An analytical Study of the Maximum Force Variable on the walkway of the (100, 1500 and 5000 m Sprinters For Applicants)

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Abstract

The Motion analysis is used to solve problems which related to the learning and training.in addition, It diagnoses movements, compares their parts, times and strengths, and compares between good and bad movement, as well as It helps to develop the movement and its performance. There are few studies in of motion analytical for study, The researcher design this study in a scientific procedure by using the scanner device (Gait Analysis) of the German company (Zebris)to read the data in a standardized manner during the test, the researcher selected the sample of the Iraqi champions in the competition of (100 m and 1500 m and 5000 m)Two for each contest in a deliberate way. for the heroes of Iraq and the number of them six, two for each contest. for the Time period from 11/9/2018 to 1/12/1018, in the laboratory of physical mechanics in the Faculty of Physical Education and Sports Sciences / University of Kufa. The search variable was chosen maximum force because it has a large role in the movement and transfer of athletic during the race, Concluded researcher to The maximum amount of force distributed on the footprint (front, center and heel) and according to the requirements of the race, and The higher the speed and force.

***Keywords**: Biomechanical indicators , print foot, analysis*

Introduction

Whether using theoretical or applied mathematical sciences or scientific methods and modern techniques, has developed the analysis of the movement of a large extent recently for several reasons, Modern techniques[1], which have helped to determine the variables of kinetics of athletes accurately, is a dynamic analysis of the important science, which relies primarily on the use of laws and foundations used in the science of biomechanics for the study of free This development was positively reflected in the level of determining the critical points in performance and in the various sporting events, especially those running short, medium and long distances, which are the activities of athletics[2], which rely heavily on the level of mechanical performance Jogging and physical abilities such as strength, speed, lengthening, endurance, explosive force [3]. The natural movements of the person and the athletics competitions is a "set of individual races that include at the same time racing relay The performance of the members of the team and this is a combination of individual and collective so as to give confidence to the contestant and the viewer alike[4, 5]. The Muscle strength is one of the necessary physical attributes of the various games and motor skills on which the achievement and its requirements depend. It means the ability or tension that the muscle group can produce against resistance at the maximum voluntary contraction [6, 7]. Motion analysis is used to solve problems which related to the learning and training.in addition, It diagnoses movements, compares their parts, times and strengths, and compares between good and bad movement, as well as It helps to develop the movement and its performance. There are few studies in of motion analytical for study . the variable of maximum force between the runners of the races (100 m, 1500 and 5000 m) in Iraq, for that The researcher design this study in a scientific procedure by using the scanner device (Gait Analysis) of the German company (Zebris)to read the data in a standardized manner during the test[9-11]. The present study aimed to identifying the variable values of the race (100 m, 1500 m and 5000 m) for the Iraqi champions at a speed of 10 km, 16 km and 22 km and Comparison of these variable values in each competitions for the heroes Iraqi at the speed of (10 km, 16 km and 22 km).

Material and Method

The researcher used descriptive analytical method to process data and information related to the nature of the problem. The method research causality is the research in which the researcher tries to determine the cause of differences in the behavior or condition of a group of individuals, which means that the observed groups vary among themselves in the attribution of some variables"[12, 13] . And the knowledge of similarities and differences requires access to information related to this phenomenon "The purpose of organizing this information and classification is to help the researcher to reach conclusions and generalizations that help us to develop the reality we are studying, the descriptive method which aims to reach conclusions that contribute to understanding this reality and develop"[14, 15]. The researcher selected the sample of the Iraqi champions in the competition of (100 m and 1500 m and 5000 m) Two for each contest in a deliberate way. for the heroes of Iraq and the number of them six, two for each contest. for the Time period from 11/9/2018 to 1/12/1018. in the laboratory of physical mechanics in the Faculty of Physical Education and Sports Sciences / University of Kufa. The search variable was chosen maximum force because it has a large role in the movement and transfer of athletic during the race, The test was held at the Bio Mechanical Laboratory on 11/9/2018 at 4:00 pm in the presence of the auxiliary team and the contestants 100m, 1500m and 5000m. The speed at which the test was conducted was determined to the maximum force the runner could play during running. the selected was a speed of 10 km / h on the device for race (5000 m) and the speed of 16 km / h for the race (1500) and the speed of 22 km / h for the distance of race (100 m). The choice of these speeds was in accordance with the times achieved by the contestants in the official competitions, By dividing the total distance on the time to extract the rate of speed (meters / second) and then be multiplied by (3.6) to convert to kilometers, because the speed on the device walking platform dealing with the kilometer, the device of gait analysis has a different speed starting from (1 km to 22 km) per hour, as well as that the device is able to extract more than fifty variables for both feet (left And right) so which the use of these variables in the identification of errors and the development of appropriate exercises to them, then the rise of contestants on the gait analysis device,(the platform walking and running) The device doing when the runner up to the speed required for each runner[16]. then The data is recorded by the cable contact with the platform to the calculator that includes the application of the platform (zebris FDM).Then the recording on device takes 10 seconds to obtain the data during the test.

Results

After extracting the data obtained by the researcher from the test in relation to the variable the maximum force of the contenders for distance (100 m, 1500 m and 5000 m) which related to the research and processing statistically by extracting the mean and standard deviation , then the researcher presented the results reached and Analyze and discuss them and then interpret indicators of achieve

Table 1: Shows the arithmetic mean and the standard deviation of the maximum (left and right) force variable of foot

Variable name	right / left		The speed 10 km\h		The speed 16 km\h		The speed 22 km\h	
			mean	SD	mean	SD	Mean	SD
Max force, N	forefoot	L	979.4	42.28	1104.8	10.60	1242.0	14.0
		R	993.1	67.88	1109.4	86.62	1157.9	12.86
	Midfoot	L	360	2.89	417.0	51.19	724.2	17.18
		R	343.	47.87	388.6	4.45	783.35	6.85
	Heel	L	303.7	43.1	462.4	124.0	380.10	4.38
		R	362.2	2.54	400.8	34.93	397.15	10.67

Table 1 shows the arithmetic mean and the standard deviation of the biomechanical variable , The maximum force of the feet (right - left) of the competitors (100 m, 1500 m and 5000 m) of the six runners for each contest two and used three speeds on the gait analysis 10 km for the contestants long competitions and the speed of 16 km for the competitions medium and the speed of 22 km for fast competitions, as the footprint of the contestants are measured for three areas of the foot is (fore foot - the mid foot - the heel foot) and the left and right.

The researcher found that attributed the reason for this difference to the nature of the competitions in terms of distance and the mechanical of jogging for the runners on the feet, additionally the nature of the competition imposing the runner to put the foot on the ground , As well as the amount of payment made by the runners so that the impulse force to the runners varies depending on the nature of the competition , as the amount of impulse depends mainly on the maximum force and contact time, the greater the amount of force (impulse force = force + time) , and therefore the runner spend force during it exerting and according to the nature of the distance. The difference in the strength of the runners is observed through the analysis of the right and left sides of the footprint and the Values of the force variable as well as forms of force curve schemas in each part of a second, as shown in **Figure 1** .

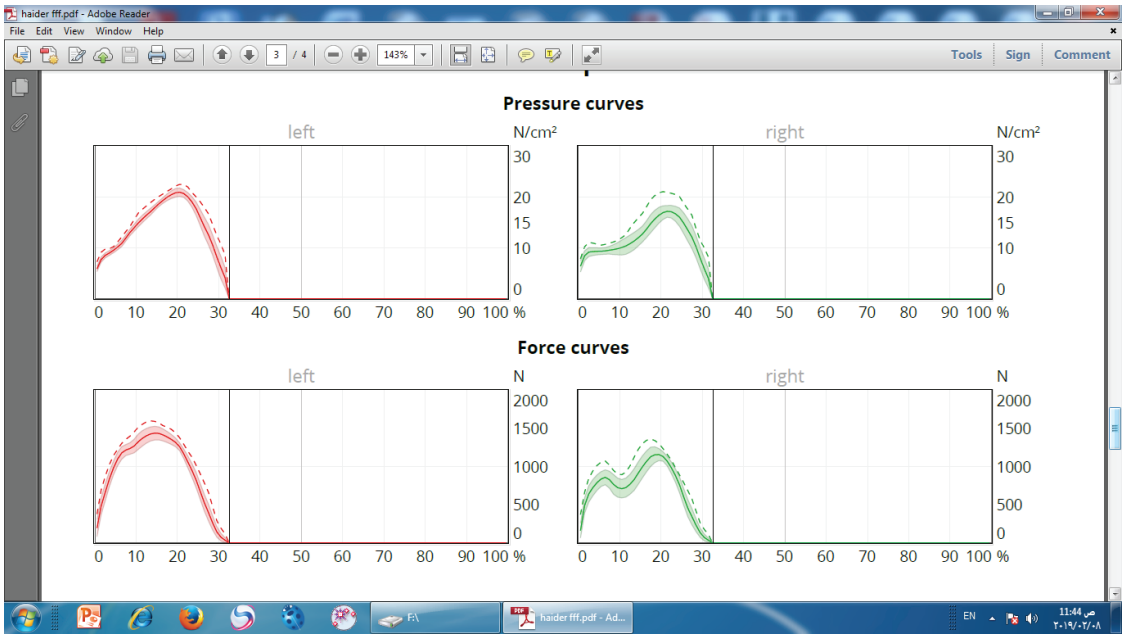

Figure 1: force curves

Table 1 shows that there is a difference between the maximum strength of the front foot and the left and right sides at the same speed for the contestants, whether run (10 km), (16 km) or (22 km). The researcher attributes the difference between the right And the foot left to the same rider is for the presence of a favorite man to the contestant or that the contestant uses a leg more than the other , during the jump or take off, which makes that leg has a greater force than the other it and shows that when running on the gait analysis device so that read the data for the footprint left or right where the difference them it ,as shown in **Figure 2** .

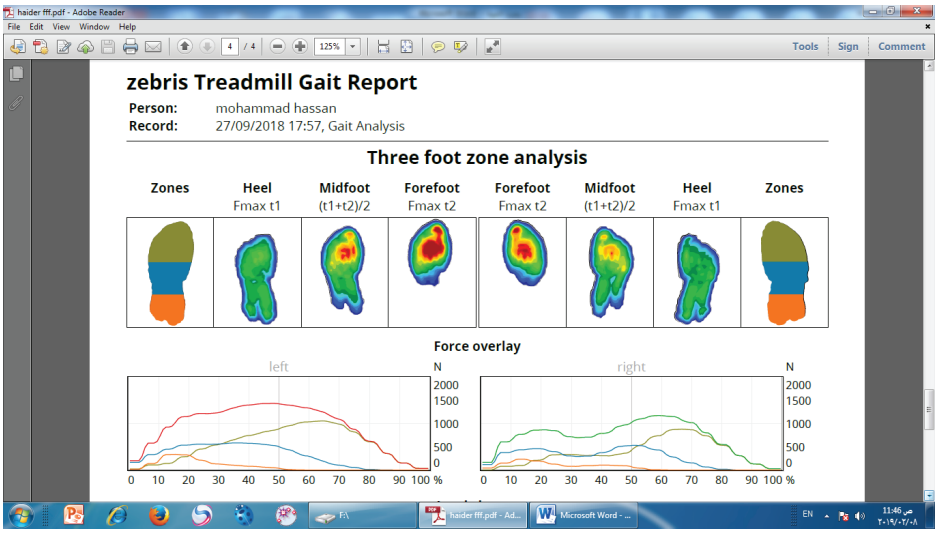

Figure 2: Three foot zone analysis

Looking back at Table 1 to analyze the values of the maximum force of the heel of the foot between the speeds of the contestants , as shown in Figure 3.

Figure 3: Separate footprints

Discussion

The spindle of the foot is the foot joint and therefore the farther of the point of impact of the force from the axis of rotation will increase the torque of the force 17, which explains that the sprinters short distance running dependent on the front of the foot any comb and thus will be the point of impact of the strength of the short distance runner at the farthest point of The front of the foot18, 19 , which helps to obtain the torque of a large force as well as generating large torque during the course of pushing the foot from the ground and get a likely background large resulting from the rotational momentum when the center of gravity of the body in front of the so-called focal of back 20, 21, and this weighted will help the work weighted Front with Good standing when the center of gravity of the body behind the focal point 22, 23, which is called the front of built upon .

As for the mid-distance sprinters, they will be after the point of influence of the force on the axis of rotation less than the fast-distance runners because they do not need a great torque to generate to swing the leg faster 24, 25, because for the length of the race distance also will lead to the fatigue of the contestant quickly26 ,

As well as for the long-distance runners will be after the point of the impact of power on the axis of rotation less than the runners of high-speed and medium because they do not need a great torque to generate a torque to swing the leg faster and for the length of the race distance

also will lead to the fatigue of the racer quickly 27, 28 , Almost runners a full footprint puts on the ground is required for the mechanical performance of jogging long distances .

Conclusion

The maximum amount of force exerted by short, medium and long distance runners varies because of the different race distance, and The maximum amount of force distributed on the footprint (front, center and heel) and according to the requirements of the race, and The higher the speed and force, the greater the pressure and the it will less space for the base of the footprint , and The maximum amount of force plays a big role in achieving the achievement for the short, medium and long distance runners and all according to its purpose.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the University of kufa, Iraq and all experiments were carried out in accordance with approved guidelines.

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