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**Raushan Kumar Scholar**  
Department of Physical  
Education, National Sports  
University, Imphal, Manipur,  
India

**Harish Kumar Tiwari**  
Assistant Professor, Department  
of Physical Education, National  
sports University, Imphal,  
Manipur, India

## A comparative study of kinematics of block start position in between Asafa Powell and sprinters of national sports university

**Raushan Kumar Scholar and Harish Kumar Tiwari**

### Abstract

This study investigated the set position of Asafa Powell (9.77 second) and sprinter of National Sports University, Manipur to determine the Set Position of both and enhance the performance of university level players by modifying the Set position according to an Olympic level player i.e., Asafa Powell.

This is a case study to determine the kinematics of start on starting block in between 100 m sprinter Asafa Powell and Sprinter of National Sports University, Manipur India. The start position of Sprinter was recorded by a high-resolution Camera and Picture of Asafa Powell was taken from a non-copyright website. Personal best timing of the sprinter is 11.95 Second, timing of Asafa Powell in respective race is 9.72 Seconds. a high-resolution digital camera (Nikon DSLR, India Asia, Pacific), sampling at 300 Hz with a pixel resolution of 6000 x 4000, were strategically placed along the track to capture data from the university level player, and Picture of both the players are analyzed with the help of 'kinovea' version 0.9.5 software, along with the Set-Position picture of Asafa Powell.

We found that the hip joint angle of Asafa Powell is greater than university player ( $79.1 < 93.5$ ) this may be due to the placing of starting block closer to starting line. In order to increase the angle of hip joint, the starting block needs to be placed slightly back. Elbow flexion angle is greater than of Asafa Powell ( $166.9 > 147.8$ ). The flex elbow helps athletes to lift up their body with greater force and also helps to lift quickly that may decrease the time taken by athletes during starts and leads for faster start. Right ankle joints having also very much difference ( $102.7 > 88.9$ ). In Performance analysis, it has been recommended that the lower the flexion angle of ankle helps athletes to bring their leg forward quickly, greater angle may laps 0.03-0.05 milli second extra time during takeoff from starting block. Right knee angle ( $118.3 < 136.7$ ) also needs to be more extended for leisure time during takeoff. Left legs ankle and knee angle are almost same there are only two to three degrees of difference. For improving Sprint Performance, the university sprinter needs to modify the set position as per recommendation.

**Keywords:** 100 m sprint, Kinematics, performance analysis, sprinting, national sports university

### Introduction

The 100 meters sprints are one of the oldest running competitions and are said to have evolved during the ancient Olympic Games. Often the most eye-catching events at the Olympics, the sprints involve a dash to the finish over distances of 100m. there has been anaerobic energy systems utilized during sprinting events and in sprinting ATP-Pc works during the race.

Asafa Powell is a one of the most renowned Jamaican sprinters and an Olympian who specializes in the 100-meter Sprints. He set the 100 meters world record twice, between June 2005 and May 2008 with times of 9.77 and 9.74 seconds. The Sprinter of National Sports University who is a university level sprinter and their personal best timing is 11.95 second.

Faculty of Sport, University of Ljubljana, Slovenia Milan Èoh, Bojan Jo.t and all 1998 found that there is significant role of start position on starting block in execution of the start during the race, and great role of kinematics for reaction time during takeoff.

In the present study the kinematic analysis of the university level player (11.95 second) is analyze with the Set position of Asafa Powell (9.77 second) to determine the Set Position of both and enhance the performance of university level players by modifying the Set position according to an Olympic level player i.e., Asafa Powell.

Joint angular kinematics is the simply the angle between the two segments on either side of the joint, usually measured in degrees. There is various way of analysis of sprint performance one

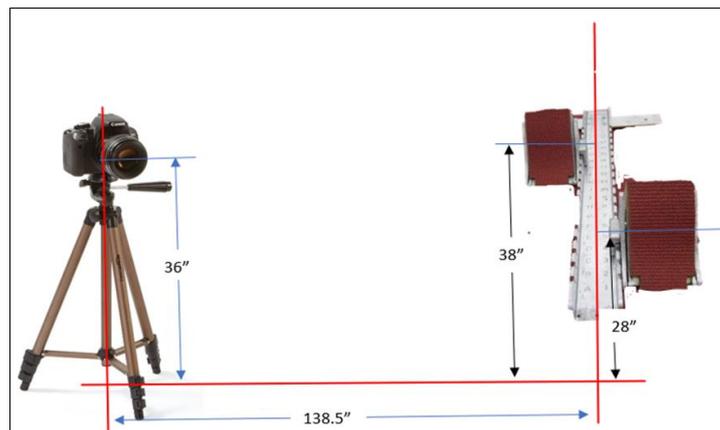
**Corresponding Author:**  
**Raushan Kumar Scholar**  
Department of Physical  
Education, National Sports  
University, Imphal, Manipur,  
India

of the most important ways is postural Kinematic analysis. Number of athletes in running event is increasing in national and international level of competition and India is an emerging Sports developing country, for the scientific approach in sports government of India set National Sports University in Manipur to enhance the sports performance nationwide with the help of scientific research.

There has been no systematic data of kinematic analysis so far in India is present and we are striving for perfection in sports that why we are comparing elite players performance and cause with our university level players to boost their performance with the postural modification in sprinting events.

### Materials and Methods

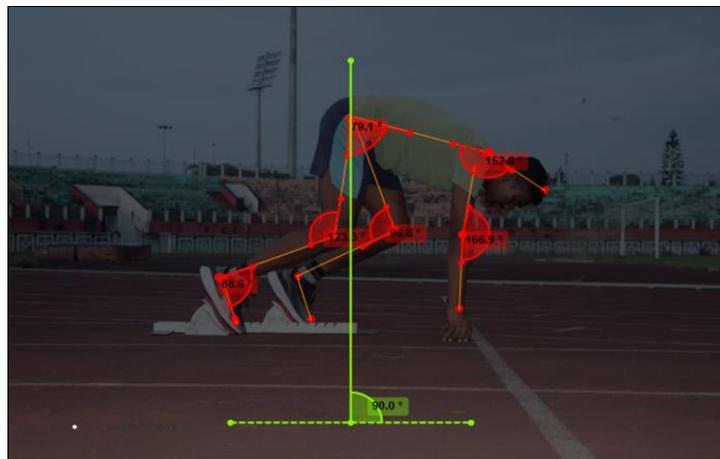
To satisfy my study university sprinter whose height and body type is almost same as Asafa Powell has been selected. To record kinematic data from the start position of university players, high-resolution digital camera (Nikon DSLR, India Asia, Pacific), sampling at 300Hz with a pixel resolution of 6000 x 4000, were strategically placed in the athletic track at Human Lampas sports complex to capture data from the university level sprinter, and picture of both the players are analyzed with the help of 'kinovea' version 0.9.5 software, along with the Set-Position picture of Asafa Powell. Picture of Asafa Powell was taken from a non-copyright website. A labeled diagram of camera installation is as follow



**Fig 1:** Camera Installation

### Analyze

An Image Analysis of Set Position is as Follow



**Fig 2:** Kinematic Analysis of University Player



**Fig 3:** Kinematic Analysis of ASAFA POWELL

## Findings on Analysis

From the Above Analysis and Comparison, we found the data as in Table 1

**Table 1:** Angle Measurement

Angle of University Sprinter (in Degree) Asafa Powell (in Degree)			
	Hip Joint	79.1	93.5
	Elbow	166.9	147.8
	Neck	152.6	147.7
Right Leg	Ankle joint	102.7	88.9
	Knee joint	118.3	136.7
Left Leg	Ankle joint	97.3	91.7
	Knee joint	98.6	100.2

**Table 2:** Height, Time, and Start Type

	Height of the Player (In cm)	Personal Best Timing (In Sec.)	Type of Start
University Sprinter	183	11.95	Elongated
Asafa Powell	183.5	9.72	Elongated

## Results and Discussion

From above reference tables we found that the height of university player is almost same as Olympic Level player i. e Asafa Powell. The set position in the blocks is very individual and depends mainly on the athlete's morphologic characteristics and motor abilities both the players are having same technique and start type during the race. But here we can see that there are lots of differences in angle of ankle, knee, hip, neck and shoulder joints. Hip joint angle of Asafa Powell is greater than university player (79.1<93.5) this is may be due to the placing of starting block closer to starting line. To increase the angle of hip joint, need to slight back placing of starting block. Elbow flexion angle is greater than from Asafa Powell (166.9>147.8). The flex elbow helps athletes to lift up their body with greater force and also helps to lift quickly that may decrease the time taken by athletes during starts and leads for faster start. Right ankle joints having also very much difference (102.7>88.9) In Performance analysis it has been recommended that the lower the flexion angle of ankle helps athletes to bring their leg forward quickly, greater angle may laps 0.03-0.05 milli second extra time during takeoff from starting block. Right knee angle (118.3<136.7) also needs to be more extension for leaser time during takeoff. Left legs ankle and knee angle are almost same there are only two to three degrees of difference.

## Conclusion

Conclusion were drawn from above analysis that the university sprinter's ankle, Right knee, Hip and Shoulder Joints angle needs major modification during Set position on starting block. At the time of block clearance, rear hip and front knee angles should not exceed 110° and 100°. It was clearly visible that the Sprinter of National Sports University had greater angle in Major Joints which is affecting the set position on starting block and it may cause of demerits with these angles. For the enhancement of sprint performance, he needs to modify the set position as per recommendation to achieve the performance up to that level.

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