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THE ROLE OF MORPHOLOGICAL TRAITS ON THE BATTING PERFORMANCE OF CRICKET BATSMEN – A REVIEW STUDY

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ABSTRACT

Background: The batting performance is assessed by considering the batting average and strike rate of a batsman. With the induction of T-20 cricket matches, the strike rate of a batsman has gained much attention from coaches and team management. To increase the strike rate a batsman required to hit powerful shots for boundaries, which assist in making maximum scores at the minimum ball. Therefore, this investigation was planned to determine the effect of body size on the batting performance of cricket batsman.

Methods: the literature for this study was selected for cricket coaching manual, cricket books, cricket batting videos, a biography of cricket batsmen, research articles. The academic documents were downloaded and shortlisted from Google Scholar, Research Gate, EBSCO, and ProQuest from 1990 to 2019.

Results: The synthesized literature review concludes, stature, longer legs, longer arms, and lean body mass of a batsman show positive effects on the execution of powerful shots in cricket. Furthermore, the maximum strength of muscles assists a batsman to boost up the initial velocity of bat swing to accomplish the ball speed for a successful and powerful shot.

Conclusions: Although stature and longer limbs of batsmen are associated with batting performance. On the other hand, the specific training would also enhance the capacity of cricket batsman for powerful shots in cricket. A future study was proposed to investigate the effect of training on the batting performance.

Keywords: Physical characteristics, Batsmen, Batting technique, cricket Bowling, Bat swing.

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INTRODUCTION

A powerful shot assists a cricket batsman to counter the fast and swinging deliveries of a quick bowler. It is played with both horizontal and vertical swing of bat [1]. A batsman reacts to the fast deliveries with the back foot and front shot to grasp the chance of a boundary for four or six runs at one ball [1, 2]. A fast bowler threatens a batsman with faster delivery, which can create a chance of head injury or miss-hit [3]. Therefore, the attacking shot of a batsman is an actual response to counter the quick bowlers. Believes that the tall batter can easily hit power full shots than the short-heightened batter [4]. The tall batsmen with larger arms and legs can swing the bat with greater force than their shorter counterparts [5,6,7,8]. A positive relationship was reported between the larger body size of cricket batsman with their performance of front foot and back foot off drive [9,10].

Previous studies have reported a positive relationship among the larger body size, handgrip strength, and batting of cricketers [11,2,13]. Previous reviews focused on front foot batting technique (Stretch et al. 2014; Bartlett, 2003) [14,15], handgrip strength, (Glazier et al.2002) [16], and coaching methods [17, 18]. It has proposed that cricket batting should be examined through interdisciplinary research, including the back-foot shots techniques [14]. Unfortunately, a lack of studies to analyze the effect of body size of batter on their batting technique and attacking shots.

This review was aimed to fill the research gaps within the field of cricket. The first objective of this paper was to review the link between body size of a batsman with the attacking shots. The second objective is to introduce a model for future research to evolve the role of anthropometric characteristics of batters, their playing experience, physical strength, and specific training effects of batting performance.

METHOD AND MATERIAL

This qualitative review relies on thematic analysis, as suggested [19]. Different sets of keywords were went to search the relevant literature from online databases like “morphological characteristics of batsmen, anthropometric characteristics batsmen and batting technique, anthropometric characteristics of batter and batting technique. These sets of keywords provided literature from cricket and baseball batting. The baseball literature was selected because similar mechanisms are involved in baseball and cricket batting, the backswing of the bat, forward swing of the bat, bat swing path, and bat-ball contact. On the other hand, a previous cricket batting study is finding supportive literature from baseball research [20, 21]. The web databases were used like Google scholar, EBSCO (sport discuss), ProQuest, and ResearchGate. The bibliographical search was also accustomed to achieving saturation, as suggested [22]. The publishing period of the tutorial documents was considered from 1990 to 2019. Sixty-three academic documents shortlisted, and

ten articles were selected from cricket and fifteen from baseball. These articles were selected from full research articles, coaching manuals, and the biography of cricket players.

Findings of a previous study

The results showed that the height (mean = 173.6, $r = 0.88$) and arm length (mean =78.2, $r = 0.88$) of batters have a positive relationship with the attacking batting technique because the height and arm length help to play shot for boundary [10].

Table 01: Morphological relationship with batting technique of powerful shots

Concept	Informant	Main points
stature relation with cricket shots	[10]	stature has a positive relationship with a powerful shot in cricket batting.
Lean body mass relation with batting technique	[6,7,8,23]	Lean body mass generates more force for powerful shots in cricket.
Body mass relation with bat swing velocity	[24,25]	Batter's lean weight is significant predictors to hit the faster ball for a powerful shot.
Segments length relations with shots technique	[10, 26,27]	Longer arm generates higher momentum of bat swing and provides a mechanical advantage for a powerful shot.
		Large legs of a batter generate large momentum that transfer of energy for cricket shot.
Muscles effects on bat swing velocity	[28,29,30]	Quadriceps and hamstrings muscles balanced the leg positions and transmitted the sequence of the body's movement from the lower limb to the upper limb.
		Small muscles also contribute to executing powerful shots.
Effects of the upper body on the bat swing velocity	[31,32]	Shoulders, elbows, and wrists transmit force into a bat hit powerful cricket shot.

As shown in baseball studies, the massive arms with bat length generate larger momentum at bat-ball collision [26]. The body mass of batter has a significant predictor ($R = 0.927$, $R^2 = 0.859$) to hit the ball further or outside the borderline [25]. Lean body mass (LBM) also contributes to coming up with the extra force at bat-ball contact [6,7,8, 23]. The strong muscles of the lower body help to initiate the sequence of body movements [28]. The lower limb muscles as quadriceps, gluteus, and hamstring stabilize the leg positions during the swing [29, 33]. On the other hand, the upper limb muscles of shoulders, elbows, and wrists stabilize the bat position and transfer energy into a played ball [31]. The stronger muscles of leg and arm generate more force, and small muscles contribute to transfer this force into a played ball [33].

Table 2: Age and Physical Strength with Batting Performance

Concept	Informant	Main Points
Experience and batting performance	[26]	Bat velocity of physically developed batter was faster than the undeveloped batter.
	[34]	Physical fitness and age affect the batting performance
	[25]	The hitting capacity of the adult batter is superior to younger
Physical strength and batting performance	[28]	The physical strength of the lower body raises the bat speed.
	[35]	The physical strength of the upper body supports batter to perform powerful shots.
	[2,36]	Back strength transfers the kinetic energy to accomplish the power shot
	[25,37]	Handgrip strength rises the bat's velocity

Note: Adult batters found strongly correlated with the batting performance, and its similar effects within the striking sports like cricket, baseball, and softball. Strong lower body segments contribute to developing momentum, and the sequence of lower and upper body segments contributes to taking care of a good bat position to strike the ball effectively. Legs strength stabilizes the batters, and the handgrip strength maintains the bat swing velocity within the specific path of bat swing.

DISCUSSION

Stature and Batting Performance

Although the all-time great cricket batsmen Sir Donald Bradman, Sunil Gavaskar, and Sachin Tendulkar were shorter in height less than (1.66m) but considered all-time great because of their greater batting average, in contrary, Clive Lloyd, Graeme Pollock and Sir Vivian Richards were taller than (1.80m) and well-known by powerful strikers the ball for hitting boundaries. Now, within the modern cricket, Matthew Hayden and Chris Gayle (1.91m) are considered the most successful and well-known batters to their power are striking the ball for boundaries [38]. It had been reported in baseball that the taller batter with more significant body segments could generate more force at bat-ball contact than the shorter batter [7,8,39]. At the time of the ball-contact, the tall batter can bring his bat's position above the ball, which helps to execute a powerful shot [4].

It was reported that five university cricket batters depict the effects of the position of the center of gravity ($r = 0.96$), height ($r = 0.88$) and arm length ($r = 0.88$) were found a significant correlation with batting performance [10]. A similar technique was employed to look at the situation of the center of gravity of the segment of five university cricket batters and their correlation with the front foot off drive technique [9]. The right-handed batter showed a

positive relationship with the front foot shot technique at stance and bat-ball contact position. Large body segments of the lower limb generate more force during the bat swing than the little body segments [40]. The big arms of batters increase the bat velocity at bat-ball contact because the large arm develops the massive momentum to execution power full cricket shot [10]. The segmental lengths of baseball batter have a positive relation with linear bat velocity in both pre ($r=0.59$ and 0.61) and post ($r=0.64$ and $r=0.68$) testing during the twelve-week training experiment[39].

Body Mass and Batting

Hoffman and colleagues [23] reported the numerous correlations between the lean body mass (LBM) of the senior baseball batters with the powerful striking of baseball batting. This study confirms the findings that the body mass of baseball batters and their batting performance have positive relations at a young age [25]. The information was categorized into three age groups from (6.4 to 15.7) and reported that the massive body mass and body mass index (BMI) of the batter has correlational statistics with baseball batting performance. The findings of those studies indicated that the enormous body mass and lean body mass have a strong relationship with bat swing. It may be assumed that the adult batter with lean body mass and young batter with large body mass can execute forceful shot in cricket batting, as indicated in cricket coaching manuals.

Playing Experience and batting performance

A batsman can do his highest performance in adult age if he develops skills and game tactics at their younger age [41]. Therefore, it is proposed a batsman should be selected during his adolescent age [34]. The adult batters were 35–40% heavier, 5% taller, uses 15% heavier, and 5% longer bat than youth batters [26]. So, the adult batters enhance mechanical advantages over youth batter, additionally as moving their body segments faster than the youth batters. Age also affects the transfer of mechanical energy in hitting because an adult can produce more bat velocity at bat-ball impact [25]. It is suggested that coaches should train the batter with specific training with the consideration of the age of batters [27].

Physical Strength and batting performance

The batting performance of batters is measured by getting information on their batting average (score per innings) and strike rate (score per hundred balls) in cricket matches [2]. Batsmen strike the ball powerfully for getting boundaries to extend the strike rate and team's run rate. The upper body strength is interlinked with bat velocity because the handgrip strength was correlated ($r = 0.317$) with batting performance in baseball [23]. The upper body strength is positively correlated with the covered distance of the played ball [2]. A positive relationship was reported among the physical strength with the batting performance [25]. The upper and lower body strength contributes to hitting boundaries in cricket [2,42]. Therefore, it is concluded the strength of the upper and lower limbs of batsmen would

be considered because the main contributing considers cricket batting.

CONCLUSION

It is concluded the stature, segmental length, body mass, and circumferences of body segments directly effect on the powerful hitting in cricket batting. Although a batting average plays an important role, especially in tests and one-day matches, in contrast, T-20 batsman required increase strike rate by hitting boundaries. Therefore, along with a good batting technique, a batsman should be good at powerful hitting for boundaries. Finally, it is proposed a specific resistance training and physical strength play a mediating role in hitting powerful shots and fulfill the requirement of modern cricket.

Future Work

The power-hitting in cricket would be considered an essential factor in extending the run rate batting team. Few parts of this study have been discussed in the "International Conference on Hospitality, Leisure, Sport, and Tourism, in 2015".The batsman should be selected on the bases of their stronger body segments, additionally at an early age. The coaches and trainers target to the event of upper and lower limb strength by using specific training.

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