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MORPHOLOGICAL CHARACTERISTICS OF MALAYSIAN NATIONAL CRICKET BATSMEN

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ABSTRACT

Background: The purpose of this study was to examine the morphological characteristics and physical strength of the Malaysian cricket batsmen.

Methods: Twenty four top order batsmen from the Malaysian senior, under-19s and under-16s cricket team were recruited for the study. Twenty six anthropometric, four somatotype and two physical strength variables were measured from all participants. Stature were measured by using stadiometer, calipers for skin-fold, non-stretch tape for girth, sliding caliper for segmental lengths and circumferences (breadths) and dynamometers for hand grip and back strength. One way analysis of variance (ANOVA) was used to analyses significant between group differences in the variables.

Results: The senior batsmen were significantly higher than under-19s and under-16s in body mass, relax and flex arm girths, forearm girth, chest girth, waist girth, calf girth, bi-acromial breadth, transvers breadth and hand grip strength. Both senior and under-19s batsmen were significantly higher than under-16s batsmen in arm span, total arm length, humerus and femur breadths. The under-16s batsmen were also significantly lesser than senior in hip girths, hand lengths and bi-ilocrist breadth, and from under-19s in sitting height and total leg length.

Conclusion: Senior batsmen were significantly higher in the anthropometric measurement of girths, breadth and lengths than U-16 because of 10 years age difference. Future research is essential to confirm the relationship between the anthropometric characteristics of batsmen with the batting technique and performance.

Keywords: Cricket batsmen, Morphology, somatotype, physical strength, Malaysia

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INTRODUCTION

Physical characteristics play an important role in the successful performance of athletes.[1,2] Sports coaches consider the physical characteristics of players to assign them playing position in team games such as defender, attacker, blocker and smasher basketball and volleyball,[3] batsmen and pitcher in baseball. [4,5] Gualdi and Russo [6] advocate that different physical characteristics of volleyball players fulfill the tactical demand of game according to the playing position. Assessment of the physical characteristics is very important to estimate the competence of individual for team selection and adopting for suitable training program to enhance player's performance [7]. Matthys and colleagues [8] suggested that anthropometric characteristics of sportsmen should be focused as selection criterion along with their technique in particular game. Simply, height and body mass anthropometric variables provide basic information of the body size and shape of an individual [9]. It was also reported that large segments of lower body produce more force than small segment of upper body [10]. Escamila and colleagues [11] concluded from baseball study that taller and heavier senior adults were higher in bat velocity than youngster batsmen.

Some specific anthropometric characteristics of cricket batsmen, bowlers, and all-rounders contribute in overall team performance [9]. Similarly, anthropometric researchers reported that batsmen were short and light than bowlers [12, 13, 14]. In contrast, no significant difference was found between the batsmen, bowlers and all-rounders in height, girths and skinfolds variables [15]. These studies compared the physical characteristics according to the playing position within the same age of cricket players. Koley [16] investigated the anthropometric measures of different age cricketers and reported that junior of (16-18yrs old) were shorter in their stature (senior=174.0±6.21, middle=169.3±6.69, juniors=167.10±6.40) and body mass (67.11±8.00, 60.07±9.92, 54.84±6.29) than the seniors (22-25y) and middle age (19-21y) players. Pyne and colleagues [17] found that senior bowlers were significantly superior in their physical characteristics than juniors. Dhaliwal and Singh [18] reported that the university baseball players were significantly large in calf, thigh, hip, chest, and upper arm and forearm girths than the college players. Researchers conclude that physical characteristics of baseball batsmen as height, arm and leg lengths improve performance and increase bat speed [19, 20,21,22]. As like baseball batsmen the specific physical characteristics may help cricket batsman to hit the powerful shot across the boundary. With the introduction short cricket (e.g., T-20s) overs matches' format batsmen focus on power hitting shots to make more runs through boundaries on minimum ball rather than orthodox defensive shots [23]. A boundary provides four or six runs at one ball rather than running between the wickets.

Physically strong batsmen can hit ball power fully for boundary [24]. Hoffman and colleagues [25] concluded that hand grip strength was significantly correlated with bats' velocity. Kohurma and colleagues [26] reported back strength is significantly predictor to increase bat velocity. It can be concluded that batsmen with stronger in hand grip strength and back strength would be better to strike the ball for boundaries.

Although, researchers investigated different factors which affect the batting performance of batsmen such as kinematics [27,28], physiological [14] and muscular strength of upper body [24]. No study was conducted to compare the physical characteristics and physical strength of different age batsmen.

Previous anthropometric studied in cricket studies compare the physical characteristics of state team batsmen, bowlers and all-rounders Stretch and Buys[15], first class (24y) senior and club (14.8 y) junior fast bowlers [17]. Choudhary and colleagues [29] compared the anthropometric characteristic of provincial team fast bowlers and spin bowlers. Koley and Yadav [30] reported anthropometric characteristics and handgrip strength of district team cricketers and non-cricketers. Koley [16] compared the anthropometric characteristics of university cricket team players of three age groups (16-18y), (18-21y) and (21-25y) younger players. However, to the best of the authors' knowledge, no study has been attempted to compare the anthropometric characteristics of senior, under-19 and under-16s national team batsmen. This study was conducted to fill this research gape as suggested by Stretch and colleagues [31] that the cricket batting should be examined through interdisciplinary research.

The purpose of this study was to compare anthropometric, somatotype and physical strength variables of senior, under-19 and under-16s batsmen. It is hypothesized that the senior cricket batsmen would be significantly higher in anthropometric, somatotype and physical strength measurements than junior counter parts of under-19 and under-16 batsmen.

METHODOLOGY

Specialist top order (n=24) batsmen purposively were selected from Malaysian cricket teams who participated in international competition in their age level. Mean age of group batsmen were found as senior (means=25y), U-19 (mean=17.5y) and U-16 (mean=14.5y). A written consent was acquired from each participant to assure their willingness in data collection procedure. Study approval was acquired from ethical committee of the Sultan Idris Education University, Malaysia. Data was collected during the training camps which provide appropriate fitness of each batsman. All data was compiled inside indoor hall of Kinara Oval Cricket Stadium, Kuala Lumpur, Malaysia.

Procedure of anthropometric data collection

Demographic, anthropometric and physical strength of each batsman was measured in a single session. Before the commencement of actual data twenty participants were tested and retested by the investigator to fulfill the inter-tester reliability as guided Carter & Ackland [32] and

adopted by [9]. Technical error of measurements (TEM) was followed as suggested by the International Society for the Advancement of Kinanthropometry (ISAK). Means of tolerance limits for (TEM) were considered less than 5% for skinfold and 1% for lengths, girths and breadths measurements as adopted [33, 17]. The procedure of anthropometric and physical strength measurements were followed by the International Society for the Advancement of Kinanthropometry (ISAK) as reported [34]. All anthropometric measurements except heights and body mass were taken from the right side of each subject with triplicate criterion and median value were considered as final score. Each batsman visited seven separate measurements stations such as 1) land marking of body, 2) skinfolds, 3) girths, 4) length, 5) breadths, 6) stature and body mass and 7) physical strengths. The batsmen were instructed to be in bare footed with light clothes during whole data collection procedure.

A cosmetic pencil was used for the anatomical land marking at acromiale, radiale, mid acromiale-radiale, subacapulare, stylion, mid-stylion, mesosternale, illiocristale, illospinale, supraspinale, trochanterion, mid trochanterion- tibial laterale, mid-thigh, tibial laterale, tibial mediale and sphyrion. Harpenden skinfold caliper (Holtain Ltd, Crosswell, Crymych, UK) was used to measure 08 skinfolds from triceps, sub-scapular, biceps, iliac-crest, supraspinale, abdonimal, frontal thigh, medial calf with minimum 0.2mm reading. A non-stretch fiberglass measuring tape (HaB Int Ltd, UK) was used to measure girth (circumferences) with 0.1cm as minimum reading. Twelve girths were measured from arm relax, arm flex, forearm maximum, wrist minimum, chest mesosternale maximum, waist minimum, hips maximum, thigh maximum and calf maximum. A large sliding anthropometric caliper (Lafayette Instruments Company, LTD, USA) was used to measure the segmental lengths of acromiale-radiale, radiale-stylion, midstylion-dactylion, Trochanterion-tibal lateral, tibial lateral height, foot length as well as breadth of biochromiale, biiliocristale, transvers chest and anterior-posterior depth of the chest. Humerus and femur breadths were measured by using small slide anthropometric caliper (Lafayette Instruments Company, LTD, USA) and .01cm was determined as minimum reading model for both lengths and breadths measurements. A stadio-meter (Holtain Ltd., Crymych Dyfed, UK) was used to measure stature (height) in upright standing position from the ground surface to the vertex of head (highest point of skull of human body). A 46 cm wooden box and meter scale chart was pasted at the wall 46cm above from floor to measure sitting height of batsman. Sitting height measurement was taken from the surface of box to the vertex of head of batsman. A scale chart was used to measure the arm span at the horizontal abduction position of back with wall with fully stretched arm, the measurements was considered from right to left dactyl-ion. Body mass (weight) was measured by using the digital standing scales (Seiko, Tokyo, Japan) with the nearest point of 0.1kg.

Measurement of the Physical Strengths

Handgrip strength was recorded by using the adjustable digital hand grip dynamometer (Taki Scientific Instruments Co, LTD. Japan). The dynamometer was exactly adjusted according the range of batsman's hand. Batsman were instructed to be in standing position with the abduction of right shoulders and flexion of elbow at 90 degree and forearm rotate inward and squeeze dynamometer tightly with applying maximum force of the both sides of his right hand musculature [30]. During the right hand grip strength measurements left arm and other body parts were neutral and not getting any support from any external object. A back-leg-chest dynamometer (Taki Scientific Instruments Co, LTD. Japan) was used to record the back strength. Each participant was instructed to make erect body position, bent knees and chest inclined over the body position at 60 degree, the hands grasped at the handle which attached through chain with the dynamometer. Each participant was instructed to straighten his knees, while applying the maximum force at handle that attached to the dynamometer with steel chain. Proper warm time was given to each participant before the collection of hand grip strength and back strength data. One minute interval was given after each trail and best score were considered as final score from triplicate criterion.

Data Analysis

Descriptive statistics (mean ± 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. All data was analyzed by using the SPSS (Statistical Package for Social Sciences) version 20.0.

RESULTS

Table 01 displayed significant difference in stature, body mass, upper arm relax and flex girth, forearm girth, chest girth, waist girth, hip girth and calf girth, stinting height, arm span, total arm length, upper arm length, hand length, total leg length, bi-acromial breadth, bi-iliarist breadth, transvers breadth, humerus breadth and femur breadth. The somatotype variables of the sum of 8 skin folds, wrist girth, thigh girth, lower arm length, upper leg length and lower leg length anthropometric variables were not significant between groups comparison.

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 $F(2,15)=7.52$, $P<.00$. Senior batsmen were significantly higher in arm relax girth than U-19 and U-16 batsmen. Mean and standard deviation of arm flex girth were (Senior=33.31±2.62cm, U-19s=27.81±2.95cm and U-16s=27.49±3.52cm), between-group difference $F(2,15)=7.28$, $P<.00$. In arm flex 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 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), be-

tween-group difference $F(2,15)=10.14$ $P<.00$. Senior was significantly higher in chest girth than U-19 and U-16 batsmen. Waist girth were (Senior=81.38±10.15cm, U-19=70.25±9.89cm and U-16=67.13±3.63cm), between-group difference $F(2,15)=6.01$, $P<.01$, senior were significantly higher than U-19 and U-16 batsmen. Hip girth variable was (Senior=97.59±9.08cm, U-19=89.40±10.83cm and U-16=82.56±3.59cm), between-group difference $F(2,15)=6.39$, $P<.02$. Senior was significantly high than U-16s batsmen but U-19s was not significant with senior and U-16 batsmen. 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.

Table 01: One way (ANOVA) of the anthropometric characteristics of the cricket batsmen

Measure	Senior	Under-19	Under-16		
	M (SD)	M (SD)	M(SD)	F	P
Stature (cm)	171.38(7.91)	171.68(4.01)	158.13(9.16)	8.84	.00
Body Mass(kg)	70.90(10.14)	57.90(11.41)	50.38(5.44)	9.85	.00
Sum of 8 skinfolds(mm)	117.95(44.58)	72.70(54.12)	66.95(17.94)	3.57	.05
Arm girth relax(cm)	29.48(3.16)	25.11(3.47)	24.09(2.02)	7.52	.00
Arm girth flex(cm)	32.31(2.62)	27.81(2.95)	27.49(2.91)	7.28	.00
Forearm girth(cm)	27.03(2.13)	24.11(1.64)	23.49(1.42)	9.26	.00
Wrist girth(cm)	16.74(1.04)	15.96(.77)	15.86(.87)	3.34	.06
Chest girth(cm)	93.78(8.71)	82.03(8.83)	77.19(4.29)	10.14	.00
Waist girth(cm)	81.38(10.63)	70.25(9.89)	67.13(3.64)	6.01	.01
Hip girth(cm)	97.59(9.08)	89.40(10.83)	82.56(3.59)	6.39	.02
Thigh girth(cm)	55.79(5.89)	55.79(7.59)	48.24(4.64)	3.08	.07
Calf girth(cm)	37.23(3.26)	33.06(2.61)	33.19(1.71)	6.60	.01
Sitting height(cm)	87.15(4.90)	87.41(3.10)	81.88(4.45)	4.38	.03
Arm span(cm)	176.50(6.09)	176.76(5.50)	166.25(9.32)	5.60	.01
Total arm length(cm)	57.36(2.49)	57.62(1.34)	53.31(2.15)	8.62	.00
Upper arm length (cm)	30.86(3.33)	32.56(1.05)	29.14(1.40)	4.98	.02
Lower arm length (cm)	25.51(1.63)	26.09(.73)	24.85(1.86)	3.23	.06
Hand length(cm)	18.96(.39)	18.39(.56)	17.98(1.14)	3.36	.05
Total leg length(cm)	88.74(2.91)	90.37(1.69)	86.33(4.93)	5.98	.02
Upper leg length (cm)	45.36(2.67)	45.00(1.72)	44.04(2.60)	.67	.52
Lower leg length (cm)	44.80(1.88)	45.11(2.21)	43.95(2.71)	2.56	.10
Bi-acromial breadth(cm)	42.14(1.96)	38.84(2.12)	36.16(1.84)	18.29	.00
Bi-ilocristal breath(cm)	28.90(3.23)	26.10(2.30)	24.80(1.50)	5.87	.01
Transvers chest (cm)	29.61(2.48)	25.54(2.41)	24.58(1.43)	12.24	.00
Humerus breadth(cm)	6.83(.46)	7.15(.44)	5.96(.40)	15.92	.00
Femur breadth(cm)	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.

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. Total arm length was (Senior=57.36±2.49, U-19=57.62±1.34cm, and U-16=53.31±2.15cm), between-group difference $F(2,15)=8.62$, $P<.00$. The U-16 batsmen were significantly lesser in total arm length than senior and U-19 batsmen. Acromial-radial (upper arm) length of batsmen were (Senior=30.86±3.33cm, U-19=32.56±1.05cm and U-16=29.14±1.40cm), between-group $F(2,15)=4.98$, $P<.02$. Post hoc showed that U-16 batsmen were significantly lesser in upper arm length than U-19 batsmen but not than senior. Mean and standard deviation of mid stylion-dactylion (hand) length 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 stylion-dactylion (hand) length of senior batsmen was significantly higher than U-16 batsmen and U-19 was not significantly different with senior and U-16 batsmen. Total leg length was (Senior=89.45±1.82cm, U-19=91.17±1.09cm and U-16=86.03±3.63cm), between-group comparison $F(2,15)=6.94$, $P<.01$. Tukey's post hoc showed that U-19 batsmen were significantly higher in leg length than U-16 batsmen and senior batsmen were not significantly different than U-19 and U-16 batsmen.

Results of breadths 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. In transvers (chest) breadth was (Senior=29.61±2.48cm, U-19=25.54±2.41cm and U-16=24.56±1.43cm), between-group difference $F(2,15)=12.24$, $P<.00$. Senior significantly higher in transvers chest breadth than U-19s and U-16s and no significant difference exist between U-19 and U-16 batmen. 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 02: One way (ANOVA) of Somatotype variables of cricket batsmen

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 02 shows no significant differences 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.

Table 03: One way (ANOVA) of hand grip and back strength of cricket batsmen

Measure	Senior	Under-19	Under-16		
	M (SD)	M (SD)	M(SD)	F	P
Right-handgrip strength (kg)	42.68 (7.33)	33.19 (4.18)	33.46 (6.26)	6.34	.01
Back strength (kg)	94.46 (24.63)	95.42 (12.90)	94.48 (13.89)	.01	.99

Significant level is p< 0.05*.

According table 03 mean and standard of the right hand strength was (Senior=42.68±7.33kg, U-19=33.19±4.18kg and U-16=33.46±6.26kg), between group comparison $F(2,15)= 6.34$, $P<.01$. Tukey's post hoc showed right hand strength of senior were significantly higher than U-19 and U-16 and no significant difference exits between U-19 and U-16 batsmen right hand grip strength. Back strength was not significantly different in between group comparison.

DISCUSSION AND CONCLUSION

This study assessed and establishes the profile of the anthropometric characteristics of senior, U-19 and U-16 batsmen. Ranking and classification of athletes is not only based on their performance but also on their anthropometric characteristics [35]. Seven years age difference of the senior batsmen than U-19 and 10 years from U-16 batsmen was the main cause of the significance difference in body mass, most of girths, and some breadth measure-

ment. Although, senior batsmen were higher in sum of 8 skinfold but no significantly different was found between group comparisons. Sum of 8 skinfolds indicate senior, U-19 and U-16 batsmen have similar playing role in team and training pattern which equalized their fat percentage. In contrast, Koley [16] believe fat ratio is influenced by age. Senior batsmen were significantly higher in all girth measurements than U-19 and U-16 except wrist girt and thigh. Senior batsmen found significantly higher in bi-acromial and transvers breadth than the other groups.

The U-16 batsmen found significantly shorter in height, sitting height, arm span, total arm length and total leg lengths. This study also support the findings of Koley [16] that senior Indian cricketers of (22-25y) were tall in height and large in segmental than (16-18y).

Table 02 showed height-weight ratio depicted that U-19 and U-16 batsmen more linearity in body shape than senior. It was confirmed from the girth and breadths results that senior were superior to U-19 and U-16 batsmen. Results of this study also support the finding of Stretch [13] that the endomorph, mesomorph and ectomorph of provincial batsmen (2.5±5.2± 2.0) and Peens [36] club level batsmen (3.7±4.5±2.4), both study showed large proportion of mesomorph of batsmen. These studies reported somatotype without consideration of batsmen but this study compare three age group batsmen and found that U-19 more muscular and slim than senior and U-16 batsmen.

According to table 03 senior batsmen were significantly stronger in hand grip strength than U-19 and U-16 batsmen. Finding of this study is supported by the statement of Koley and Yadav [30] that hand grip strength is influence by the age and body size. Playing experience may also influence on hand grip strength, because batsman holds the bat from handle for defensive or attacking shots [37]. Similar mechanisms involve in bat grip at the handle and hand grip strength. The joints of the fingers flexed and forearm muscles exert force [38,39]. No significant difference of the back strength measurement between-group comparison. This study support the by the findings Koley [16] that middle (19-21), senior (22-25y) and junior (16-18y) were almost similar in back strength.

PRACTICAL APPLICATION

Results of this study suggest that the anthropometric characteristics and physical strength may be included along with the batting technique for the selection of batsmen. The use of multiple selection criterions may provide valuable finding may indicate suitable position of batsmen as well for test, one day and twenty-twenty games. Furthermore, future research is required to find the relation of the anthropometric and physical strength of batsmen with their batting performance and the kinematics of front foot and back foot shots.

Assessment of the anthropometric variables of batsmen could not present full phenomena of cricket batting of senior and junior. It would be concluded that stature and segmental length depends on parental genetics would not be controlled training. On other hand body mass, skin folds and girths also depends on parental genes but it can be controlled through training. French and colleagues [40] suggested that physical strength and power increase throwing range and bat speed of baseball players. Therefore, hand grip and back strength also focused to improve as like batting technique against all types of short pitch and over pitch deliveries of fast and spin bowler and shot selection.

Finally, it is suggested that future studies should be conducted to estimate the effect of anthropometric characteristics and physical strengths on batting performance, kinematics of front foot and back foot shots technique, perception and shot selection, on power hitting which provide boundaries to batsmen.

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