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Effectiveness of the Correlation Between the Loss of Linear Momentum and Digital Level During the Approach Stage of the Players of the Long Jump Skill

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Abstract: The research aims at studying the impact of the loss of linear momentum during running up stage of the long jump skill at the horizontal distance achieved through the performance. The researcher used the descriptive curriculum with video and two-dimensional motion analysis on a sample consisted of three players who have the first position in the championship of the Egyptian universities 2009/ 2010; they were about 21years old, their length was 1.76 m and their weight was 74.33 kg.The researcher used video camera with card memory 25 per second in order to shoot them. The cameras have been put perpendicularly beside the player. He also used the program of two- dimensional motion analysis (Skillspector) to achieve the process of analysis and get the results. As the most important results showed that there is a correlation between the loss of linear momentum during the stage of running up and the achieved horizontal distance of long jump players.

Key words: Kinesiology % Long Jump % Loss of linear momentum % Digital level % Flying distance % Horizontal distance

INTRODUCTION

Long jump is a simple motor activity which is desirable and a common practice not only in the track and field events, but in many other sports. It passes consequent and connected technical stages affecting each other including approach, running up, flying and finally landing stage. As each of two of them associate with each other closely, there is relation between running up and approach stages and flying and landing stages. Also, the direction of the flying and landing mainly affects by the achieved performance during running up and approach stages [1]. From the mechanical point of view, the horizontal distance achieved in the long jump (digital level) affects by the speed of the approach, the angle of flying and the height of the center of body gravity during the approach according to the law of the projectiles [2].

Thus, the researcher thinks that there are mechanical variables during running up stage affect on the effectiveness of the approach such as the horizontal speed of the running up. Then the approach stage works as a main link and a mediator to maintain gained horizontal speed during running up and to get a strong and effective approach. Thus the player can approach as quickly as possible and at the ideal flying angle taking care to leave the feet leaning on the land and making the center of gravity at the top of his high. Finally the player can achieve the most suitable values for the three main variables that affect on the distance of horizontal flying. As a result; the player can achieve the ideal flying stage and finally land in the best position.

The researchers differ in studying the long jump. Some of them try to find affective variables in the jump distance and their relations together as in previous studies [3-5]. The others try to find the moral links and extract some of decline rates [6].Also,some of them tried to extract the most affective exercises [7, 8]. And some try to increase the level of achievement through the theoretical treatments of the affective performance variables [9]. According to the previous studies which dealt with the effect of approach variables of flight distance, they focus on the horizontal speed loss without taking in consider the mass of player's body [9]. Therefore, the researcher will try to identify the linear momentum of the player's body as a main element of player's speed.

Basing on the above mentioned about the importance of the approach as a link between the running and flying, the researcher will try to identify the loss of the horizontal linear momentum during this stage and its effect on their horizontal distance of flying, which has several factors including the player's weight,some technical aspects such

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as rising from the ground with unfolded leg, as well as body's load on the resting leg largely to start the next step and some physical aspects such as when the resting leg can't bear player's weight and can't compensate this at the end of this stage. In addition to turning a large part of the player's horizontal speed into vertical one and down and the differences of the player's achieved horizontal distances during the approach.

MATERIALS AND METHODS

The sample of the research included the above mentioned three players whose age average was 21years standard with deviation 1, the total length average of the sample was 1.76m with deviation 0.06 and players' weight average was 74.33 Kg with deviation 5.13. Each player did six attempts and the researcher choose the two best for each player according to the digital level of the player, so the total attempts of motor analysis can reach to six attempts. The researcher used a video camera with card memory 25 per second for shooting and put this camera perpendicularly beside the player. He also used the program of two- dimensional motion analysis (Skillspector) to achieve the process of analysis. He also aimed to extract the following variables: the time of performance stages, the speed of body gravity center and the momentum through the stages of performance, the lost momentum during the approach, horizontal flying distance as well as the long jump distance. After that the data has been processed statistically using the comparison between the attempts of the high and the low lost momentum in both distances of flying and the total horizontal distance of the long jump skill using the test of Man Whitney and Metry. As the researcher depended on that if there are significant differences statistically, this means that there is a correlation and vice versa.

Table 1 shows that the players' length ranged between 1.70:1.65, their weights ranged between 72:74 kg, entry speed of the approach for research sample ranged between8.28:7.82 m/s with momentum ranged between 609.76:5700.86 kg m/s, exist speed ranged between 7.80:8.21 kg with momentum ranged between 607.54:562.32 kg. If we calculate the lost speed considering players' weights, we will find that the lost linear momentum ranged between 31. 68:1.4kg m/s. As for flying distance, it ranged between 6.18: 5.86 as well as the total calculated horizontal distance ranged between 7.07:6.52 m. Generally, according to the correlation between those results as above mentioned, we conclude that there is correlation between the lost horizontal speed and the lost momentum. This difference is because of the different weight of the players in addition to the increase and decrease of horizontal and flying distance that measured for jump inversely and the lost linear momentum of the players.

Table 2 shows that the torsion and kurtosis coefficients of the variables ranged between ±3 and refers to the moderation of the research sample in these variables.

Table 1: Some of affective Biomechanical variables during approach stage of the long jump

The player	Attempts' number	Length m	weight Kg	Entry speed at approach m/s	The momentum for entry moment Kg m/s	Exit speed m/s	The momentum for exit moment Kg m/s	Loss momentum Kg m/s	Flying distance m	Horizontal distance m
First	First attempt	1.6	74	8.19	606.60	8.00	592.00	14.60	5.62	6.52
First	Second attempt	7	74	8.24	609.76	8.21	607.54	2.20	6.18	7.07
second	First attempt	1.6	72	8.10	583.20	8.04	578.88	4.32	6.12	7.05
second	Second attempt	5	72	8.28	594.0	7.81	562.32	31.68	5.86	6.81
Third	First attempt	1.7	73	8.21	599.33	8.00	584.00	19.00	5.94	6.62
Third	Second attempts	0	73	8.82	570.86	7.80	569.0	1.46	5.99	6.98

Table 2: Statistical description for variables (s=6)

Variables	Measurement unit	Average	Broker	Standard deviation	The highest value	The least value	Torsion coefficient	Coefficient of kurtosis
Length	m	1.67	1.67	0.02	1.70	1.65	0.00	-1.87
Weight	Kg	73.00	73.00	0.89	74.00	72.00	0.00	-1.88
Entry speed	m/s	8.14	8.20	0.17	8.28	7.82	-1.07	2.44
The momentum for entry moment	Kg	593.96	596.67	14.75	609.76	570.86	0.55	-0.53
Exit speed	m/s	7.98	8.00	0.15	8.21	7.80	-0.46	-0.36
Momentum for exit	Kg m/s	582.32	581.44	16.23	607.54	562.32	-0.16	-0.16
Loss of momentum	Kg m/s	12.21	9.46	11.91	31.68	1.46	-0.69	-0.22
Horizontal distance	m	6.84	96.00	0.23	7.08	6.52	-0.69	-1.85
Flying distance	m	5.95	5.97	0.20	6.18	5.62	-0.20	0.58

Table 3: Statistical differences significance between the attempts of a high and low loss of momentum and the flying distance of long jump skill

	High loss		Low loss							
Variable	m	a	m	a	Grade average	u	w	z	Significance average	Direction
Flying distance	5.81	0.71	6.10	0.10	2.000 5.000	0	6	1.98	0.48	The highest level

Table 4: Statistical differences significance between the attempts of a high and low loss of momentum and the total horizontal distance of long jump skill

	High loss		Low loss							
Variable	m	a	m	a	Grade average	u	w	z	Significance average	Direction
Horizontal distance	6.65	0.15	7.30	0.50	2.000 5.000	0	6.00	1.97	0.49	The highest level

RESULTS AND DISCUSSION

Table 3 shows that there are significant differences between the attempts of high and low loss of momentum and the flying distance for long jump skill in the direction of the attempts of low loss of momentum. As the value of significance level is less than the significance level by 0.05.Thus, there is a statistic significant correlation inverse between the loss of momentum and flying distance for long jump skill.

Table 4 shows that there are significant differences between the attempts of high and low loss of momentum and the achieved total horizontal distance for long jump skill in the direction of the attempts of low loss of momentum. As the value of significance level is less than, the significance level by 0.05.Thus, there is a statistic significant correlation inverse between the loss of momentum and the total horizontal distance for long jump skill.

Tables 1-4 show that there is a positive relation between the loss of linear momentum and the loss of horizontal distance during the entry and the exit of the running up. The values differ according to the weights as the player's speed contrasted with their weights during the entry, but the values didn't affect. So, we consider that the players who have high weights will record less speed, but the results pointed to the variation because the players' physical capacity and height differ. We also noted that the loss of linear momentum values of the players differ through their performance. On one hand; according to the statistic correlation, there is inverse correlation between the loss of linear momentum and both of the horizontal flying and the total horizontal distance of the jump. On the other hand, we find that the values of this relation for each players equal one.Finally, the researcher concluded that the player's weight is related positively with the loss horizontal speed and thus inversely with the flying distance and the measured horizontal distance. Thus the researcher see that we should take into account the weight with motion speed through trainings in order to achieve greater horizontal distance.

CONCLUSION

There is a statistic significant inverse correlation between the loss of momentum and the flying distance for the long jump skill. The more the lost momentum is, the less the flying distance for the long jump skill is.

Recommendation:

- Taking into account the linear momentum and its loss during training process.
- Focusing on the compensation for the lost weight by doing speed exercise and decreasing the loss of linear momentum.
- Taking into account the results of research through the development of training plans for the long jump.

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