THE EFFECT OF TRAINING & COMPONENT OF HARMONIC CAPACITY IN SOME PHYSICAL,BIO-KINEMATIC VARIABLES & ACHIEVEMENT OF LONG JUMP

Nahida Hamed Mashkour
Faculty of Sport Education – Basra University
nahedhamed2003@yahoo.com

Abstract
If players do not train on components of harmonic capacity, they may face difficulty in advanced stages. Therefore, the researcher integrated some exercises which contribute to develop this harmonic capacity in the training course and determining the effect of these exercises through kinematic analysis of some bio-kinematic variables and achievement for the sample of the study. The study aims to prepare training of harmonic capacity components related to the long jump event within the training course of the empirical group and then determine the effect of this training on some physical, bio-kinematic variables and achievement in the long jump for the empirical group. In addition, it aims to determine differences in some physical, bio-kinematic variables and achievement between empirical and control groups in post-tests. The study hypothesizes that training of harmonic capacity components has a positive effect between pre and post-tests in some bio-kinematic variables and achievement in the long jump event for the sample of the study. Moreover, the study hypothesizes that there are significant differences between empirical and control groups in post-tests for the sake of the empirical group. The researcher adopted the empirical method as it is consistent with the nature of the study problem for players of Basra Junior long jump team (8 players with ages between 16 and 17 years old). Players were chosen purposively and then sample of the study was divided by the researcher randomly into empirical and control groups. Each group contains 4 players. The former trained due to components of harmonic capacity and the latter used ordinary daily training. The researcher concluded that training of harmonic capacity components has a positive effect on physical, bio-kinematic variables and achievement under study in the long jump event for the sample of the study. She also found that there are statistically significant differences between post tests for the empirical and control groups in physical and bio-kinematic variables under study for the sake of the empirical group.
Keywords: harmonic capacities, bio-kinematic variables, long jump.

1. Introduction

Latest years witnessed great progress at all fields including physical education. This has a great effect in determining new tasks for the training process based on finding the best ways to develop any event and keep up with science and development. The long jump is one of these events as it requires kinematic harmony to perform its phases and relate them to the right technique of the event's kinematic path. Long jump was described as one of the easiest games, but it is difficult for any student and researcher in its details as it needs accuracy and mastery in performance. It also requires considering physical and bio-kinematic aspects for performance accuracy to get the farthest distance with the right performance. This is the hoped goal of the training process. Since this event is characterized by performance speed, kinematic analysis was adopted for some bio-kinematic variables as biomechanics is one of the sciences which help to find the best ways to reach optimal performance by athletes.

Talha. 1993:7 referred that biomechanics is concerned with application of al knowledge, information and research methods related to structural and functional formation in humans. Accordingly, he discovers weak points and sets their kinematic solutions and assessment as well as enhancing points of strength and set suitable kinematic paths for technical performance in the long jump. Hence, the significance of this study lies in finding helping training in developing components of harmonic capacity in long jump and, in return, acquiring ability for good performance and reducing errors to get the best distance.

2. Problem of the Study:

Long jump is one of the games in which technical performance (the technique) is one of the main factors on which achievement is based. It is one of the games which need to develop harmonic capacities in performing its stages. Therefore, there should be great concern with in finding methods which raise the level of technical performance and achievement in return, especially at juniors' stage. It is important for junior athletes to reach the right performance mechanisms. If they are not trained on these components, they may face difficulty in performing advanced stages. Therefore, the researcher integrated some exercises which contribute to develop this harmonic capacity in their training course. Mohanad Mahmoud, 2015:5 believes that sport training on multiple technical skills and with the use of variable training methods is effective to enhance the level of harmonic capacities and develop them. Determining the effect of these exercises is done through kinematic analysis of some bio-kinematic variables and

achievement for the sample of the study .The study aimed to prepare exercises of components of harmonic capacity related to long jump within the training course of the empirical group and then determine the effect of this training on some physical, bio-kinematic variables and achievement between empirical and control groups in post-tests. The study hypothesizes that training of harmonic capacity components has a positive effect between pre and post-tests in some bio-kinematic variables and achievement in the long jump event for the sample of the study. Moreover, the study hypothesizes that there are significant differences between empirical and control groups in post-tests for the sake of the empirical group.

3. Methodology:

The researcher adopted the empirical method as it is consistent with the nature of the study.

Population & Sample of the Study:

Population of the study was represented in players of Basra Junior long jump team (8 players with ages between 16 and 17 years old). Players were chosen purposively and then sample of the study was divided by the researcher randomly into empirical and control groups. Each group contains 4 players. The former trained due to components of harmonic capacity and the latter used ordinary daily training. Respondents were subjected to homogeneity and equality tests as in table No. (1):

Table No. (1): Values of arithmetic means, standard deviations, difference coefficient value for homogeneity between both groups and the counted (T) value of equality between both groups:

Groups / Variables	Control Group			Empirical Group			Counted (T) Value	Significance
	Mean	S.D ±	D.C	Mean	S.D ±	D.C		
Length (cm)	1.65	0.32	19.39	1.68	0.44	17.85	1.42	Random
Weight (kg)	56.95	1.88	3.30	58.24	1.25	2.14	1.87	Random
Age (years)	16,50	0.5	3.03	16.92	0.7	4.13	2.09	Random
Explosive strength of legs (cm)	2.13	0.37	17.37	2.15	0.31	14.41	0.99	Random
Dash speed (30 m / sec)	4.64	0.6	8.62	4.68	0.3	6.41	1.75	Random
Agility / sec	11.82	1.12	9.47	11.87	1.15	9.68	0.67	Random
Achievement	5.10	0.04	0.73	5.15	0.06	0.55	0.67	Random

*** The (T) tabulated value at freedom degree (6) and significance level (0.05) = 2.44**

Tests used in the Study:

Physical Tests

- Explosive strength test – wide jump from stationary (Mohamed Hussein et al 1982:93).
- Agility test: zigzag run using the power method (Mohamed Sobhy 1995: 368).
- Speed test: 30 m dash test from movement (Qais Nagy Abd et al 1997:363).

Bio-kinematic Variables:

1- Approach speed.
2- Rising time.
3- Rising angle.
4- Flying time.
5- Flying angle.
6- Maximum height for body weight center in flying.
7- Jump distance (achievement).

4. Steps of the Research:

Pre-tests:

Pre-tests were conducted on the sample of the study on 19/03/2015 at 6:00 pm in the athletics playground of the Faculty of Physical Education, Basra University and consecutive physical ability tests. After that, the sample was photographed using two photographic cameras to extract bio-kinematic variables. Cameras were put on a distance of 12 m away from performance place

and at the height of photography lens from the ground (1.55 m) with all consistent temporal and spatial conditions for the purpose of similarity with post-tests.

Training Course:

The training course was applied on 21/03/2015 until 23/06/2015 including 24 training units distributed on 12weeks (two training units a week). Stages of the program were distributed due to the following time distribution:

1- Preparatory stage: 8 weeks divided into:
A) General preparation: 4 weeks
B) Special preparation: 4 weeks
2- Competition stage: 4 weeks

Each training unit included three parts as in annex (1): a- preparatory part b- main part c- final part.

Intensity and load size for each training unit were determined based on average potential of members of the sample with consideration of gradual and regular rise of loads which is consistent with the limits of reached susceptibility. The researcher also considered training specialty as the course was planned due to physical and functional abilities of members of the sample. The training course, which contains harmonic capacity training (speed, strength and agility), was applied on the empirical group, and the control group used daily training prepared by the trainer.

Post-tests:

Post-tests were conducted on the sample of the study on 25/06/2015with all consistent temporal and spatial conditions for the purpose of similarity with pre-tests.

5. Discussion of Results:

Analysis of results of pre and post tests for physical, bio-kinematic variables and achievement for the empirical and control groups for the sample of the study.

Table (2): Pre and post tests and the counted (T) value for physical variables for the empirical and control groups:

Variables	Control Group					Significance	Empirical Group					Significance
	Pre-test		Post-test		T		Pre-test		Post-test		T	
	Mean -	SD ±	Mean -	SD ±			Mean -	SD ±	Mean -	SD ±		
Legs explosive strength / cm	2.13	0.37	2.17	0.31	7.33	Significant	2.15	0.31	2.28	0.25	9.29	Significant
Dash speed 30 m / sec	4.64	0.6	4.55	0.51	6.99	Significant	4.68	0.3	4.35	0.2	11.36	Significant
Agility / sec	11.82	1.12	11.02	1.15	7.76	Significant	11.87	1.15	10.90	0.52	17.27	Significant

*** The (T) tabulated value at freedom degree (3) and significance level (0.05) = 3.18**

Table (3): Pre and post tests and the counted (T) value for bio-kinematic variables for the empirical and control groups:

Variables	Control Group					Significance	Empirical Group					Significance
	Pre-test		Post-test		T		Pre-test		Post-test		T	
	Mean -	SD ±	Mean -	SD ±			Mean -	SD ±	Mean -	SD ±		

Approach speed m / sec	6.15	1.40	6.35	1.55	6.34	Significant	6.33	0.82	6.95	1.43	7.39	Significant
Rising time / degree	0.17	0.04	0.16	0.02	3.35	Significant	0.17	0.01	0.15	0.02	5.97	Significant
Rising angle / sec	57.42	2.17	59	1.86	6.87	Significant	56.12	2.22	60	1.03	6.60	Significant
Flying time / sec	0.64	0.32	0.74	0.07	13.5	Significant	0.65	0.30	0.79	0.06	15.28	Significant
Flying angle / degree	16.13	1.41	17.30	0.74	9.15	Significant	15.92	2.15	19.12	1.11	17.49	Significant
Maximum height of body weight center	1.62	0.09	1.72	0.05	8.99	Significant	1.64	0.07	1.85	0.04	9.91	Significant
Achievement	5.10	0.04	5.20	0.7	5.94	Significant	5.15	0.06	5.35	0.04	7.66	Significant

* The (T) tabulated value at freedom degree (3) and significance level (0.05) = 3.18

Analysis of results of post-tests for physical, bio-kinematic variables and achievement for the empirical and control groups for the sample of the study

Table (4): Post (physical) tests and the counted (T) value for the empirical and control groups:

Test	Control Group		Empirical Group		Counted (T) value	Significance
	Mean	S.D ±	Mean	S.D ±		
Explosive strength of legs	2.17	0.31	2.28	0.25	5.77	Significant
Dash speed 30 m / sec	4.55	0.51	4.35	4.35	7.82	Significant
Agility / sec	11.02	1.15	10.90	10.90	5.98	Significant

* The (T) tabulated value at freedom degree (6) and significance level (0.05) = 2.44

Table (5): Post tests and the counted (T) value for the empirical and control groups:

Test	Control Group		Empirical Group		Counted (T) value	Significance
	Mean	S.D ±	Mean	S.D ±		
Approach speed m / sec	6.35	1.55	6.95	1.43	10.12	Significant
Rising time / degree	0.16	0.02	0.15	0.02	7.90	Significant
Rising angle / sec	59	1.86	60	1.03	4.88	Significant
Flying time / sec	0.74	0.07	0.79	0.06	8.61	Significant
Flying angle / degree	17.30	0.74	19.12	1.11	7.22	Significant
Maximum height of body weight center	1.72	0.05	1.85	0.04	7.45	Significant
Achievement	5.20	0.7	5.35	0.04	6.66	Significant

*** The (T) tabulated value at freedom degree (6) and significance level (0.05) = 2.44**

6. Discussion of Results:

Tables (2) and (3) showed that there is a development in results of pre and post-tests for physical, bio-kinematic variables and achievement for the empirical and control groups as a result of the effect of the adopted training program and the training program which contained training of some components of harmonic capacity including speed, explosive strength of legs, agility and bio-kinematic variables. We also found a progress in these variables as a result of the effect of both training programs on them. This development in physical and bio-kinematic variables leads to enhance achievement for the sample of the study and for the empirical and control groups.

As for table (4), it shows post-tests for physical variables despite the difference between pre and post tests for both groups in variables under study. However, post-tests showed that the empirical group, which used harmonic capacity training in its training program, is better than the control group. The researcher found that this development is due to the use of harmonic capacity training serving long jump event. Although the training program contains training for these components, they did not take suitable importance as their effect was indirect, so the empirical group excelled over the control group in post-tests. Speed developed in post-tests for the empirical group as the training program included the training of this quality and this quality is very important and has a clear effect on long jump with approach run speed also plays an important role in this event. Concerning explosive strength, it also developed in post-tests for the empirical group through the set training which played a great role in successful take-off. Bastawisy Ahmed 1997:338 believes that good take-off cannot be reached only if it is related to a harmonized rhythm in approaching stage. He adds that the take-off stage is considered the most important stage of kinematic performance. This importance lies at the center of body weight without gaining additional distance or changing kinematic level after the feet leaving the ground. We can also notice that agility developed in post-tests for the empirical group because of the effect of agility training in the training program referred to by (Mohanad Mahmoud 2015:62) as being one of the qualities which help in quickness of performance and mastery of kinematic skills. The more a player is agile, the quicker more accurate and more effective his movement will be.

When it comes to table No. (5), we find that post-tests for the empirical group in bio-kinematic variables and achievement excelled over the control group. This is related to the distinction of the empirical group at physical variables as we notice that approaching speed has been enhanced for the empirical group in post-test. This is because the training program contains speed development exercises. Accordingly, it had a positive effect on developing approaching speed as it is important in acquiring horizontal speed in performing the run in long jump. Khaled Attiat etal 2011:9 refers that this factor is the most important in long jump as it represents possession of horizontal speed transformed into a horizontal and vertical strength. As for rising time variable, we found that it reduced due to the effect of explosive strength training of legs, acquiring horizontal strength, speed and also agility components of harmonic strength as it is important in connection to reach the best performance. One of requirements of good take-off is moment reach to the highest strength and the least time. We also found that the rising angle was enhanced in post-tests of the empirical group sue to the speed, take-off strength and agility acquired by the player to make the rising angle better. As for flying time variable, we also found that the empirical group was consistent with the control group in post-test as a result of the acquired horizontal speed due to speed training and take-off strength acquired from explosive strength training of legs so they led to increase flying time. Concerning flying angle variable, there was an improvement in the empirical group in post-test. The researcher found that this was because of the capacity component training which helped develop flying angle and there was a positive effect of explosive strength training on body strength during the stage of pushing the ground at the moment of leaving the ground to start flying. Flying angle is considered one of the most important criteria of skill performance in long jump during approaching and flying stages as they are basic and effective factors on flying time and this was asserted by Khaled Attiat et al 2011:10. When it comes to maximum height variable, it had a positive effect on post-test in the empirical group as the take-off angle increased as Bastawis Ahmed 1997:342 referred that the height of weight centre depends on increasing the take-off angle. All these developments in physical and bio-kinematic variables are due to the effect of training of some components of harmonic ability within the training program which led to develop achievement for the sample of the study.

7. Conclusions:

1- Training of harmonic capacity components has a positive effect on physical, bio-kinematic variables and achievement under study in the long jump event for the sample of the study.
2- There are statistically significant differences between post tests for the empirical and control groups in physical and bio-kinematic variables under study for the sake of the empirical group.

8. Recommendations:

1- The necessity of focusing on harmonic capacity components related to long jump and giving it importance with the training program of the players.
2- The necessity of considering physical tests periodically to set the effect of harmonic capacity components training related to the event.

3- Considering diagnosing errors through bio-kinematic variables for their importance in detecting and diagnosing errors.
4- Conducting similar researches for other events and different categories.

9. References:

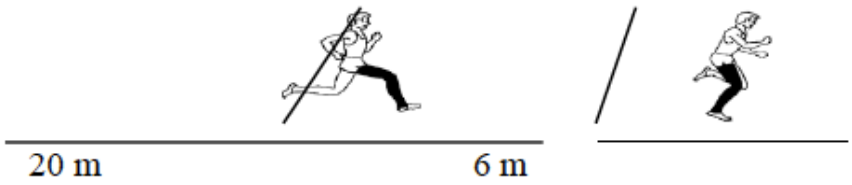
- Bastawisy Ahmed (1997): "Track-and-Field Competitions: Education – Technique and Training', 1st Ed., Dar Al Fikr Al Arabi – Cairo.
- Khaled Attiat & Akef Taifour (2011): "Kinematic Antecedents for the Long Jump at a Sample of Junior Players", Journal of Al Najah Research University, the Jordanian University.
- Talha Hossam Eldin (1993): "Biomechanics: Theoretical & Practical Basics", Cairo – Dar Al Fikr Al Arabi
- Kassem Hassan Hussein (1991): "The Comprehensive Sport and Physical Encyclopedia in Games, Events and Sport Sciences", Beirut.
- Qais Nagy Abdeljabar & Bastawisy Ahmed (1997): "Tests and Principles of Statistics in Sport", Baghdad, Al Watanya Office.
- Mohamed Hasssan Allawy & Mohamed Nasr El Din Radwan (1982): "Kinematic Performance Tests", Cairo, Dar Al Fikr Al Arabi.
- Mohamed Sobhy Hassanein (1995): "Measurement and Evaluation in Sport and Physical Education", 3rd Ed., Part. 1, Cairo, Dar Al Fikr Al Arabi.
- Mohanad Mahmoud Mohamed (2015): "The Effect of using Harmonic Capacities on some Physical and Skill Variables for Football Juniors in Palestine", PhD Thesis, Palestine, Al Najah National University.

Annex (1)

Model of Harmonic Training on the Main Section of Training Units

Speed:

An area with a length of 6 m is determined and one of the players waits at the end of the area. This player speeds up when his partner enters the area and starts running from a distance of 20 m.



- Using a post or rope with a length of 1.5 m.
- Running on a straight line.

The front player drags the post or rope and then leaves it to start speed training.

Rest for (3) minutes between groups

Agility:

Using ground ladder

5x2 joining legs inside the ladder and getting them out sideward with continuing to the end of ladder

5x2 hopping by right leg

5x2 hopping by left leg

5x2 jumping with both legs inside the ladder, to the right side and then return inside the ladder and jumping to the other side till the end of the ladder

5x2 jumping with both feet inside the ladder and forwards till the end of ladder

Running at the approaching zone for different distances and jumping to the ascending zone with a barrier of a height of 50 m rising with rest gradation (3) minutes among groups.

Explosive Strength of Legs

2x5 hurdles: crossing hurdles with both feet (hurdle height 50 cm)

3x5 jumping for a distance of 20 m on left foot, 20 m on right foot and 20 m speed running

Rest is (3) minutes among groups.