

The Effect of Specific Endurance Exercise on Some Physical Variables and Functional Indicators during Wrestlers' Anaerobic Change Threshold.

Samir Abd El Nabi Shaaban Essa

Department of training exercises and gymnastics - Faculty of Physical Education for Men, Alexandria University, Egypt.

Waleed Mohsen Moustafa Nasra

Department of combat training and individual sports, faculty of Physical Education for Men, Alexandria University, Egypt.

Abstract

This research aims to identify specific endurance exercise on some physical variables and functional indicators during wrestlers' anaerobic threshold, Main study conducted using experimental approach on a random sample of (20) wrestlers from wrestling team at Faculty of Physical Education for Men, Alexandria University, experiment conducted for (10) weeks, (30) training unit, (3) units weekly.

The most important results :

- 1- *Post-measurements for all physical variables (under study) were better than pre-measurements during wrestlers' anaerobic change threshold .*
- 2- *Post-measurements for all Functional indicators (under study) were better than pre-measurements during wrestlers' anaerobic change threshold.*

Through these results, researchers recommend the following :

- 1- *Using the proposed exercises program with specific endurance exercises in wrestling sport to improve physical and functional variables during wrestlers' anaerobic change threshold, and in turn improve performance level and access highest performance levels .*
- 2- *Using the proposed exercises program with specific endurance exercises in sports generally, and specifically in individual combat sports to improve physical and functional variables during anaerobic change threshold, and in turn improve athletes' performance level and access highest performance levels.*
- 3- *This study results to be communicated to Egyptian Federation of Wrestling to be benefited with during preparation of Egyptian wrestling team..*

Introduction:

Standardized athletic training and its physical and skill requirements are considered of the most important factors that lead to improve functional processes which confer its practitioners some functional changes that occur under systemized training loads' influence. Training programs and loads are considered purposeful stimuli lead to enhance physical, functional and skill levels to access high performance levels.(Hammad, 2009:p70)

Athletic achievement and player's motor performance mastering are determined by what he has from functional ability, therefore modern trend to improve player' physiological efficiency is directing training programs to focus on developing energy fitness. One of the most important training functional aims is to achieve the maximum of aerobic and anaerobic energy production systems (El-Sayed, 2002: p2), as well as the training process aim is to find out best ways that work on

developing player's achievement. (Abdel-Khalek, 2000: p114).

Standardized training programs are working to improve physical and functional levels and develop body systems to advance motor activity and access to highest sport levels, that is through physical exercises systems which are the basis for developing human body's vital systems. (Zahran, 1997: 9)

There is necessity for an athlete to has some physical abilities associated with achievement in specific sport activity; namely strength endurance, speed endurance, power endurance, and performance endurance, which are integrated with each other in mutual influence for well completion and delivery of performed movement. (Gallahue, 1993: p22), (Wall& Murray, 1995: p15), (Kudo, 2008: p1)

Wrestling requires wrestler to have special abilities to win and access high levels and needs distinct and integrated preparation of all aspects: physical, functional, skill ,

tactical and mental according to nature of the combat (Al-Rihani, 2006:p86)

Wrestling's performance effectiveness is determined by wrestler's ability of recording largest number of technical points during the performance of group of artistic movements without any falling in his physical, functional abilities could prevent following movements' intensity and continuity (El-Roby, 2007:p25)

Physical and functional characteristics which determine wrestlers' performance are the basis for success in the combat. Adjusting training loads and organizing training process is imperative in developing these physical and functional determinants. (Oppliger et al, 2008: p156) (Horswill, 2008:p25)

Wrestling's specific endurance is one of the complex physical characteristics that combines strength, speed and performance endurance, low level of wrestlers' specific endurance lead to weak ability to continue combating with high efficiency, in addition to the negative impact on recovery speed between matches. (Qutb, 2002: p3)

Specific wrestling' endurance requires the ability to continue exert strength that guarantees performing skills and overcome opponent's resistance until the end of match. (Fodor, 1992: p41)

There is an importance for developing wrestlers' specific endurance associated with latest amended for match time, which was approved by the International Federation of Associated Wrestling (FILA, 2014), where match time became six minutes divided to two equal rounds separated by 30 seconds rest period (<http://www.file-official.com>)

Wrestling is characterized with competitive nature, where all matches are played in one day, leading to wrestler exposure to fatigue and inability to continue playing the same efficiency with a drop in player's physical and functional abilities due to performance repetition. (Abdel-Halim, 2013: p4)

Researchers - through the follow-up of performance level of faculty wrestling team during Alexandria University wrestling championships- noted significant drop of players' physical and functional level; which leads to significance occurrence of fatigue phenomenon and the inability to continue performance effectively. Researchers are in the opinion that wrestling specific endurance as required by this study nature means wrestler's ability to face fatigue when continue training in anaerobic conditions for the maximum training or match time with high functional efficiency and without any drop of physical and skill performance level..

The importance of specific endurance exercise and its impact on physical and functional aspects within different sport athletes is evidenced by the changes in heart muscle, improvement in blood circulation, increase in heart size, increase in blood volume pushed by heart, improving lung ventilation, using players' economically, mastering motor duties with good coordination, ability to exert continuous effort for long time, improvement in the ability of muscular and respiratory systems, an increase in rib cage width, and developing motor muscular coordination. (Tolan et al, 2012: 176)

Anaerobic threshold level is determined by athletes' specific preparation and individual differences. Specific endurance lie in sub-maximal load area and high intensity area; therefore determination of anaerobic change threshold considered is considered a criterion with utmost importance when testing physical efficiency and also in determining load intensity for athletes to develop athletes' endurance level and delay the onset of fatigue, which invited the researchers to conduct this study as an attempt to develop athletes' physical and functional level anaerobic change threshold using exercises for specific endurance and its compounds (strength, speed, and performance endurance).

Research objectives:

The research aims to identify:

- 1- The effect of specific endurance exercise on some physical variables during wrestlers' anaerobic change threshold
- 2- The effect of specific endurance exercise on some functional indicators during wrestlers' anaerobic change threshold

Research Hypotheses:

- 1- There are statistically significant differences between pre and post measurements in some physical variables during wrestlers' anaerobic change threshold in favor of post measurement.
- 2- There are statistically significant differences between pre and post measurements in some functional indicators during wrestlers' anaerobic change threshold in favor of post measurement.

Research procedures: -

Research Methodology: -

Experimental approach with one group design has been used as it suits research nature

Research domains:

Human domain:

The study was conducted on a sample of wrestling players in Faculty of Physical Education for Men, Alexandria University.

Spatial domain:

Research has been applied in combat lounge and Exercise Physiology Laboratory at Faculty of Physical Education for Men, Alexandria University

Time domain: -

Pilot study was conducted in the period from December^{1st}, to December^{8th}, 2013, Pre measurements conducted in the period from December^{9th}, to December^{12th}, 2013, main study conducted in the period from December^{14th}, 2013 to March ^{5th}, 2014 and dimensional measurements in the period from March ^{6th} to March ^{9th}, 2014.

Research sample: -

Main study were conducted on a random sample of (20) players from wrestling team at Faculty of Physical Education for Men, Alexandria University, while pilot study were conducted on intentional sample of 10 students, including (5) distinctive players, and (5) indistinctive players.

Measurements and tests:

I- Basic measurements of research sample:

- 1- Age: has been calculated to the nearest month.
- 2- Total body height: has been measured to nearest one centimeter.
- 3- Body weight: has been measured to the nearest kilogram.

II- Specific physical tests:

Videography used to determine number of correct attempts during time allocated for each test

- 1- Power Endurance Test (Back Cast Skill Performance Test for 40 seconds) (Nasra,2004: p51)

- 2- Strength Endurance Test (Back Cast Skill Performance Test for 1 minute) (El-Roby,2005: p214)
- 3- Specific Power Test (Bridge Skill 3 times Performance Test) (Issa,1995: p49)
- 4- Agility Test (Bridge Skill 10 seconds Performance Test) (Issa,1995: p 47)
- 5- Speed Endurance Test (Bridge Skill 30 seconds Performance Test) (El-Roby,2005: p 212)
- 6- Performance Endurance Test (Bridge Skill 60 seconds Performance Test) (El-Roby,2005: p 212)

III- functional measurements:

Measurement of respiratory functions done using argospirometer device (Everson, 2001)

- 1- Heart rate (HR).
- 2- Heart rate reserve (HRR).
- 3- Oxygen pulse (O₂PULS).
- 4- Oxygen uptake volume (VO₂).
- 5- Specific Oxygen uptake volume (VO₂/KG).
- 6- Carbon dioxide uptake volume (VCO₂).
- 7- Breathing Exchange rate (BER).
- 8- Maximal pulmonary ventilation (VE_{max}).
- 9- Breathing reserve (BR%).
- 10- Breathing frequency (BF).

Pilot study:

Pilot study was conducted to confirm suitability of physical tests to research sample by standardizing the tests (Tables 1, and 2).

Validity coefficient:

Table (1)

differences between distinctive and indistinctive groups to calculate validity coefficient for specific physical tests

Statistics		Distinctive group n=5		Indistinctive group n=5		Mean differences	T value	Validity coefficient
		Mean	SD	Mean	SD			
Power Endurance Test	Back Cast Skill Performance Test for 40 seconds	11.05	2.14	7.23	0.55	3.82	*3.87	0.81
Strength Endurance Test	Back Cast Skill Performance Test for 1 minute	2.60	0.55	4.60	0.55	2.00-	*5.77	0.90
Specific Power Test	Bridge Skill 3 times Performance Test	6.60	0.55	10.40	1.34	3.80-	*5.86	0.90

Statistics Specific Physical tests		Distinctive group n=5		Indistinctive group n=5		Mean differences	T value	Validity coefficient
		Mean	SD	Mean	SD			
Agility Test	Bridge Skill 10 seconds Performance Test	11.20	2.17	17.60	0.89	6.40-	*6.10	0.91
Speed Endurance Test	Bridge Skill 30 seconds Performance Test	8.40	0.89	15.80	1.10	7.40-	*11.70	0.97
Performance Endurance Test	Bridge Skill 60 seconds Performance Test	11.20	0.84	21.00	2.55	9.80-	*8.17	0.94

* Significant at the 0.05 level = 01.86

Table (1) results reveal availability of statistically significant differences between distinctive and indistinctive groups. T value ranged between (3.87 to 11.70); these values are significant at 0.05 level. The

validity coefficient ranged between (0.81 to 0.97), which confirms that tests are valid, and measure what they designed for.

Reliability coefficient:

Table (2)
Differences between first and second test applications to find reliability coefficient for (n=10)

Statistics Specific Physical tests		1 st application		2 nd application		Mean differences		T value	Reliability coefficient
		Mean	SD	Mean	SD	Mean	SD		
Power Endurance Test	Back Cast Skill Performance Test for 40 seconds	11.05	2.14	11.03	2.13	0.02	0.05	1.11	0.94
Strength Endurance Test	Back Cast Skill Performance Test for 1 minute	2.40	0.89	2.50	0.50	0.10-	0.55	0.41	0.94
Specific Power Test	Bridge Skill 3 times Performance Test	7.60	1.34	7.70	1.72	0.10-	0.55	0.41	0.97
Agility Test	Bridge Skill 10 seconds Performance Test	12.70	2.44	12.60	2.86	0.10	0.65	0.34	0.98
Speed Endurance Test	Bridge Skill 30 seconds Performance Test	8.80	2.17	8.90	1.78	0.10-	0.65	0.34	0.96
Performance Endurance Test	Bridge Skill 60 seconds Performance Test	13.10	2.25	13.20	2.17	0.10-	0.22	1.00	0.99

* Significant at the 0.05 level = 2.262

Table (2) results reveal that there is no statistically significant difference between the two tests applications, T values ranged between (0.34 to 1.11). These values are not significant at 0.05 level. The reliability coefficient ranged

between (0.94 to 0.99), which confirms that the tests are reliable and give same results if re-applied on the same sample at the same conditions..

Homogeneity:

Table (3)
Statistical indication for research sample basic variables (n = 20)

Statistics Basic variables	Mean	SD	Skewness	Kurtosis	differentiation factor %
Age	20.60	0.50	0.44-	1.02-	2.43%
Height	175.40	4.83	0.27	0.51-	2.75%
Weight	73.60	2.12	0.30	0.48-	2.88%
Training age	2.50	0.19	1.08	0.08	7.53%

Table (3) results reveal that skewness values were between (-0.44) to (1.08) which are between (± 3); which confirm that sample are free from un-normal distributions defects, table results also shows that differentiation coefficients are

between (2.56%) to (7.53%), value of less than 20% of average, which indicates homogeneity of research sample in all the variables under consideration.

Table (4) Statistical indication for physical tests for research sample (n = 20)

Statistics		Mean	SD	Skewness	Kurtosis	differentiation factor %
Specific Physical tests						
Power Endurance Test	Back Cast Skill Performance Test for 40 seconds	11.08	0.94	0.62-	0.62-	%8.46
Strength Endurance Test	Back Cast Skill Performance Test for 1 minute	2.75	0.15	0.13-	0.08-	%5.46
Specific Power Test	Bridge Skill 3 times Performance Test	7.90	0.74	0.30	0.78-	%9.42
Agility Test	Bridge Skill 10 seconds Performance Test	12.65	1.13	0.29	0.28-	%8.96
Speed Endurance Test	Bridge Skill 30 seconds Performance Test	9.00	1.03	0.55	0.96	%11.40
Performance Endurance Test	Bridge Skill 60 seconds Performance Test	12.55	0.93	0.09	0.68	%7.40

Table (4) results reveal that skewness values were between (-0.78) to (0.96) which are between (± 3); which confirm that sample are free from un-normal distributions defects, table results also shows that differentiation coefficients are between (5.46%) to (11.40%), value of less than 20% of average, which indicates homogeneity of research sample in all the variables under consideration.

$$\begin{aligned} \text{targeted training pulse for 60\% intensity} &= \frac{60 \times \text{pulse reserve}}{100} + \text{resting pulse} \\ &= \frac{60 \times 129}{100} + 71 = 149 \text{ p/m} \end{aligned}$$

Main study:

The experimental group underwent a training program using specific endurance exercises (strength, speed and performance endurance).

The proposed program:

Program design foundation

- Periodic training with low and high intensity was used.
- Karvonen formula was used to determine targeted training pulse using value of pulse reserve as follows:

$$\text{targeted training pulse} = \frac{\text{intensity required} \times \text{pulse reserve}}{100} + \text{resting pulse}$$

Resting pulse = 71 p/m.

Maximal pulse = 220 - Age

= 220-20 = 200 p/m (Ackland,1999: p28), (Mcardle, & Katch, ,2001: p322), (Juba,2007: p20)

- Pulse Reserve = Maximal pulse - resting pulse

$$= 200-71 = 129\text{p/m}$$

- Intensity ranging between 60% - 85%.

- targeted training pulse for 85% intensity = 181 p/m
- So targeted training pulse is between 149p/m and 181 p/m.
- Thus with measuring resting pulse rates every two weeks to determine adaption with training load
- The principle of load and rest was used as training basis considering individual loads for research sample players as per each player’s physical ability. (Hassanein,2001: p101), (Osman,2000: p45)
- Load was increased gradually, and in continuity. (Hossam El-Din,1997:p44) (El-Bisatti,1998: 65), (Abdel-Khalek,2000: 76)
- Training unit consisted of (6) exercises.
- Exercises time performance were between (90-180) seconds.
- Resting pulse: between (120-130) p/m.
- Groups: between (2 and 3) times.
- Frequencies between (3 and 5) times.
- Rest time between groups (2 to 5) minutes.
- Rest time between exercises (45 to 90) seconds.

- Work to rest ratio: (1: 2)
- Average unit time (60 to 90 minutes) distributed as follows: (5) minutes of warm-up, (50 to 80 minutes) for main part, (5) minutes of cool-down.
- The experiment has been applied for (10) weeks - (30) training units, (3) units weekly, on Saturday, Monday and Wednesday.

SPSS program has been used in extraction of the following statistics:

Mean	Standard Deviation	Skewness coefficient
Kurtosis coefficient	Differentiation coefficient	Validity coefficient
Correlation coefficient	Improvement percentage	T paired test

Statistical work:

Results:

Table (5)
Statistical significance for specific physical test for experimental group before and after experiment

Statistics Specific Physical tests		Pre-measurement		Post-measurement		Mean differences		T value	Improvement Percentage (%)
		Mean	SD	Mean	SD	Mean	SD		
Power Endurance Test	Back Cast Skill Performance Test for 40 seconds	9.00	0.94	13.60	2.11	4.60-	3.10	*6.63	51.11
Strength Endurance Test	Back Cast Skill Performance Test for 1 minute	12.55	0.15	19.10	2.83	6.55-	4.32	*6.78	52.19
Specific Power Test	Bridge Skill 3 times Performance Test	11.08	0.74	8.87	1.48	2.20	2.88	*3.42	19.90
Agility Test	Bridge Skill 10 seconds Performance Test	2.75	1.13	4.05	0.94	1.30-	1.13	**5.15	47.27
Speed Endurance Test	Bridge Skill 30 seconds Performance Test	7.90	1.03	9.65	1.95	1.75-	2.95	*2.65	22.15
Performance Endurance Test	Bridge Skill 60 seconds Performance Test	12.65	0.93	15.20	2.46	2.55-	4.63	*2.46	20.16

* T significance at 0.05 level = 2.093

Table (5) results reveal availability of statistically significant differences between pre and post measurements in all specific physical tests where t value ranged between

(2.46, and 6.78), and all tests improved in post-measurements with improvements rates ranged between (20.16%), and (52.19%).

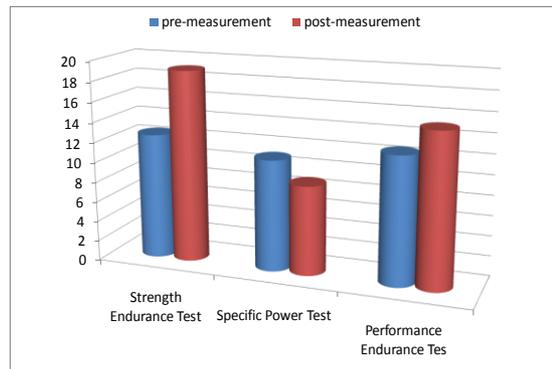
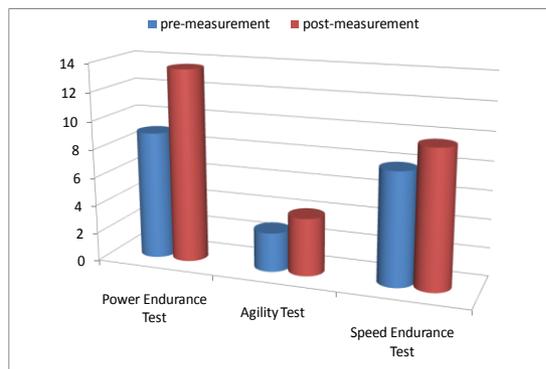


Figure (1) specific physical tests average for experimental group before and after experiment

Table (6)
 Statistical significance for functional measurements for experimental group
 before and after experiment

Statistics Functional measurements	Pre-measurement		Post-measurement		Mean differences		T value	Improvement Percentage (%)
	Mean	SD	Mean	SD	Mean	SD		
Heart rate (HR)	188.10	9.71	172.60	16.07	15.50	11.00	*6.30	8.24
Heart rate reserve (HRR)	25.05	13.06	19.80	12.20	5.25	4.19	*5.60	20.96
Oxygen pulse (O ₂ PULS).	16.40	7.58	20.50	7.61	4.10-	0.45	*41.00	25.00
Oxygen uptake volume (VO ₂).	3.00	1.45	4.05	1.47	1.05-	0.11	*43.62	35.10
Specific Oxygen uptake volume (VO ₂ /KG).	40.25	21.24	42.60	21.11	2.35-	0.30	*34.59	5.83
Carbon dioxide uptake volume (VCO ₂).	2.72	1.34	1.97	1.08	0.75	0.34	*9.86	27.48
Breathing Exchange rate (BER).	0.90	0.04	1.19	0.03	0.30-	0.05	*25.59	33.22
Maximal pulmonary ventilation (VE _{max}).	93.48	24.06	96.80	25.27	3.32-	5.43	*2.74	3.55
Breathing reserve (BR%).	48.70	23.22	41.25	21.25	7.45	3.41	*9.77	15.30
Breathing frequency (BF).	44.85	13.21	37.55	12.78	7.30	1.45	*22.44	16.28

* T significance at 0.05 level = 2.093

Table (6) results reveal availability of statistically significant differences between pre and post measurements in all functional measurements where t value ranged

between (742, and 362), and all tests improved in post-measurements with improvements rates ranged between (3.55%), and (35.10%).

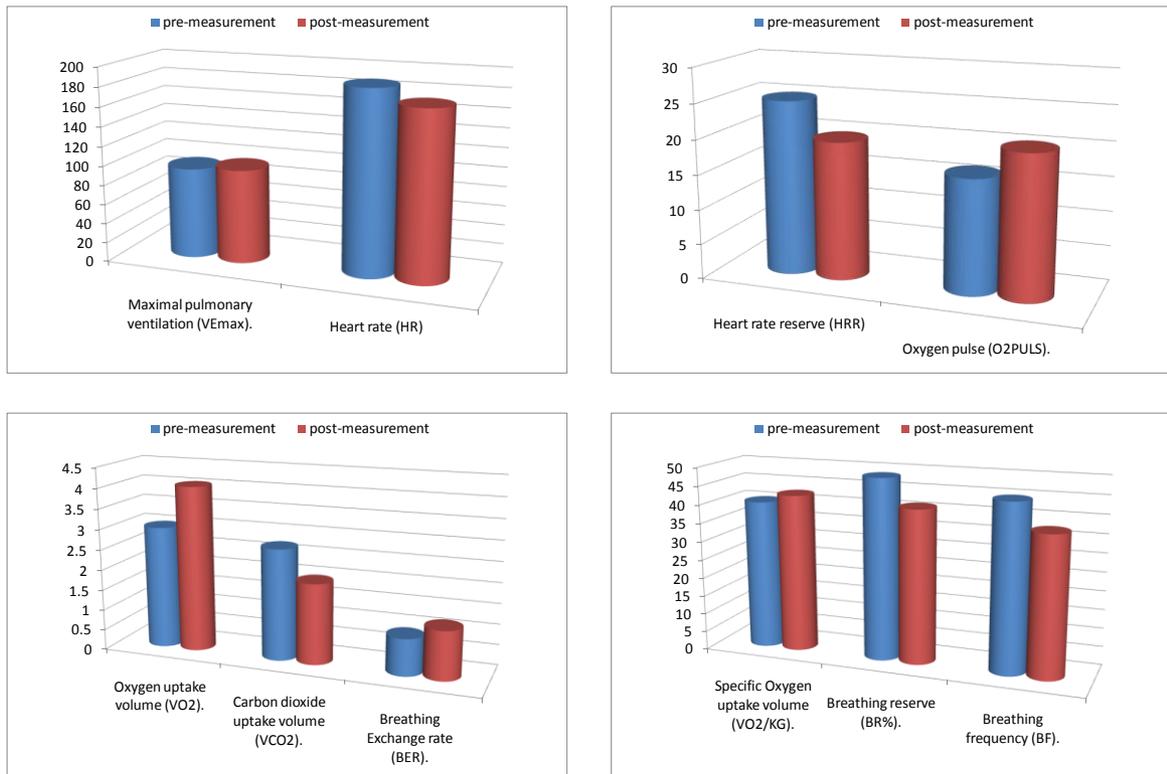


Figure (2) Functional measurements average for experimental group before and after experiment

Discussion:

Responses level to physical is based in functional development of body vital system, as it evidenced by this study result and the positive effect of the proposed training program in developing physical variables. Table (5) and Figure (1) show statistically significant differences between pre and post measurements of physical tests in favor of post-measurements

Researchers attribute this progress in all specific physical tests to training program effectiveness, as specific endurance exercises (strength, speed, and performance endurance) lead to develop physical variables and significantly delay the fatigue onset. (Ramadan, 2001) (Khattab et al, 2006) (Hariz, 2008).

Specific endurance exercises is characterized by contributing to rise player's general ability level in various sports activities (13), that is through regular and continuous training which work on development of physical abilities and develop them. (Celli, 1997) (Zahran, 1997) (Soliman, 2001)

El-Sayed (1994, p311) and Wilmore, and Costill (1994, p269) noted that sport training directed to develop some specific physical abilities could contribute to development of some other physical abilities; this is known by training positive impact transfer. (El-Sayed, 1994: p311), (Wilmore, and Costill, 1994: p269)

Martell (1993, p131) note that wrestling training during the season can improve some of physical abilities, e.g. strength, coordination, flexibility and agility.

Qutb (2002, p11) explain that ability to efficiently continue the combat to mach end and resist fatigue arising from performance, performing attack and defense skills while maintaining high functional efficiency require wrestler having a high level of endurance

Horsol (2008, p960) add that: in spite of short time wrestling match in comparison to many other sporting activities, but wrestler having specific endurance is able to continue combating during the game as well as completing the tournament.

Qutb (2002, p12) confirms that specific endurance training and its components improve physical and functional variables, as well as skill variables for wrestlers

Mahmoud (1982, p53) argue that wrestler acquire your endurance through skills training and competitive wrestling and that the best preparation for wrestling is wrestling itself

Table (6) and Figure (2) show statistically significant differences between pre and post measurements of

functional measurements in favor of post-measurements. Researchers attribute this improvement to the nature of proposed training program which used specific endurance exercises.

Specific endurance exercises improve lungs efficiency and capacity and positively affect heart and circulatory system, where it leads to a decrease in heart rate at rest, and work on the widening blood vessels and increase its elasticity and increasing the heart's ability to push more blood per minute. (Abdel-Rahman,2000: p12) (ElSayed & Noor, 2003: pp3.4)

Sharaf (2009, p226) argues tht physical exercise improves functional efficiency where oxygen pulse is one of measurements of heart efficiency as an index expresses the blood amount pushed from the heart in each pulse.

Scientific consensus confirm that standardized training is one of the most important factors that lead to improve functional processes which confers on its practitioners some functional changes that occur under the influence of training loads the organization, because the software and training loads are considered stimuli purposeful lead to elevate the level of physical, functional and skill to reach high levels. (Abdel Wahab, 1995: p71) (Hammad, 2009: 70)

Abdel-Fattah, (1997, p179) mentions that specific endurance lead to maximum use of functional abilities to resist fatigue and continue training and competition effectively to achieve high results in specialized activity

Tolan et al (2012, p76) mention that specific endurance has essential role in sporting achievements because it is related to efficiency type and its need extent to enable athlete to continue performance through availability of sufficient and appropriate endurance to face physical and functional effort and resist external influences that may face the athlete during performance. Specific endurance lead also as help athlete to face and accomplish some tactic requirements with high efficiency and easy performance whether in competition or training as specific endurance level integration lead to fewer tactic errors and lack of endurance lead to the contrary..

Conclusions:

- 1- Post-measurements for all physical variables (under study) were better than pre-measurements during wrestlers' anaerobic change threshold.
- 2- Post-measurements for all Functional indicators (under study) were better than pre-measurements during wrestlers' anaerobic change threshold.

Recommendations:

- 1- Using the proposed exercises program with specific endurance exercises in wrestling sport to improve physical and functional variables during wrestlers' anaerobic change threshold, and in turn improve performance level and access highest performance levels.
- 2- Using the proposed exercises program with specific endurance exercises in sports generally, and specifically in individual combat sports to improve physical and functional variables during anaerobic change threshold, and in turn improve athletes' performance level and access highest performance levels.
- 3- More studies to be conducted using various exercises type as per standardized training program to check its effectiveness.
- 4- This study results to be communicated to Egyptian Federation of Wrestling to be benefited with during preparation of Egyptian wrestling team.
- 9- El-Bisatti, Amr-Allah Ahmed(1998): Sports training principles, rules and applications, Dar ElMaaref, Alexandria. (in Arabic language)
- 10- El-Roby, Mohammad Reda (2005): principles of freestyle wrestling training, Mahy Publishing, Alexandria. (in Arabic language)
- 11- El-Roby, Mohammad Reda (2007): Training programs and preparation exercises, Mahy Publishing, Alexandria. (in Arabic language)
- 12- El-Sayed , Abdel-Maksoud El-Sayed (1994).: Endurance training and Physiology, 2nd ed., Elshabab ElHor Press, Alexandria. (in Arabic language)
- 13- El-Sayed, Azmi Faisal(2002): Effect of step exercises on developing aerobic and anaerobic energy systems for "13-15" years age stage, Master Thesis, Faculty of Physical Education for Men, Alexandria University. (in Arabic language).

References

- 1- Abdel Wahab, Farouk (1995): Sports - Health and Fitness, ElShorook House, Cairo. (in Arabic language)
- 2- Abdel-Fattah, Abul-Ela Ahmed (1997): sports training - physiological foundations, Dar ElFekr El Arabi, Cairo (in Arabic language)
- 3- Abdel-Halim , Fathi Abdel-Halim (2013): Effect of differential training on some physical abilities and skill performance effectiveness within wrestlers, Journal of Sports Sciences, Faculty of Physical Education, Minya University. (in Arabic language)
- 4- Abdel-Khalek, Essam El-Din (2000): athletic training, theories and applications, 10th ed., Dar El-Maaref, Alexandria (in Arabic language)
- 5- Abdel-Rahman, Neemat Ahmed (2000) Aerobic activities, Dar El-Maaref, Alexandria (in Arabic language)
- 6- **Ackland, J. (1999):**The Complete Guide To Endurance Training A&C Black, London.
- 7- Al- Rihani, Ali Saeed (2006): Scientific Encyclopedia for Wrestlers , Dar ElFekr ElArabi, Cairo. (in Arabic language)
- 8- **Celli, B.R. (1997):**Pulmonary rehabilitation ,N:A practical approach to pulmonary medicine ,edited by Goldstein, R.H, Connell, J.J., Karlinsky, J. B., Lippincott –Reven, Philadelphia,U.S.A
- 14- ElSayed, Neama , and Noor, Mustafa (2003): The effect of mixed physical exercise (aerobic and anaerobic) on some of breathing functions for teenagers in some, different climate environments, Journal of theories and applications, Faculty of Physical Education for Men, the University of Alexandria. (in Arabic language)
- 15- **Everson. M . (2001):**The Measurement of physiology ZAN - 680 ergo spirometry system ZAN messgract , GmbH . by 7723 ober thulba Germany
- 16- Fodor,T. (1992):Special Endurance of Wresters and the Developmental Methods, Maggar Testnevelesi Egyetem Kozlemenyei, VOL.2,No.3,Budapest.1992.
- 17- Gallahue, L.D. (1993) :Development physical Education Of Today Elementary Children, 1 St., ed., Macmillan publishing, 1993.
- 18- Hammad , Mufti Ibrahim(2009): Beginners sports training and successful coach, Modern Book House, Cairo. (in Arabic language)
- 19- Hariz, Eid (2008): The effect of breathing exercises on some physical and physiological variables, Master Thesis, Faculty of Physical Education, Banha University. (in Arabic language)
- 20- Hassanein, Mohamed Sobhi (2001): Measurement and Evaluation in Physical Education and Sports, vol. 1, 4th ed., Dar ElFekr ElArabi, Cairo. (in Arabic language)

- 21- Horswill, P. (2008); The relationship between body composition and anaerobic performance of elite young wrestlers, fitness and nutrition, Vol. 4
- 22- Hossam El-Din, Talha Hussein (1997): Scientific encyclopedia in training, Book publication, Center Cairo. (in Arabic language)
- 23- <http://www.fila-official.com>
- 24- Issa. Mohammed El-Sayed (1995): the impact of proposed training program to develop agility and power on skill of performance level for some groups of back stepping for wrestlers, Ph.D. thesis, Faculty of Physical Education for Men, Alexandria University. (in Arabic language)
- 25- Juba, K (2007): Swimming for Fitness. A & C Black, London,
- 26- Khattab, Attiyat; Fikri, Maha, and Shokir, Shahira (2006): Exercise basics and rhythmic exercises, Book publication Center, Cairo. (in Arabic language)
- 27- Kudo, E. (2008) :The Martial Arts Education in Akita Han, <http://ci.nii.ac.jp/naid/110001919939/en>, 2008.
- 28- Mahmoud, Mossad Ali (1982): The effect of losing weight different methods on respiratory endurance and muscular endurance within wrestlers, Ph.D. thesis, Faculty of Physical Education for Men, Alexandria, Helwan University, (in Arabic language)
- 29- Martell, W.A (1993): Greco-Roman wrestling , Human kinetics publishers ,Champaign, IL.1993.
- 30- Mcardle, D., Katch, I.& Katch, L.: Exercise Physiology, Energy, Nutrition, and Human Performance, 5th Lippincott, edition, Williams & Wilkins, U.S.A, 2001.
- 31- Nasra, Waleed Mohsen Moustafa (2004): the effect of developing specific power for some back throw movements group on some skill and physiological variables of wrestlers , Master Thesis, Faculty of Physical Education for Men, Alexandria University (in Arabic language)
- 32- Oppliger, R. et al. (2008); Weight loss in wrestlers, American college of sports medicine, Vol. 28, No.2.
- 33- Osman, Mohamed(2000): Training load, adaptation and physiological responses to training loads stresses between theory and real application, Dar ElFekr ElArabi, Cairo. (in Arabic language)
- 34- Qutb, Sabri Ali (2002): Enzymatic responses associated with development of specific endurance and its compounds (strength endurance – speed endurance) for some leg falling movements within wrestlers, Ph.D. thesis, Faculty of Physical Education for Men , Alexandria University. (in Arabic language)
- 35- Ramadan, Adel (2001): the effect of developing anaerobic ability at training unit end on some physical and physiological variables and basic skills within basketball juniors (16-18 years) PhD Thesis, Faculty of Physical Education, Port Said, Suez Canal University,. (in Arabic language)
- 36- Sharaf, Mohammed Masood (2009): the impact of a health rehabilitation and education program according to a pilot model on functional, physical , and health status for overweight children at age of 10-12 years, Ph.D. thesis, Faculty of Physical Education for Men, Alexandria University.. (in Arabic language)
- 37- Soliman, Salahuddin(2001): exercise and pictured exercise, University Book Houswe, Cairo (in Arabic language)
- 38- Tolan, Sedik Mohammed; El-Shazly, Ahmed Fouad, and Morgan, Nader Mohamed (2012): scientific basis for exercises and sports shows, Dar El-Wafaa printing and publishing, Alexandria. (in Arabic language)
- 39- Wall, j., & Murray,N. (1995): Children & Movement, physical education in the Elementary school, 2 nd, Brown & Benchmark, U.S.A.
- 40- Wilmore, J.H., and Costill D.L (1994): Physiology of sport and Exercise, Human Kinetics, U.S.A.1994.
- 41- Zahran, Leila Abdul Aziz (1997): Scientific and practical foundations for exercises, Dar ElFekr ElArabi, Cairo, (in Arabic language)

