THE EFFECT OF RUN-UP DISTANCE AND SOME KINEMATICS VARIABLES ON LONG JUMP DISTANCE FOR THE PRIMARY STAGE ATHLETE STUDENTS IN AL-TAFILAH DISTRICT

Hashem Kilani and Jehad Al-Rofu
Faculty of Physical Education, University of Jordan, Amman, Jordan

The purpose of this study were to investigate the best Run-up length contributing to Long Jump distance, and to investigate the relationship between the Run-up and the kinematics' variables for which a regression formula was established to predict jumping performance that can be used for athletes selections. (80) Long Jumping students were served as a subject in this study in which best 11 athletes ages range "13-15" had been assigned 3 trials in six Run-ups lengths and these were randomly ordered to each subject (10, 15, 20, 25, 30, 35, and 40 m). The kinematics' variables were calculated at the center of gravity of the body and they were take off angle (TOA), take off velocity(TOV), horizontal take off velocity(HTV), vertical take off velocity(VTV), take off height(TOH) and Run-up velocity (RUV). Results showed that (20) meters Run-up length was the best for the subject in the study and that the relationship between the horizontal take off velocity and the jump distance was strong and proportional. A provisional prediction formula was established and it was suggested to adopt shorter run-up length for the primary students in Jordan to achieve better kinematical relation.

KEY WORDS: run-up, kinematics, long jump, primary.

INTRODUCTION: In Jordan where most coaches and athletes are copying the technique of elite athletes without restrictions especially when dealing with novice and beginners. Many of those coaches and their athletes consider the maximum Run-up length (45 m) as it's written in the International rule when executing the long jump. In the long jump run-up where had an effect on the subsequent velocity, or the stride pattern, it was found that most of the adjustment in stride pattern occurred in the last two strides, and this may have been responsible for the observed reduction in velocity immediately prior to takeoff (Galloway & Connor, 1999, Aura, O. and Viitasalo, J.T. 1989, Kilani, 1998). In triple jump however, a linear relationship between the loss in the horizontal velocity and the gain in the vertical velocity during three support phases was found for individual athletes (Kilani, 1990,Al-Kilani,& Kilani 1993, Bing,1999). It is important to investigate whether the long Run-up chosen in this study is the best fit for the student's ages between 13-15 yrs when competing at the local level. Thus, the purpose of this study were to investigate the best Run-up length contributing to Long Jump distance, and to investigate the relationship between the Run-up length and the kinematics' variables for which a regression formula was established to predict jumping performance that can be used for athletes selections.

METHODS: Since great variations in the distance jumped would occur from a population of 80 students who have had participated in the preliminary evaluation, a three group were classified according to least variations in age, height and distance jump. The study samples consisted of the best (11) students from the high primary stage in Tafilah district in Jordan, and were chosen intentionally as a homogenous group from the population of (80) Long Jumping students. Then each subject assigned 3 trials during six Run-ups lengths and these were randomly ordered to each subject (10, 15, 20, 25, 30, 35, and 40 m) Table 1. The subjects then were filmed from the saggital plane during the execution of the last three strides of the Run-ups until the take off phase by using (50) frame/second Sony digital camera. The kinematics' variables were calculated at the center of gravity of the body and they were take off angle (TOA), take off velocity (TOV), horizontal take off velocity (HTV), vertical take off velocity (VTV), take off height (TOH) and Run-up velocity (RUV). The (RUV) were calculated based on the average horizontal displacement of the center of the gravity of the body during the last tow steps prior the take off over time. Data then were analyzed using SPSS software package, where means, standard deviations, skew ness, correlation, one

way ANOVA, followed by LSD post hoc test and multiple linear regression analysis were performed.

RESULTS: Table 1 showed that (20) meters Run-up was the best for the subjects in the study, and that the relationship between the horizontal take off velocity and the jump distance was strong and proportional.

Table 1 Mean, standard deviation, according to the Run-up distance.

Run-up (m)	Mean (m)	Standard Deviation
10	4.02	0.26
15	4.31	0.24
20	4.48	0.32
25	4.32	0.22
30	4.31	0.23
35	4.32	0.33
40	4.33	0.52

Table 2 One way ANOVA of Distance of the jump(according to the Run-up length).

Variable	Variation source	Sum of squares	D F	Mean squares	F- value	P value
jump distance	Run-up length	1.63	6	0.27	2.62	*0.023
	Error	7.26	70	0.10		
	total	8.89	76			

Table 2 illustrated the ANOVA between seven run-ups length for the 80 long jumpers and the distances performed were significant at p-value < 0.05, while an LSD post hoc test was administered to determine the most significant Run-up length that affect the jumping distance. (Table 3).

Table 3 LSD post hoc test for the jump distance.

Variable	Category	Mean difference	Significant for
jump distance	20 - 10	0.46	20
	20 - 30	0.29	
	40 - 20	0.15	

Table 4 Mean, standard deviation and Skew ness of some kinematics variables according to 20 m Run-up leng.

Variables	Unit	Mean	Standard deviation	Skew ness
TOA	Degree	16.27	7.04	0.85
TOV	m/s	6.64	1.10	0.52
TOH	m	0.83	0.06	0.94
HTV	m/s	7.39	0.97	0.93
VTO	m/s	6.38	0.47	0.28
VRV	m/s	1.86	0.19	0.13
Jump distance	m	4.48	0.32	0.22

Table 4 illustrate the kinematics variables for 11 subjects jumped using a 20m Run-up length and a Person correlation coefficient between those kinematics variables was applied (Table 5).In this table a significant correlation was found between the jump distance and the RUV & HTV respectively. This was supported by the linear regression showed in Table 6. Therefore, a regression formula can be used as follow:

DISTANCE JUMP = HTV X 0.712 + 0.284.

Table 5 Person correlation coefficient between the kinematics variables.

kinematics variables	TOA	TOV	TOH	RUV	HTV	VTV	Jump distance
TOA	1.0	**0.428**	**0.480**	**0.196**	***0.841**	0.113	0.116
TOV		1.0	0.534	0.293	****0.929**	****0.611**	0.293
TOH			1.0	0.114	0.185	0.016	0.104
RUV				1.0	0.261	0.112	****0.955**
HTV					1.0	**0.794	**0.802
VTV						1.0	0.218
Jump distance							1.0

Table 6 Regression analysis results of the kinematics variables contributing to jump distance.

Contributing variables	constant	coefficient	Contribution percent
HTV	0.284	0.712	91.7 %

CONCLUSION: An identification of the kinematical variables that had a significant effect in jumping distance was determined. Although there was a strong correlation between jump distance and running speed, the length of the run-ups are not always the key for the HTV. Many of the subjects in this study may accelerate or decelerate their stride patterns prior the last three strides of the take off to adjust their take off foot accuracy at the take off board. This lead to more variations during the running approach disregarding the length of the run-up length. Therefore HTV was used as a predictor for determining the distance jump rather the RUV. Due to short period of training experiences at this level, it also found that at this age the shorter the Run-up the better the jump. It was suggested therefore, to direct students at this level to choose a 20 m Run-up rather than to stick with the available long Run-up in the field as it was suggested in the International Athletic rules. This was evident when comparing different Run-up lengths.

REFERENCES:

Al-Kilani, M. & Kilani, H. (1993). Ptimization of triple jump performance: A simple model. DIRASAT, *U. OF J.*

Aura, O. & Viitasalo, J.T. (1989). Biomechanical characteristics of jumping. *International Journal of Sports Biomechanics*, 5, 89-98.

Bing Yu, (1999). Theoretical & applied sports biomechanics - Keynote lecture: Biomechanical Studies on Triple Jump Techniques: Theoretical Considerations & Applications. *Proceedings of XVII ISBS*, Perth Australia.

Galloway & Connor, (1999). The effect of steering on stride pattern & velocity in Long Jump. *Proceedings of XVII ISBS*, Perth Australia.

Kilani, H. (1998). A Kinematics analyses of high school championship long jumpers" *XVI International Symposium of Biomechanics in Sport ISBS*. July 20-23, Konstanz. Ger.

Kilani, H. (1990). A Periodic analysis of an elite female triple jumper". *Abhatha Al-Yarmouk* vol. 6, No.3, pp. 61-72.