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Factor study of some BioKinematic variables of the step of crossing barriers (3-6-9) in the 110m run barriers for young runners

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Abstract---*The aim of the research is to set a set of BioKinematic variables for the step of crossing barriers (3–6–9) in a 110-meter barrier for young runners. The researchers concluded the study by interpreting and discussing the results that the most important variables must be relied upon when training and selecting runners that got the best saturation on their factors: 1-The first factor which refers to the total distance of the plan to pass the third barrier + the total distance of the plan to pass the ninth barrier + the total distance Plan to cross the sixth barrier. 2-The second factor which refers to the total vertical speed before passing the third barrier + the total vertical speed before the sixth barrier + the total vertical speed before the ninth barrier. 3- The third factor which refers to the time for the total vertical distance before the third barrier + the time for the total vertical distance before the sixth barrier + the time for the total vertical distance before the ninth barrier. 4- The fourth factor which refers to the angular velocity in the first basement of the third barrier + the angular velocity in the first basement of the sixth barrier + the angular velocity in the first basement of the ninth barrier.*

Type of Paper--- *Review*

Key words: *Bio Kinematic variables, crossing barriers, young runners.*

Introduction:

Reaching the highest levels in athletics requires following the scientific principles in planning, training and all aspects of player preparation. The evaluation of technical performance through kinetic analysis is one of the most important factors helping to identify the minute details of the stages of performance through the values of BioKinematic variables which are describing the human body as a subject Mechanical movement which seeks to study the dynamic path Sports skills in order to improve athletic technical performance.

Barriers races are field races that depend to a large extent on motor technical performance related to muscular nervous compatibility and high physical efficiency, as the 110m hurdles are complex technical races that require superior skill in performance as well as a high level of fitness (Othman, 1990 , P. 260). From here the importance of research is demonstrated by trying to set the most important BioKinematic variables for the step of crossing barriers (3- 6 - 9) in the running of 110 m barriers. The research problem lies in trying to find out the reasons for the low digital level in running 110m barriers for young runners and trying to study some Biokinematic variables for several barriers of effectiveness in order to reach the best solutions. But the aim of the research is to set a set of Biokinematic variables for the step of crossing barriers (3-6-9) in 110m barriers for young runners.

Method and tools:

The two researchers used the descriptive method in the survey method because it is the most appropriate scientific method for the nature of the problem to be examined and the research sample was chosen intentionally for (5) hostile running 110 m barriers from the youth category and who have advanced positions in the sports season (2018 - 2019).

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Tools of the research:

- Tests and scales.
- Arab and foreign sources.
- The International Information Network (Internet).
- Scale to count the runners mass.
- Video camera number (4) type (Sony) with frequency (25) images / second.
- Video device (1 piece) type (National).
- Video tape (4pieces) type (National - VHS), and CDs (4pieces).
- A Pentium-4 computer.
- A motion analysis and results extraction program installed on a computer (TimeRver3.1).
- Pixel screen calculator.
- Stop watch (3pieces).
- Individual registration forms.
- Drawing Scale (1m) and phosphorescent marks on the joints of the runners.

Implementation of the research methodology:

The researchers conducted the main experiment on Wednesday 2/4/2019 in the stadium of the Ministry of Youth and Sports / Baghdad. After installing the cameras, the runners 'attempts were recorded from the moment the hostility was launched from the start up to the end of the run (110 m barriers by (4) cameras placed in areas Specified from the left for the runners, and (9 pm) to photograph the barriers selected in the research (3- 6- 9) ,video filming on video tapes and then transferred to a hard disk (CD). Then the (XING) program was used to cut pictures and store them in the disk Steel (CD). Adoboe Photo Shop 5.5 was used to obtain the X-y and X-axis data according to the point coordinates of the calculator screen, then the data is entered into the Excel program in order to convert the data into a centimeter system. Two attempts were made for each runner between (20) minutes of rest, and the best attempt time was taken.

The Biokinematic variables for the barrier crossing step were also defined, which included (the total distance of the barrier step, the horizontal distance of the barrier step, the total horizontal speed, the total vertical distance before the barrier, the time for the total vertical distances before the barrier, the total vertical distance before the barrier, and the vertical distance after the barrier ,the time for the total vertical distances after the septum, the angular velocity in the primary authority, the angular velocity in the second authority, and the peripheral velocity in the primary reference) of the barriers (3- 6- 9). The IBM SPSS Statistics Ver25 was used to calculate the following: mean, standard deviation and factor analysis of the basic components method of (Harold Hotelning)

The Results:

The researchers extracted a value of 0.123 KMO Test, which is greater than (0.50), which indicates the adequacy of the sample size (Thaer, 2015, p. 89). According to that, the law of factor analysis was used by the method of the basic components of Harold Hoteling, and the factors were deliberately recycled by the method (Alterimix to Kaiser). Four factors were found, as shown in tables (2 and 3), and the variables that saturate with significant values were adopted for each factor in light of the major saturations 0.5, it was also relied on (Guilford's criterion)
which indicates "acceptance of the factor that saturates at least three significant variables" (Hamdi, 1982, p. 21)

Table (1) the mean and Standard Deviations of Biokinematic Variables of the Step of Crossing Barriers (3-6-9) in running 110m Barriers

SD	mean	variables	No
0.026	4.496	The total distance of the step to pass the third barrier	1
0.018	4.244	The total distance of the step to cross the sixth barrier	2
0.230	4.054	The total distance of the step to cross the ninth barrier	3
0.089	2.984	The horizontal distance of the step crossing the third barrier	4

0.238	2.902	The horizontal distance of the step crossing the sixth barrier	5
0.008	2.858	The horizontal distance of the step to cross the ninth barrier	6
0.158	7.440	The total horizontal speed of the third barrier	7
0.192	6.862	The total horizontal speed of the sixth barrier	8
0.151	6.196	The total horizontal speed of the ninth barrier	9
0.158	0.230	The total vertical distance before the third barrier	10
0.001	0.315	The total vertical distance before the sixth barrier	11
0.002	0.273	The total vertical distance before the ninth barrier	12
0.008	0.361	Time for the total vertical distance before the third barrier	13
0.371	0.475	The time for the total vertical distance before the sixth barrier	14
0.001	0.394	Time for the total vertical distance before the ninth barrier	15
0.001	0.557	The total vertical speed before the third barrier	16
0.001	0.756	The total vertical speed before the sixth barrier	17
0.001	0.694	The total vertical speed before the ninth barrier	18

0.002	0.276	The total vertical distance after the third barrier	19
0.005	0.178	The total vertical distance after the sixth barrier	20
0.001	0.246	The total vertical distance after the ninth barrier	21
0.001	0.257	Time for the total vertical distance after the third barrier	22
0.001	0.256	Time for the total vertical distance after the sixth barrier	23
0.001	0.267	Time for the total vertical distance after the ninth barrier	24
0.006	1.064	The total vertical speed after the third barrier	25
0.002	0.678	The total vertical speed after the sixth barrier	26
0.003	0.905	The total vertical speed after the ninth barrier	27
0.549	458.604	The angular velocity in the initial reference to the third barrier	28
13.915	437.654	The angular velocity in the initial reference to the sixth barrier	29
0.612	374.319	The angular velocity in the initial reference to the ninth barrier	30
0.646	436.561	The angular velocity in the second basement of the third barrier	31
0.524	378.848	The angular velocity in the second basement of the sixth barrier	32
1.519	327.029	The angular velocity in the second reference to the ninth barrier	33
0.494	9.095	Peripheral velocity in the initial reference to the third barrier	34
0.222	8.329	Peripheral speed at the initial reference to the sixth barrier	35
0.142	8.509	Peripheral speed at the initial reference to the Ninth Barrier	36

Table (2) the factor matrix of the Biokinematic variables of the step of crossing barriers (3-6-9) in 110 m ran barriers before rotation

factors				variables	No
fourth	third	second	first		
.071-	.467	.008	.882	The total distance of the step to pass the third barrier	1
.211-	.401	.041	.890	The total distance of the step to cross the sixth barrier	2
.014	.399-	.083-	.872-	The total distance of the step to cross the ninth barrier	3
.297-	.645	.701-	.064	The horizontal distance of the step crossing the third barrier	4
.485-	.644-	.045	.590	The horizontal distance of the step crossing the sixth barrier	5
.761	.328	.132	.544	The horizontal distance of the step to cross the ninth barrier	6
.370-	.097	.329	.863-	The total horizontal speed of the third barrier	7
.084	.165-	.402	.897	The total horizontal speed of the sixth barrier	8
.064	.042-	.544-	.835	The total horizontal speed of the ninth barrier	9
.747-	.052	.426-	.508	The total vertical distance before the third barrier	10
.113-	.261-	.904	.319	The total vertical distance before the sixth barrier	11
.452-	.367-	.783	.219	The total vertical distance before the ninth barrier	12

.479	.575	.610-	.260-	Time for the total vertical distance before the third barrier	13
.452-	.367-	.783	.219	The time for the total vertical distance before the sixth barrier	14
.694	.354	.523-	.347-	Time for the total vertical distance before the ninth barrier	15
.029-	.224	.972	.071	The total vertical speed before the third barrier	16
.160	.689-	.390-	.589	The total vertical speed before the sixth barrier	17
.445-	.621	.612	.203-	The total vertical speed before the ninth barrier	18
.445-	.621	.612	.203-	The total vertical distance after the third barrier	19
.677	.625	.347	.175	The total vertical distance after the sixth barrier	20
.079-	.249-	.614-	.744	The total vertical distance after the ninth barrier	21
.014	.399-	.283-	.851-	Time for the total vertical distance after the third barrier	22

.377	.377	.318	.784	Time for the total vertical distance after the sixth barrier	23
.108-	.136	.332	.927	Time for the total vertical distance after the ninth barrier	24
.009-	.275	.960	.056-	The total vertical speed after the third barrier	25
.085	.272	.730-	.621	The total vertical speed after the sixth barrier	26
.469	.445-	.147-	.749-	The total vertical speed after the ninth barrier	27
.853	.471-	.225	.003	The angular velocity in the initial reference to the third barrier	28
.550-	.262	.758-	.233	The angular velocity in the initial reference to the sixth barrier	29
.492-	.355	.700-	.377-	The angular velocity in the initial reference to the ninth barrier	30
.300-	.388	.756	.433	The angular velocity in the second basement of the third barrier	31
.173-	.913-	.235	.287	The angular velocity in the second basement of the sixth barrier	32
.542	.129	.580	.594	The angular velocity in the second reference to the ninth barrier	33
.182-	.027	.900	.394-	Peripheral velocity in the initial reference to the third barrier	34
.183-	.503-	.604	.591-	Peripheral speed at the initial reference to the sixth barrier	35
.250	.641-	.324	.650	Peripheral speed at the initial reference to the Ninth Barrier	36
6.152	7.483	10.902	12.462	**)In-kind values (latent root**	
16.628	20.223	29.466	33.682	**%Importance of factors**	
100	83.372	63.148	33.682	**%Cumulative variance ratio**	

Table (3) the factor matrix of Biokinematic variables of the step of crossing barriers (3-6-9) in 110 m ran barriers after rotation

factors				variables	No
fourth	third	second	first		
.209-	.057	.143	.966	The total distance of the step to pass the third barrier	1
.290-	.076	.143	.943	The total distance of the step to cross the sixth barrier	2
.019	.106-	.002-	.994	The total distance of the step to cross the ninth barrier	3
.763-	.616-	.092	.171	The horizontal distance of the step crossing the third barrier	4
.184-	.793	.549	.189	The horizontal distance of the step crossing the sixth barrier	5
.590	.410-	.089	.690	The horizontal distance of the step to cross the ninth barrier	6
.194-	.138	.733-	.637-	The total horizontal speed of the third barrier	7
.296	.469	.265	.789	The total horizontal speed of the sixth barrier	8
.175-	.138-	.791	.570	The total horizontal speed of the ninth barrier	9
.833-	.227	.395	.315	The total vertical distance before the third barrier	10
.384	.791	.315-	.357	The total vertical distance before the sixth barrier	11
.310	.419-	.849-	.086	The total vertical distance before the ninth barrier	12

.049-	.996	.021	.072-	Time for the total vertical distance before the third barrier	13
.080	.944	.268-	.175	The time for the total vertical distance before the sixth barrier	14
.241	.943	.075	.216-	Time for the total vertical distance before the ninth barrier	15
.029-	.224	.972	.071	The total vertical speed before the third barrier	16
.181	.240	.948	.103	The total vertical speed before the sixth barrier	17
.302-	.156	.911	.231	The total vertical speed before the ninth barrier	18
.302-	.156	.911-	.231-	The total vertical distance after the third barrier	19
.521	.503-	.407-	.557	The total vertical distance after the sixth barrier	20
.259-	.004	.891	.372	The total vertical distance after the ninth barrier	21
.019	.106-	.002-	.942	Time for the total vertical distance after the third barrier	22

.333	.084-	.001	.939	Time for the total vertical distance after the sixth barrier	23
.008	.354	.131	.926	Time for the total vertical distance after the ninth barrier	24
.326	.364	.818-	.303	The total vertical speed after the third barrier	25
.339-	.489-	.638	.489	The total vertical speed after the sixth barrier	26
.474	.214-	.054	.852-	The total vertical speed after the ninth barrier	27
.966	.034-	.232	.113-	The angular velocity in the initial reference to the third barrier	28
.879	.247-	.391	.111	The angular velocity in the initial reference to the sixth barrier	29
.833	.429-	.018	.350-	The angular velocity in the initial reference to the ninth barrier	30
.048-	.436	.553-	.708	The angular velocity in the second basement of the third barrier	31
.249	.836	.471	.131-	The angular velocity in the second basement of the sixth barrier	32

.666	.087	.101-	.734	The angular velocity in the second reference to the ninth barrier	33
.236	.501	.823-	.124-	Peripheral velocity in the initial reference to the third barrier	34
.274	.615	.423-	.606-	Peripheral speed at the initial reference to the sixth barrier	35
.554	.576	.489	.349	Peripheral speed at the initial reference to the Ninth Barrier	36
7.039	8.158	9.714	11.089	**(In-kind values)latent root**	
19.553	22.660	26.985	30.803	**%Importance of factors**	
100	80.447	57.787	30.803	**%Cumulative variance ratio**	

Discussion:

By explaining the factors, we find that (the first factor) which was (the total distance of the step to cross the barriers) whereas the best saturations were for the variables (the total distance of the step to pass the third barrier 0.996, the total distance of the step to pass the ninth barrier 0.994.and the total distance of the step to pass the sixth barrier 0.943. The researchers believe that the result is logical, because there must be a large force and a high speed at the beginning of the run (high incremental acceleration) in the first distance from the run to pass the barriers, which leads to obtaining a big step and in a short time. In addition to that the return of the hostility to the regular speed to be able to achieve an appropriate step length and frequency, which depends mainly on the similarity of the rhythm in the distances of the steps between the barriers and this is consistent with what (Hussein,1976, 155) indicated by saying, "Because the basis for running barriers is to perform three steps with a weighted time between the barriers, as this is of great importance and impact."

Thus, the three best variables were filtered to obtain the highest saturation on the factor.

As for (the second factor), which was (the total vertical speed before crossing the barriers), and the researchers believe that the large total vertical distance before passing the barrier and the lack of time taken on it is a positive aspect of the hostility before the barrier, and this is consistent with (Khuraibet and Shalash, 1992, p. 150) who indicated thatThe greater the vertical velocity of the runner the more he will be able to have a suitable time to cross the barrier before the effect of gravity on flight. He also pointed out that the contestant works to shorten the step before the barrier to allow its center of gravity to move and rest on the front foot for the purpose of preparing for the body's tendency to pass the barrier."

Thus, the three best variables were filtered to obtain the highest saturation on the factor.

As for (the third factor) which was (the total time of the vertical distance before crossing the barrier), the time factor and the sense of time are very important in developing the speed of the runner during the passage of the barrier. The researchers believe that the large total vertical distance before passing the barrier and the short time spent on it is a positive aspect of hostility before the barrier, and this is consistent with (Resan, 1989, p. 63) who indicated that One of the most important foundations that govern the time the athlete takes in running contraindications is the way in which the center of gravity of the body rises to a minimum when passing the barrier.

Thus, the three best variables were filtered to obtain the highest saturation on the factor.

As for (the fourth factor), which was (the angular velocity in the initial reference before crossing the barriers), which is a logical result, as the researchers see that the importance of the force of the runner to cut the total distance from running to pass the barriers and the time of collision and leaving too little is what leads to the angular velocity being Better and bigger. This is consistent with (Zina, 2018, p. 71), citied in (Frank Abdul Karim Al-Fadli 2014) who stated that strengths are related to time from moments of fulcation. So, momentary power levels must be with the least time in order to contribute significantly to increasing acceleration after touching the ground after landing, and whenever the exertion of

force in a short time and at a high speed indicates the efficiency of the player. And his possession of neuromuscular reactions to produce the required movement spee

Thus, the three best variables were filtered to obtain the highest saturation on the factor.

The researchers concluded by interpreting and discussing the results that the most important variables that must be relied upon when training and selecting runners are the ones that got the best saturation on their factors, as follows:

(In relation to the first factor) ,the total distance of the plan for crossing the third barrier + the total distance of the plan to cross the ninth barrier + the total distance of the plan for passing the sixth barrier.

For (the second factor), it included the total vertical speed before the third barrier + the total vertical speed before the sixth barrier + the total vertical speed before the ninth barrier.

For (the third factor) ,the time for the total vertical distance before the third barrier + the time for the total vertical distance before the sixth barrier + the time for the total vertical distance before the ninth barrier.

For (the fourth factor), the angular velocity in the first basement of the third barrier + the angular velocity in the first basement of the sixth barrier + the angular velocity in the first basement of the ninth barrier.

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