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A comparative study of physical fitness between batsman and bowler in cricket

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Abstract
The research entitled ‘‘A comparative study of physical fitness between batsman and bowler in cricket’’. “Physical fitness is ability of an individual to daily routine work without getting fatigue and moreover reserves enough capacity to meet an emergency”. The role of physical fitness in the game of cricket is very well known. The purpose of the study was to analyze and compare difference in physical fitness of Batsman and Bowler in different club of Nagpur district. The subjects were randomly selected into two groups of fifty male each consisting of Batsman and Bowler in the mean age group of 16 years. Selected variables were Agility, Speed, Cardiovascular endurance, Flexibility. The physical fitness of different clubs Batsman and Bowler was compared while applying independent T-test. It was observed that batsman were significantly higher in Agility, Speed, Cardiovascular endurance, Flexibility. It was concluded that Batsman are highly significant than Bowler in respect of physical fitness.

Keywords: batsman, bowler, difference, physical, fitness, agility, speed, cardiovascular endurance, flexibility

Introduction
Physical fitness is the capacity to carry out, reasonable well, various forms of physical activity, without being unduly tired and include quality important to the individuals health and wellbeing. Physical fitness has been defined in various ways. Someone defines it as absence of disease, and some rate this according to the amount of masculature developed, and few define physical fitness as ability to perform certain sports skills. The most comprehensive definition defines “Physical fitness as the measure of the body’s strength endurance and flexibility. Physical fitness can be classified into two categories namely health related physical fitness and motor skill related physical fitness health related physical fitness could be defined as a scientific body of the positive effect of regular and vigorous exercises with the prevention of degenerative diseases such as coronary heart disease, obesity and various muscular-skeleton disorders. The physical fitness of human beings is the main objective of physical education and sports programmes. It is therefore, essential for all cricket players and coaches to know about physical fitness, its components and their measurement. Physical fitness testing had interested the human beings of all walks of life from general public to experts in the disciplines of physical education, health education, pedagogy, medicine, human biology, exercise physiology, sports coaching etc. Generally speaking, the physical fitness tests are conducted to achieve one or more of the purposes.
Agility is an important motor ability in majority of the sportive activities, especially in badminton, tennis, trampoline, gymnastics, hockey, basketball, football, dance, dubbing, pole vaulting, hurding etc. Commonly speaking, Agility means ability of quick and swift movements, and ability of quick apprehension of body movements. As used in physical education and sports, agility may be defined as "one's controlled ability to change body position and direction rapidly and accurately".
Speed refers to quickness of actions and one's ability to perform rapidly successive movements in a single direction over a short duration. According to Barrow and McGee (1971), speed is defined as "one's ability to perform successive movement of the same pattern at a fast rate".
Cardiovascular endurance may be defined as the ability of heart and lungs to take in and to transport adequate amounts of oxygen to the working muscles for activities that involve large muscle masses, to be performed over long periods of time. For example, running, swimming and bicycling activities involve large muscles. Cardiovascular endurance has many synonyms like cardio-respiratory endurance, circulatory-respiratory endurance, cardio-pulmonary endurance etc. The cardiovascular endurance involves moderate contraction of large muscle groups for long periods of time during which maximum adjustments of circulatory - respiratory system are necessary as in continuous running, swimming, climbing, hiking, aerobics, bicycling and the like.
In general, flexibility means the range of movements around the skeletal joints of the body. The flexibility is not a general body character but it is specific to each body region. If a person has highly flexible shoulder joint, it does not necessarily mean that he/she will have good knee flexibility or hip flexibility. Even it is possible that one shoulder joint is more flexible than the other. For a good physical fitness, it is essential that a person has quite flexible joints and is able to maintain his or her body flexibility. The flexibility component of physical

fitness enables the person to have free body movements, better coordinated movements requiring lesser work and to handle greater stress with lesser chances of injury.

There is no exact record available which shows when and by whom this game was started in England. It is essentially an English game. There were certainly many games played in early times which bore some resemblance to cricket. Old works suggested that cricket is as old as 13th century. It was known as "club and ball "game"". It was apparently a single wicket game in which the score was recorded as in cricket. There are writers who believe that the word "cricket" appeared for the first time in 1685. others claim to have traced it to never 1550. The game evidently developed rapidly in the seventeenth century with underarm bowling. There were no prepared pitches. At first the winner of the toss selected the stretch of turf on which he chose to play and naturally did so to suit his own team. The first L.B.W law did not appear until 1774 and no decisions under it can be founded prior to 1794 though this may have been due to inadequate records. A tremendous change in the method of bowling was evolved towards the ends of the eighteenth century until 1835 when legislation by M.C.C. permitted the hand to be as high as the shoulder. A further 29 year ensured before the bowler overarm as we know it today and that is possibly the greatest single change in the development of the game, for modern cricket without overarm bowling cannot be imagined. There was a time when the bowler could once in the same innings. In 1870 that was altered to "twice". but as a concession the bowler was allowed to bowl two overs consecutively. In India the game of cricket was introduced by English men about a century ago. They started playing as a past time and later on as the Indians started to play this game matches were played. The first Presidency match that was played in India, was played at Bombay in 1895, between the European and Parsees. There used to be two matches of this nature every year one was played at Bombay and the other at Poona. When the Hindus started playing in 1907, the tournament was known as Triangular Tournament. From 1912 to 1936 Quadrangular Tournaments were being played and the Muslims started taking part. The Pentangular Tournament started in 1937 and the fifth consisted of Indian Christians and Anglo-Indians. Since 1934 the Inter Provincial Cricket Tournament was started. It is known as the Ranjit Trophy Tournament after the great Indian cricketer Prince Ranjit Singhji. The cup was donated by the late Maharaja of Patiala. In 1886 a Parsee cricket team went to England and played few matches. This was the first team to go to England from India. The first England team came to India in 1826. India was given the test status in 1932 and an Indian team went to England under the captaincy of Maharaja of Porbandar. The first official M.C.C team visited India in 1933. As the years progressed India acquired international status in the game. International status in this game and now it is having regular visits to and from England, Australia, west Indies, New Zealand and Pakistan. (AIBARA, 1973) [1]

Literature review

1. Johnstone, JA and Ford, PA conducted research on "Physiologic profile of professional cricketers". This study aims to pro (JOHNSTON J. A., 2010) [6] vide a physiologic profile of professional cricketers and note positional differences at the start of the 2007/08 competitive season. Fifteen participants (9 bowlers, 6 batsmen) aged 25.0 ± 5.0 years took part in this study. Participants completed a series of field-based fitness assessments: body composition, flexibility, predicted maximal oxygen uptake, upper and lower-body strength, speed, and explosive power. In addition, after effect size calculations, the results showed that some physical fitness differences existed between playing positions. Cricket professionals possess a superior level of physical fitness and strength, and conditioning coaches should seek to progress these physical parameters and further identify position-specific physical requirements to progress the modern game.
2. Caroline F. Finch, Bruce C. Elliott & Alicia C. McGrath conducted research on "measures to prevent cricket injuries" where he found that cricket is a major international sport, generally played in British Commonwealth nations. These movements, if performed incorrectly or too frequently, can lead to overuse injuries of the back, particularly in elite and high level cricketers. Although a number of measures to prevent cricket injuries have been widely suggested in the literature, there have been very few studies that have formally assessed their effectiveness in preventing injury. Further research is needed to gain a greater understanding of the biomechanics of cricket actions, the mechanisms of resultant injuries and the role of various risk factors in injury causation. (CAROLINE F. FINCH, 1999) [3]
3. CLOE CUMMINS, RHONDA ORR, HELEN O CONNOR, CAMERON WEST did a systematic review on "Global positioning system and microtechnology sensors in team sports" as use of Global positioning system (GPS) technology in team sport permits measurement of player position, velocity, and movement patterns. GPS provides scope for better understanding of the specific and positional physiological demands of team sport and can be used to design training programs that adequately prepare athletes for competition with the aim of optimizing on-field performance. (CLOE CUMMINS, 2013**)** [4]
4. Subhasis biswas, Ankur biswas and Nita bandyopadhyay conducted research on "Effects of Four Weeks Intervention of Yogic Practices on cricket specific Motor Fitness" in where he founded that the potentiality of yogic practices to improve physical and mental ability is well-known. The inclusion of yogic practice in cricket training protocol is a controversial topic. Plenty of research literature suggested that yogic asana improves physical fitness and controls competition pressure as well as match stress. One group underwent through selected yogic asana practices along with their regular training and another group did not include yogic asana practice in their training schedule. Basic physical and physiological parameters along with some cricket specific motor fitness components were measured before and after four weeks of yogic practices.

Four weeks of yogic practice significantly improved the muscle endurance, agility and balance. A positive effect has also been observed in the predicted O2 max (BANDYOPADYAY, 2021)

5. Dr. Sahadev Mandrekar conducted research on "A comparative study on selected physical fitness variables of inter collegiate cricket and football players of Goa" in which purpose of the present study was to compare the selected physical fitness variables of professional college football and cricket players who actively participate in inter collegiate sports tournaments. Total sixty four (64) (32 from Football and 32 from cricket) male players from various colleges of Goa were selected for this study. Study concluded that significant difference found between the means of selected physical fitness variables such as speed and agility (shuttle run), explosive strength of legs (SBJ), speed of lower extremities(50mt. dash) and explosive strength, cardio-vascular endurance (12 min run & walk) and no significant difference found between the means of muscular strength (dynamic) and endurance of arm & shoulders (Pull-ups), muscular strength and endurance of trunk (bent-knee sit ups) of college level football and cricket players. Keywords: Physical Fitness, Football and Cricket Players. (MANDREKAR, 2017) [8]
6. Dinshaw N. Pardiwala, Nandan N. Rao, Ankit V. Varshney, conducted a research on "injuries in cricket" where they found that Cricket is a popular global sport that requires a combination of physical fitness, skill, and strategy. Although a noncontact sport, overuse and impact injuries are common since players engage in a wide range of physical activities, including running, throwing, batting, bowling, catching, and diving. Significant or match time-loss injuries are defined as those that either prevent a player from being full available for selection in a major match, or during a major match, cause a player to be unable to bat, bowl, or keep wicket when required by either the rules or the team's captain. This review describes the various region-wise injuries sustained in cricket along with their epidemiology, biomechanics, treatment, and prevention. (VARSHNEY, 2017)
7. Carl j. peterson, David pyne, Brian Dawson, Marc Portus, Aaron Kellett did research on "Movement patterns in cricket vary by both position and game format "where they compared the movement patterns of cricketers in different playing positions across three formats of cricket (Twenty20, One Day, multi-day matches). Cricket Australia Centre of Excellence cricketers (n = 42) from five positions (batting, fast bowling, spin bowling, wicketkeeping, and fielding) had their movement patterns (walk, jog, run, stride, and sprint) quantified by global positioning system (GPS) technology over two seasons. Marked differences in movement patterns were evident between positions and game formats, with fast bowlers undertaking the greatest workload of any position in cricket. Fast bowlers sprinted twice as often, covered over three times the distance sprinting, with much smaller work-to-recovery ratios than other positions. Fast bowlers during multi-day matches covered 22.6 ± 4.0 km (mean ± s) total distance in a day (1.4 ± 0.9 km in sprinting). In comparison, wicketkeepers rarely sprinted, despite still covering a daily total distance of 16.6 ± 2.1 km. (KELETT, 2009)
8. Kunvar Singh and Dr. Ratnesh Singh conducted research on "An association of anthropometric and physical fitness variables of cricket players with the performance of running between the wickets". Fifteen male Cricket players were participated as subjects in the present study. The samples were selected from Department of Physical Education Cricket match practice group, G. G. V. Bilaspur, Chhattisgarh on the basis of purposive sample selection technique. The age of the subjects was ranging between 21 to 28 years. The mean and SD of the age of the subject was 24.533 and 2.263. To know the relationship of selected anthropometric and physical fitness variables with the running between the wicket performance of Cricket players Pearson product-moment correlations were calculated. All the statistics were calculated with the help of SPSS 16.0 version software. The findings of the study shows that there are significant relationships of running between the wicket performance with selected anthropometric variables.
9. Thakur Rahul conducted a comparative study of "Morphological and selected variables of junior and senior cricket players". The main objective of the present study was to compare the morphological and selected fitness variables of Junior and senior cricketers. 100 cricketers were selected for the present study. For the study16 Anthropometric (stature adjusted and absolute) variables and the 04 Motor fitness variables were used in the discriminate analysis to discriminate under-19 Junior and above under-19 senior cricket players. The study found that there was difference in morphological characteristics among junior and senior cricketers. Agility, Muscular endurance, body mass index, stature adjusted hip width were four variables which effectively discriminated the senior cricketers from those of junior cricketers.
10. Lokendra Bahadur, Kathayat and Ashok Kumar did a study on "Anaerobic Fitness of Cricket Players in Punjab" The purpose of this study was to observe anaerobic fitness of cricket players in Punjab. The design of this study required participants to perform six sprints each of 35meter. Materials & methods: There was one hundred fifty (N=150) trained male cricketers between the ages of 15 and 25 years volunteered for this study. Anthropometric rod, Weighing machine were used. The mean maximum power, minimum power, average power and fatigue index of cricketers was 510.33±131.402watts, 353.18±92.731watts, 424.60±106.663watts watts and 4.7891±2.093respectively. Conclusion: It was con\cluded from the results of this study that sprint time and power decline in cricketers may be due to reduced energy production via anaerobic glycolysis and muscle acidosis.

Research Methodology

This chapter adopts the following procedure including information regarding research design, source of data, sampling method, selection of subjects, criterion measures and collection of data etc. The statistical analysis of the gathered data provides a well-neat picture of a completed and successful hypothesis as prescribed by researcher. The chapter has been dividing into following headings. Procedure adopted for collection of data is as follows.

Sources of Data

The data required for present study is been collected from various cricket clubs of Nagpur city.

Selection of subject

The purpose of this study is to find out whether there is any significant difference in the physical fitness of Batter and Bowler under the age group of 14 -18 years. The subject is been selected from the different academies on random basis. The number of subjects is been limited to 50 batsman and 50 bowlers. These two groups are been tested by administering physical tests of both component under strength.

Selection of variables

The physical fitness plays an important role for performance in any game thus the research scholar after going through reviews, following parameter of physical fitness is been selected.

1. Agility
2. Speed
3. Cardio-vascular endurance
4. Flexibility

Method of sampling

For this study random sampling method is been adopted in selection of the subject.

Criterion measure

The criterion to measure the physical fitness is as follows: -

Research will conduct testing of all the variables simultaneously and standardize it with the help of experts and then it will be implemented for the study.

- Agility Shuttle run
- Speed 50yard dash
- Cardio vascular endurance Harvard step test
- Flexibility Sit and reach test

Administration of testing

The standard testing was been conducted on batter and bowlers of different clubs of Nagpur city for the study. For agility shuttle run was administered in which two parallel lines on the floor. Place two wooden blocks behind one of the lines. The student starts from behind the other line. To start test, use the signal Ready, Go! On the word Go! the student runs to the blocks, picks one block. Then the student runs back, picks up the other block, and runs across the starting line as fast as possible. Start the stopwatch on the signal Go! and stop it as the student crosses the starting line. Two trials are administered, with a rest in between. The best time of the better of two trials recorded to the nearest tenth of a second in the score. For speed three subjects started at a time on the sound of the clappers, running a distance of 50 yards. The time taken by each subject to complete the distance was recorded with the help of a stop watch. Three trials were given with some rest in between. The best time of the trials the one nearest to 1/100th of a second was recorded as final score whereas for testing of cardiovascular endurance the subject stand before the bench and on command to begin steps on to the bench with one foot, then the other on the third count he steps down with one foot, then the other. The cadence in 30 steps per minute, which means that he mounts the bench and step down 30 times in one minute. The cadence for the placement of each foot would be 120 per minute. The body should be erect when he steps on to the bench. There are no regulations regarding which foot the subject should lead off with, nor is there any requirement to alternate the feet periodically. This is left up to the individual who mayor may not alternate. The subject continues to exercise at prescribed cadence for 5 minutes, unless he falls he must stop before then because of exhaustion as soon as he stop exercising, he sits down and remains seated and quiet throughout the pulse counts. PFI=Duration of Exercise in seconds * 100 / 5.5 * pulse count of 1 to 1.5 minutes after exercise. The best score is recorded in the data and for testing of flexibility the subject assumed a sitting position on floor with knees fully extended and of the feet against bench. Subject will be asked to flex-trunk 4 times with arms fully extended with hands on the top of each other. Last attempt will be held for one second so as to take measurement. Tester placed the yard stick with 15inch mark at near edge of bench. Measurement approaching mark (not being able to reach toes) was scored negative while those behind 15 inches mark were scored, positive, measured to nearest.

Standard procedure to be used

For the purpose of analyzing the data, the t-ratio was used. The calculations will be done by the method of ungrouped data. The following formulae will be used to analyze the results.

MEAN-For a data set, the mean is the sum of the observations divided by the number of observations. It identifies the central location of the data, sometimes referred to in English as the average. The mean is calculated using the following formula.

$$M = \frac{\sum(X)}{N}$$

Where ∑ = Sum of
X = Individual data points
N = Sample size (number of data points)

Standard Deviation

The standard deviation is the most common measure of variability, measuring the spread of data set and the relationship of the mean to the rest of the data. If the data points are close to the mean, indicating that the responses are fairly uniform, then the standard deviation will be small. Conversely, if many data points are far from the mean, indicating that there is a wide variance in the responses, the the standard deviation will be zero. The standard deviation is calculated using the following formula.

$$S^2 = \frac{\sum(X-M)^2}{n-1}$$

Where ∑ = Sum of
X = Individual score
M = Mean of all score
N = Sample size (number of score)

Standard Error of Mean

The standard error of the mean (SEM) is the standard deviation of the sample mean's estimate of a population mean. (It can also be viewed as the standard deviation of the error in the sample mean with respect to the true mean, since the Sample mean is an unbiased estimator.) SEM is usually estimated of the population standard deviation (sample standard deviation) divided by the square root of the sample size (assuming statistical independence of the values in the sample)

$$SE_X = \frac{S}{\sqrt{n}}$$

Where S is the sample standard deviation (i.e., the sample- based estimate of the standard deviation of the population), and n is the size (number of observation) of the sample. This estimate may be compare with the formula for the true standard deviation of the sample mean:

$$SD_X = \frac{\sigma}{\sqrt{n}}$$

Where σ is the standard deviation of the population.

Results

The performance in the related variable were scored and recorded as described in the preceding chapter. 't'-ratio was applied to the data to determine if there were any significant difference amount the Batter and Bowler of Club boys, in respect of their strength.

Level of significance

The probability level below which we rejected the hypothesis is termed as the level of significance. The 't' ratio obtained were compare to at 0.05 level of significance. In using the analysis of 't' ratio 2.02 were for significance at 0.05 level of confidence. The tests are usually called the tests of significances as we have to find out whether the difference among the Batsman and Bowler scores of the samples are significant or not. In the present study, if they obtained values were greater than the expected values at 0.05 levels then the null hypothesis was rejected to the effect that there existed significances difference between the means of the groups compared. And if the obtained values were lesser than the table values at 0.05 levels then the null hypothesis was accepted to the effect that there existed no significant differences between the means of the groups under study.

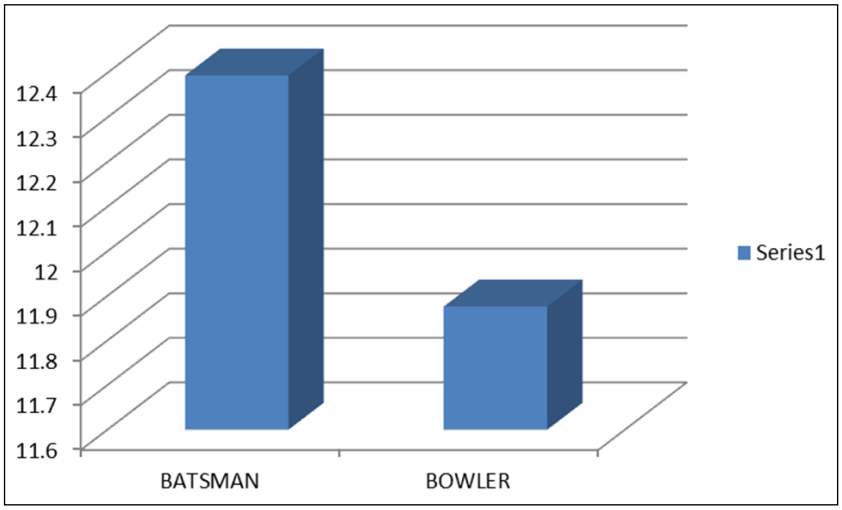
Sit and reach test

Compare of data on Sit & reach test of Batsman and Bowlers of different clubs.

Table 1

Group	Mean	D M	SD	t-ratio
Batsman	12.394	0.518	0.577762221	0.19638445
Bowler	11.876		2.86374665	

It is evident from the above table that the mean number of meters of Sit & reach test by Batsman is more than the mean meters of sit & reach test of Bowler by 0.518 points. The obtained t-value of 0.19638445 was more than that table value of 0.02 at 0.05 Level. Hence the difference was considered as statistically significant and it was concluded that Batsman were highly significant in respect of sit & reach than Bowler.



Graph 1: Sit and Reach Test

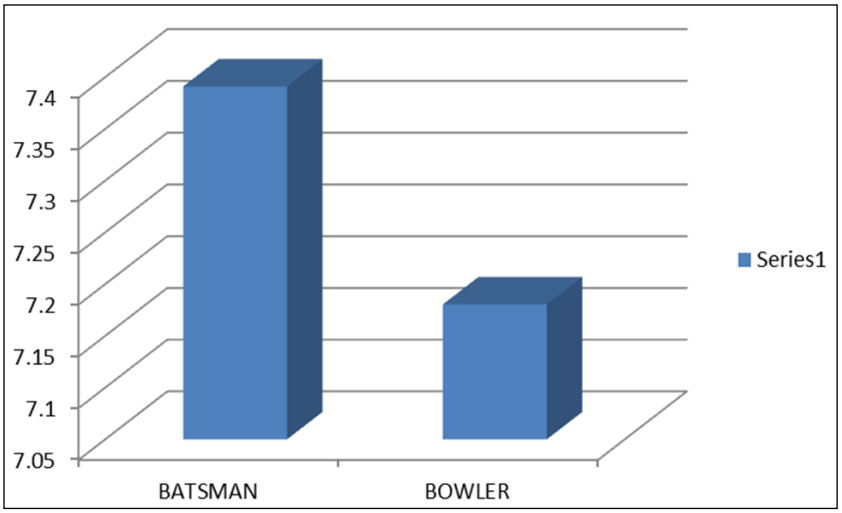
50-yard dash

Compare of data on 50-Yard dash test of Batsman and Bowlers of different clubs.

Table 2

Group	Mean	D M	SD	t-ratio
Batsman	7.3910	0.2106	0.577762221	0.050119491
Bowler	7.1804		0.686386456	

It is evident from the above table that the mean number of meters of Sit & reach test by Batsman is more than the mean meters of sit & reach test of Bowler by 0.2106 points. The obtained t value of 0.050119491 was more than that table value of 0.02 at 0.05 Level. Hence the difference was considered as statistically significant and it was concluded that Batsman were highly significant in respect of sit & reach than Bowler.



Graph 2: 50-yard dash

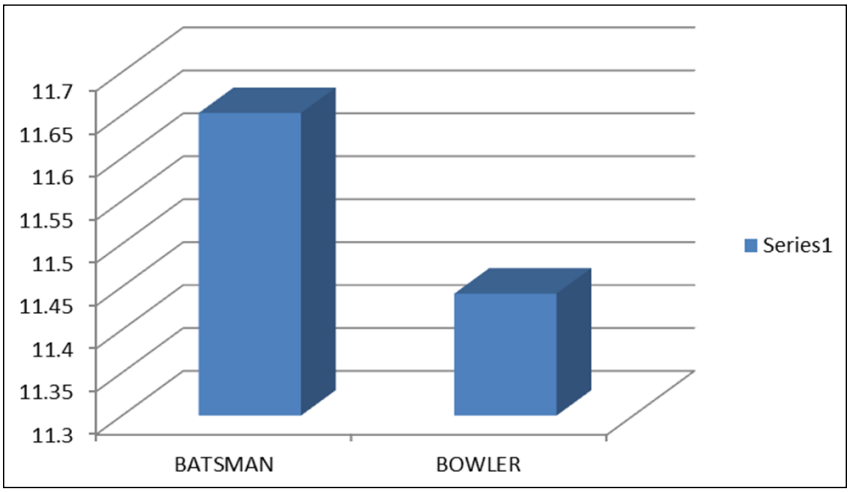
Shuttle Run

Compare of data on Shuttle Run test of Batsman and Bowlers of different clubs.

Table 3

Group	Mean	D M	SD	t-ratio
Batsman	11.6524	0.2104	1.05258004	0.16551024
Bowler	11.442		1.10059909	

It is evident from the above table that the mean number of meters of Shuttle Run test by Batsman is more than the mean meters of Thirty Feet Shuttle Run test of Bowler by 0.2104 points. The obtained t value of 0.16551024 was more than that table value of 0.02 at 0.05 Level. Hence the difference was considered as statistically significant and it was concluded that Batsman were highly significant in respect of Shuttle Run than Bowler.



Graph 3: Agility

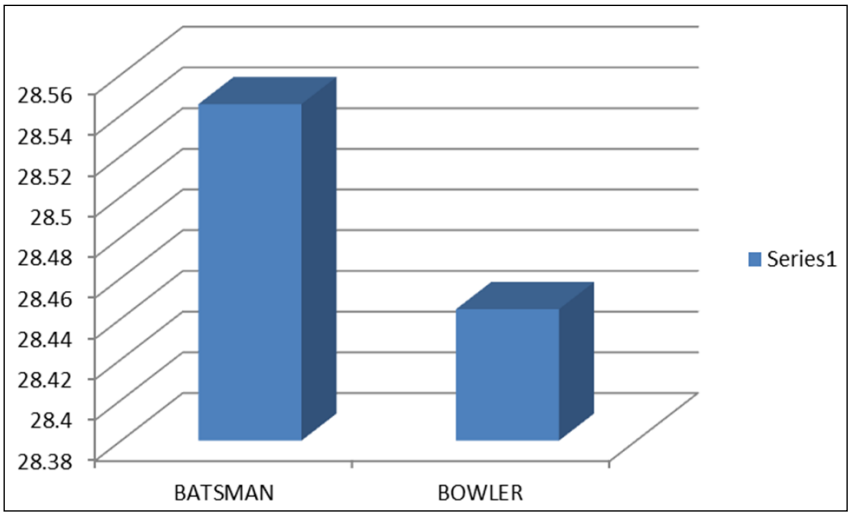
Harward Step Test

Compare of data on Harvard Step test of Batsman and Bowlers of different clubs.

Table 4

Group	Mean	D M	SD	t-ratio
Batsman	28.5454	0.1008	3.955372	0.443075
Bowler	28.446		3.6887508	

It is evident from the above table that the mean number of meters of Harvard Step test by Batsman is more than the mean meters of Harvard Step test of Bowler by 0.1008 points. The obtained t value of 0.443075was more than that table value of 0.02 at 0.05 level. Hence the difference was considered as statistically significant and it was concluded that Batsman were highly significant in respect of Harvard Step test than Bowler.



Graph 4: HARVARD STEP TEST

Discussion on findings

The results of this study show that the physical fitness of Batsman is superior to Bowler. More studies are to be conducted by using large samples to find out the truth. In all items batsman and bowlers are nearer to each other. As we could see in above tables also bowlers are having more significant value then batter in Push up's and Broad jump, which indicates that bowlers are having better arm strength (Push up's) and leg strength (Broad jump) than batter.

Suggestions

Based on the results of the study the following suggestions have been made.

1. Academies and clubs should keep the training curriculum with physical fitness development program four to five times a week.
2. The same study may be conducted on large sample of Batsman and Bowler training at high altitude and low altitude.
3. The same study may be conducted in other district of Maharashtra state.
4. To improve the physical fitness of the Indian players, the investigator suggests to take a comparative study of physical fitness status of different sub-group like one district and another district, state player vs other state player, professionals vs amateur, University players vs National players.
5. Batter and Bowler possesses different set of skills so the training methods needs to be different according to their skills.

Conclusion

The purpose of this study was to find out and compare physical fitness of Batsman and Bowlers of Nagpur District. 50 subjects of Batsman and Bowlers from different cricket academies and clubs in the age group of 14-18 years were selected. The subjects selected were administered with physical fitness test which measures four elements of physical fitness test battery. The data collected from these respondents were converted into normal scores and are statistically analyzed with the two groups to find out the physical fitness. It was hypothesized that there will be no significant difference between Batsman and Bowlers of clubs and academies. The results revealed does not support the hypothesis, that there is no significant difference between Batsman and Bowler of Nagpur city in respect of their physical fitness. This may be because of the fact that in the recent times due to emphasis on physical fitness by International Batsman has attracted young batsman towards it. Special attention on physical fitness of batsman has been given by the coaches in recent times due to change in approach towards the game with change in format. Where as in Cricket academies even though Bowler were provided with special training programme it was observed that the training methods were not better comparatively. More over the commitment on the part of Academies and Clubs for Bowler was not appeared to be high as there seems to be a perception among coaches and trainers that bowling as a skill itself fulfills or enhance the required level of physical fitness itself.

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