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Original Article

The Effect of Core Drills on Developing Some Special Physical Abilities of Spike in Volleyball

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Abstract

The volleyball player cuts in average during the performance of the game about 1500 - 2000 m interspersed with about 100 - 350 movements, and each movement in the preparation and then rapid running and then a dynamic leap and therefore requires volleyball players exercises for the development of fitness Anaerobic especially for the elements of skill, speed, muscle strength. This study aims to design a training program using training core stability and identify its impact on the physical variables and the skill level of the participants. Thirty players from the Police Sports Club and Esco sports Club participated in the study. The results emphasis the positive effect of the designed training program that improves the core stability on both of physical and skill variables that tested in the study.

Keywords: *Core Stability , Training Program, Spike in Vollball*

Introduction

Athletic training aims to consistently guide athletes toward achieving peak performance in sports competitions. This is accomplished through effective coordination of physical capacities, and comprehensive development of physical fitness elements. Additionally, it involves acquiring and applying technical skills, achieving tactical proficiency, and successfully implementing gameplay strategies tailored to the individual athlete's needs. (Lotfy, 2006)

In modern volleyball, fitness is one of the most critical performance requirements. It serves as a decisive factor in winning matches, especially when competing teams have similar matched skill levels. Physical fitness is also essential for elevating players' overall performance standards (Hamdi, 1986)

Good core stability plays a key role in enhancing athletic performance and preventing injuries. Power generation originates from the trunk, and a well-conditioned core facilitates better control and distribution of this power, resulting in smoother, more efficient, and coordinated limb movements. Furthermore, strong core muscles minimize injury risks by maintaining proper posture and protecting the spine and skeletal structure during dynamic activities. (McGill, 2010)

The core is often described as a muscular box comprising the abdominal muscles at the front, the paraspinals and gluteals at the back, the diaphragm at the top, and the pelvic floor and hip girdle at the bottom. This structure contains 29 muscle pairs responsible for stabilizing the spine, pelvis, and kinetic chain during functional movements. Without these muscles, the spine becomes mechanically unstable under compressive forces as minimal as 90 N, which is far less than the weight of the upper body. When the core functions effectively, it ensures proper force distribution and maximum power generation with minimal strain or abnormal forces on the joints. (Venu, 2008)

Volleyball movements are primarily anaerobic, consisting of short bursts of intense activity lasting 5–15 seconds, followed by rest periods of 10–15 seconds. These movements are repeated thousands of times during matches and training, with players covering an average distance of 1,500–2,000 meters per match. This high-intensity activity relies heavily on anaerobic energy systems, speed, and muscular strength. (Mohamed, 1997)

The study aims to design a core stability training program and evaluate its effects on developing the physical variables and enhancing the skill levels.

Hypotheses

1. There are statistically significant differences between the pre- and post-measurements of the research sample in physical variables, favoring the post-measurements.

2. There are statistically significant differences between the pre- and post-measurements of the research sample in skill levels, favoring the post-measurements.

Method

The study used the experimental method, using an experimental design for measurement (pre-post) for one experimental group.

Participants

The research community has been chosen the way deliberate Volleyball players sit in Menoufia Governorate , reaching a strength of the research community (30) for the player.

Was selected sample way deliberate on the (10) players from Shebin El-Kom Sports Stadium players season 2019/2020, and the number of exploratory sample (20) player (10)

players from the Shebin El-Kom Sports Stadium players and outside the core sample, (10) players from Salam Sports Club in Tanta in order to conduct scientific transactions (Believe – stability).

The **researcher** finding homogeneity of the sample as a whole of (12) for the player to make sure they happen under the curve in the equinoctial variables (Age – Height - Weight - old training) and that are shown in table 1.

Table 1. Statistical characterization of the sample individuals in the variables "Age – Height - Weight – Training experience"

Variables	Unit	Mean	Median	SD	Skewness
Age	year	18.64	18.04	0.86	0.106
Height	cm	178.36	177.55	2.37	0.032
Weight	kg	70.46	69.32	1.62	0.557
Training experience	year	5.42	4.92	1.05	0.419

Table (1) shows that skewness of variables from research sample are between (+3, -3) in the variables of (Age - Height - Weight – training experience) which indicates the coherence of the sample.

The researcher also finding homogeneity of the sample in the physical and skill variables of the sample individuals and so are shown in Table (2).

Table 2. Statistical charcterization of the physical and Skill performance of the participants (n=30)

Variables	Unit	Mean	Median	SD	Skewness
Sit Ups (Bent Knees)	sec	13.16	13.00	1.14	0.42
Reverse Sit Ups	sec	22.31	23.00	1.18	0.18
push the medical ball	c.m	5.10	4.60	0.84	0.86
push the medical ball of the right hand	c.m	4.25	4.70	0.53	0.13
push the medical ball of the left hand	c.m	3.95	3.60	0.37	-0.67
serve	points	12.45	12.00	1.33	0.26
Cross spike	points	14.68	14.00	1.22	0.38
Line spike	points	13.74	13.00	1.41	0.44

Table (2) shows the homogeneity of the research sample in physical and skill tests, as the skewness of research sample are between (+3, -3) in the variables.

Collecting Data

The authors reviwed the studies that related to the aims of the current study in order to learn about core stability excercises, the objective physical tests, and the performance tests of the spike. After that, a questionnair of the collected variables and tests, experties were asked to answer this questionnair for selecting the appropiate tests to be used in the study.

Procedures

The realiability and the stability of the selected tests had to be verified. Therefore, two groups were asked to do the physical and skill tests, each group was (10) players.The first group was from Shebin El-Kom Sports Stadium players as a (distinguish group), while the second group was players from Salam Sports Club (non distiguish group), the tests were on Sunday, 4/ 10/2022 Shebin El-Kom Sports Stadium, and on Saturday, 3/10/2022 Salam Sports Club in Tanta. Table (3) shows the significance of differences between the two groups (distinctive and undistinctive) in the selected tests.

Table 3. Significance of differences between the distinctive and undistinctive groups In physical and skill tests (n1=n2=10)

Variables	Unit	Undistinctive group		distinctive group		Means difference	'T' value*
		mean	SD	mean	SD		
Sit Ups (Bent Knees)	sec	13.45	1.62	10.08	1.05	3.37	3.90
Reverse Sit Ups	sec	21.17	1.35	17.14	1.64	4.03	4.24
push the medical ball	c.m	5.20	0.25	3.61	0.16	1.59	11.98
push the medical ball of the right hand	c.m	4.57	0.13	3.11	0.31	1.46	9.71
push the medical ball of the left hand	c.m	3.18	0.11	2.65	0.26	0.53	4.20
serve	points	14.61	1.84	8.49	1.15	6.12	6.31
Cross spike	points	18.20	1.09	14.10	1.26	4.1	5.67
Line spike	points	17.57	1.16	13.22	1.39	4.35	6.02

* Tabular T value at (0.05) = (1.83)

Table (3) shows that there is no statistically significant differencse between distinctive and undistinctive groups in physical and skill tests, as the values of calculated "T" were greater than Tabular T value at (0.05). This result verify the the selected tests can distinguish between individuals.

Stability of the tests

The autheors re tested the two groups after a week in order to verify the stability of the tests. Table (4) shows the result of T test between the test and re-test output. Correlation between the test and the retest are positiv most of the tests are strongly correlated. That indicates to the stability of the tests.

Table 4. Stability of the physical and skill tests (n1=n2=10)

Variables	Unit	Test		Re-test		Means difference	corelation
		mean	SD	mean	SD		
Sit Ups (Bent Knees)	sec	13.45	1.62	13.29	1.49	0.16	0.914
Reverse Sit Ups	sec	21.17	1.35	21.00	1.41	0.17	0.961
push the Medical ball	c.m	5.20	0.25	5.37	0.24	0.17	0.985
push the Medical ball of the right hand	c.m	4.57	0.13	4.25	0.12	0.32	0.964
push the Medical ball of the left hand	c.m	3.18	0.11	3.44	0.12	0.26	0.934
serve	points	14.61	1.84	15.26	1.37	0.65	0.922
Cross spike	points	18.20	1.09	18.43	1.17	0.23	0.57
Line spike	points	17.57	1.16	17.81	1.34	0.24	0.39

Training Program

The training program was designed according to the energy system that vollyball players depends on to perform fast and powerful. Where the energy system contribution percentages during the game, as mentioned Al-Lala (2016), is (40%) ATP-PC, (10%) Lactic and (50%) Oxgyn The training load has to be graduallly and wavey for physiological adaptation in a way that ensure the appropriate intensity and the rest between exercis groups. The training program duration was devided into three phases, first the general preperation for four weeks from Saturday, 24/10/2022 to Wednesday, 18/11/2022, second the specific preperation for five weeks from Saturday, 21/11/2015 to Wednesday, 23/12/2022, third phase was preparing for the compitition for three weeks from Saturday, 26/12/2022 to Wednesday, 13/1/2023. Figure (1) presents the training load during the whole 12 weeks, where the maximum load intensity was (85-95%), the high load was (70-85%), and the medial load was (50-70%). Inside the training unit, the authors used (1-1) load form. The next are examples of the maximun, high, and medial loads (figures 2, 3,and 4).

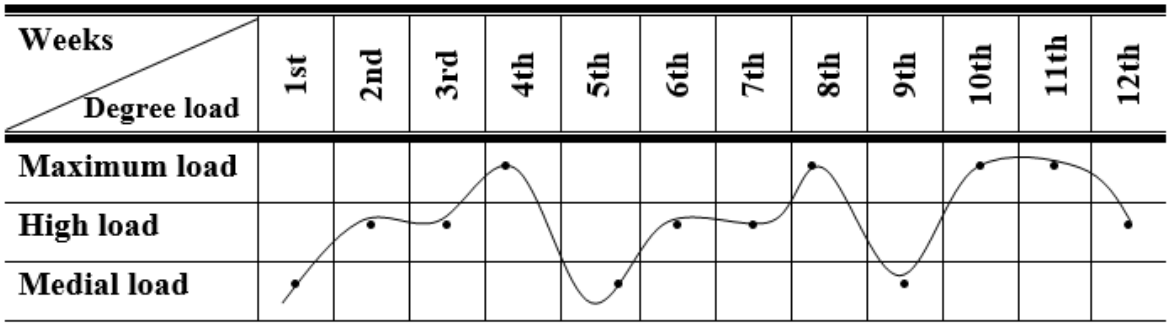

Figure 1. Training load during the 12 weeks of the training program

Days / dagree load	saturday	sunday	monday	tuesday	wednesday	thursday
Maximum load						
High load		•			•	
Medial load	•			•		
Unit time	90m	110m		90m	110m	

Figure 2. Example of a medial load week

Days / dagree load	saturday	sunday	monday	tuesday	wednesday	thursday
Maximum load		•			•	
High load	•			•		
Medial load						
Unit time	110m	130m		110m	130m	

Figure 3. Example of a high load week

Days / dagree load	saturday	sunday	monday	tuesday	wednesday	thursday
Maximum load	•			•		
High load		•			•	
Medial load						
Unit time	110m	130m		110m	130m	

Figure 4. Example of a maximum load week

According to the above figures the players trained (1200 min) under the medial load for 3 weeks, and (2400 min) under high load for 5 weeks , and (1940 min) under maximum load for 4 weeks, which means totally (5520 min) during the whole training program.

Table 6. Time plan of the training problems

phase		First phase				Second phase					Third phase		
Interval		General physical preparation				Special physical preparation					Games preparation		
Weeks		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
Maximum load					•				•		•	•	
High load			•	•			•	•					•
Medial load		•				•				•			
Total (100%) min		400	480	480	480	400	480	480	480	400	480	480	480
Warm up (10%) min		48	48	48	48	48	48	48	48	48	48	48	48
Physical preparation	load	65%	60%	50%	50%	45%	40%	35%	30%	25%	20%	15%	10%
	min	205	238	198	198	142	158	139	119	79	79	60	40
Technical preparation	load	25%	25%	30%	30%	35%	35%	35%	30%	30%	20%	20%	10%
	min	79	99	119	119	111	139	138	119	95	79	79	40
Tactical preparation	load	10%	15%	20%	20%	20%	25%	30%	40%	45%	60%	65%	80%
	min	32	59	79	79	63	99	119	158	142	238	257	316
Main part		316	396	396	396	316	396	396	396	316	396	396	396
Cooling down		36	36	36	36	36	36	36	36	36	36	36	36

Each training unit or session consisted of 3 parts, which were warm-up ,a main part , and cooling down. Warm-up aims to prepare and create the athlete in all respects for the main part, warm-up (12 min) allocated to the unit daily training during the training program the total time during which the mind own physical game of volleyball elements. While the main part represents allocated to the unit daily training total time during the program, and has those meals that contribute to the development of training status of the individual sports, as determined by those duties in accordance with the aim of the training module, taking into account the scientific conditions for each training in terms of intensity and size and density. Cooling down part aims to return to the athlete to normal status, after the effort, which represents a conclusion (9 min) allocated to the unity of the kidneys training time during the training program. Table (6) presents the time plan of the training program.

Measurements

Pilot Study

The main objective of conducting surveys is to identify the difficulties they may encounter researcher and scientific transactions of the tests used and the appropriate tools and equipment used in the study and application of some units of the program.

Pre-tests

The researcher conducting pre measurement of the research group and the experimental finding homogeneity of the sample in the variables (age - Height - weight – old training) and perform measurement tribal variables physical and skill on friday, 23/10/2015.

The proposed training program

The researcher from the application of the training program on Saturday, 24/10/2022 -to- Wednesday, 13/1/2023, and the duration of the training program (12) a week

Post-tests

After the time limit for the implementation of the basic experiment, the researcher conducting the after measurements of asample search for variables physical and skill on Saturday, 16.1.2016 took into account that the researcher is (post) measurements under the same conditions that were conducted in the pre- measurements..

Tools and devices

Restameter to measure length, weight balance, dinamomcitr device for measuring force, swiss balls, medical balls, stopwatch, Volleyball, cons , fome matresses, protractor scale on the wall.

Statistical analyses

The correlation coefficient to calculate the stability of physical and skill tests, Test "T", Analysis of variance in one direction, improvement Ratio by percentages.

Results

According to statisical analyses of the mentioned tests in this study, Table (7) shows the significant differences between the averages of two measurements pre and post in favor of (post) measurement in physical and skill variables where the value of calculated (T) were greater than the values of tabular (T) at (0.05).

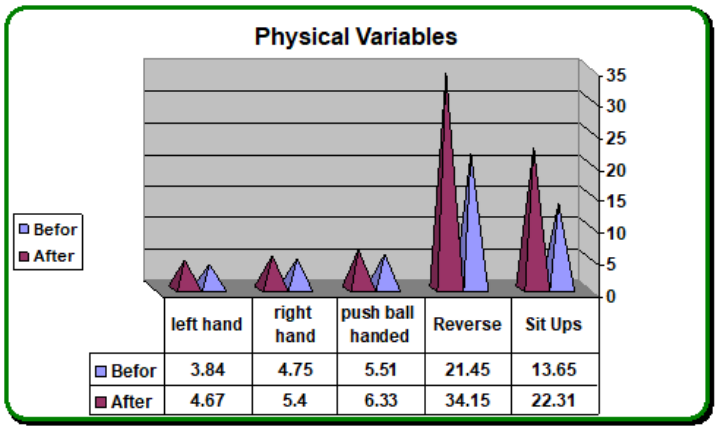

Figure 5. The differences between the pre and post measurements of the physical tests

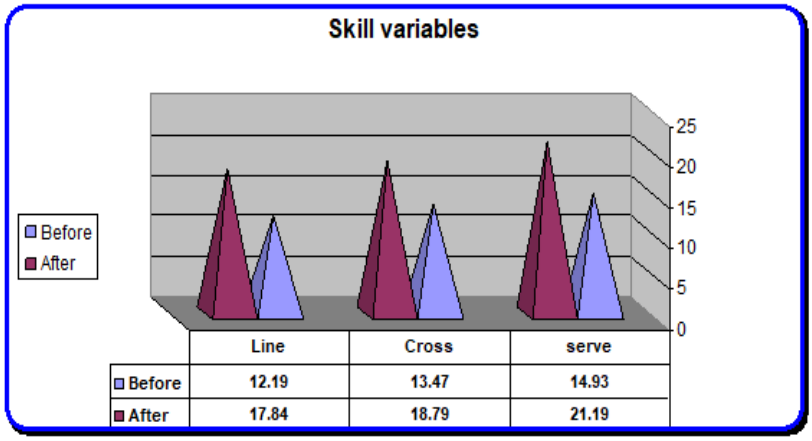

Figure 6. The differences between the pre and post measurements of the skill tests

Table 7. Significance of differences between the mean of (pre – post) measurements in physical and skill tests (n1=n2 =10)

Variables	Unit	Pre measurement		Post measurement		Means difference	'T' value *	Improvement Percentag
		mean	SD	mean	SD			
Sit Ups (Bent Knees)	sec	13.65	1.43	22.31	1.35	8.66	13.2	63.44
Reverse Sit Ups	Sec	21.45	1.37	34.15	0.76	12.7	12.2	59.21
push the medical ball	c.m	5.51	1.95	6.33	1.36	0.82	2.07	14.88
push the medical ball of the right hand	c.m	4.75	0.23	5.40	0.34	0.65	4.75	13.68
push the medical ball of the left hand	c.m	3.84	0.12	4.67	0.25	0.83	8.98	21.62
serve	points	14.93	1.94	21.19	0.89	6.26	8.80	41.93
Cross spike	points	13.47	1.41	18.79	0.73	5.32	5.42	39.50
Line spike	points	12.19	1.67	17.84	0.91	5.65	5.77	46.35

* The value of tabular"T" (0.05) = (1.83)

Discussion

It is clear from Table (7) and Figure (5) that there are statistically significant differences between the averages of the pre- and post-measurements in favor of the post-measurement (post-measurement) of the research sample in the physical variables, as the calculated (t) value was higher than the tabular (t) values paid at a significance level of (0.05).

The researcher attributes the improvement in the physical abilities of the experimental group to the effectiveness of the training program, which included exercises for the arms, legs and trunk. The training loads were regulated to suit the nature and characteristics of the age group of the research sample members, and the training was graduated from easy to difficult, which...

It arouses the players' interest and motivates them to exert more effort, thus raising the efficiency of the nervous and muscular systems, which works to develop and improve physical abilities..

This is consistent with Richardson (2004) states that trunk stability is a group of muscles that work to create stability and stability for the abdominal area, back area, and thigh area to perform the skill efficiently. Trunk stability exercises also work to make the spine more stable in terms of resisting gravity during movement.

Trunk stability exercises also affected the back muscle group, which helps in the movements of extension, bending and rotation of the spine.

The spine in any direction, which provides support to the spine, as it achieves stability for the center of the body and helps in the movements of arching backwards and rotating to the sides and protecting the spine from injury.

This is confirmed by Lorelase, (2009) The trunk muscles act as a bridge that connects the upper and lower limbs of the body. The force generated by the trunk is called the energy source for the limbs. In order for the body to be stable and secure, a healthy spine is required.

These results are consistent with the findings of the study of Mahmoud (2020), Al-Sayed (2017), and Rafat (2020), whose results indicated the effectiveness of training programs using trunk and shoulder stability exercises on variables. Physical, as training programs using trunk and shoulder stability exercises lead to the development of their various physical and skill abilities.

Thus, the researcher was able to verify the validity of the first hypothesis, which states that there are no statistically significant differences in the physical variables under study in favor of the post measurement

According to the results of the statistical research sample between the results of the pre- and post-measurement in the skill variables under study, it is clear from Table (7) and Figure (6) in terms of the differences between the averages of the pre- and post-measurements, and the absence of statistically significant differences between the pre- and post-measurement of the experimental research group, as the value of (t) (1.83) was less than the calculated value of (t)

at the significance level (0.50) in favor of the post-measurement, as the results showed a significant progress in the skill variables under study.

Ather points out Mohammed My patience The beautiful(2013)In order for a player to reach the desired level in his sport, he must train on many standardized training programs based on scientific foundations with the aim of providing players with the compatibility and physical capabilities specific to his sport. (4:63)

Physical fitness in volleyball is considered one of the most important requirements for performance in modern volleyball, as it is a decisive factor in winning matches, especially when it is equal to or close to the skill level of the teams, and a necessary condition for raising the level of players in volleyball. (Hamdi, 1986)

Simply put, good core stability can help maximize running performance and prevent injury. Power comes from the core, and a properly equipped core helps control that power, allowing for smoother, more efficient movement and better coordination in the extremities. Additionally, well-equipped core muscles help reduce the risk of injury from poor posture. The ability to maintain good posture while running helps protect the spine and skeletal system from extreme ranges of motion and from excessive or abnormal forces acting on the body.

This Agree with what He mentioned it. Abdel Fattah and Hassanein (2004) that only skill Training is not enough to improve This is amazing Skill And get On the results fruitful, where that it next to development Skill Must from Capacity development Physical And the movement Private With skill itself, Therefore to improve in Performance In a way general.

Issam Abdel Khaleq (2005) also adds that success in performing any skill requires developing the physical components that contribute primarily to performing it in an ideal and integrated manner.

It is clear from the foregoing that the improvement rates have gradually increased, indicating that the program has been well codified in the right frame where they can not come in the development of serve accuracy and attack spike only through training programs that were planned well.

And thus have achieved a second hypothesis, which states that no statistically significant differences in the skill variables under discussion in favor of the post measurement.

Conclusion

Considering the nature of this study and the sample and the methodology used and the results of the statistical analysis in the scope of this research researcher reached the following conclusions:

-The impact of the training program in the development of the physical requirements for a moment the muscles of the trunk through the implementation of the program for 12 weeks.

- There is a strong correlation between the development of the ability of muscle of the trunk and the ability for muscular arms through the implementation of the program for 12 weeks.

- Based on the outcome of the search results that there is a strong correlation between the development of the physical demands and the level of performance skills, the more increased physical demands increased improvement in the skill level of performance.

Recommendation

According to the nature of the study and the sample and the methodology used and the results of the statistical analysis, the researcher ased on the study's conclusions, sample, methodology, and statistical results, the researcher recommends that training programs for volleyball players should incorporate core stability exercises due to their significant impact on skill development. Additionally, similar studies should be conducted on other volleyball skills and across different individual and group sports.

References

Abdel Fattah, A. A., & Hassanein, M. S. (2004). *Physiology and morphology of athletes and methods of measurement and evaluation* (1st ed.). Dar Al Fikr Al Arabi, Cairo.

Abdel Khaleq, E. (2012). *Sports training: Theories and applications* (12th ed.). Manshat Al-Maaref, Cairo.

Abdel-Moneim, H. (1986). *Methods of analysis of the match in volleyball*. Arab Thought House, Cairo.

Abul-Ela, A. F. (1997). *Sports training: Physiological bases*. Arab Thought House, Cairo.

Akuthota, V., & Mocleb, A. (2008). Core stability exercise principles. *Current Sports Medicine Reports, 7*(1), 39–44.

Al-Jumaili, A. M. S. (2013). The rhythm of academic track and field Iraqi sports.

Elsaid, A. (2020). The effect of core stability exercises on muscle balance and the degree of performance of rhythmic exercises with tools for students of the Faculty of Physical Education (Master's thesis). College of Physical Education for Boys and Girls, University of Port Said.

Lorelase, B. (2009). Training for volleyball resources book. Retrieved March 15, 2012, http://www.barrylovelace.com

Lotfy, M. (2006). *Sporting achievement and the rules of training work*. Book Publishing House.

Mahmoud, A. (2020). The effect of the use of core stability exercises on the accuracy of performing the skill of overwhelming in volleyball (Master's thesis). College of Physical Education for Boys and Girls, University of Port Said.

Marshall, P. W. (2005). Core stability exercise on and off a Swiss ball. *Department of Sport and Exercise, University of Auckland, New Zealand, Archives of Physical Medicine and Rehabilitation*.

McGill, S. M. (2010). Core stability: Evidence and current concepts. *Journal of Back and Musculoskeletal Rehabilitation*.

Al-Lala, O (2016). Sports Training and Energy Production Sources, Moroco.

Refaat, M. (2020). The effect of using core stability exercises on kinetic balance and some skill performances for junior footballers. *Scientific Journal of Physical Education and Sports Sciences*, Faculty of Physical Education for Boys, Helwan University, (89).

Richardson, C., Hodges, P., & Hides, J. (2004). *Therapeutic exercise for lumbopelvic stabilization: A motor control approach for the treatment and prevention of low back pain* (2nd ed.). Churchill Livingstone, London.

Sobhi, M. (1997). *Scientific bases for volleyball and methods of measurement and evaluation*. Book Publishing House, Cairo.

Stanton, R., & Reabum, P. (2004). The effect of short-term Swiss ball training on core stability and running economy. *Journal of Strength and Conditioning Research*.

Talha, H. E. D., & Hamdy, M. (1997). *Scientific encyclopedia (1) in athletic training*. Book Publishing House, Cairo.