

## Effect of Functional Exercises on Some Components of Somatic Composition and Response of the Immune System in Discus Throwers

Mohammed Abdel Mawgoud Abdel Aal<sup>1</sup>

<sup>1</sup> Assistant Professor at the Department of Theories and Applications of Field and Track Events, Faculty of Physical Education for Boys, Zagazig University, Egypt

### Abstract

*The objective of this research was to establish a suggested training program by using functional exercises and to know the effect of such program on some components of somatic composition (percentage of body fat, mass of fatty cells, mass of non-fatty cells, body mass index, and total mass of body water) and the response of the immune system through such variables as function of the response of the immune system and those were (basophil, lymphocyte, monocyte, neutrophil and eosinophil) and the numerical level of discus throwers in the research sample. The researcher applied the experimental method to a sample of (7) competitors of athletics specialization at Sports Secondary School, Zagazig in 2013/2014 academic year by applying the suggested training program for (10) weeks to the research sample. The results showed that functional exercises had significantly positive effect on some components of somatic composition viz. percentage of body fat, mass of fatty cells, mass of non-fatty cells, body mass index and total mass of body water in the research sample individuals. Also, the functional exercises had significantly positive effect on the numerical level of discus throwers in the research sample as well as having significantly positive effect on variables as function of the response of the immune system viz. basophil, lymphocyte, monocyte and eosinophil in the research sample individuals. Moreover, the functional exercises led to percentage of improvement in the level of the lymphocyte variable; however, this improvement was non-significant in the research sample individuals. The researcher recommended the importance of using the functional exercises for their positive effect on some components of somatic composition and the response of the immune system in discus throwers.*

### Introduction and Research Problem

Science is the basis of the progress of nations and of determination and analysis of problems to resolve them for achievements. With science and thinking we can recognize impairments and defects to tackle and to resolve them and to discover the individual's potential abilities to show up accompanied with his strength and excellence.

Fabio Comana (2004) stated that the term "functional" was relative and its concept varied according to its objectives assigned for it to be applicable to individuals on purpose to improve their functional status and to help them perform their life activities very well. He added that functional exercises were integrated movements of multiple levels not depending on external anchors during the performance but they used the vertebral column to facilitate the movements. (Fabio comana, 2004: p88)

Dave Shamitz (2003) indicated that functional exercises were characterized by concentrating on the center muscles of center and alternating periphery group, the integrated movement, the qualitative activity and the qualitative speed. (Dave shamitz , 2003: p30).

Micheal Boyle (2003), confirmed that functional exercises were dealing with the function of the body movement and indispensable abilities to achieve the highest level of the athletic performance and specialized activity, to support the performance and to minimize injuries. ( Michael Boyle., 2003: p14)

The majority of scientists agreed during the international conference on training, physical fitness and health that physical fitness comprised six components such as flexibility, body formation, muscular strength, muscular endurance, aerobic ability and anaerobic ability (Abu Al-Ella Ahmed Abdel Fattah and Ahmed Nasr Al-Din, 2003: p25).

The effect of physical training and the occurrence of injuries on the immune system was the most important main point for the athlete due to the important role of this system in resisting diseases and physical changes when injuries occurred and healed quickly that they were increased in the training season and during competition (Shepard, R. J. and Shek, P. N., 1996).

Rated moderate physical training programs were useful for the immune system and working to activate it; however, non-rated long very severe exercises had side effects such

as susceptibility of viral infection, occurrence of diseases and immune tumors on the immune system (Baha'a El-Din Salama, 2002: p65)

The importance of the current investigation was existed in the necessity of the rated athletic training that included in its objectives the prevention of injuries to the player being trained and who is considered the main point of the training process; however, the researcher found out through his experience, the peruse and the constant follow-up of championships of all levels as well as his being a coach, the majority of couches do not consider how to avoid injuries as concerned with improving physical and skill aspects to the utmost level. On the other hand; the training load has been raised to its maximum level or as called to the imaginary level that has recently become the competition load training leading to increase injuries during training and competition. Hence, it has been necessary to consider studying and responding the immune system responsible for protecting the body from such injuries together with studying components of somatic formation as the more improvement of the components of somatic formation the better prevention of injuries. Therefore; the researcher decided to carry out the current investigation to set a sort of rated functional exercises and to know its effect on the components of somatic composition and the response of the immune system in discus throwers in the research sample to upgrade the numerical level of this event. Baha'a El-Din Salama (2002: p 65) confirmed that the rated moderate athletic training programs were useful for the immune system and they helped activate it and many functions of such system improved as a result of the rated regular athletic training.

Also, through his perusal of several scientific studies and in the limits of his knowledge, the researcher noticed that there has been no scientific study dealing with the effect of functional exercises on some components of somatic composition and the response of the immune system in discus throwers as this event depends on the explosive strength during the performance and consequently, the player becomes more susceptible to injuries as a result of the technique of performance of this event and that made the researcher conduct the current investigation to improve some components of somatic composition and the response of the immune system in the research sample to minimize the rate of injuries and to develop the numerical level.

## Research Objectives

The objectives of the current investigation were to set a suggested training program by using functional exercises and to know its effect on some components of somatic composition and the response of the immune system in the research sample through the following:

- To identify the effect of functional exercises on some components of somatic composition and the numerical level of discus throw in the research sample individuals.
- To identify the effect of functional exercises on the response of the immune system in the research sample individuals.

## Research Hypotheses

To direct the work in the research procedures and to pursuit to achieve the research objectives, the researcher set the following hypotheses:

- The functional exercises positively effect on some components of somatic composition and the numerical level of discus throw in the research sample individuals.
- The functional exercises positively effect on the response of immune system in the research sample individuals.

## Research Procedures

### Method:

The researcher applied the experimental method by using the experimental layout of the pre and post-measurements of one experimental group so as to suit the nature of the current investigation.

### Sample:

The research sample was selected intentionally from students specialized in athletics in the 3rd secondary grade at Sports Secondary School, Zagazig in 2013/2014 academic year. It purposely consisted of the best (7) students in discus throw of the event under investigation and another (5) students for the pilot study from the same research people. The following tables illustrate description and homogeneity of the sample individuals in the research variables under investigation.

Table 1  
Statistical description of the total research sample in growth variables (n=12)

No.	Variables	Measuring units	Arithmetic mean	Standard Deviation	Median	Skewness
1	Height	Cm	176.17	1.85	176.00	0.27
2	Weight	Kg	81.10	1.16	81.20	0.25-
3	Age	yr.	17.84	0.49	17.70	0.87
4	Training age	Yr.	8.13	0.48	8.10	0.16

Table 2  
Statistical description of the research sample in the components of somatic composition and the numerical level of discus throw of the sample under investigation (n=12)

No.	Variables	Measuring units	Arithmetic mean	Standard Deviation	Median	Skewness
1	Percentage of body fat	%	11.84	0.21	11.86	0.18-
2	Mass of fatty cells	kg	6.97	0.55	6.81	0.90
3	Mass of non-fatty cells	kg	47.61	0.45	47.41	1.32
4	Body mass index	kg/m <sup>2</sup>	20.81	0.52	21.13	1.82-
5	Total mass of body water	kg	34.31	0.44	34.17	0.92
6	Numerical level of discus throw	M	28.94	0.40	29.12	1.29-

Table 3  
Statistical description of the research sample in variables indicating to the response of the immune system under investigation (n=12)

No.	Variables	Measuring units	Arithmetic mean	Standard Deviation	Median	Skewness
1	Basophil	%	0.78	0.07	0.80	0.70-
2	Lymphocyte	%	33.98	0.80	34.25	1.01-
3	Monocyte	%	5.67	0.17	5.70	0.60-
4	Neutrophil	%	58.26	0.62	58.33	0.32-
5	Eosinophil	%	3.86	0.13	3.85	0.27

#### Tools of collecting data:

#### Equipment and tools used to measure the research variables:

- Restameter to measure height cm.(Mohammed Sobhi Hassanein, 2001:p52)
- Medical balance to measure total weight kg. (Mohammed Sobhi Hassanein, 2001:p51)
- 50 m -measurement tape.
- Discs of different weights (1.5, 1.75, 2 kg).
- Dumbbells and different medical balls of different weights in sufficient number.
- Statements prepared to tabulate data.
- Boxes of different heights.
- Chalks to draw and to measure stand broad jump court.
- Circle and throwing sector.
- Swedish bench.
- Electronic analyzer to analyze body components TBF410-Tanita.
- Sufficient number of plastic Syringes 5 and 10 cm. used one time only.
- Preservatives containing anticlotting powder (EDTA) to preserve blood till analysis.

- Preservative of tools, medical cotton and antiseptic.
- Sterile plastic test tubes to keep blood samples.
- Center Fugue to separate serum.
- Sterilization device, heparin and alcohol.
- Stethoscope to measure pulse rate at maximum oxygen consumption (Ali Mohammed Galal Al-Din, 2003:p82).

#### Methods of measuring the research variables:

The researcher reviewed a sort of specialized references and previous studies in the field of the specialization. He perused the national information network and he sat with some professors at Faculty of Physical Education and Faculty of Medicine to outline variables related to components of somatic composition and the response of the immune system. He concluded the following:

#### Variables related to components of somatic composition:

- Body mass index.
- Percentage of body fat (Fat %).
- Mass of body fat.
- Fat free mass.
- Total mass of body water.

**Variables related to the response of immune system:**

- Basophil
- Lymphocyte
- Monocyte
- Neutrophil
- Eosinophil

**Measurement of components of somatic composition:**

To measure components of somatic composition, the researcher used the bioelectric method as Jackson (1998) confirmed that this method was one of the main methods to know components and internal variables of the individuals (Jackson, 1998: p67).

The researcher used electronic body component analyzer TBF (Tanita) that depends on the examinee standing on the device to allow the electric current of 500 to 800 Amp / 50KHz. to pass from one of the two feet to the other through the two legs and a big part of the torso. The electric conductivity through cells between the two electrodes (the two feet) depends on water distribution and mineral salts in these non-fatty cells that contain a considerable amount of water in contrast to the fatty cells that contain a less amount of body water and consequently, the electric conductivity is faster and more

considerable in non-fatty cells in comparison with the fatty cells with the result that the amount of electric current passing through cells expresses the relative amount of fat content and can get data indicating to the body composition of the examinee. (<http://www.Tanita-scale.com/pro.scales/tbf410.html>).

**Measurement of the response of the immune system:**

A medical team of specialists was requested to take and to analyze blood samples. The analysis was conducted in laboratories belonging to Zagazig University.

Blood samples were taken after the examinee had worked on argometric bike at 60 to 70 rotations/min. under 150 Watt load intensity till reaching pulse rate of 150 to 170/min. then stopping and the examinee sit and the analysis specialist took the blood sample from the vein of the examinee in a step to analyze it and to get the percentages of variables related to the response of the immune system in the research sample.

**Pilot study:**

The researcher carried it out during the period from Monday, 2/12/2013 to Tuesday, 10/12/2013 on a sample of (5) students from the research people.

**Training program.**

Training weeks	Training content	Training load components			Total time in the program units
		Severity	Volume	Intensity	
1st and 2nd	A set of exercises (special physical preparation, functional exercises, skill preparation) to initialize the sample muscular sets.	55-75 %	4-12 times	2-4 min.	85-115 min
3rd and 4th	Special physical preparation, functional exercises to improve the skill performance of discus throw with concentration on the working muscles.	65-80%	6-10 times	2-5 min.	85-115 min
5th and 6th	Functional exercises and skill preparation with weights to strengthen the working muscles and to concentrate on the technical performance to improve the numerical level of discus throw.	70-80 %	8-12 times	4-6 min.	85-115 min
7th and 8th	Skill exercises to raise the level of technical performance and the use of all technical abilities from the functional aspect of the sample in addition to a set of functional exercises to improve the training status and to develop the sample tactic performance.	80-100 %	6-10 times	5-8 min.	85-115 min
9th	Skill exercises to raise the level of technical performance and the use of all technical abilities from the sample	90-100 %	6-10 times	5-8 min.	85-115 min

	functional aspect in addition to a set of functional exercises to improve the training status and to develop the sample tactic performance.				
10th	A set of exercises (special physical preparation, functional exercises, skill preparation) to slow down and to be ready for the post-measurement.	55-75 %	4-12 times	2-4 min.	85-115 min

### Conducting the research sample:

#### Pre-measurements:

They were carried out on the research sample individuals on the Zagazig University Stadium Track on Wednesday, 11/12/2013 where the numerical level of discus throw was measured and on the following day variables of the components of somatic composition were measured and blood samples were taken to be analyzed in laboratories of hospitals of Zagazig University to measure the response of the immune system in the research sample individuals.

#### Applying the training program:

The suggested training program was applied to the research sample individuals with effect from Saturday, 14/12/2013 to Thursday, 20/2/2014 for (10) training weeks by (4) units per week under the supervision of the researcher. The main part in the training unit extended from 90 to 120 min.

#### Post-measurements:

They were conducted on the research sample individuals on the Zagazig University Stadium Track on Saturday, 22/2/2014 and the numerical level of discus throw was measured and on the following day variables related to the

components of somatic composition were measured and blood samples were taken to carry out the analysis in laboratories of hospitals of Zagazig University to outline the response of the immune system in the research sample individuals. The researcher considered that the post-measurement was under the same conditions and descriptions of the pre-measurement to avoid mistakes.

#### Statistical treatments:

The non-barometric statistical technique with SPSS program was applied to suit the nature of the current research and it included the following:

- Arithmetic mean.
- Median.
- Standard deviation.
- Wilcoxon's test.
- Skewness coefficient.
- Mean of categories.
- Significance of probability of values.
- Percentages of improvement.

### Presentation and Discussion of Results

#### Presentation of results:

#### Presentation of results of the 1<sup>st</sup> hypothesis:

Table 4

Significance of differences between the pre and post-measurements in the components of somatic composition and the numerical level of discus throw under investigation (n=7)

No.	Variables	Units	Pre-measuremen t X <sup>-</sup>	Post-measurement X <sup>-</sup>	Categories mean		Statistic Z- test from Wilcoxon	Significance of probability values
					(-)	(+)		
1	Percentage of body fat	%	11.80	9.59	4.00	0.00	2.37	0.02
2	Mass of fatty cells	k.g	7.07	5.75	4.00	0.00	2.37	0.02
3	Mass of non-fatty cells	k.g	47.69	51.40	0.00	4.00	2.37	0.02
4	Body mass index	k.g/m <sup>2</sup>	20.81	19.13	4.00	0.00	2.37	0.02
5	Total mass of body water	kg	34.32	38.34	0.00	4.00	2.37	0.02
6	Numerical level of discus throw	m	28.93	33.17	0.00	4.00	2.37	0.02

\*Significant at probability value < 0.05

Table 5  
Percentage of improvement in the components of somatic composition and the numerical level of discus throw (n= 7)

No.	Variables	Measurement Units	Pre-measurement	Post-measurement	% of improvement
			X <sup>-</sup>	X <sup>-</sup>	
1	Percentage of body fat	%	11.80	9.59	23.01
2	Mass of fatty cells	kg	7.07	5.75	23.09
3	Mass of non-fatty cells	kg	47.69	51.40	7.80
4	Body mass index	kg/m <sup>2</sup>	20.81	19.13	8.76
5	Total mass of body water	kg	34.32	38.34	11.73
6	Numerical level of discus throw	m	28.93	33.17	14.68

Table 6  
Significance of differences between the pre and post-measurements in variables related to the response of the immune system under investigation (n=7)

No.	Variables	Units	Pre-measurement X <sup>-</sup>	Post-measurement X <sup>-</sup>	Categories mean		Statistic Z-test from Wilcoxon	Significance of probability values
					(-)	(+)		
1	Basophil	%	0.77	0.53	4.00	0.00	2.37	0.018
2	Lymphocyte	%	33.97	32.91	4.17	3.00	1.86	0.063
3	Monocyte	%	5.67	4.43	4.00	0.00	2.38	0.02
4	Neutrophil	%	58.29	59.42	0.00	4.00	2.37	0.02
5	Eosinophil	%	3.85	2.46	4.00	0.00	2.37	0.02

\*Significant at probability value < 0.05

Table 7  
Percentage of improvement in variables related to the response of the immune system (n=7)

No.	Variables	Measurement Units	Pre-measurement	Post-measurement	% of improvement
			X <sup>-</sup>	X <sup>-</sup>	
1	Basophil	%	0.77	0.53	46.47
2	Lymphocyte	%	33.97	32.91	3.21
3	Monocyte	%	5.67	4.43	28.06
4	Neutrophil	%	58.29	59.42	1.94
5	Eosinophil	%	3.85	2.46	56.51

## Discussion of Results

### Discussion of results achieving the 1<sup>st</sup> hypothesis:

Through the presentation of results concluded by the researcher from the pre and post-measurements during running the basic experiment, the researcher analyzed such results by using the non-parametric statistical method on SPSS program he achieved the following:

Data in Table (4) illustrate significance of differences between the pre and post-measurements by using Wilcoxon's test in the components of somatic composition and the numerical level of discus throw in the research sample. It is indicated that there are significant differences in all variables related to the components of somatic composition and in the numerical level of discus throw between the pre and post-measurements in favor of the post-measurement in the research sample as the P. value is < 0.05 in these variables in the research sample individuals.

Also, data in the same table show that the mean categories between the pre and post-measurements are improved in all components of somatic composition and the numerical level of discus throw in the research sample as the mean categories in variables viz. percentage of body fat, mass of fatty cells and body mass index are all decreased towards negative signs indicating to the improvement. On the other hand; the mean categories in variables viz. mass of non-fatty cells, total mass of body water and the numerical level of discus throw are all increased towards the positive signs when comparing mean categories between the pre and post-measurements in the research sample individuals indicating to the improvement.

The researcher attributed such significance in the differences and improvement of mean categories towards negative and positive signs to the effect of the suggested training program by using functional exercises that has been applied to the research sample individuals during running the basic experiment as the functional exercises led to improve variables of the components of somatic composition through burning a proportion of body fat and consequently, the mass of muscles and non-fatty cells

were increased leading to improve the numerical level of discus throw in the research sample individuals. This agreed with results achieved by Krider, (1998), Mohammed Fekry Al-Sayed (2006), Osama Ahmed Zaki, (2011) and Mohammed Abdel Mawgoud, (2011) who stated that the exercise led to a positive effect on the constituents of somatic composition and the numerical level in samples of their researches.

As Lamp, (1992) mentioned that the exercise contributed to lower the volume not the number of fatty cells explaining the reason for decreasing the proportion of fat and consequently; the mass of non-fatty cells and body water was increased due to the connection between them as the mass of body water was increased with the increase of the non-fatty mass and it was decreased with increasing the mass of body fat. (Lamp 1992: p292)

Table (5) shows improvement percentages of variables of components of somatic composition and the numerical level of discus throw in the research sample. The results show that there percentages of improvement on the pretest and post test in favour of the post test in all variables.

The highest percentage of improvement was in Mass of fatty cells variable 23,04% . and the less percentage on variables Mass of non-fatty cells 7,80%. The other variable percentages ranged between those two extreme percentages, the cause of this improvement is attributed to the effect of that supposed training programme applied to the study sample, using functional exercises that have positive effect on those variables , this matches with what's found out by. Mohamed. fekry Alsayed (2006), Osama ahmed Zaki. ( 2011), . Mohamed Abdel Mawgood (2011) that training programmes were the main reason of improvement variables of components of body composition, Now the first hypothesis is valid

#### **Discussion of results achieving the 2<sup>nd</sup> hypothesis:**

Data in Table (6) show significance of differences between the pre and post-measurements through Wilcoxon's test in variables related to the response of the immune system as there are significant differences in all variables related to the response of the immune system in the research sample individuals between the pre and post-measurements in favor of the post-measurement as the probability value was  $< 0.5$  in such variables in the research sample individuals, whereas the differences are non-significant in the variable of lymphocyte as the probability value is  $> 0.5$  between the pre and post-measurements in the research sample individuals.

Data in the same table indicate that the mean categories of the pre and post-measurements are improved in all

variables related to the response of the immune system in the research sample individual as the mean categories in variables viz. basophil, lymphocyte, monocyte and eosinophil are all decreased towards the negative signs indicating to the improvement, whereas the mean categories in the variable of neutrophil is increased towards the positive signs indicating to the improvement when comparing the mean categories between the pre and post-measurements in the research sample individuals.

The researcher related this significance in the differences and the improvement in the mean categories towards the negative and positive signs in variables connected with the response of the immune system viz. basophil, lymphocyte, monocyte and eosinophil to the effect of the suggested training program that has been applied to the research sample individuals with a rated and scientific technique using the functional exercises that helped improve such variables through increasing the functional efficiency of these variables and in turn, the function of white blood cells represented the body line of defense against any microbe or injury was improved.

This agreed with results of Baha'a Al-Din Salama (2002) that the rated and moderate exercise programs were useful for the immune system and they helped activate it and the severe and long exercises led to inhibit different types of the response of this system. (Baha'a El-Din Salama, 2002: p65)

The researcher attributed the non-significance in the differences in the variable of lymphocyte between the pre and post-measurements to that this variable needed longer time of training as it was improved but not to the limit of significance and needed improvement on the long range. This agreed with results of Jeffery Friedman and Jeffery Halasz (1998), Mohammed Salah El-Din Mohammed (2000), Medhat Kassem Abdel Razek (2001), Michael Glessan (2002) and Mohammed Mohammed Ahmed and Mahmoud Mohammed Ahmed (2004) who achieved that the rated and regulated athletic exercise had a positive effect on the immune indications in their research samples.

Data in Table (7) refer to percentage of improvement between the pre and post-measurements in variables related to the response of the immune system in the research sample individuals. There are percentages of improvement between the pre and post-measurements in favor of the post-measurement in all variables as the greatest percentage of improvement is found in the variable of basophil of (46.47%) whereas the lowest percentage of improvement is found in the variable of neutrophil of (1.49%) and the other percentages of improvement range between those two values. The researcher attributed the reason of such improvement to

the effect of the suggested training program that was applied to the research sample individuals using functional exercises of this positive effect on such variables. This agreed with results of Mohammed Salah Al-Din Mohammed (2000) and Medhat Kassem Abdel Razek (2001) who found that their training programs led to percentages of improvement in variables of the immune system in their research samples. Through tables (7&8) the validity of the 2nd hypothesis is achieved stating “the functional exercises positively effect on the response of the immune system in the research sample individuals”.

### Conclusions

In the limits of the research sample, objectives and hypotheses and in the limits of the study and its results, the researcher achieved the following conclusions:

1. The functional exercises positively and significantly effect on components of somatic composition viz. percentage of body fat, mass of fatty cells, mass of non-fatty cells, body mass index and total mass of body water in the research sample individuals.
2. The functional exercises positively and significantly effect on the numerical level of discus throw in the research sample individuals.
3. The functional exercises positively and significantly effect on variables related to the response of immune system viz. basophil, lymphocyte, monocyte and eosinophil in the research sample individuals.
4. The functional exercises led to a percentage of improvement in the level of the variable of lymphocyte but this improvement has not reached the level of significance in the research sample individuals.

### Recommendations

In the limits of the research sample and results achieved, the researcher recommended the following:

1. The functional exercises should be used for their positive effect on some components of somatic composition.
2. The functional exercises should be used for their positive effect on the numerical level of discus throw.
3. The functional exercises should be considered to improve some variables related to the response of immune system.
4. It is necessary to consider improving the response of the immune system to avoid injuries in the discus throw event.

5. The quantitative values indicating to the components of somatic composition and the response of the immune system should be made as guidance to carry out similar researches in other competitions and using other samples.

### References

1. Abu Al-Ella Ahmed Abdel Fattah and Ahmed Nasr El-Din (2003): Physiology of Physical Fitness. 2nd Ed., Arab Thought House, Cairo. (in Arabic Language)
2. Ali Mohammed Galal Al-Din (2003): Physiology of Physical Education and Sports Activities. 2nd Ed. Arab Publication Center, Zagazig. (in Arabic Language)
3. Baha'a El-Din Salama (2002): Sports Health and Physiological Limits of Sports Activity. Arab Thought House, Cairo, . (in Arabic Language)
4. Dave Shamitz(2003) : Funcnaitonal training pyramids , new truer hight school , kinetic wellness department ,USA .
5. Fabio Comanna (2004) : Function training for sports , Human Kinetics, champing 1 L , England.
6. Jackson , A. , (1998) : Reliability and body composition , journal of applied physiology , Vol 55 , No 2 .
7. Jeffrey Friedman , Jeffrey halss (1998): Natue magazine , Lssue 395.
8. Kraider , R. , (1998) : Effects of greatine supplementation strength and sprint performance , medicine sport exercise.
9. Lamb. D,. (1992): Physiology of exercise responses and adaptation 2nd , edmacmillan publishing company , New York, USA.
10. Micheal Boyle (2003) : Functional Balance training using adomed device , spine , vol . 21pp2640-2650, London .
11. Micheal glesson (2002): Biochemical and immunological markers of training , journal of sport science medicine .
12. Medhat Kassem Abdel Razek (2001): Effectiveness of strength and flexibility elements in the prevention of common injuries and the effect of injuries on the level of the immune system efficiency in soccer players. Ph.D. Thesis, Faculty of Physical Education for Boys, Helwan University. (in Arabic Language)
13. Mohammed Abdel Mawgoud Al-Sayed (2011): Effect of developing aerobic power on some somatic components and abilities of middle distance runners. Journal of Sports



Sciences and Arts, Faculty of Physical Education for Girls, Helwan University. (in Arabic Language)

14. Mohammed Mohammed and Mahmoud Mohammed Ahmed (2004): Effectiveness of integrated functional exercises on some physical variables and the level of blood macro-elements and the level of numerical achievement in running short distances. Scientific production. Journal of Medicine, Faculty of Medicine, Zagazig University. (in Arabic Language)

15. Mohammed Fekry Sayed Ahmed (2006): Effect of using weight training to develop muscular power on some components of somatic composition and sole motor performance for young handball players. Journal of Sports Sciences and Arts, Vol. (25), No. (3). Faculty of Physical Education for Girls, Helwan University. (in Arabic Language)

16. Mohammed Salah Al-Din Mohammed (2000): Effect of performing exercises of different severity on the body

immune system in 100m, 1500m, 5000m runners in track events. Ph.D. Thesis, Faculty of Physical Education, Port Said, Suez Canal University. (in Arabic Language)

17. Mohammed Sobhi Hassanein (2001): Measurement and Evaluation in Physical and Sports Education. Arab Thought House, Cairo. (in Arabic Language)

18. Osama Ahmed Mohammed Zaki (2011): The effectiveness of functional exercises on some physical variables and mineral intensity in lumbar vertebrae of spinal column and the level of the numerical achievement in discus throw. Journal of Sports Sciences and Arts. Faculty of Physical Education for Girls, Helwan University. (in Arabic Language)

19. Shepard RJ. , Shek PN. , (1996) : Impact physical activity and sport on immune system , Rev ,Environ health II (3) : 133 - 47 .

20. [Http:// www. Tanita-scale.com/pro.scales/tbf410.html](http://www.Tanita-scale.com/pro.scales/tbf410.html)