Research Paper Physical Education

Performance Analysis in Long Jump

*T.Christopher Nallarasu **Dr.V.Mahadevan

* Director of Physical Education, Margregorios College, Chennai

** Director of Physical Education i/c, University of Madras, Chennai

ABSTRACT

The aim of the study was to performance analysis in long jump. To achieve this purpose, 60 male long jumpers who had participated in the inter-collegiate track and field meet during the year 2011-12 were selected randomly from affiliated colleges of University of Madras, Chennai. The best and lowest performance jump trails were considered as the test trails. The selected jumpers were tested with their approach run speed, length of the strides and long jump performance. The collected data were analyzed with simple correlation. The study was concluded that the performance of the long jump depended upon the approach run speed and length of the strides.

Keywords : Stride length, approach run speed, penultimate stride and jump Prformance.

Introduction

The Long Jump and Triple Jump are the two horizontal jumping events of track and field. They have in common 1) the primary goal of maximizing the horizontal distance jumped; 2) a sprint-like approach on a runway (often the same one) to a take-off marker; 3) an attempt to achieve a desired flight phase trajectory; and 4) similar training techniques used by the athletes (Ramey) Success in the long jump requires (a) a fast approach run; (b) an effective takeoff; and (c) a well-controlled landing. Despite its central importance to success in the event, the takeoff has been accorded little attention by sports biomechanists (Hay, 1992). The biomechanical analysis of long jump has been conducted with many different purposes. Ballreich and Brüggemann (1986), presented the principles of analysis and researched the best variables to explain the success of the athletes. Alexander (1990), identified the principles that govern optimum speed and leg angle for the take-off of long jumping and concluded that a faster run-up is desirable in long jumping to allow a great horizontal component of velocity at take-off. Bridgett and Linthorne (2006), analyzed an experienced male athlete using a single high speed camera and they concluded that the athletes should use a maximal run-up speed and place the take-off leg at about 61° to the horizontal with a minimum of knee flexion. Graham-Smith and Lees (2005), have performed a three-dimensional analysis of the touchdown to take-off phase in the long jump. They studied fourteen male high level long jumpers and found that performance in the long jump is dependent not only on speed but also on technique and strength. According to these authors, many three dimensional studies of long jump exist, but the only studies to have reported detailed data on the touch-down to takeoff phase were two-dimensional. This paper had an attempt to briefly summarize some performance analysis techniques that can be used to study the Long Jump. Based on the above points the researcher has designed to findout the relationship between the long jump performance and the selected variables.

Methods

The purpose of the present study was to find out the relationship between the long jump performance and the selected variables of 18 to 25 year old college men. 60 male long jumpers who had participated in the inter-collegiate track and field meet during the year 2011-12 were selected randomly from affiliated colleges of University of Madras, Chennai. To achieve the purpose of the study, long jumpers' best and a lowest jump performance trail were considered as a test trail. Simple correlation was used as statistical technique to find out the significant association among the selected variables and level of significance was fixed at 0.05. The jumpers best and lowest performance trails were tested in the following variables.

TABLE I
SELECTED PARAMETERS

Approach run distance	
Approach run speed in	First 5mts
	Middle 5mts
	Last 5mts
Length of the Strides in	First Three strides
	Last stride
	Penultimate Stride
Performance	Long Jump Performance

ANALYSIS

TABLE II
selected parameters test and Descriptive statistics

Variables	Test	Mean	SD	Minimum	Maximum
Height (in cms)	Stadio meter	169.4	6.34	158	186
Weight (in Kgs)	Weighing machine	63.47	5.21	54	80
Approach run distance (in mts)	Measuring tap	32.06	3.39	28	42

Table III
selected parameters test and Descriptive statistics

Variables	Tested in	Best performance		Lowest performance	
		Mean	SD	Mean	SD
Approach run speed (in sec)	First 5mts	1.49	0.25	1.49	0.23
	Second 5mts	1.34	0.19	1.39	0.25
	Last 5mts	1.41	0.21	1.43	0.21
Length of the stride (in mts)	First three strides	4.33	0.24	4.52	0.19
	Penultimate strides	2.15	0.16	1.90	0.20
	Last strides	2.19	0.17	2.25	0.21
Long jump performance (in mts)	Measuring tap	6.29	0.69	6.09	0.71

Table II
INTER CORRELATION MATRIX AMONG THE SELECTED VARIABLES AND LONG JUMP PERFORMANCE

Variables			Best performance	Lowest performance
Approach run distance		---	0.371*	0.352*
Speed	First 5mts	Lowest	---	-0.053
		Best	0.035	---
	Middle 5mts	Lowest	---	0.51*
		Best	-0.322*	---
	Last 5mts	Lowest	---	0.032
		Best	0.025	---
Length of the Stride	First 3 strides	Lowest	---	0.764*
		Best	0.634*	---
	Penultimate stride	Lowest	---	0.663*
		Best	0.700*	---
	Last stride	Lowest	---	0.082
		Best	0.093	---

*Significant r0.05 (58) = 0.250.

Results
Analysis of the data indicates that performance in long jump (best and lowest) was significantly correlated with the approach run distance. Middle 5mts speed significantly associated with the performance. At the same time first and last 5mts speed was not significantly correlated with the performance. First three stride and length of the penultimate stride was significantly correlated with performance. Besides, last stride length, first and last 5mts speed were some relation to the performance in long jump.

Discussion
Calculations showed that the performance of the long jump depended upon the approach run distance, penultimate stride and approach run middle 5mts speed. The results of the study may depend upon the following factors related to long jump performance: **Jones, (2012), stated that** "The 'Jump formula' for Powell might be summarized as follows: shortened second-to-last stride, vertical lead leg landing stiff landing of the takeoff leg with a large offset, incorporation of the pelvis in the locomotion due to powerful trunk, energetic swing. The lowest center of mass position is reached in the beginning of the last surface interaction. Considerable loss in the horizontal velocity is compensated by a large gain in the vertical component. "The 'Jump Formula' for Lewis: significant elongation of the second-to-last stride, early lowering the center of entering a very short last stride with zero vertical velocity, very short last stride and takeoff with fast inward hip motion. A world class jumper Powell (9.85mts jump in1991) and Lewis's (9.81mts jump in1991) length of last stride is less than the penultimate stride. In the same way the Beamon's (1968 jump) length of last stride is more than the penultimate stride. As for as our study is concern the performance of the long jump depend upon the first three strides and penultimate stride. At the same time length of last stride is more than the penultimate stride.

Conclusion
The present study was concluded that

1. Long jump performance was depends upon the middle 5mts speed
2. Strong association between the jump performance, first 3 strides length and length of the penultimate stride.
3. Best performance trail's length of the first three strides and last stride were less than the lowest performance trail.
4. Best performance trail's penultimate stride was more than the lowest performance trail.

REFERENCES

1. Ae M and Kubo Y. (1999), "A Biomechanical Approach to the Improvement and Optimization of Sports Techniques", Proceedings of The '99 Seoul International Sport Science Congress, pp.865-887. | 2. Ae M, Fujii N, and Takamatsu J. (1997), "A biomechanical method for the construction of a Standard Motion and the identification of essential motions my motion variability. Book of abstracts", XVIth Congress of the International Society of Biomechanics, Tokyo, Japan, p.27. | 3. Ae M., Shimizu S, Taya H, and Mizutani S (1995), "A System for the Identification of Technical Faults in Sports Techniques on the Basis of a Biomechanical Motion Data-Base", Proceedings FISU/CESU Conference The 18th Universiade 1995 Fukuoka, pp.108-111. | 4. Alexander, R.M. (1990), "Optimum Take-Off Techniques for High and Long Jumps", Philosophical Transactions of the Royal Society of London: Series B, Biological Sciences, 329(1252), pp.3-10. | 5. Ballreich, R. & Brüggemann, G.P. (1986), "Biomechanik des weitsprungs", In: Ballreich, R. & Kuhlow, A. (Eds.), Biomechanik der sportarten 1. Biomechanik der Leichtathletik (pp 28-47). Stuttgart: Enke. | 6. Bridgett, L.A. & Linthorne, N.P. (2006), "Changes in Long Jump Take-Off Technique with Increasing Run-Up Speed", Journal of Sports Science, 24(8), pp.889-97. | 7. Dapena, J. Hay's (2003), "Research on the Biomechanics of the Long jump", Symposium paper presented at 27th Annu. Meeting Am. Soc. Biomech., Toledo, OH. | 8. Graham-Smith, P. & Lees, A. (2005), "A Three-Dimensional Kinematics Analysis of the Long Jump Takeoff", Journal of Sports Science, 23(9), pp.891-903. | 9. Hay, J.G. (1986), "Biomechanics of the Long Jump", In K. Pandolf (Ed.), Exercise and Sport Sciences Reviews, (pp. 401-446). New York: Macmillan. | 10. Hay, J. G. (1988) Approach strategies in the long jump. International Journal of Sport Biomechanics, 4, 114-129. | 11. Jones, Mike, (March, 2012), "The Last Three To Five Strides In The Long Jump Approach", Information for Track & Field/Athletics Coaches the LJ Approach run, www. | 12. Nelson W(1985), "Application of Biomechanical Principles: Optimization of Sport Technique. In The Elite Athlete (editors Butts NK, GushikenTT, and Zarins B), Medical & Scientific Books, Spectrum Publications, INC., NY. pp.81-92. | 13. Nixdorf, E. and Brüggemann, G-P. (1990), "Biomechanical Analysis of the Long Jump -- an Approach towards a Biomechanical Profile of the World's Best Long Jumpers", New Studies in Athletics (Scientific Research Project at the Games of the XXIVth Olympiad -- Seoul 1988), pp.263-301. | 14. Nolan, Lee et al., (2006), "A Biomechanical Analysis of the Long-Jump Technique of Elite Female Amputee Athletes", Medicine & Science in Sports and Exercise, 38(10), pp.1829-1835. | 15. Ramey MR., "Biomechanics of the Long Jump and Triple Jump", Department of Civil Engineering and Department of Physical Education, University of California, Davis, California 95616, U.S.A.