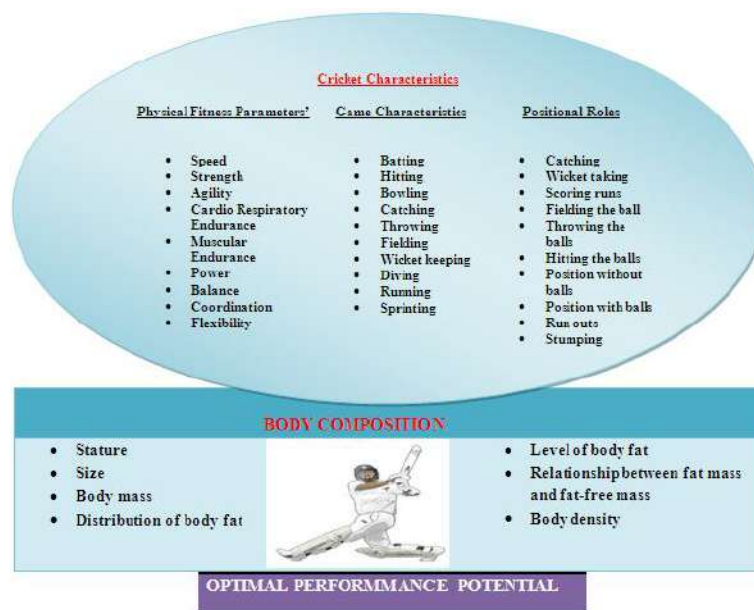
Although cricket is one of the oldest organized sports, there is a lack of scientific research of the sports or its players. There are for example, very few studies of the morphological, anthropometrical, and on specific motor fitness attributes of top-class cricketers. Perhaps this reflects the innate conservatism of either game or the scientist who study it. (T.D. Noakes, J.U.Durandt, 2000)

Today it is necessary for sports scientist and coaches to recognize the vital part of scientific investigation, which plays an important role in successful conduct of athletic programmes. To contribute to the best of one's ability, all aspects of sports and athletics performance will require a good understanding of the available scientific knowledge. In today's age of scientific knowledge man is making rapid progress in all walks of life including the area of games and sports. The progress of games and sports may be attributed to improve scientific understanding of human organism. Sports performance is based on complex and intricate diversity of variables, which include body morphology, anthropometry, body composition, general physical condition, specific physical condition and psychological factors. The relationship between motor ability, body composition and anthropometrical variables and sports performance is the objective of our study. (Chandu Lamani, 2016)

SPORTS SCIENCE AND CRICKET

As the game of Cricket is ever changing, players and teams focus now more than ever on developing as top-class athletes. Yet it was not so long ago that most sport coaches would treat the idea of support from a sport scientist with abject cynicism teams can no longer rely on coaching folklore and techniques that have been passed down through the generations, furthermore, gone are the days when a player could get by on talent alone. Today, it is far more commonplace for teams to seek an input from sport scientists for a contemporary approach in the quest for that competitive edge.

Cricket is one of the most popular sports in the world, and with this popularity there are spiralling costs of purchasing players in the transfer market, consequently pressure can be placed on National teams, clubs, and Franchise to identify, develop and nurture their existing players (Bhogle Harsha, 2011).



Purpose of the Study

The main purpose of the present study was to describe the Selected Anthropometrical, Morphological and Motor fitness profiles of Junior and senior cricket players of Goa, who actively participating in state and

BCCI Tournaments. Since the term Morphology and Motor fitness is a broad concept, Specific Hypothesis involving some of the Anthropometrical, Morphological and Motor Fitness Profile were formulated

Statement of problem

1. There will be difference in Anthropometrical variables among u-16, u-19 and Seniors above 19 years but below 23 years of age
2. There will be difference in Morphological parameter Somato body typing among u-16, u-19 and Seniors above 19 years but below 23 years of age
3. There will be difference in selected motor fitness variables among junior u-19, and seniors above 19 years but below 23 years of age.

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 counselling, 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 - Subject and Test Administration

In order to accomplish the purpose Anthropometric measurement and Motor Fitness test were administered, the selection of subject and procedure followed in the collection of data.

For measurement of anthropometrical variables total 30 cricketers were selected, equally divided in to three different groups n=10 of u-16 age, n=10 of u-19 years, and n=10 senior above 19 years but below 23 years of age and for selected motor fitness variables only two groups were made junior and senior, total 50 subjects, n=25 of u-19 years and n=25 above 19 years but below the age of 23 years. A total of 80 cricketers were examined, the entire test were administered and recorded at BITS, Pilani K.K.Birla Goa campus Gym and Cricket Ground, the Anthropometric, Body Composition and Motor Fitness measures were obtained during each testing session. The measurements were all recorded in Metric system; Necessary permission was taken from Goa Cricket Association President and Secretary. Standard BCCI-NCA protocols and procedures were followed for taking 18 Anthropometric Measurements and nine (9) specific Fitness measures from each Subject.

Table I: List of Anthropometrical n= (18) and Specific motor fitness Variables n=09, measured and recorded for the study

Anthropometrical tests	Scale	Motor fitness test	Measured in
Standing Height (Stature)	CM	Speed	
Sitting Height (Leg length)	CM	20 meter dash	In Seconds
Weight in KG (Body mass)	KG	40 meter dash	In Seconds
Sum of Skinfold at six (6) sites		Agility	
Sub scapular	MM	Run – A-Three	In Seconds
Abdominal	MM		
Supraspinale	MM	Explosive power of leg	
Triceps	MM	Vertical jump	
Mid-thigh	MM	Strength and Muscular Endurance	
Medial calf	MM	Abdominal crunches	Repetitions'
Width Tests		Pull Ups (shoulder muscles)	Repetitions'

		Endurance)	
Biacromial width	MM	Floor Push Ups (shoulder muscles Endurance	Repetitions'
Biilliocrystal,width	MM	Half Squats (thigh muscles Endurance)	Repetitions'
Biepicondylar Humears Width	MM	Flexibility	
Biepicondylar Femur Width	MM	Seat & Reach	CM
Arm span	MM		
Hand span	MM		
Girth Tests			
Tense arm Girth	CM		
Relaxed forearm girth	CM		
Calf Girth	CM		

Data analysis

Descriptive statistics (mean $\pm$ standard deviation) were calculated from the selected anthropometric and Three Somato body types variables. One way analysis of variance was applied to compare the three group senior under-16, under-19 and senior and followed by Tukey's post hoc test. Level of significance was set at $P < 0.05$ for all measured variables. For Specific motor fitness variables Mean and Standard Deviation was computed. Comparison was made on the basis of activity i.e.U-19 and U-23 Cricket players, 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.

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.

$$\text{Endomorphy} = 0.1451 \times -0.00068 X^2 + 0.000014 X^3 - 0.7182$$

B) Mesomorphy component was obtained from the following equation.

$$\text{C) Mesomorphy} = 0.858 (E) + 0.601 (K) + 0.188 (A) + 0.161(C) - 0.131 (H) + 4.5$$

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):

$$\text{R.P.I.} = h / (w^3) \text{ or } h (w-0.333)$$

If RPI is greater than 40.75,

$$\text{Ectomorphy} = 0.732 \text{ RPI} - 28.58$$

If RPI is equal t or less than 40.75 and greater than 38.25,

$$\text{Ectomorphy} = 0.463 \text{ RPI} - 17.63$$

If RPI is equal to or less than 3825, a minimal Ectomorphy rating of 0.1 is assigned.

RESULTS AND FINDING OF THE STUDY

Table II: Mean, SD, & One way (ANOVA) of the anthropometric characteristics of Junior and Senior cricket players of Goa

Variables	Seniors	U-19	U-16	F	P
	M(SD)	M(SD)	M(SD)		
Stature	171.38(7.91)	171.68(4.01)	158.13(9.16)	8.84	.00
Body mass	70.90(10.14)	57.90(11.41)	50.38(5.44)	9.85	.00
Sitting height	87.15(4.90)	24.11(1.64)	23.49(1.42)	9.26	.00
Relaxed forearm girth	27.03(2.13)	24.11(1.64)	23.49(1.42)	9.26	.00
Flexed arm girth	32.31(2.62)	27.81(2.95)	27.49(2.91)	7.28	.00
Calf girth	37.23(3.26)	33.06(2.61)	33.19(1.71)	6.60	.01
Arm span	176.50(6.09)	176.76(5.50)	166.25(9.32)	5.60	.01
Hand span	18.96(.39)	18.39(.56)	17.98(1.14)	3.36	.05
Bi-acromial width	42.14(1.96)	38.84(2.12)	36.16(1.84)	18.29	.00
Biiliocrystal,width	28.90(3.23)	26.10(2.30)	24.80(1.50)	5.87	.01
Epicondylas Humerus width	6.83(.46)	7.15(.44)	5.96(.40)	15.92	.00
Epicondylas Femur width	9.68(.57)	9.83(.76)	8.79(.48)	6.62	.01
Significant level is $p < 0.05^*$. Note: table 01 shows the descriptive and (ANOVA) results of anthropometric variables of the senior, Under-19 and Under-16 batsmen.					

Table II, Reveals senior cricket players above the age of 19 and below the age of 23 years were significantly better than u-16 years and u-19 years in stature, body mass, relaxed forearm, flexed arm girth, and calf girth, Sitting height, arm span, , hand span, bi-acromial breadth, bi-iliac breadth, , humerus breadth and femur breadth.

- Mean and standard deviation of stature (height) of batsmen (Senior=171.38±7.91cm, U-19=171.90±4.01cm, and U-16=159.13±9.16cm), between-group difference $F(2, 15) = 8.84$, $P < .00$. Tukey's (HSD) post hoc results exhibited that U-16 batsmen were significantly shorter than senior and U-19 batsmen and no significant difference exists between senior and U-19 batsmen.
- In body mass (weight) was (Senior = 70.90 ± 10.14kg, U-19s = 57.90 ± 11.41kg and U-16 = 50.38 ± 5.44kg), between-group difference $F(2, 15) = 9.85$, $P < .00$. Senior batsmen were significantly heavier than U-19 and U-16 batsmen.
- Mean and standard deviation of arm relax girth was (Senior = 29.48 ± 3.16cm, U-19s = 25.11 ± 3.47cm and U-16s = 24.09 ± 2.69cm), between-group difference $F(2, 15) = 7.52$, $P < .00$.
- In flexed arm girth senior batsmen were significantly higher than U-19 and U-16. Forearm girth was (Senior=27.03±2.13cm, U-19s=24.11±1.64cm and U-16s=23.49±1.42cm), between-group difference $F(2,15)=9.26$, $P < 0.00$.
- Senior batsmen were significantly superior in the relaxed forearm girth than U-19 and U-16. The chest girth were (Senior=93.78±8.71cm, U-19s=82.03±8.83cm and U-16s=77.19±4.29cm), between-group difference $F(2, 15) = 10.14$ $P < .00$.
- Calf girth was (Senior=37.23±3.26cm, U-19=33.06±2.61, and U-16=33.19±1.71cm), between-group difference $F(2, 15) = 6.60$, $P < .04$. Senior batsmen Senior were significantly high than U-19 and U-16 batsmen.
- Mean and standard deviation of sitting height was (Senior =87.15±4.90cm, U-19=87.41±3.10, U-16=81.88±4.45cm), between-group difference $F(2,15) = 4.38$, $P < .03$. Post hoc results shows in sitting

height variable the mean difference U-16 batsmen were significantly shorter in sitting height than U-19 but not than senior batsmen.

- Arm span was (Senior=176.50±6.09, U-19=176.76±5.50cm, and U-16=166.25±9.32cm), between-group difference $F(2,15)=5.60$, $P<.01$. The U-16 batsmen were significantly short in arm span than senior and U-19 batsmen. No significant difference was found between senior and U-19 batsmen.
- Mean and standard deviation of mid stylium-dactylium (hand span) was reported as (Senior=18.96±0.39cm, U-19=18.39±0.56 and U-16=17.98±1.14cm), between-group comparison $F(2,15)=3.36$, $P<.05$. Post hoc results showed mid stylium-dactylium (hand span) of senior batsmen was significantly higher than U-16 batsmen and U-19 was not significantly different with senior and U-16 batsmen.
- Results of breadth variables found as bi-acromial (shoulders) breadth was (Senior=42.14±1.96cm, U-19=38.84±2.12cm and U-16=36.16±1.84cm), between-group comparison $F(2,15)=18.29$, $P<.00$. According tukey's post hoc that senior batsmen were significant wider in bi-acromial (shoulder) than U-19 and U-16 batsmen as well as U-19 were also wider than U-16 batsmen. Bi-iliacrist (pelvis) breadth was (Senior=28.90±3.23cm, U-19=26.10±2.30cm, and U-16=24.80±1.50cm), between-group comparison $F(2, 15)=5.87$, $P<.01$.
- Post hoc results showed that senior were significant wider in bi-iliacrist breadth than U-16s batsmen and U-19 were not significantly different than senior and U-16 batsmen.
- Humerus (elbow) breadth was (Senior=6.83±0.46cm, U-19=7.15±0.44cm and U-16=5.96±0.40), between-group comparison $F(2,15)=15.92$, $P<.00$. Tukey's post hoc showed that U-16 batsmen were significantly shorter in Humerus breadth than senior and U-19 batsmen but no significant difference found between senior and U-19 batsmen.
- Femur breadth was (Senior=9.68±0.57cm, U-19=9.83±0.76cm and U-16=8.97±0.48cm), between-group comparison $F(2,15)=6.62$, $P<.01$. Tukey's post hoc result showed that U-16 batsmen were significant lesser in femur breadth than senior and u-19 and no significant difference exists between senior and U-19 batsmen.

Table III: Mean, SD, & One way (ANOVA) of Somatotype variables of Junior and senior cricket players of Goa

Measure	Senior		Under-19		Under-16
	M (SD)	M (SD)	M (SD)	F	P
Height- Weight ratio	41.96 (1.60)	43.81 (2.84)	43.21 (2.91)	.85	.45
Endomorph	3.73 (1.22)	2.45 (1.53)	2.20 (1.03)	2.49	.12
Mesomorph	4.82 (1.15)	4.95 (1.46)	4.33 (1.47)	.34	.72
Ectomorph	2.17 (1.12)	3.53 (1.87)	3.03 (2.14)	.92	.42
Significant level is $p< 0.05^*$.					

- Table III, reveals no significant differences in Somatotype variables of height-weight ratio, endomorph, Mesomorph and Ectomorph in between group comparison.
- Although, U-19 players were superior in height-weight, Mesomorph and Ectomorph parameter compare to senior and U-16 players.
- Senior players found more endomorph, U-19 Mesomorph and U-16 Ectomorph but failed to reach significant level when comparison was made among the groups.

Table-IV: Means, Standard Deviation 9 (Nine) specific Motor Fitness Variable (Junior Cricketers Under-19 (n=50) and Senior Cricketers above 17 years but below 19 years and seniors above 19 years but below 23 Years of Age (n=50)

Variables	Age category of the player	N	Mean	Std. Deviation
Vertical Jump in Cms	Under 19	25	55.0200	6.01186
	Under 23	25	55.1961	6.06637
20mtrs Dash in Sec	Under 19	25	3.1214	.12053
	Under 23	25	3.1186	.11947
40mtrs Dash in Sec	Under 19	25	5.3356	.26712
	Under 23	25	5.3302	.26621
Run A Three in Sec	Under 19	25	9.6718	.38841
	Under 23	25	9.6537	.40102
Pull ups	Under 19	25	7.2000	2.70298
	Under 23	25	7.2157	2.67816
Half Squats	Under 19	25	20.8400	3.66651
	Under 23	25	20.9020	3.66199
Push-ups (Floor)	Under 19	25	31.9800	7.98849
	Under 23	25	32.3922	8.20263
Sit and Reach in Cms	Under 19	25	15.9000	2.32535
	Under 23	25	15.9804	2.33658
Abdominal Crunches	Under 19	25	67.6200	10.58086
	Under 23	25	67.9608	10.65075
Significant level is $p < 0.05^*$.				

- The above descriptive table presents mean and Standard deviation of selected physical fitness variables of Goa U-19 and U-23 age Cricketers.
- Under 23 age Cricketers are having higher mean in, Vertical Jump, Pull ups, Squats, Pushups, Sit and Reach and Abdominal crunches than the Under 19 age category Cricketers of Goa
- While Under 19 Cricketers are having higher mean in Run-a-three, 40 meter and 20 meter Dash than the Under 23 age category Cricketers of Goa state.
- To verify whether their means are significantly different, data is subjected to independent sample t-test.

Table V- Independent Sample t-test of Junior above 17 years but below 19 years and seniors above 19 years but below the age of 23 years

Parameters		t	df	Sig.(2-tailed)
Vertical Jump	Equal variances assumed			
	Equal variances not assumed	-.147	98.988	.884
20mtrs Dash	Equal variances assumed	.116	99	.908
	Equal variances not assumed	.116	98.918	.908
40 meter Dash	Equal variances assumed	.102	99	.919
	Equal variances not assumed	.102	98.946	.919

Run A Three	Equal variances assumed	.250	99	.819
	Equal variances not assumed	.250	98.986	.818
Pull ups	Equal variances assumed	-.029	99	.977
	Equal variances not assumed	-.029	98.916	.977
Half Squats	Equal variances assumed	-.085	99	.932
	Equal variances not assumed	-.085	98.955	.932
Floor Push ups	Equal variances assumed	-.256	99	.799
	Equal variances not assumed	-.256	98.996	.799
Sit and Reach	Equal variances assumed	-.173	99	.863
	Equal variances not assumed	-.173	98.980	.863
Abdominal Crunches	Equal variances assumed	-.161	99	.872
	Equal variances not assumed	-.161	98.982	.872

- T-test table reveals no significant level of difference between any physical fitness variable of U-19 and U-23 age category of Goa state Cricketers.
- All though U-23 age Cricketers are having higher mean in Vertical Jump, Pull ups, Squats, Push-ups, Sit and Reach and Abdominal crunches than the Under 19 age category Cricketers of Goa
- While Under 19 Cricketers are having higher mean in Run a three, 40 Mtr and 20 Mtr Dash than the Under-23 age category Cricketers of Goa state means are not significantly different at 0.05 levels.
- So from this we can conclude that there is no significant difference between any physical fitness variable of Under 19 and Under 23 age Cricketers of Goa state.
- Although Under 23 age category Cricketers are having higher mean in 6 (eight) physical fitness components and Under 19 age Category Cricketers are having higher mean in 3 (three) components mean difference in not at the significant level.

DISCUSSION ON FINDINGS

The author found that there was difference in anthropometrically, morphologically and motor fitness 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).

- 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 and motor fitness 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 19 years of age and for senior cricketers it was above 19 but below the age of 25. 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.

CUNCLUSION

Anthropometrical variables:

Through statistically it was revealed that the senior cricket players above the age of 19 and below the age of 23 years were significantly better then u-16 years and u-19 years in stature, body mass, relaxed

forearm, flexed arm girth, and calf girth, Sitting height, arm span, , hand span, bi-acromial breadth, bi-iliac breadth, , humerus breadth and femur breadth.

Morphological Variables, Somatotype Body

No significant differences was found in Somatotype variables of height-weight ratio, endomorph, Mesomorph and Ectomorph in between group comparison. Although, U-19 batsmen were superior in height-weight, Mesomorph and Ectomorph values than senior and U-16 batsmen. Senior batsmen found more endomorph, U-19 Mesomorph and U-16 Ectomorph but not significant in between-group comparison.

Specific Motor Fitness variables

In 6 specific motor fitness variables seniors above 19years but below 23 years Cricket players were superior to U-19 Cricketers but failed to reach the significant level. It was concluded that results of this study were not as conclusive.

RECOMMENDATION FOR FUTURE RESEARCH WORK

Extensive research have been undertaken in several sports disciplines to identify morphological characteristics of young sports children which enables coaches to identify promising talent in their respective sports disciplines. However, no research is traceable which identify morphological and other characteristics of young cricketers.

- Therefore it is recommended to undertake research which might identify the morphological, physiological, psychological 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.
- It is recommended to investigate growth pattern of young crickets with either longitudinal or mixed longitudinal or cross section study.
- Within each sports disciplines the demands placed on various specialists differs. Therefore Investigation of morphological, physiological and psychological profiles of cricketers specializing in bowling, batting, wicket keeping is recommended.
- The present investigation involved cricketers at state level. The morphological 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

- It is recommended that either training regime be made demanding or select candidates with suitable body types.
- 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 morphological and physiological profile required for various departments of the game of cricket.

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