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Kinematical Analysis of First Step Length at Varied Angles of Block in Athletics

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Abstract

The purpose of the study was to compare the varied angles of block in relation to first step length in sprint start. Eight male (national / inter university level) sprinters were selected from Sub Centre Sports Authority of India, Lucknow and Banaras Hindu University Varanasi who's age ranged between 17 to 30 years. The data were analyzed using, analysis of variance (ANOVA) test was applied. Insignificant difference was found at varied angles of block in athletics in relation to First step length,

Keyword: Biomechanics, Linear kinematics, Block Angle ,45/45,45/60,60/75,75/90

45/45=front block angle 45, Rear block angle 45.
45/60 =front block angle 45, Rear block angle 60.
60/75= Front Block angle 60, Rear Block angle75.
75/90= Front Block angle 75, Rear Block angle 90.

INTRODUCTION

Performance in the 100 m sprint is influenced by a multitude of factors including starting strategy, stride length, stride frequency, physiological demands, biomechanics, neural influences, muscle composition, anthropometrics, and track and environmental conditions. The sprint start, the accelerative phase of the race, depends greatly on muscular power. Three considerations of the sprint start are reaction time (time to initiate response to the sound of the starting gun), movement time (onset of response until end of movement) and response time. Maximal velocity running is a result of stride length and stride frequency. While stride length can be greatly limited by an individual's size and joint flexibility, stride frequency can be affected by muscle composition, neuromuscular development, and training. Although 100 m sprint world record times have progressed drastically, there is limited evidence for how technology has contributed to such improvement. As such, human physiology and physique combine to be the most influential determinants of improved sprint performance**.(Aditi S. Majumdar and Robert A. Robergs) (2006)**

METHODOLOGY

Eight male (National / Inter university level) sprinters were selected from Sub Centre Sports Authority of India, Lucknow and Banaras Hindu University Varanasi who's age ranged between 17 to 30 years. . According to availability of two Casio EX-F1 high speed cameras were used, which have frequency from 60 to300 frames per second (f/s).The data were recorded from sagittal plane and frontal plane. The data was analyzed by Silicon coach-pro7 motion analysis software.

Table- 1: Descriptive Statistics at Varied Angles of Block in Athletics in Relation to First Step Length

Angle	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
45/45	1.4063	.27055	.09565	1.1801	1.6324	1.08	1.86
45/60	1.4638	.18150	.06417	1.3120	1.6155	1.28	1.72
60/75	1.3113	.16287	.05758	1.1751	1.4474	1.05	1.59
75/90	1.4600	.25939	.09171	1.2431	1.6769	1.11	1.88
Total	1.4103	.22150	.03916	1.3305	1.4902	1.05	1.88

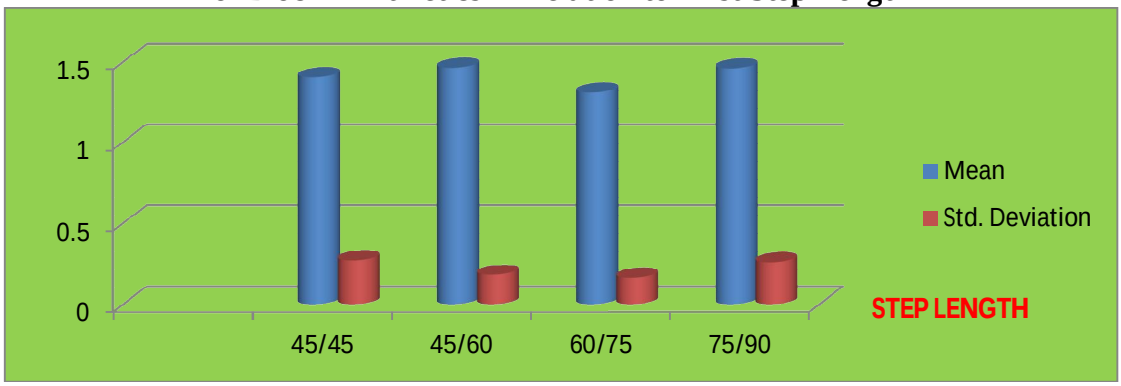
Table-2: Analysis of Variance of Mean at varied Angles of Block in Athletics in Relation to First Step Length

Source of Variable	Sum of Squares	Degree of Freedom	Mean Square	F
Between Groups	.121	3	.040	.808
Within Groups	1.400	28	.050	

* Significant at 0.05 level, Tabulated F-value required to be significant at (3, 28) = 2.95

Table- 2 revealed that insignificant difference was found at varied angles of block in athletics in relation to First step length, as obtained F-ratio was (.808), which was less than the tabulated value of (2.95), at 0.05 level with (3, 28) degree of freedom.

Graph-1: Graphical Representation of Comparison of Means of Sprinters at Varied Angles of Block in Athletics in Relation to First Step Length



First step length was found greater at 45 to 60 degree of block at varied angles of block in athletics.

DISCUSSION AND FINDINGS

Insignificant difference was found with first step length at varied angles of block in athletics. First step length was found (1.463 meter) greater at 45/60 degree of block and second best step length was found (1.46 meter) at 75/90 degree of block In athletics.

first step length was found optimal on 45/60 and 75/90 degree of block angle due to equal distributed there body weight medium block spacing were used by all the athlete so that at 75/90 degree block oblique is high so the at the time of drive the front knee forward for maintaining the COM so that the length of first step was found also well on 75/90 degree of block.

45/60 radian oblique angle on the block allowed the athletes to apply their foot force perpendicularly against the block for a longer time period. An increase in the runners' explosive impulse coming out of the blocks produced longer block clearance times, and slightly higher maximal velocities during the accelerative phase (steps 2, 3, and 4). Although the angled block did not produce greater velocities during the first step, it did facilitate an effective transition to form running with slightly higher velocities which were non-significantly different in the latter steps measured. According to research conducted by **Stevenson (1997),** a longer stride resulted in a higher linear velocity at take-off, but hindered block clearance time. The present study found that the angled starting block produced slightly longer step lengths which resulted in higher linear velocities but slower block clearance times. Overall, 45/60 degree block angle was found better step length in comparison of other block angle. Although, these slight differences may appear to be insignificant, they may be beneficial for coaches and athletes, in sprinting events where the margin of winning or losing is measured in milliseconds.

Although this suggests a longer first step length will lead to enhanced sprint performance, a number of confounding variables, including stance type, anthropometrical variable training factor block spacing, and center of mass, may have contributed to the data variability.

Rather than a longer or shorter first step being most beneficial, an optimal first step length is key for enhanced performance, which is individualized.

References

Aron J. Murphy, Robert G. Lockie and Aaron J. Coutts (2003). Kinematic determinants of early acceleration infield sport athletes. Journal of Sports Science and Medicine (2003) 2, 144-150

Babic, V., Harasin, D., & Dizdar, D. (2007). Relations of the variables of power and morphological characteristics to the kinematic indicators of maximal speed running. Journal of Kinesiology. 39, 28-39.

Coh, M. and Tomazin, K. (2006). Kinematic analysis of the sprint start and acceleration from the blocks. New Studies in Athletics, 21 (3), 23-33.

Corey Babcock, Philipp Roye, & Duncan Secor "First Step Length and 20-Meter Sprint Time in Male Collegiate Track & Field Sprinters" .College of Saint Benedict/Saint John's University Department of Exercise Science & Sport Studies.

Harland, M.J. and Steele, J.R., Biomechanics of the Sprint Start, Sports Medicine, 1997, 23(1), 11-20.

Hay, J.G. (1993). The Biomechanics of Sports Techniques (Fourth Edition). Prentice- Hall, Inc, Englewood Cliffs.

Henry, F.M., Force-Time Characteristics of the Sprint Start, Research Quarterly, 1952, 23(3), 301-317.

Mackala, K. (2007). Optimisation of performance through kinematic analysis of the different phases of the 100 metres. New Studies in Athletics. 22 (2), 7-16.

Mann, R. and Herman, J. (1985) Kinematic analysis of Olympic sprint performance: men's 200 meters. International Journal of Sport Biomechanics 1,151-162.

McGinnis, Peter M. (2005). Biomechanics of Sports and Exercise (Second Edition).State University Of New York: College at Cortland

Mero, A., Kuitunen, S., Harland, M., Kyrolainen, H. and Komi, P.V., Effects of Muscle-Tendon Length and Joint Moment and Power During Sprint Starts, Journal of Sports Sciences, 2006, 24(20), 165-174.

Neil Edward Bezodis"Biomechanical Investigations of Sprint Start Technique and Performance ***"University*** of Bath (2009).

S. J.Shabu (2011) Kinematic analysis of block placements and its effects on stride distance and stride time in sprint starts International Journal of Health, Physical Education and Computer Science in Sports, pp.37-40, 2231-3265.

Salo, A. and Bezodis, I., Which Starting Style is Faster in Sprint Running – Standing or Crouch Start?, Sports Biomechanics, 2004, 3(1), 43-54.

Schot, P. K. and Knutzen, K. M. (1992) A biomechanical analysis of four sprint start positions. Research Quarterly for Exercise and Sport 63, 137-147.

Songhua Van and Jichun Jin (2004) study on stride length, rate, and speed of 100m sprint running with five kinds of speed. ISBS 2004 / Ottawa, Canada.

Tellez, T. & Doolittle, D. (1984). Sprinting from start to finish. Track Technique. 88, 2802-2805.

Verma J.Prakash (2011) statistical methods for sports and physical Education. New Delhi: Tata McGraw Hill Education private Limited.

Wagner, G., The 100-Meter Dash: Theory and Experiment, The Physics Teacher, 1998, 36, 144 146.