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KINEMATICS OF THE BLOCK START OF INTER UNIVERSITY ATHLETES



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ABSTRACT

The purpose of this study was to determine the kinematics of the block start of inter university athletes. The subjects were 05 athletes from All India University Athletics Championship. The subjects were ranging from 18 – 24 years of age. Kinematic variables were angle of wrist joint, shoulder joint, hip joint, knee joint and ankle joint and other kinematic variables were height of center of gravity. Cinematography techniques were used in order to register and analyze the performance. The data for the other variables were obtained by using the standard procedures. Pearson's Product Moment Correlation (r) was calculated for assessing the relationship of performance and angle of the leaving block with the surface kinematic variables. Calculation of $r = -0.827$ which was significant at 0.05 level. Further the Correlation (r) of performance and the leaving block angle were computed for 20 mt, 40 mt, 60 mts and 80 mts. Which were -0.638, -0.584, -0.425, -0.793 and only the significance found at only at 80mts.

KEYWORDS: kinematics, wrist joint, shoulder joint, hip joint, knee joint, ankle joint

INTRODUCTION

In world of game and sports has crossed many milestones as result of different type of research and variety of scientific advancement in general and their application in the field of sports in particular. In the modern scientific age athletes are being trained by highly sophisticated means for better achievement in their concerned sport and they are being exposed to the exercise and training methods

which have proved beneficial for achieving higher standards.

Track and field athletics is the inevitable outgrowth of basic energies and urges in man. The modern track and field competition includes three categories of events namely, running events, jumping events and throwing events. To run, to jump and to throw are not merely natural activities of the large muscle and vital organs they are the primary means of development of individual. The running events are further classified into sprinters, middle distance and long distances. The sprints include races from 100meter to 400 meter including hurdles and relays, and the uses of starting block in all these races are obligatory.

In all sprint events "start" play an important roll. Winning in an event largely depends upon the type of start, taken by the athletes. For sprinters, the start means half the race. The winning margin of most sprint races rarely exceeds a few feet. So if a sprinter can gain even slight edge at the start, he has a great advantage over his opponents. Since a good start is important, it is required to be mastered by keeping in mind, that a good start is not only speed of the block but that will carry the sprinter to full sprinting stride in the fastest fashion.

Much experimental work has been done in past two decade in an attempt to determine the most effective starting position. Mostly this work has been concerned with the forces applied against the starting blocks at various foot springs. On the basis of distance between blocks- front block and rear block, the crouch start is classified in to three categories. These are bullet or bunch start, medium start and elongated start. From the work of Franklin Headly in U.S.A., it would seem that medium spacing of the feet, i.e. about 16 inches between blocks produce mechanical sound action. If the feet are too close together in what was once called a bullet start, the sprinter will clear the blocks quickly. But because the forces applied against the block operate for only a short time, the acceleration factor is less impressive. In case of elongated start feet are too far apart and the legs have an even longer time in which to work, but the movement is slower. One must, therefore, find for each individual an optimum spacing which will balance speed and work.

Richard (1964) conducted study on a cinematographically analysis of sprint running on varsity athletes from university o maryland. The purpose of the study was to examine the relationship of velocity of running to tree factors which may influence the velocity. These factors were a) the angle to which the leg is raised in front of body, b) the length of two strides and c) the angle that the legs makes with the ground at point of crouch down.

With a view to above study and the literature, an attempt has been made to understand the kinematics of the block start of the Inter University athletes.

Methodology:

The subjects were 05 athletes from All India University Athletics Championship. The subjects were ranging from 18 – 24 years of age. Kinematic variables were angle of wrist joint, shoulder joint, hip joint, knee joint and ankle joint and other kinematic variables were height of center of gravity. Cinematography techniques were used in order to register and analyze the performance. The subject were photographed in saggital plane for obtaining individual photographic sequence, the subject were photographed in a controlled condition. The distance of the camera from the subject was 7.18 meter and was fixed 1.30meter high. Stick figures utilizing joint point method in which subject is taking block start. The data for the other variables were obtained by using the standard procedures. Pearson's Product Moment Correlation (r) was calculated for assessing the relationship of performance and angle of the leaving block with the surface kinematic variables.

Result and Discussion:

The following results comes form the data.

Table 1
Location on of centers of gravity of body segments:

Segment	COG location expressed as percentage of total distance between reference points
Head	46.6% to vertex; 53.4% to chin-neck intersect.
Trunk	38.3% to suprasternal notch, 61.7% to hip axis.
Upper arm	51.9 % to shoulder axis; 48.1% to elbow axis.
Fore arm	38.1% to elbow axis, 61.9% to wrist axis.
Hand	81.6% to wrist axis, 18.4% to knuckle III.
Thigh	37.9% to hip axis; 62.1% to knee axis.
Calf	37.4% to knee axis; 62.6% to ankle axis.
Foot	44.0% to heel; 56.0 to tip of longest toe.

Pearson's Product Moment Correlation (r) was calculated for assessing the relationship of performance and angle of the leaving block with the surface kinematic variables. Calculation of r = -0.827 which was significant at 0.05 level. Further the Correlation (r) of performance and the leaving block angle were computed for 20 mt, 40 mt, 60 mts and 80 mts. Which were -0.638,-0.584,-0.425,-0.793 and only the significance found at only at 80mts.

Table 2
Correlation (r) of Performance and the leaving block angle

Acceleration Distance	Correlation r
20	-0.638
40	-0.584
60	-0.425
80	-0.793*

Table 3
Correlation (r) of Performance and the angle of wrist joint.

Acceleration Distance	Correlation r
20	0.63
40	0.54
60	0.45
80	0.38

Angles of various joint and performance computed for 20 mt, 40 mt, 60 mts and 80 mts; Shoulder joint 0.42,0.51,0.59,0.60., hip joint 0.41,0.53,0.55,0.621, knee joint 0.391,0.46,0.49,0.78* and ankle joint 0.48,0.50,0.58, 0.654 respectively. The negative sign of correlation is due to time score in acceleration performance.

Finding of the study enlighten the facts that the angular kinematic characteristics specially the joint angle modification that took place during the start for university level of athletes were quite less than required when compare to model and this is might be the result of the variation in training experience as well as application of force through a smaller distance. The COG's angle with horizontal during the final position was 420 which is much higher than the required to get the greater horizontal component of force at the time of start.

CONCLUSION:

The university athletes block start and their performances are quite below than the standards. The variables of the kinematics in the block start of the university level athletes need to be modifying for the better performance.

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