Effect of some Muscle Balance drills for legs on the Record Level in the 110 Race / Meter Hurdles

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Introduction and Research Problem

Ability and speed are two main characteristics that must be found in hurdles runners. In addition to the element of flexibility, especially in the pelvic joint, the ability to perform with both feet and neuromuscular compatibility, a good sense of steps and keeping balance after crossing the barrier, the ability to divide the effort over the race distance and finally, self-confidence, perseverance and ambition to win. (3:179)

Will Freeman (2015) A 110-meter hurdle rider must possess a set of attributes, whether physical or anthropometric, and in order to be able to control "performance" he must have these characteristics in it. The hurdle race is characterized by difficulty in performance as it is one of the sprint's precedents in which speed is important and necessary, as the race includes With a quick start to the first checkpoint, then the ability to quickly cross the checkpoint, then sprint between the checkpoints, then the sprint from the last checkpoint until reaching the finish line. (24:144)

And **Thomas Skowronek** (2013) adds that the barrier step must be applied in the least amount of loss of horizontal velocity, while moving smoothly to bypass the barrier and thus rapidly cross the center of gravity above the barrier, and there must be a correlation between the step before the barrier and the step of the barrier and the step after the barrier, And then you represent a step from the enemy's steps and you a little exaggerated. (22:1)

Suleiman Ali Hassan, Zaki Muhammad Darwish, Ahmed Mahmoud Al-Khadem. (1983) explain that the basic obligations of the step length must be available for step length, Where the required thrust is in the rear focal point in order to obtain the required range in flight required for the length of the step with the availability of the appropriate speed for the frequency of steps (4: 91)

Paul Collins (2010) also show the importance of muscle strength for obstacle runners, as it represents the essence of the performance of high-speed

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races under different movement conditions, and the exerted physical effort can bring about functional changes, which include neuromuscular adaptation to the working muscles and its correlation with the possibility of increasing the rate of speed during Race. (19: 9)

Nadia Sultan and Sakina Nasr (2005) assert that the development of the muscle strength component is necessary, especially for the integrated preparation in order to improve the competitor's level, through balanced development of all musclegroups(14:60)

Hani El-Deeb (2003) states that the decrease in the range of motion of the joint is the result of an imbalance in the muscular balance between the muscles surrounding the joint, and then the negative impact on the competitor's level of speed, strength and compatibility, and thus a decrease in the competitor's skillful performance. (15: 4,3)

Brain Sharkey (2011), and E. Paul Roiert, Mark E. Kovacs. (2011) agree that avoiding exposure to an imbalance between muscle and also delayed physical and skill level, attention and focus must be placed on the presence of muscle balance between all muscle groups, as well as between the muscles of the upper extremity and the muscles of the lower extremity as well as the sides of the body, as desired. A training unit should not be devoid of muscular
balance exercises, whether for the working muscles or the corresponding
muscles. (16: 178) (20: 69)

Muhammad Salama (2003) believes that the muscle balance tests determine the areas that must be taken into account and focus on during training, so the trainers should focus on those weak areas, and give a greater volume of training on the weak areas that cause the imbalance rate, during the special preparation period to improve the Muscular balance ratio while maintaining a balance of power during the competition period. (12: 310)

Atef Rashad (1999) indicated that the concept of the specific ratio between muscle groups working on the joint and corresponding, which confirms the difference between the muscle groups working on and opposite the joint, and scholars have determined that there is a difference of 10% in The strength of the working muscles and the corresponding muscles in favor of the working muscles on the knee joint which makes the athlete exposed to injury. (6: 5)

Abu Al-Ela Abdel Fattah (1997) indicates that high levels of speed

and strength as well as compatibility for the contestants do not appear, due to
the presence of an imbalance in the muscular balance on the joints, and thus a decrease in the range of motion of the joint in addition to the lack of levels of neuromuscular compatibility, whether between intra-muscle, or between muscles. This indicates an economic decline in effective performance. (1:247)

Muhammad Reda Al-Robi (2008) adds to the importance of weight training in improving muscle balance, as it is an effective way to develop muscle strength of all kinds. In weight training, it increases strength in muscles, as a result of being exposed to weights that are progressively difficult, and this leads to an adaptation of the working and corresponding muscles, Thus, muscle strength increases as a result of being subjected to greater and greater resistance. (11: 128)

The above shows the importance of muscle balance of 110 / meter hurdles riders and through theoretical readings and reference survey of some studies related to the subject of research and through the exploratory study carried out by the researcher on a number (2) of the record level distinctive in the race and registered in the Dakahlia athletics area shows the existence of differences In the level of strength between the muscles working on knee joint, The results of the survey revealed that there was a deviation between the average measurement of the maximum fixed strength of the biceps femoris and the quadriceps femoris muscle of the right leg, and the difference between the average measurement of the maximum fixed strength of the biceps femoris and the muscles of the quadriceps femoris of the left leg, and the existence of a deviation between the average measurement of maximum strength Fixation of quadriceps femoris muscles of the right leg and quadriceps femoris muscles of the left leg. At rates above the rate of 10%, which indicates an imbalance in muscular balance on the lower limb muscles This is confirmed by the study of **David Lipman (1998) (15).** Therefore, the researcher tries through this experimental study to use some muscle balance drills during the special preparation period for the race 110 / meter hurdles, and to know the effect of some muscle balance drills on the record level of the race 110 / meter hurdles.

-Research objectives

identify the impact of some Muscle Balance drills for

legs on the Record Level in the 110 Race/ Meter Hurdles from:

1- identify the impact of some Muscle Balance drills for quadriceps and biceps femoris Muscle of the right leg

2- identify the impact of some Muscle Balance drills for quadriceps and biceps femoris Muscle of the left leg

3- identify the impact of some Muscle Balance drills for legs on the Record Level in the 110 Race / Meter Hurdles

- Imposition of the research:

1- Muscle balance Drills positively affect Muscle strength of quadriceps and biceps femoris Muscle of the right leg

2- Muscle balance Drills positively affect Muscle strength of quadriceps and biceps femoris Muscle of the left leg

3- Muscle balance Drills positively affect record Level in the 110 Race / Meter Hurdles

Search Terms:

- Muscle balance: is the strength of a muscle or muscle group and their relative relationship to the strength of a muscle or other muscle group, or the corresponding end, and muscle balance reflects the relative limits of muscle strength. (16: 451)

- Muscular imbalance: is the increase or decrease in muscle strength of a muscle or muscle group around a joint from the muscle or the corresponding muscle group around the same joint or the other end of the body. (16: 451)

Related studies

1- Maha Kabbari Mahmoud Hassan (2003) (12):

Title: The Impact of a Proposed Training Program for Working Muscles at the Record Level of 100m Hurdles

Objective: To identify the impact of a proposed training program for muscles working at the record level of the 100m hurdles.

Method used: Experimental

Sample: 10 young women and registered in the Egyptian Federation of amateur athletics for the training season 2000-2001 Club Smouha.

Main results: - The use of the method of combining weight training and plyometric positively affects the physical qualities and the record level of the 100m hurdles for young women.

2- Study: Abdo Mohamed Ibrahim (2007) (9):

Title: Effect of Speed Training Program on Record Level for Beginners in 110m / Hurdles.

Objective: To design and know the impact of a proposed

training program for speed development on the record level for beginners in the 110m / hurdles

Method used: Experimental

Sample: (26) beginners of the second-year distinguished students in the Faculty of Physical Education - Mansoura University

Main Results: The proposed training program with its contents and the characteristics of its load formation has a positive and statistically significant effect on the development of speed types positively and has positively affected the progress of the record level for beginners.

3- Study: Osama Ismail Al-Shaer (2011) (2):

Title: Effect of Some Improved Kinematic Variables of the Hurdles Step on Skill Performance and Record Achievement of 110m / Hurdles.

OBJECTIVE: To improve some of the kinematic variables influencing the hurdles step.

Method used: Experimental

Sample: Riders under 20 years for 110m / hurdles at Smouha Club.

Main Results: - Training content led to improvement of biomechanical variables under study for the hurdles step

- Improved biomechanical variables of the hurdles step led to improved skill performance and hence improved time of 110 m / hurdles of the study sample

4 - **Study: the study of Khalid Wahid Ibrahim (2013) (18):**

Title: Effect of weight training in different proportions on the muscular balance of the driving arm and some kinematic variables of the disposal phase in the shot put competition.

OBJECTIVE: To investigate the effect of different weight training drills on the muscular balance of the driving arm and some kinematic variables of the disposal phase in the shot-put competition.

Method used: Experimental method

Sample: (6) of the contestants of shot put at Mansoura Sports Stadium under (20) years

Main results: The use of weight training in different proportions of flexor and extensor muscles to help the arm of the propulsion according to the strength of each muscle to improve muscle balance among them within the training programs for shot put racers at the level of the research sample.

Search procedures:

Method used: Experimental method using experimental group and pre-post measurement.

Area range: Olympic Village and track and field at Mansoura University.

Time domain: The surveys and all the research measurements were conducted

within the training program for the 110 / meter hurdles in the period from 8/7/2018 to 29/10/2018.

- The research sample: The research sample was chosen by deliberate method from the registered athletes in Dakahlia area under (20 years) and with the distinctive record level in the race 110 / meter hurdles and the research sample included (5) contestants.

Research measurements and tests:

• Basic measurements:

* Age for the nearest half year.
* Length to nearest cm.
* Weight to nearest kg.

• Physical measurements:

1- Maximum power measurements:

- Measure muscle strength of the material to the back.
- Measure the muscle strength of the material for the two legs.

2- Measuring the incremental speed:

- 30m sprint from low start.

3- Measuring the Maximum speed:

- 30 m sprint of flying start.

4- Measuring the muscle capacity of the two legs:

- Wide jump test of stability.
- Vertical jump test of stability for Sargent.

5- capacity measurement:

- Shot put in front of the body.
- Shot put from behind the body.

- Measurements and tests used: -

- Measuring the maximum holding strength (quadriceps muscle) of the right leg (kg)
- Measuring the maximum holding strength (quadriceps muscle) of the left leg (kg)
- Measuring the maximum extensor (biceps femoris) of the Right leg (kg).
- Measurement of maximal extensor strength (muscle of the femoral head) for the left leg (kg).

*** Search devices and tools:**

- Restameter for measuring height and weight
- Dynamometer for measuring strength
- Legal hurdles
- Stopwatch (، 01 of a second)
- Legal shot

- **Exploratory study:**

The researcher conducted several studies during the period from 8/7/2017 to 14/8/2017 in order to develop the training program for the 110 meters / hurdles race and to ensure the suitability of its content to the research sample and to ensure the validity of tools and devices used.

1- The first exploratory study:

This study was conducted in the period from 8/7/2017 to 13/8/2017 with the aim of selecting and determining the content of the training program of the research group and identifying

the suitability of the content of its training for the sample, as indicated by specialized scientific references and previous studies. It was demonstrated that his training was suitable for the research sample under study through the application of many of his training to some students outside the research sample, who numbered (2) students from the field and track competitions Advanced.

2- The second exploratory study:

This study was conducted on 14/8/2017 and aimed to ensure the validity of the devices and tools used in the research. This study was conducted on a sample of (2) students from the field and track competitions training outside the research sample has been shown to be valid.

- The training program is attached (3):

The content of the training program was determined and selected based on the analysis of scientific studies

The training programs for the 110 / meter hurdles indicated by specialized scientific references and associated studies the researcher has trained the research group using a training program for (10) 4 weeks of training per week with a time limit of 90 to 120 minutes during the special preparation period.

pre measurements: The pre measurements were conducted in the period from 16-17/ 8/2017, and then it was confirmed the moderation of the values of the research variables of the sample before starting the implementation of the experiment as shown in Table (1), (2) (3). Parity and homogeneity were done for the research sample.

Table (1)

Statistical characterization of study sample in basic variables

n = 5

Variables	measurement unit	Mean	median	Standard Deviation	Skewness coefficient
Age	year	19.100	19.000	.41833	-0.512
Height	Cm	183.90	183.80	.23452	1.744
Weight	Kg	74.620	74.800	.79498	-1.463
Training Age	year	4.2800	4.4000	.25884	-0.502

Table (1) show the basic variables for study sample are normally distributed. Confined between (-3, +3) Indicating the moderation of values of the study sample before the start of the experiment.

Table (٢)
Statistical characterization of study sample in physical variables n = 5

Variables	measurement unit	Mean	median	Standard Deviation	Skewness coefficient
30m sprint from low start.	sec	4.0758	4.0900	.04374	-1.901
30 m sprint of flying start.	sec	3.4460	3.4400	.01819	0.564
Muscle strength for back extensors	kg	175.16	175.10	1.6891	0.959
Muscle strength for legs extensors	kg	218.20	218.20	.73824	0.000
Wide jump from stability	cm	265.60	265.00	1.8166	0.567
High jump from stability	cm	50.120	50.100	.13038	0.541
shot put in front of body	m	11.252	11.320	.24067	-0.230
shot put in back of body	m	12.456	12.600	.24714	-0.513

Table (1) show the physical variables for study sample are normally distributed. Confined between (-3, +3) Indicating the moderation of values of the study sample before the start of the experiment.

Table (3)
Statistical characterization of study sample of basic maximum muscle strengthen 110 /meter Hurdles n = 5

Variables	measurement unit	Mean	median	Standard Deviation	Skewness coefficient
biceps femoral muscles of right leg	kg	41.600	42.00	3.50714	0.902
biceps femoral muscles of left leg	kg	48.800	47.00	3.42053	0.595
quadriceps femoral muscles of right leg	kg	60.200	58.00	5.26308	1.613
quadriceps femoral muscles of left leg	kg	71.200	73.00	3.56371	-0.935
Record level	sec	15.934	15.950	.05177	-0.363

Table (3) show the and variables for study sample are normally distributed All torsion values in the study sample for the muscle balance of the two legs are between (-3, +3),

which indicates the moderation of the values of the study sample

Basic measurement: The application of drills for muscle balance during the special preparation period within the training program for the race 110/ meter hurdles in the period from 19/8/2017 To 26/10/2017 and for a period of (10) weeks (4) training modules per week and unit time (90-120) minutes. Attachment (1).

Post Measurements: After the completion of the application of muscle balance drills for legs were conducted after the post measurements on 28-29 / 10/2017

Statistical treatments:

- Arithmetic mean - Standard deviation
- Torsion coefficient
- Mediator - Wilcoxon Test - Critical Value of Z - Mann and Whitney

- Presentation and discussion of the results:

• View results:

- Presentation of the results of the research by "identifying the significance of the differences between the results of the pre and post measurements of muscle balance of the two men at the record level in the race 110 meters / hurdles:

Table (٤)
significance Differences between pre and post measures in fixed maximum muscle strength in 100 meter/hurdles n= 5

Variables		Measurement unit	Pre measurement		Post measurement		Mean Rank	Sum of Ranks	Z value
			Mean	Standard deviation	Mean	Standard deviation			
fixed maximum muscle strength	biceps femoral muscles of right leg	kg	41.60	3.5071	48.60	1.5166	٣	١٥	*٢.٠٣٢
	biceps femoral muscles of left leg	kg	48.80	3.4205	52.00	2.8284	٣	١٥	*٢.٠٣٢
	quadriceps femoral muscles of right leg	kg	60.20	5.2631	66.00	4.3012	٣	١٥	*٢.٠٣٢
	quadriceps femoral muscles of left leg	kg	71.20	3.5637	72.400	1.1402	٣	١٥	*٢.٠٦٠
	Record level	sec	15.9340	0.0518	14.972	0.0879	٣.٥	٣	*٢.٠٢٣

Wilcoxon significant at 0.05 = 8 Z significant at 0.05 = 1.96

Table (4) results reveal presence of statistically significant differences. between pre and post measurements of fixed maximum muscle strength for legs in 110meter/hurdles for the post measurements values. while Z value was greater than its significance value at 0.05 and that ensure group enhancement.

Table (٥)

significance Differences between pre and post measures muscular imbalance of the corresponding muscles on the opposite sides and the imbalance ratios n= 5

	Variables		Measurement unit	Pre measurement				Post measurement			
				Standard deviation	Mean	Measurements difference	percentage	Standard deviation	Mean	Measurements difference	percentage
fixed maximum	biceps femoral muscles of right leg	right	kg	41.60	3.507	7.2	%١٤.٨	48.60	1.517	3.4	%٦.٥٤
		left	kg	48.80	3.421			52.00	2.828		
	Quadriceps femoral muscles of right leg	right	kg	60.20	5.263	11	%15.5	66.00	4.301	6.4	%٨.٨٣
		left	kg	71.20	3.564			72.400	1.1402		
	biceps femoral muscles of right leg	right	kg	41.60	3.507	18.6	%30.9	48.60	1.517	17.4	%٢٦.٣٦
	Quadriceps femoral muscles of left leg	right	kg	60.20	5.263			66.00	4.301		
	biceps femoral muscles of right leg	left	kg	48.80	3.421	٢٢.٤	%31.5	52.00	2.828	٢٠.٤	%٢٨.١٨
	Quadriceps femoral muscles of left leg	left	kg	71.20	3.564			72.400	1.1402		

As shown in **Table (5),** the ratio of imbalance in the fixed maximum muscle strength of the bicep's femoral muscles of the legs and the muscles of the Quadriceps femoral muscles of the legs in the pre-measurement exceeded 10%, while in the post measurement less than 10%. Fixed maximal muscle strength of the right femoral biceps and

right Quadriceps femoral muscles, and improved imbalances in the strength of the fixed maximum muscle of the left femoral

Discuss the results of pre- and post-measurements in fixed maximum muscle strength values for the legs and the record level in the 110 m / hurdles

It is clear from **Table (4)** that there are statistically significant differences at the level 0.05 between the pre and post measurement in the values of the maximum fixed muscle strength of the two legs for 110 m / hurdles and for the benefit of post measurement. Fixed maximum muscle strength of the right femoral biceps and of right Quadriceps femoral muscles , and improved imbalance ratios in the fixed maximum muscle strength of the left femoral biceps muscles and the muscles of the left Quadriceps femoral muscles This is consistent with **Abdul Aziz Al-Nimr (1993) (7)** that when designing strength programs, it is important to choose drills that work to strengthen muscle groups on both sides of the body and on both sides of the joint because it is necessary that the rider's joints are surrounded by muscles. Developed in a balanced manner, keeping the muscles in real balance while increasing strength is the first requirement to develop the ability of the muscles to produce maximum strength in the maximum range of movement at the highest possible rate of speed.

It is consistent with what **Talha Husam al-Din et al. (1997) (4)** indicated that physical efficiency based on both muscle strength and ability is of great importance in most sports activities and is an area to distinguish athletes from each other. Many studies have emphasized the importance of resistance training In the development of both muscular strength and ability, especially those drills that rely on the use of weight training and plyometric training**. Bertionen et al.**

(2000) (19) also refer to traditional drills to develop the strength of the muscles behind the thigh, which bend the knee and the Quadriceps femoral muscles muscle that extends the knee. Which helped to balance these muscle groups

As shown **in Table (4)** the presence of statistically significant differences at the level 0.05 between the pre and post measurement of the record level in the race 110 m / hurdles in the sample of research and for the benefit of telemetry. Which helped to increase the strength of the working muscle and the corresponding, which helped to improve the consistency in performance and speed in passing the hurdles, which positively affected the record level This is consistent with **Bastawisy Ahmed (1997) (3)** that hurdles racers have special requirements such as high physical fitness, ability to cross the hurdles with both legs, neuromuscular compatibility, and ability to balance after crossing hurdles, smoothly, neuromuscular compatibility, and balance before and during After crossing the hurdles, there is also a good sense of step and ability to distribute the effort along the race distance and increased flexibility in the pelvic joint to facilitate the crossing of the hurdles. He also agrees with **Will Freeman (2015) (23)** that the advanced hurdle rider raises his center of gravity as little as possible above the hurdles so that he does not lose more than 0.2 milliseconds to cross the hurdles along with the time taken to travel without hurdles, thus the fastest way To cross the hurdles is the way the center of gravity of the rider rises as little as possible above the hurdles.

As shown in **Table (5),** there is a discrepancy between the average pre-measurement in the fixed maximum muscle strength of the femoral biceps muscles of the left and right legs by (14.75%), and the difference between the average pre-measurement in the maximum

fixed muscle strength of Quadriceps femoral muscles of the right and left legs by (15.45%) This indicates that there is an imbalance in the flexors and extensor muscles of the two legs , while it is clear from the same countries that there is no imbalance in the telemetry between the fixed maximum muscle strength of the femoral biceps of the left and right legs (6.54%). Lack of imbalance in Muscular balance in telemetry between the maximum fixed muscle strength of the Quadriceps femoral muscles of the left and right legs (8.83%), where the percentage decreased less than 10% This is consistent with **David Lipman (1998) (15)** One of the main causes of injury, especially during weight training, is the difference in strength between the left and right sides of the body. The normal difference between the two sides of the body should not exceed 10%, but many Athletes suffer from muscular imbalance, and the difference between the strength ratios between the sides of the body exceeds 10% and this causes poor mechanical performance of the musculoskeletal system during movements involving both sides of the body, this leads to the work of the secondary muscles compensate leading to increase the mechanical obstruction of sound movement, and when we add Weight to those The result is the injury. It also agrees with **Abu El-Ela Abdel-Fattah (1997) (1)** to the importance of the lack of imbalance in the muscles on the joints, which leads to the narrow range of mobility of the joint, and thus impede the level of show strength, speed and compatibility in the athlete, and lead to poor level of compatibility Between the muscle fibers within the muscle, as well as between the muscles and this leads to a decrease in economic performance, and often a major cause of the occurrence of muscle injuries and ligaments It has been shown that the

effectiveness of physical preparation for the development of muscle strength increases significantly in the case of increasing the range of mobility of the joint, Narrow range of motion also increases the difficulty and slow performance of motor skills. The implementation of the required movement in its full range and therefore affected the level of sports skill.

As shown in **Table (5)** improved imbalance ratios in the fixed maximum muscle strength of the right biceps femoris muscles and of the muscles with the right four femoral heads where the ratio was (30.9%) while the telemetry improved (31.46%). In the maximal fixed muscle strength of the left femoral biceps and the muscles of Quadriceps femoral muscles where the proportion in the pre-measurement (26.36%), while improved in telemetry (28.18%) This is due to the drills used where it helped in the convergence of strength between the muscles of the biceps femoris and the - Quadriceps femoral muscles This is consistent with **Wazen (1993) (22)** that many activities cause an increase in the muscular strength of a single muscle group without synchronization in the corresponding muscles. there are working muscles and other corresponding regulate the direction of movement and amounts of speed and make the movement balanced and accurate. **Essam Helmy and Mohamed Brekah (1997) (10)** indicate that strong muscles enable the athlete to move quickly and increase the stability of the joints by the balance of strength in muscle groups around the joints. **Abdul Aziz Al-Nimr, Nariman Al-Khatib (1996) (8)** that the muscles control the movement of the body from extension, and the stronger the muscles, the more effective these flexions, as this increases the yield of strength and thus increases speed and ability and

agility as well as the advancement of many skills

Conclusions: -

In presenting and discussing the results, the following conclusions were reached:

- Drills on the balance of muscle led to a positive impact on the maximum muscle strength of the muscles of the Quadriceps femoral muscles and biceps femoral muscles of the right leg.
- Drills for muscle balance led to a positive effect maximum muscle strength of the muscles of the Quadriceps femoral muscles and biceps femoral muscles of the left leg.
- Drills on muscle balance have positively affected the record level in a race 110 / meter hurdles

Second: Recommendations

- In light of the findings of the research, the researcher recommends

the following:

- The use of drills for muscle balance in special programs in the race 110 / meter hurdles
- Diversity in the application of drills that work in the same direction of the motor track in the race 110 / meter
- Trainers should pay attention to the development of muscle strength and balance and be an essential part of the training program for the 110m

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