

The Impact of the Strength Training Center Use on Some Physical Variables and the Level of Skilled Performance of High Jumpers

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Introduction and research problem

In recent years, fitness specialists have become increasingly interested in using the exercises of the central part of the body in the training programs for athletes, because of the enormous impact of these exercises on sports performance, which results in tremendous strength to provide maximum performance for the lower and upper limbs.

that the compatibility between the muscles working in the movement depends on the mechanism of muscle work, the compatibility works to be the contraction of the muscles in the joint in the direction required for movement and regulates the nervous system internal compatibility in the same muscle and also between the muscles working in Performance by organizing close cooperation between these working muscles and working to reduce the degree

of resistance caused by the muscles, Which contributes significantly to the ability of the muscles working to produce more muscle strength. (6: 129)

The central part of the body is a muscle group consisting of the trunk and pelvic muscles responsible for maintaining the stability of the spine, which includes the muscles of the abdomen and muscles of the hip joint and muscles connected to the spine. (16:29) (22:29)

note that the central part of the body which consists of a group of twenty-nine muscles known as the Lumbo-Pelvic-hip complex. center of gravity (mid) body. (17: 20) (37:29)

mentions the benefits of exercises to strengthen the muscles of the central part of the body. These include increased motor efficiency during exercise and daily activities, stability of the body,

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increased control and balance during movement.

Producing tremendous strength not only from those muscles but from adjacent muscles such as the muscles of the shoulders, arms and legs because many of these muscles are responsible for the stabilization of the spine and pelvis in their natural positions and help these exercises to achieve better balance of the spine and pelvis during the performance of the violent physical activities (65: 9)

suggests that some may be confused with the term "central part stability" and "central part force". Despite the similarity between them, stability does include both muscle strength and ability. Muscle control and central muscle strength are of great importance but this importance can be of no use unless used at the right time and time. Therefore, the central part exercises help to increase muscle stability and control while producing the necessary strength for performance. (12: 87)

And the ability to "stability", which is the ability of the player to control and manage the different parts of the body during the various

movement. It's a matter that occupied a large number of researchers in the recent period and reflected the spread of training and programs to improve the level of stability and balance of the body, especially runners and jump and throw players. Athletics to achieve a perfect level of control of the trunk muscles in particular during running, jumping, throwing and not to use movements or deviations of the side or front or back during the performance to try to rationalize the player and not to be wasted away from the path or direction of performance (47:22) (24:23)

In order to achieve an optimal level of stability and balance, it is necessary to achieve the necessary strength and stability of the region to be stabilized and balance. For example, improving the strength of the trunk is the first basis for achieving stability and balance of the trunk area and its strength during performance. Nikolinko et al.

Stability of the trunk means access to control and manage movements of the upper body as a whole, allowing optimal production of

motor transport as well as control the production of more power during performance (87:10) Athletics or field and track competitions are old sports Other sports, the modern game play and the scale of the civilizations of the nations, as well as the physical, skill, psychological and moral integration of the individual.

In the second half of the twentieth century there was a marked and comprehensive change in the achievement of indices in various sports competitions, especially in short distances, Both at the global and Olympic levels. (12:13)

Both Donald (2001) and Stephan (2000) agree that jumpers are one of the field athletics competitions practiced by men and women without changing the place of the competition, a complex skill that begins to approach and ends with the landing.

It is a challenge between the player and himself in every attempt to achieve And the superiority of it is always from the mental state, psychological, technical and physical better than others, and knowledge of the technical stages of the contest and its

ability to imagine the correct performance before entering a promising in the competition contributes to the sense of optimal performance and thus focus attention before performance and after performance. (14:27) (44:28)

Holcombe (2001) also pointed out that the high jump competition aims to achieve the highest possible vertical distance requiring special possibilities and advantages (74:19) The ability of the player to take advantage of all his powers and reach the maximum distance possible.

In the view of both "Bastoise Ahmed" (2003), Bassi (2000) that the high jump competition subjects that still occupy the minds of those interested in the process of training in order to achieve development in the level of performance, Because it contains a large number of detailed movements that can be evaluated for work On the link and guidance, in addition to the steps of approach, especially the few steps that may be influential in the process of upgrading, We find that the process of upgrading the most important stages of high jump and harder because the

contestant performs all his movements in a very short time does not go. The second stage is the stage of elevation, in which the player's body is subject to the law of gravity and then comes the landing stage and the player's keenness to avoid hitting the crossbar. (46:25)

And the researcher's work in the field of academic area and sports noted the weakness of the level of high jump players and attributed the researcher to the weakness of the muscles of the center responsible for the full transfer of force from the bottom end through the trunk to the upper tip as a result of the concentration of trainers on the movement of limbs with a high dynamic range. The effect of moving from the lower limbs (feet) to the trunk to the upper limbs (arms)

That affect the level of skill performance. Therefore, the researcher saw the importance of development of the elements of strength and balance using this type of training through proposing programs which using the exercises of the central part and identify the impact on some physical variables and the level

of performance of high jump skill in an attempt to find a solution to the weakness of the level of some elements of fitness affecting the players of high jump and may help to solve the problem of weakness of the level of players in formality, Research as one of the attempts to find a method that takes into account the recent trends in training and can improve the level of strength of all types as one of the indicators to improve the level of height of the jump as well as improve the level of the balance element, which achieves more effective stability during the upgrade and flight to perform the skill of high jump

. Research goal

The aim of the research is to identify the effect of the use of strength training on some physical variables and the skill level of high jump players.

Research hypotheses

- There are statistically significant differences between the averages of pre and post measurements in some physical variables and the level of skilled performance of high jump players and for the experimental research group.

- There are statistically significant differences between the averages of pre and post measurements in some physical variables and the level of skilled performance of high jump players and for the control group.

- There are statistically significant differences between the averages of the two dimensions of the experimental and control groups in the level of some physical variables and the level of skilled performance of high jump players and in favor of the experimental research group.

Search procedures:

First: Research Methodology:

The researcher used the experimental method using the experimental design of the two

groups, one experimental and the other control using the pre and post measurement, in order to suit the nature of the sample

Second: Society and Research Sample:

The sample of the research included the students of the second year of the Faculty of Physical Education - University of Aswan for the academic year (2015-2016) and the number of (28) students, has been selected (20) students to conduct the basic experiment of the research was divided into two groups one experimental and the other control of each group (10) students in addition to (8) players for the study of exploratory research.

Table (1)

Arithmetic mean, standard deviation, median and spindle coefficient For age, height, weight and physical variables And the numerical and skillful performance of the research sample N = 28

Variables	measuring unit	Average Arithmetic	standard deviation	Mediator	Factor Sprains
Age	Year	18.29	1.17	18.20	0.230
Height	Cm	172.82	2.33	172.00	1.055
Weight	Kg	63.91	1.25	63.50	0.984
Strength of abdominal muscles	No	15.20	0.88	15.00	0.681
Strength of back muscles	Kg	37.80	1.14	37.50	0.789

Follow Table (1)

Arithmetic mean, standard deviation, median and spindle coefficient For age, height, weight and physical variables And the numerical and skillful performance of the research sample N = 28

Variables		measuring unit	Average Arithmetic	standard deviation	Mediator	Factor Sprains
Strength of the muscles of the legs		Kg	41.13	1.45	41.00	0.268
Strength of the center		S	71.60	2.11	71.50	0.142
The ability of the two legs		Cm	29.70	1.17	29.60	0.256
Level of skill performance	Accession	Degree	1.22	0.21	1.20	0.32
	Upgrade	Degree	1.45	0.11	1.40	0.15
	Running and falling	Degree	1.98	0.15	1.95	0.52
	Total degree	Degree	4.65	0.61	4.55	0.11
Digital level		Cm	166.52	1.36	166.00	0.17

It is clear from the previous table (1) that all the values of the arithmetic averages exceed the values of the standard deviations, and that all the torsion values are

Parity Sample Search:

limited to +3 and 3 indicating homogeneity of the sample and free of irregular distribution defects for age, height and weight variables.

Table (2)

Parity of both of research group in growth rates , physical variables , level Skill and digital performance N = 20

Variables	measuring unit	The experimental group		Control group		T value
		M	E	M	E	
Age	Year	18.10	1.12	18.15	1.02	0.65
Height	Cm	170.25	1.15	171.21	1.08	0.47
Weight	Kg	62.54	1.32	63.01	0.17	0.36
Strength of abdominal muscles	No	15.02	0.98	15.11	0.54	0.36
Strength of back muscles	Kg	37.81	0.81	37.25	0.25	0.22
Strength of the muscles of the legs	Kg	41.35	0.86	41.32	0.69	0.54
Strength of the center	S	71.55	0.89	71.62	0.85	0.25
The ability of the two legs	Cm	29.65	0.47	29.20	0.47	0.84

FollowTable (2)

Parity of both of research group in growth rates , physical variables , level Skill and digital performance N = 20

Variables		measuring unit	The experimental group		Control group		T value
			M	E	M	E	
Level of skill performance	Accession	Degree	1.28	0.32	1.30	0.12	0.54
	Upgrade	Degree	1.46	0.28	1.44	0.11	0.14
	Running and falling	Degree	1.94	0.21	1.95	0.17	0.63
	Total degree	Degree	4.68	0.47	4.69	0.32	0.22
Digital level		Cm	165.28	0.39	165.20	0.21	0.74

The value of "T" is the table at the significance level (0.05) = 1.746

Table (2) shows that there are no statistically significant differences between the experimental and control groups at the level of growth rates and some physical variables and the level of skill and digital performance in the high jump, indicating the equality of the two groups in the variables of age, height and weight.

Data collection tools:

First: Devices used:

- Restameer for measuring length.
- Stop watch.
- Medical Balance.
- Tape measure.
- Dynamometer to measure the strength of the muscles of the back and legs.
- Swiss ball is a flexible rubber ball filled with air and diameter

ranging from 45 cm: 75 cm (18 to 30 inches).

- High jump + mattresses.

Second: Tests used in research:

1. Sit-up knees bent to measure the muscle strength of the abdominal muscle groups (16: 221, 222).
- 2- Test the strength of the muscles of the two men using a dynamometer to measure the strength of the muscles of the material of the two men Leg Lift Strength (15: 210, 211).
- 3- Back Strength Test. Measure the strength of the muscles of the trunk (back muscles) (16: 209, 210).
- 4- Vertical jump test of stability to measure the muscle strength of the two men (305: 304: 16).
- 5 - Test the throwing of a medical ball not distance to

measure the muscle capacity of the farmers (16: 308).

6. Test the level of skill and digital performance.

Third: Forms used in research

Three forms of expert opinion were designed on:

- Determining the most effective physical components in the performance of high jump skills and how to develop it by training the strength of the center stability, namely the special muscles affecting the lower limb and trunk area and upper end of the skill performance.

- Determination of physical tests according to the selected elements.

- Determine the technical tests of the skill in question.

- Expert questionnaire on the program.

Steps to build the program:

Proposed Program:

After studying the specialized scientific books and previous research, the researcher identified the muscles of the central part as well as the muscles working in the high jump skill and designed a program aimed at improving the skill level and digital high jump players, using exercises Center stability to

strengthen the muscles of the central part of the body.

First: the goal of the program

Upgrading the skillful and digital level of high jump skills:

- Increase the muscle strength of the muscles of the central part (arms - abdomen - back - thigh).

- Increase the stability of the muscles of the central part through the use of exercises.

Second: Foundations of the program:

- Attention to warm up and prepare the body for training.

- The program is suitable for the age stage and the skill level of the female students of the sample.

- Graduation in exercises from easy to difficult and from simple to complex and from stability to movement.

- Taking into account individual differences.

- Taking into account the diversity of the program and within the units.

Preparation of the program in its initial form

The researcher prepared the program in its preliminary form and included the following:

A. The time division of the program

Duration of the program:
(8) weeks (3 units per week).

Divided into (3) periods each unit contains a number of exercises.

Number of lessons: (24) units.

Unit Time: (90) minutes.

The practical part of the program

The researcher presented a number of (24) exercises of the Center's steadfastness on the experts to select the appropriate ones and after presenting the program in its initial form to a number of (10) specialized faculty members who have experience to learn about their opinions in the program in terms of:

- The extent to which the program achieves its objective.
- Time allocated to the program as a whole.
- Time division of the program.
- Timely distribution of parts of the lesson.
- Pressing and selecting the most appropriate exercises that achieve the goal.

Third: Design of the proposed program

The program was divided into (3) phases:

View and discuss the results

First: Showing results: -

The first stage :

- Unit content: preliminary exercises to stabilize the central part of the body to perform exercises in a steady state.

- Duration: 2 weeks.

- Number of units: (4) units (3) units per week.

Lesson time (90) minutes

The second phase:

- **The content of the unit:** exercises compound to stabilize the central part of the body to perform exercises in the position of stability with the movement of arms and legs.

- Duration: 3 weeks.

- Units: (8) units (3) units per week.

Lesson time (90) minutes

Third level:

- Module content: primary and composite exercises and exercise performance in the stability and movement.

- Duration: 3 weeks.

- Units: (8) units (3) units per week.

Lesson time (90) minutes

The program appears in its final form in Annex (5)

Table (3)

The significance of the differences between the pre and the post in the level of some physical variables and the performance of skilled and digital high jump experimental research group N = 10

Tests	measuring unit	Pre measurement		Post measurement		Differences between the two averages	Improvement rate	T value	Level of significance	
		SMA	standard deviation	SMA	standard deviation					
Strength of abdominal muscles	No	18.10	1.25	24.45	0.62	5.35	29.55%	4.15	significance	
Strength of back muscles	Kg	15.02	0.98	20.44	0.25	5.42	36.08%	4.21	significance	
Strength of the muscles of the legs	Kg	37.81	0.81	48.15	0.21	10.34	27.34%	4.65	significance	
Strength of the center	S	71.55	0.89	83.70	0.85	12.15	16.98%	4.32	significance	
The ability of the two legs	Cm	29.65	0.47	34.18	0.32	4.53	15.27%	4.39	significance	
Level of skill performance	Accession	Degree	1.28	0.32	2.15	0.28	0.87	67.96%	4.65	significance
	Upgrade	Degree	1.46	0.28	2.29	0.41	0.83	56.84%	4.85	significance
	Running and falling	Degree	1.94	0.21	3.15	0.32	1.21	62.37%	4.29	significance
	Total degree	Degree	4.68	0.47	7.59	0.18	2.91	62.17%	4.63	significance
Digital level	Cm	165.28	0.39	171.32	0.32	6.04	3.65%	4.52	significance	

* Tabular value (t) at significance level (0.5) = 1.860

Table (3) shows the existence of statistically significant differences between the averages of the pre and post measurements in the level of some physical variables and the level of skill and numerical

performance of the high jump players. The empirical research group where the value of (T) ranged from (4.14 to 4.85) The value of the scale at the level of significance (0.05).

Table (4)

The significance of the differences between the pre and post indices in the level of some physical variables and the skill and numerical performance in the high jump control group control N = 10

Tests	Measurement unit	Pre measurement		Post measurement		Differences between the two averages	Improvement rate	T value	Level of significance	
		SMA	standard deviation	SMA	standard deviation					
Strength of abdominal muscles	No	18.15	1.32	20.60	0.51	2.45	13.49%	2.98	significance	
Strength of back muscles	Kg	15.11	0.54	18.25	0.25	3.14	20.78%	2.58	significance	
Strength of the muscles of the legs	Kg	37.25	0.25	39.30	0.32	2.05	5.50%	2.65	significance	
Strength of the center	S	71.62	0.85	73.95	0.14	2.33	3.25%	2.59	significance	
The ability of the two legs	Cm	29.20	0.47	31.17	0.32	1.97	6.74%	2.74	significance	
Level of skill performance	Accession	Degree	1.30	0.12	1.55	0.14	0.25	19.23%	2.77	significance
	Upgrade	Degree	1.44	0.11	1.69	0.11	0.25	17.36%	2.63	significance
	Running and falling	Degree	1.95	0.17	2.11	0.25	0.16	8.20%	2.54	significance
	Total degree	Degree	4.69	0.32	5.35	0.41	0.66	14.07%	2.17	significance
Digital level	Cm	165.20	0.21	167.10	0.18	1.90	1.15%	1.98	significance	

* Tabular value (t) at significance level (0.5) = 1.860

Table (4) shows statistically significant differences between the averages of pre and post measurements in the level of some physical variables and

the level of skill and numerical performance of high jump players. The control group ranged from (1.98 to 2.98) The value of the scale at the level of significance (0.05).

Table (5)

The significance of the differences between the two dimensions in the level of some physical variables and the skill and numerical performance of high jump Players Experimental search and control N 1 = n 2 = 10

Tests	Measurement unit	Pre measurement		Post measurement		T value	Level of significance	
		SMA	standard deviation	SMA	standard deviation			
Strength of abdominal muscles	No	24.45	0.62	20.60	0.51	3.11	significance	
Strength of back muscles	Kg	20.44	0.25	18.25	0.25	3.25	significance	
Strength of the muscles of the legs	Kg	48.15	0.21	39.30	0.32	3.54	significance	
Strength of the center	S	46.70	0.36	43.90	0.25	3.24	significance	
The ability of the two legs	Cm	83.70	0.85	73.95	0.14	3.65	significance	
Strength of abdominal muscles	No	34.18	0.32	31.17	0.32	3.64	significance	
Level of skill performance	Accession	Degree	2.15	0.28	1.55	0.14	3.18	significance
	Upgrade	Degree	2.29	0.41	1.69	0.11	3.21	significance
	Running and falling	Degree	3.15	0.32	2.11	0.25	3.69	significance
	Total degree	Degree	7.59	0.18	5.35	0.41	3.32	significance
Digital level	Cm	171.32	0.32	167.10	0.18	3.47	significance	

* Tabular value (t) at significance level (0.5) = 1.746

Table (5) shows that there are statistically significant differences between mean distance measurements in the experimental and control groups at the level of some physical variables and the skill and digital level. The value of T ranged from 2.98 to 3.54.

Second: Discuss the results

Table (3) shows the existence of statistically significant differences between the averages of the pre and post measurements in the level of some physical variables and the level of skill and numerical performance of the high jump players.

The empirical research group where the value of (T) ranged from (4.14 to 4.85) The value of the scale at the level of significance (0.05).

The researcher attributed this improvement to the good planning of the training program of the center's power and the regulation of training loads in a scientific manner suitable for the age and training phase of the research sample to use the Swiss ball training and light weights as a main part in the strength training center for the development of muscle strength. By training various muscle groups, especially the muscles of the central part.

The results of this study indicate that the exercises used in the study, such as muscle strength, strength, balance, strength training and stability exercises, improved the level of physical strength of the muscles (arms, legs, back, abdomen), muscular strength (arms and legs) Center, balance of foot (left and right).

The results of this study are consistent with Shaimaa Najib (2015), (4), Amr Abu El Fadl (2015). (7) The proposed program using the center's training had a positive effect on

the development of these variables.

The researcher attributes this improvement to the proposed program using The training of the center, as training the stability and strength of the muscles of the center main exercises help to improve the results of the rest of the measurements of the variables in question

This is in line with Allen, Skip and Allen (2002). The most important benefits of exercise exercises are strengthening the muscles of the central part of the body, increasing the motor efficiency during exercise and daily activities, increasing the stability and stability of the body, producing tremendous strength of the muscles of the central part of the body, Neighboring (shoulder, arms and legs) (9:41).

In this regard, Dave Schmitz (2004) points out that the strong center muscles connect the lower end to the upper end, in addition to the training center strength includes multi-directional movements, multi-directional, where his exercises by focusing on one end single limb making it The best

exercises used to improve the strength of the center muscles (mid body). (25:12)

The improvement in the characteristic strength of speed (muscle capacity) is confirmed by Adams and others Allen, et al. (2002) (9) states that rubber reflex activity allows the excellent transfer of the force characteristic of velocity (muscle capacity) to the same biomechanical similar movements that require high capacity of the trunk and legs and show results at high jump performance.

The strength training and stability of the center have improved the ability of the nervous system to increase the compatibility of muscular action between the muscles of the upper and lower limbs of high jump athletes often require during the performance of the movement during the matches to the compatibility of large parts of his body during performance and this is linked to the ability of the central nervous system to provide tone muscular tension or muscular tension in proportion to the nature of the target performance as reflected reflexes work to achieve the balance required between the

processes of arousal and cessation during the system of muscles working within the performance of the movement (25: 8)

These results are consistent with "Nicole" (2009) (24) that the strong central muscles given to both the beatings of arms and movements of the two men is a key force to perform the movement and therefore strengthening these muscles will lead to a stronger and faster and through the above it is clear that the results achieved imposition The study, which provides that there are differences of statistical significance between the averages of tribal and remote measurements in some physical variables and the level of skilled performance of high jump players and in favor of the experimental research group.

Table (4) shows statistically significant differences between the averages of the pre and post measurements at the level of some physical variables and the level of skill performance among the high jump players in the control group. The table value ranged from 2.47 to 2.98.

The results of this study are based on the positive impact of the high-performance (traditional) high-performance performance control group, which is based on explanation and model. It includes explanation of performance and clarification of skill points with correcting mistakes, which improves the level of players. .

The researcher also attributes this progress to the efficiency of the control group. Regularity and continuous practice in addition to the continuous competition between the players to provide the best physical and skillful performance has had a significant impact on raising the level of physical abilities, which reflected the impact on the development of skills.

In the above, it is clear that the results achieved the imposition of the study, which provides that there are differences of statistical significance between the averages of pre and post measurements in some physical variables and the level of skilled performance of high jumpers and for the control group control

Table (5) shows that there are statistical differences between mean post measurements in the experimental and control groups at the level of some physical variables and the level of performance of the crushing wall. The value of T ranged from 1.98 to 3.54.

The researcher attributed the rate of improvement in favor of the experimental group from the control group to the proposed exercises for the stability of the alarm, which helped to strengthen the stability of the muscles of the central part, which in turn led to improve the skill level of high jump players.

The researcher also pointed out that the stability of the central part is an important factor in field and track sports and high jump, since the good player must have strong central muscles that help to increase the effectiveness of the technique and the overall form of performance, and therefore the researcher returns these differences that the proposed program for the development of stability The central part has a positive effect on improving the skillful performance of high jump skill.

Wilardson & Jeffrey (2007) note that the exercise performance to develop the stability of the central part on a non-stationary surface such as the Swiss ball is better than its performance on a stable surface, which helps to develop the elements of fitness.

The strength of the stability of the center improved the strength and ability of the muscles of both legs and arms as well as the balance element.

The success of the high skill performance in the high jump requires the ability of the muscles of the two legs so that the player can jump up and to the maximum distance and the strength and ability of the arms. .

The results of this study agree with the study of both Nicole Kahle (2009) [24] that the training center strength contribute to improve strength and muscle strength and balance.

The results show that there is a statistical difference between the two dimensions of the two dimensional measurements in the experimental and control groups at the level of some physical variables and the skill level of the high jump players

and for the experimental research group.

Conclusions

1- The program of training the stability of the central part led to an improvement in the strength of the muscles of the arms, strength of the muscles of the abdomen, strength of the muscles of the back, the strength of the muscles of the two legs in the high jump players.

2- The training program of the stability of the central part led to an improvement in the strength of the center of high jump players.

3- Program of training the stability of the central part led to an improvement in the level of muscle strength of the muscles of the arms and muscle capacity of the muscles of the two legs in the high jump players.

4 - Program of training the stability of the central part led to an improvement in the level of skill and digital performance of high jump players.

Recommendations

1- Practice exercises stability of the central part on other sports.

2- The application of exercises stability of the central part on other skills.

3- Identifying the effect of some other fitness elements on the muscles of the central part and their effect on the skill level.

References

1- Abdel Rahman Abdel Hamid Zaher: Physiology of jumping and jumping competitions, 1, the book center for publishing, Cairo, 2000

2- Ahmed Bashir Sharif: Jumping and High jumping in athletics, the House of Jamahiriya for publication and distribution and advertising, I 5, Libya, 2008.

3- Allen, Skip: "Core Strength Training", Science Institute Sports Science Exchange Roundtable, USA,2002

4- Amr Mahmoud Abu El-Fadl Effect of strength training and stability of the center on some physical variables and the level of some stability conditions in gymnastics, published scientific research, the 16th International Scientific Conference, Faculty of Physical Education for Boys, pyramid, 2015.

5- Bastoise Ahmed Bastawissi: Track races, field competitions "Education - Technic - training" I 3, Dar al-Fikr al-Arabi, Cairo, 2003.

6- Borghuis J, Hof AL, Lemmink KA. Source The importance of sensory-motor control in providing core stability: implications for measurement and training,2005

7- Byars,A , Gandy. Moodie ,N: Greenwood, L,Stanford, MS, Greenwood ,M (2011): "An Evaluation of the relationships Between core stability, core strength ,and running economy in trained runners, Journal of strength &conditioning research", National strength & conditioning Association.

8- Dave Salo & Scoll A. Riewald: Complete conditioning for swimming, Human Kintics, USA,2008

9- Dintiman,G., Ward, R., Tellez, T. & Dears, B Sport Speed, 2nd., ed., Human Kinetics Publishers, Champaign, Illinois, 2001.

10- Donald, C.P Jumping into Plyometrics, 2nd., ed., California, 2001

11- Elen Keighbaum, Katharine ‘ Barhtles Biomechanics, a Qualitative Approach for Studying Human Movement, 2nd ., Printed in U.S.A., 2005, P. 348

12-. Essam El-Din Abdel-Khaliq: Mathematical Training (Theories and Applications),

edition for publication and distribution, Alexandria, 2003.

13- Faries, M, and Greenwood, M.: Core Training: Stabilizing the Confusion. Strength and Conditioning Journal, 2007

14- Fredericson, M., and T. Moore: Core stabilization training for middle and long-distance runners. New Stud. Athletics, 2005

15- Havriluk, R. (2005). Performance level differences in swimming: A meta-analysis of passive drag force. Research Quarterly for Exercise and Sport, 76(2), 2005

16- Hisham Mohamed El-Giaouchi, Mamdouh Mohamed Bayoumi: Effectiveness of the pelvic stability on the level of production of the ability of jumping athletes, published scientific research, Journal of Physical Education Sciences, No. VII and VIII, Faculty of Physical Education,

17- Holcomb, W.R., Lander, J.E The Effectiveness of Modified Plyometric Program an Power and the Vertical Jump, Journal of Strength and Conditioning Research, 10 (2) May, 2001.

18- JA Freeman & others (2011): "The effect of core stability training on balance

and mobility in ambulant individuals with multiple sclerosis, A multi center series of single case studies.

19- John Mullen Buoyancy means (paws - buoys) and its importance to improve the performance of swimming, Human Quintx Magazine ,2011

20- King, M.,: "Core Stability : Creating a Foundation for Functional Rehabilitation," Athletic Therapy Today, March 2004

21- McGill, SM. Ultimate Back Fitness and Performance. Waterloo, ON: Wabuno, 2004.

22- Nicole Kahle (2009): The Effects of Core Stability Training on Balance Testing in Young, Healthy Adults, University of Toledo Honors Theses, Exercise Science

23- Pease, D.g Cognitive and Affective Assessments Through the use of Video Recall, Sea Games Scientific Congress, Chiang, Mai, Thailand, 5-8 December, 2000

24- Rolle, Rachael A.,MA (2006): "Core stability and overuse shoulder injuries in female collegiate swimmers"

25-Saeterbakken,Atle, Van den tillaar, Roland, Seiler, Stephen: "Effect of core stability training on throwing velocity in female Hand ball

player", National strength & conditioning Association, Vol.25.

26- Salmian Ahmed Hajar, Aways Mohammed Al-Jabali: Theoretical and Applied Athletics, Al-Tayseer Press, Cairo, 2001.

27- Shaimaa Mohammed Najib: The impact of training exercises the stability of the central part of the body at the physical level and the skill and digital competition for the payment of the package, published scientific research,

Journal of Physical Education Sciences, Faculty of Physical Education for Girls,

28- Steben, R.e.,& Steben, A.h The Validity of the Stretch- Shorting Cycle in Selected Jumping Events, J. Sports Med., Phys. Fitness, Turin, Vol.21, No.1, 2000

29- William E. prentice: Arnheim's principles of Athletic training Acompetency – Based Approach "11th " ed, Library of congress U. S. A,2003