REVIEW OF RESEARCH

ISSN: 2249-894X
IMPACT FACTOR : 3.8014(UIF)
VOLUME - 6 | ISSUE - 4 | JANUARY – 2017

# BIOMECHANICAL ANALYSIS OF BLOWING IN CRICKET

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## ABSTRACT

*The principle point of this examination was to assessing the different relationships of the recognized biomechanical variables towards the execution of bowling and assessing the commitment of distinguished biomechanical variables and development of predictive model. Five interuniversity level leg-turn bowlers were enlisted from LNIPE, India, and their bowling activities were caught by three video cameras, in a field setting. " value of= 0.05 was utilized for all tests as the rule to decide the nearness or nonattendance of importance. Pearson s item minute connection coefficient r was utilized for assessing the different relationships of the chose variables towards the execution of turn bowling. Significant relationship was found between the Angle of Release (r = 0.965, P < 0.05), Average Velocity (r = 0.541, P < 0.05), Elbow joint Right (r = - 0.392, P < 0.05), Hip Joint left (r = 0.402, P < 0.05), and Shoulder joint left (r = - 0.383, P < 0.05).Multiple Linear Regression was utilized for assessing the commitment of distinguished biomechanical variables and development of predictive model. The regression condition was reliable as the value of R2 was 0.945. The two variables chose in that regression condition clarifies 94.5% of the aggregate changeability in horizontal deviation of ball was great. Since F-value for that regression model was very significant, the model was reliable. This examination gives additionally comprehension of the biomechanical variables are related with talented execution in cricket leg-turn bowling, which coaches ought to consider when preparing less-gifted performers.*

**KEYWORDS:** *kinematics, cricket, ball deviation.*

## 1. INTRODUCTION

Today, in the cutting edge focused cricket time, each cricket player is in a race to exceed expectations others, what's more, cricket competitions have turned out to be principal method of human expression as they are one of the imperative capacities by which National and International acknowledgment and esteem is picked up. From its extremely straightforward from cricket has risen into profoundly sorted out movement of Indian

society and it has turned into a mind boggling social and cultural marvel. Cricket has saturated the vast majority of our social foundations including instruction, financial matters, craftsmanship, legislative issues, law, mass communication and international diplomacy [1].

In an example of nine male quick medium bowlers revealed a high connection between's ball discharge speed and the length of the bowling arm. Anthropometric dimensions and morphological attributes assume a critical part in deciding the achievement of a sportspersons The significance of passing, length arm has been expressed by Irwin (1971) as competitors and players who have longer arm may do well to utilize the better grasp since it gives better control over the ability. Chest bigness and composition and body composition were significantly identified with ball discharge speed at different circumstances amid the spell. Quick bowling is key to all types of cricket. Chest size and composition and body composition were significantly identified with ball discharge speed at different circumstances amid the spell.

Body estimate affected bowling execution in a heterogeneous populace of various ages. The quick bowling activity can be named side-on, front-on, semi-front-on or blended contingent upon the introduction of the shoulder± hip tomahawks and back foot arrangement amid conveyance. Bowlers who utilize the side-on and front-on methods are not at as much danger of injury as the individuals who utilize the blended method. The semi-front-on activity is another procedure that is in light of indistinguishable standards from the two `safe activities', where the arrangement of the shoulders what's more, hips is a similar way. A blend of these elements has been connected to an expanded rate of radiological highlights in the thoracolumbar spine, including spondylolysis, between vertebral circle degeneration and spondylolisthesis

Spondylolisthesis was accounted for in50% of A-grade quick bowlers over a time of 5 years and has been found to speak to 45% of hard abnormalities announced by retired, tip top quick bowlers.

## 2. REVIEW OF LITERATURE

***Sankar, C.K. (2011***) directed an examination entitled as "The Relationship amongst Anthropometric and Kinematic Variables and Ball Release Speed in Men's Slow-Medium Bowling". Twelve male slow-medium bowlers (age=21.33 ± 1.87years), speaking to different cricket clubs, playing at the divisional level of Coimbatore city willfully participated in the investigation.

The relationship between chose anthropometric variables and ball release speed and kinematic variable and ball release speed was recognized utilizing Pearson's item minute correlation coefficients. The kinematic variable of conveyance walk length (112.1 ± 10.4cms, $r=0.611$, $P<0.05$, $r^2=0.373$) was firmly identified with ball release speed (87.33kph ± 4.53kph). This solid positive correlation recommends that bowlers with long conveyance walk lengths can accomplish more prominent ball release speed. Coefficient of assurance ($r^2=0.373$) shows 37.3% of the difference between conveyance walk length and ball release speed and the staying 63.6% of the fluctuation is because of different variables of bowling. High correlation was recognized between the leg length (93.59 ±\4.37cms, $r=0.578$, $P<0.05$, $r^2=0.334$) and ball release speed and aggregate tallness (175.9 ± 8.56cms, $r=0.582$, $P<0.05$, $r^2=0.338$) and ball release speed in this gathering of bowlers. A high correlation between leg length and stature and ball release speed proposes that tall bowlers with long legs can release the ball with higher speeds. The change between leg length and ball release speed and stature and ball release speed was 33.4% and 33.8% individually. From the above outcomes it can be theorized that anthropometric attributes of the bowler contribute significantly to the ball release speed. Upper appendage length has been found to have high correlation with ball release speed. These impacts of appendage length joined with bowling system clarify why world-class fast bowlers are tall [2].

***N.P. Stockill and R.M. Bartlett.(1992***) directed an examination "A Three Dimensional Cinematographically Analysis of The Techniques of International and English County Cricket Fast Bowlers ". Seventeen tip top fast and fast medium bowlers (delegated such by Abernethy, 1981) were shot amid the 1991 season at Test and Britannic Assurance County Matches and Preal Tanged Open Net Sessions. The ball release speeds (37.4±1.87m.s-1). The examination of Run up speed was observed to be decidedly corresponded (r=O.55, p<O.05) with ball release speed, however because of the constrained (8m3) alignment volume used, delivering strangely high approach speeds (6.81 m.s-J), these outcome must be treated with alert. Potentially because of these errors no relationship was found between keep running up speed and the point of the back foot, hips or shoulders at back foot contact. Significant relationships were found between the point of back foot and the hips at back foot (r=0.73, p<0.05) and front foot contacts (r=0.60, p<O.05), and furthermore between the edge of the back foot and the shoulders at back foot contact (r=0.51, p<0.05). These discoveries are predictable with past work which has recommended that the accomplishment of a side-on position, as estimated by bear point, is to a great extent dependent upon the edge of the back foot at back contact. From an instructing point of view this finding proposes suggestions as far as the significance set on amend situation of the back foot, and the ensuing decision of the connect kind of procedure (Side-On or Front-On) that is trained for individual bowlers.

***K D. Aginsky, L Lategan, R A Stretch (2004)*** directed "Shoulder injuries in commonplace male fast bowlers — inclining factors "To examine the relationship between bear adaptability and isokinetic quality as conceivable variables that may incline commonplace fast bowlers to bear injuries. Twenty-one players, 12 of whom had no history of shoulder injuries and 9 of whom had encountered a shoulder injury to the bowling arm, were surveyed for bear quality utilizing a Cybex Norm isokinetic dynamometer. Total and relative pinnacle torque measures were acquired at isokinetic speeds of 90°/s and 180°/s, with both concentric and erratic compressions performed. Shoulder adaptability was tried utilizing a Leighton Flexometer in both inside and outside shoulder revolution. The bowlers were named front-on (N = 7), side-on (N = 7) and semi-front-on (N = 7). Of these, 12 had not maintained a shoulder injury to their bowling arm, while the other 9 had managed an endless shoulder injury to their bowling arm. The outcomes uncovered that 5 of the 7 bowlers with a front-on strategy had endless shoulder injuries. Bowlers with the side on and semi front-on bowling procedures detailed 2 injuries each, with 1 of these injuries being an interminable shoulder injury. Irrefutably the concentric and flighty torque measure 90°.s-1 and 180°.s-1 for inside shoulder pivot was not distinctive between the injured and uninjured gatherings. Be that as it may, when the concentric inner pivot was weight-standardized, the injured subjects had a higher torque at 180°.s-1 (65.20 ±10.30 versus 45.91 ± 10.26; injured versus uninjured (;p = 0.009).The pinnacle torque values of shoulder outer revolution Showed no significant contrast between the injured and uninjured gatherings and inside gatherings between the speeds. The total torque proportions between the injured and uninjured subjects for outside and inside shoulder revolution demonstrated no significant.

***Elissa Phillips, Marc Portus, Keith Davids, Nick Brown and Ian Renshaw (2010)*** directed an investigation entiled as "How do our 'Quicks' Generate Pace? A Cross Sectional Analysis of the Cricket Australia Pace Pathway.Method and physical commitments to ball conveyance speed in fast bowling have been well known research subjects in sports science. Thirty, Australian nationally-contracted (NAT, n = 8, age 29.1 + 3.2 yrs), focus of excellence and emerging (EMG, n = 11, age 20.8 + 3.1 yrs) and junior pace squad (JNR, n = 11, age 17.4 + 0.6yrs), fast bowlers performed 30 trials of good, short and full length conveyances at match force. Bowling activity and coordination were estimated from three-dimensional full body development information caught utilizing a 22-camera VICON movement examination framework (Oxford Metrics Ltd., Oxford, UK)sampling at

250 Hz. The University of Western Australia group based model was utilized to ascertain three-dimensional joint kinematic measures.

## 3. RESEARCH OBJECTIVES

1. To Know Whether Bowlers with long conveyance walk lengths can accomplish more noteworthy ball release speed.
2. To know whether Upper limb length has been found to have high correlation with ball release speed.
3. The goal of this examination is to fundamentally assess the logical investigation identified with the biomechanics of bowling for better bowling execution in cricket.

## 4. RESEARCH METHODOLOGY

### *Participants*

Five male leg-spin bowlers were enrolled from the cricket foundation of Lakshmibai National Institute of Physical Education, India. These bowlers were interuniversity level players at this age bracket (mean ± s: age = 19.0 ± 1.0 years; mean body mass 72.0 ± 9.4 kg; mean tallness 177.6 ± 8.9 cm). To help coordination's, all bowlers were correct given. They had spoken to their best group in the University cricket tournament [3].

### Experimental Protocol

The participants were told to attempt a cricket related warm-up action of their decision. Every bowler was permitted a more than (six deliveries) of training deliveries to help familiarization with the test condition. An over at most extreme exertion was then knocked down some pins.

Every bowler knocked down some pins six deliveries and six honest to goodness barring no balls and exact deliveries were recorded for every participant for biomechanical investigation of leg-spin bowling. Trials were led in a randomized manner keeping in mind the end goal to limit the probability of weakness influencing one condition more than any of the others. What's more, participants were given the opportunity to take breaks on the off chance that they started to feel tired whenever. All deliveries were played with a standard match Kookaburra ball (mass of 0.156± 0.163 kg and perimeter of 0.224± 0.229 m) at stamped target territories on the pitch, at a decent length .5 – 14.5 m from the bowling wrinkle). An effective trial required the ball to arrive inside the stamped zones were chosen for investigation. The main things of clothing worn were preparing shoes and sports shorts to encourage the recognizable proof of anatomical landmarks. All subjects experienced a similar testing convention and were sans injury at the season of testing. Prior to the test, assent shapes were gathered. Subsequent to issuing directions to the subjects, their body statures and weights were recorded. White stickers (25 mm in measurement) were put regarding the matters bodies at sixteen anatomical joint focuses (right and left: toe of boot, lower leg, knee, hip, bear, elbow, wrist, and forefinger knuckle) to encourage the programmed video image digitization.

### Biomechanical Assessment

Biomechanical investigation of bowling was led by catching the outdoor bowling activity trials of every participant on video. Three video cameras (Nikon D-3100, Sony HDR-C-CX200 and Panasonic SDR-H101; 50 outlines/second), in a field setting was utilized in this examination. The camera was set-up on an inflexible tripod. Six authentic barring no balls and exact deliveries were recorded for every participant.

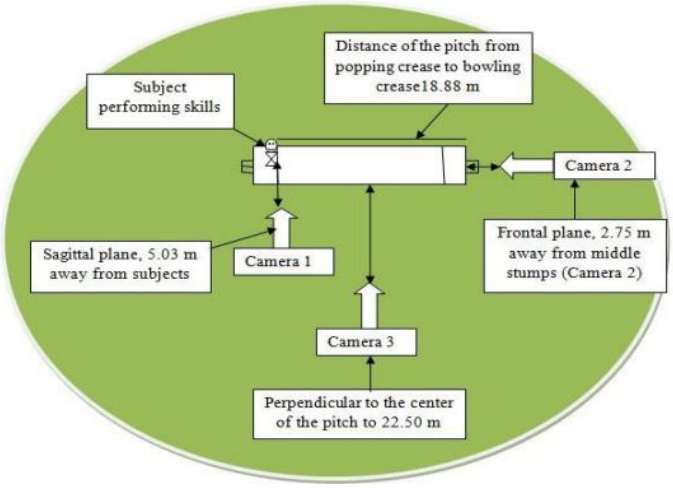


**Fig 1 Diagram of Camera Set-up for Collecting Data**

**Fig 2 Angle of the Joints at the time of Ball Release Moment**

## 5. DATA ANALYSIS

Before talking about the exploration issues the idea of the variable were dissected through Descriptive Statistics which have been displayed in Section ". Pearson s Product To comprehend the idea of the information different statistics, for example, Range, Minimum, Maximum, Mean, Standard Deviation, Skewness, Kurtosis, Standard Error of Skewness (SES) and Standard Error of Kurtosis (SEK) has been figured [4].

**Table 1: Descriptive Statistics of Biomechanical Variables**

| Variables | Range | Min. | Max. | Mean | S.D | Skewness | SES | Kurtosis | SEK |
|---|---|---|---|---|---|---|---|---|---|
| Height of Center of Gravity | 30.40 | 88.44 | 118.84 | 99.81 | 9.01 | .450 | .427 | -.968 | .833 |
| Angle of Release | 4.00 | 8.00 | 12.00 | 10.20 | 1.03 | -.024 | .427 | -.587 | .833 |
| Height of Release | 42.83 | 181.02 | 223.85 | 199.26 | 14.05 | .495 | .427 | -1.009 | .833 |
| Average Velocity | 3.53 | 12.33 | 15.86 | 13.96 | 1.04 | .740 | .427 | -.270 | .833 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ankle Joint right | 43.00 | 88.00 | 131.00 | 109.60 | 12.56 | .044 | .427 | -1.034 | .833 |
| Knee Joint right | 32.00 | 115.00 | 147.00 | 131.63 | 9.81 | -.255 | .427 | -1.338 | .833 |
| Hip Joint right | 30.00 | 138.00 | 168.00 | 156.83 | 6.04 | -.998 | .427 | 2.238 | .833 |
| Shoulder joint Right | 55.00 | 129.00 | 184.00 | 152.73 | 13.65 | .333 | .427 | -.127 | .833 |
| Elbow joint Right | 25.00 | 160.00 | 185.00 | 169.93 | 6.19 | .744 | .427 | .545 | .833 |
| Wrist Joint Right | 28.00 | 152.00 | 180.00 | 165.10 | 8.22 | .258 | .427 | -1.152 | .833 |
| Ankle Joint left | 30.00 | 108.00 | 138.00 | 123.03 | 8.27 | -.081 | .427 | -.834 | .833 |
| Knee Joint left | 53.00 | 134.00 | 187.00 | 162.40 | 13.31 | -.633 | .427 | .090 | .833 |
| Hip Joint left | 30.00 | 99.00 | 129.00 | 113.43 | 8.13 | .173 | .427 | -.797 | .833 |
| Shoulder joint left | 34.00 | 9.00 | 43.00 | 25.90 | 11.19 | -.177 | .427 | -1.355 | .833 |
| Elbow joint left | 56.00 | 49.00 | 105.00 | 84.27 | 18.88 | -.782 | .427 | -.667 | .833 |
| Wrist Joint left | 58.00 | 119.00 | 177.00 | 150.57 | 18.40 | -.109 | .427 | -1.457 | .833 |

For testing the typicality of the information (Table 1) skewness and kurtosis (elucidating statistics) has been performed. As a rule, a skewness value more than twice its standard error demonstrates a takeoff from symmetry. Since maximum of the variables aside from the Hip Joint Right skewness is lesser than twice its standard error, subsequently maximum of the variables were symmetrically circulated. Attributable to this guideline the Hip Joint Right was contrarily skewed as its value was more than twice its standard error. In this way, it can be deciphered that the execution of the subjects on Hip Joint Right was more on the upper side and higher than the mean value. Thus, as a rule, kurtosis values more than twice its standard error shows a significant kurtosis. Since maximum of the variables aside from the Hip Joint Right kurtosis is lesser than twice its standard error, henceforth maximum of the variables have typical kurtosis. Attributable to this standard the Hip Joint Right was leptokurtic as its value was positive. In this manner, it can be deciphered that the execution of the subjects on Hip Joint Right was delicately spread and thought around the mode [5].

## 6. CONCLUSION

In this examination, we intended to build up a biomechanical technique for assessing leg-spin bowling execution in cricket. This strategy effectively estimated all the basic biomechanical variables of a spinning ball. Considering the reason alongside destinations of the examination, in view of the investigation and inside the restrictions of present examination, conclusions inferred were: The chosen average values of various recognized variables had commitment at the season of spin bowling (at the season of release). Aftereffect of the minimum and maximum scores was given a limit of distinguished variable scores at the season of spin bowling. The biomechanical variables to be specific Angle of Release, Average Velocity, Elbow joint Right, Hip Joint left and Shoulder joint left was discovered significantly related with the horizontal deviation of ball in leg-spin bowling. Angle of Release and Hip joint right were legitimate in evaluating the horizontal deviation of ball of a leg-spin bowling. The different models created in the present investigation enables the experts for foreseeing the parallel deviation of the ball in leg-to spin bowling. This outcome can be utilized for some reasons: 1. to dispassionately dissect the execution of leg-spin bowling; 2. characterize model beforehand obscure to coaches and players.

## 7. REFERENCES

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