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Physiological Profile of the Young Egyptian Wrestlers

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Abstract: The study aims to identify the physiological profile characteristics of the Egyptian youth wrestlers as well as to identify the differences in the physiological profile between small weights wrestlers and medium weights wrestlers in the physiological measurements under investigation, at rest and after the effort. The research sample was purposefully chosen from the winning wrestlers ranking between first to sixth position in the National Championship. Sample included 30 wrestlers aged 16:18 years, divided into two groups: 12 small weights wrestlers their weight between 50: 60 kg and 18 medium weights wrestlers their weight between 66: 84 kg. The most important results are the existence of set of distinctive physiological characteristics of the Egyptian wrestlers within the sample under investigation, in addition to the existence of differences, but not statistically significant between small weights wrestlers and medium weights wrestlers in the physiological variables under study.

Key words: Physiological profile % Wrestlers

INTRODUCTION

Wrestling is a sport consisting of high intensity efforts interspersed with brief periods of mild- to moderate-intensity work or resting characterized by the evort of the athlete to maintain physical control over his opponent. Recent rule changes have shortened match duration (from 5 to 2-min rounds) and encouraged power maneuvers that require both absolute whole-body strength and explosiveness integrating a large isometric component for technical performance [1]. A wrestling match requires tremendous physical activity, power and strength of body musculature as well as isometric force for various wrestling techniques [2].

Power in wrestlers is related with quick and explosive effort that leads to wrestling success [3]. Anaerobic power and capacity are important in wrestling because of the need of short-duration and high intensity performance. Wingate test can be used to reflect the maximum ability of wrestlers to generate power [4]. Demand on the cardiovascular system. Oxygen demand by the muscles increases sharply. Metabolic processes speed up and more waste is created. More nutrients are used and body temperature rises. To perform as efficiently as possible the cardiovascular system must regulate these changes and meet the body's increasing demands [5].

A number of studies investigate physiological factors in combat sport.One study investigated aerobic capacity body composition of sumo wrestlers to athletes in combat and other sports [6]. Another investigated the variation in resistive force selection during brief high intensity cycle ergometry and discussed the implications of these results for power assessment and production in elite karate practitioners [7]. A third investigated heart rate and blood lactate responses to modern wushu techniques [8]. A group of researchers conducted a three dimensional analysis of the center of mass for three different judo-throwing techniques [9].

Wrestling is one of the combat sports that require great effort and a high degree of compatibility between the exerted physical effort and the efficiency of the internal organs in the body in order to the wrestler is able to achieve the physiological requirements of performance.

A wrestling match is an intermittent physical exercise of variable intensity [10]. It is characterized by sudden, explosive attacks and counterattacks that are executed repeatedly [11] In wrestling, as in many other sports, both anaerobic and aerobic energy systems are employed to a various degree [12, 13]. The anaerobic system provides the short, quick bursts of maximal power during the match while the aerobic system contributes to the wrestler's ability to sustain effort for the duration of the match [13].

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As regards the duration of the load, this factor has significant physiological implications. When making an effort involving over 1/6 or 1/7 of total body musculature (e.g. running), the cardiovascular, respiratory, neuromuscular and metabolic systems actively participate in the exercise. If the duration of exercise is equal to or less than 1 minute, the cardiovascular system will be important throughout the repetitions (and during the pauses) but there will not be enough time - in each repetition, mainly the first - for the neuromuscular system to take part. We could say that there is "a physiological delay" in the response and adjustment between the cardiovascular and neuromuscular systems that is used by intermittent exercise [14].

So the Cardiovascular respiratory system is an importance vital system in body athletes of combat sports generally and wrestling especially because it involves many indications on the willingness to bear the burden training.

Cardiovascular adaptations to exercise have been systematically defined and differ with respect to the type of conditioning: endurance training (sometimes also described as dynamic, isotonic, or aerobic) such as long-distance running and swimming; and strength training (also referred to as static, isometric, power, or anaerobic) such as wrestling, weightlifting, or throwing heavy objects [15].

Given the importance of physiological variables in the field of wrestling, the current study aims at identifying the physiological profile that characterizes Egyptian wrestlers along with the differences between the physiological measurements in a small and medium weights group.

MATERIALS AND METHODS

The sample of 30junior wrestlers was purposefully chosen from the junior wrestling (age between 16: 18 years) ranking from first to sixth in the National Championship of small and medium weights wrestlers. Sample was divided into two groups 12 wrestler weight 50: 60 kg and 18 wrestler weight 66: 84kg and the skewness was limited to the variables of age, height, weight, Chest circumference and BMI between ± 3. Measurements were taken from 20-9-2011 to 16-10-2011.

Physiological Measurements: Physiological measurements were taken under both resting and effort conditions, as measurements were taken at rest while wrestlers were completely laid-back, while effort measurements used a cycle ergo meter (150 W, b/min). Fox test was taken after the first minute and the end of the fifth minute, The study used the following equations to measure the variables under consideration:

- Heart rate (HR)(resting - effort)

The heart rate was measured by a specialist using a stethoscope.

- Blood pressure, systolic (SP) and diastolic (DP)(resting - effort)

Blood pressure measurements were taken both supine and immediately upon standing and were measured by a specialist using a Sphygmomanometer.

- Mean arterial pressure (MAP)(resting - effort) mean arterial pressure (MAP) was calculated using the formula; MAP= [(2×DP)+SP]/3 [16]
- Cardiac output (CO)(resting - effort) The Cardiac output was measured using the following equation: SV = EDV - ESV (17) Q = SV×HR [17]
- Absolute and relative maximal oxygen consumption.Absolute VO2 max in sub-maximal exercise was measured by a cycle ergo meter (150 W, b/min) by the Fox test. The values were calculated using the Fox equation for men VO2 max = 6.3 - (0.0193 x HR). The values were corrected by the factor for the age [18].

Relative VO_2 max in sub-maximal exercise was measured using the following equation Relative VO_2 max = (Absolute VO2 max (liter)× 100) / body weight (Kg).

- Oxygen pulse oxygen pulse was measured using the following equation: O2P= VO2/HR [19].

- Blood glucose level (resting - effort). Blood glucose Was measured in both comfort and effort by pulling a blood sample and tested by a specializing lab in medical analysis.

RESULT AND DISCUSSION

Table 1 shows the mean and standard deviation for each of the variables age, height, weight and chest circumference (Normal/Max inhalation) and body mass index for each group of small (50: 60) and medium (66: 84) weights.

Table 1: Personal characteristics and body posture to small and medium weights group (M±SD)

Variable		Weight (50: 60) N=12	Weight (66: 84) N=18
Age (year)		16.58±0.79	16.9±0.960
Height (cm)		173.5±0.040	174.5±0.040
Weight (kg)		56.7±3.890	70.17±2.91
Chest circumference (cm)	Normal	85.3±2.300	86.5±1.600
	Max inhalation	89.58±2.57	91.9±1.870
BMI (kg/m^2)		18.85±1.70	23.15±1.15

Table 2: Statistical description of the physiological measurements for a small weights group (50:60) N=12

Variable	Mean	SD	Max	Min	Range
Heart rate resting (Beats/min)	68.67	2.46	7.00	65.00	72.00
Heart rate effort (Beats/min)	181.92	4.42	13.00	175.00	188.00
Systolic BP resting (Mm/Hg)	108.25	2.80	10.00	102.00	112.00
Diastolic BP resting (Mm/Hg)	68.83	2.66	9.00	65.00	74.00
Systolic BP effort (Mm/Hg)	137.58	3.63	16.00	130.00	146.00
Diastolic BP effort (Mm/Hg)	99.25	5.97	18.00	90.00	108.00
Mean arterial pressure resting (Mm/Hg)	81.97	2.24	8.00	78.67	86.67
Mean arterial pressure effort (Mm/Hg)	112.03	4.24	14.67	103.33	118.00
Cardiac output resting (L/min)	6.51	0.39	7.20	5.94	1.26
Cardiac output effort (L/min)	21.84	1.00	20.83	23.81	2.98
Absolute vo2max (L/min)	2.79	0.09	0.25	2.67	2.92
Relative vo2max (L/min)	4.56	0.59	1.60	3.82	5.42
Oxygen pulse (Mm/min)	35.50	1.94	5.47	32.98	38.45
Blood glucose resting (Mg/cm3)	89.75	5.55	100.00	80.00	20.00
Blood glucose effort (Mg/cm3)	102.00	5.29	130.00	94.00	36.00

Table 3: Statistical description of the physiological measurements for a medium weights group (66:84) N=18

Variable	Mean	SD	Max	Min	Range
Heart rate resting (Beats/min)	68.33	2.50	8.00	64.00	72.00
Heart rate effort (Beats/min)	182.78	5.65	20.00	170.00	190.00
Systolic BP resting (Mm/Hg)	107.44	3.71	12.00	100.00	112.00
Diastolic BP resting (Mm/Hg)	70.33	2.83	9.00	66.00	75.00
Systolic BP effort (Mm/Hg)	138.39	3.76	14.00	132.00	146.00
Diastolic BP effort (Mm/Hg)	96.11	8.67	42.00	67.00	109.00
Mean arterial pressure resting (Mm/Hg)	82.70	2.15	8.00	78.67	86.67
Mean arterial pressure effort (Mm/Hg)	110.20	5.82	29.33	89.67	119.00
Cardiac output resting (L/min)	6.34	0.52	7.92	5.76	2.16
Cardiac output effort (L/min)	22.24	0.93	23.50	20.24	3.26
Absolute vo2max (L/min)	2.77	0.11	0.39	2.63	3.02
Relative vo2max (L/min)	4.18	0.45	1.49	3.51	5.00
Oxygen pulse (Mm/min)	35.42	1.59	5.22	32.98	38.20
Blood glucose resting (Mg/cm3)	88.00	5.09	110.00	80.00	30.00
Blood glucose effort (Mg/cm3)	118.00	4.00	128.00	97.00	31.00

Tables 2 and 3 show that the average heart rate at rest and effort is confined between 68.67: 181.9 for the small weights wrestlers and between 68.3: 182.78 for the medium weights wrestlers. In spite of the different groups weighted the two groups but the results of heart rate came close with a slight difference between them and the study returns that to the difference in age.

Heart rate (HR) is an easy to measure but important indicator of cardiovascular health. Though the heart rate dynamics during and after cessation of exercise have been used extensively as markers of cardiovascular health, it is only in the past few years that resting heart rate (RHR) has gained attention as a simple but powerful marker of cardiovascular health [20].

Resting heart rate averages from 60 to 80 beats/min in healthy adults. In sedentary, middle aged individuals it may be as high as 100 beats/min. In elite endurance athletes heart rates as low as 28 to 40 beats/min have been recorded [21].

Before exercise even begins heart rate increases in anticipation. This is known as the anticipatory response. It is mediated through the releases of a neurotransmitters called epinephrine and nor epinephrine also known as adrenaline and nor- adrenaline [5].

After the initial anticipatory response, heart rate increases in direct proportion to exercise intensity until a maximum heart rate is reached. Maximum heart rate is estimated with the formula 220-age. But this is only an estimation and not particularly accurate. The only direct method for determining maximum heart rate is to exercise at increasing intensities until a plateau in heart rate is found despite the increasing work rate.

The results show that the systolic and diastolic blood pressure, at rest was confined between 68.83: 108.25 for small weights wrestlers, while confined between 70.33: 107.44 for the medium weights wrestlers.

The results suggest that systolic and diastolic blood pressure in the effort was confined between 99.25: 137.58 for small weights wrestlers, while confined between 96.11: 138.39 for the medium weights wrestlers. systolic blood pressure reach to 130:100 mm/Hg for the athletes o at rest and a diastolic pressure is usually be in the range of 80:60 mm/Hg [22].

The average systolic blood pressure reach up to 100.6, while not exceeding 60.6 for diastolic blood pressure of male wrestlers [23]. From the above it appears that there is no significant differences between the players of small and medium weights in both systolic and diastolic blood pressure at rest and effort and the study see that is because the convergence at physical level between the wrestlers and the length of the practice of wrestling.

It Is clear from Tables 2 and 3 that the convergence in the average pressure between small and medium at rest and effort, since it was confined between 81.97: 112.03 for the small weights wrestlers, while confined between 82.7: 110.2 for medium weights wrestlers. The average blood pressure values reach in athletes of 90:80 mm/Hg at rest; and that the values associated with the value cardiac payment [24].

Tables 2 and 3 show that cardiac output at rest and effort for the small weights wrestlers was confined between 6.51: 21.84 liters/minute, while confined to between 6.34: 22.24 for medium weights wrestlers.

Cardiac output increases proportionally with exercise intensity which is predictable from understanding the response of heart rate and stroke volume to activity. At rest the cardiac output is about 5L/min. During intense exercise this can increase to 20-40L/min [21].

The convergence of the values observed in the level of payment heart at the rest for the two groups, but there are differences between the two groups in the effort and the study explains that the difference in weight may lead to increased cardiac output.

In an average-sized subject at rest, the cardiac out put of approximately s L/min is provided by a stroke volume of around 70 mL pumped at a frequency of around 70 beats/min. whenever metabolic demand rises there is a need for greater volume delivery of blood around the body. Our capacity to perform whole body exercise is limited primarily by the upper limit to cardiac output which in an untrained individual is around 450% of the value at rest [25].

Tables 2 and 3 show that the maximum consumption of absolute oxygen for both small and medium weights wrestlers was 2.8, while the value of the maximum consumption of relative oxygen to the small weights wrestlers was 4.6 and 4.2 for the medium weights wrestlers and the study explain that because of the difference in the weights.

The study results describe that the mean for the maximum of the pulse oxygen (O2P) for small weights wrestlers was 35.50 mm/min, while for the medium weights wrestlers was 35.42 mm/min and despite the differences in weight in the two groups the results of the maximum of the pulse oxygen came very close.

The results indicate that there is a convergence of glucose in the blood between the wrestlers in the resting of small and medium weights, where was 89.75 mg/cm3 for the wrestlers, while the small weights of 88 mg/cm3 for the medium weights wrestlers.

The results also show that there is a convergence of glucose in the blood after the effort among small and medium weights wrestlers of where the 102 mg/cm3 for the wrestlers, while small weights were 118 mg/cm3 for the medium weights wrestlers. The percentage of blood glucose in athletes is limited to between 80:110 mg/100ml blood [26]. Increasing the level of glucose in the blood after the effort, due to the hormone cortisol, may stimulate the formation of glycogen from sources other than carbohydrate in the liver [27].

CONCLUSION

Despite the differences in the two groups in weight, the results of physiological variables for the two groups were very close.

There are no statistical significant differences between the two groups, but the most obvious distinction is the difference between the diastolic blood pressure in

effort Where the difference between small weights wrestlers and medium weights wrestlers was 3.14 mm/Hg and there was also difference in the percentage of blood glucose in after effort between, small and medium weights wrestlers (16 mg/cm^3).

Recommendation: The study recommends that with the progress in the sport of wrestling and the diversity of training methods and increasing the training sizes that the organizers should take into account of the physiological variables of wrestlers that control the physical performance in wrestling.

In view of the continuous changes of international rules, the training units should be standardized to match the physical requirements needed by the wrestlers to achieve higher levels.

The study recommends that researchers should pursue in the future to do research in the field of muscle fatigue and how to use the natural reserves of glycogen in improving the level of muscular endurance of the wrestlers and reduce the fatigue phenomenon with taking into account the physiological variables under study, especially those relating to cardiac output and oxygen consumption.

Finally, the study recommends trying to set up a physiological profile of heavy weights wrestlers and try to identify the distinctions between it and the physiological profile of small and medium weights wrestlers.

REFERENCES

1. Horswill, C.A., 1994. Physiology and nutrition for wrestling. In: D.R. Lamb, H.G. Knuttgen and R. Murray (eds) Physiology and nutrition for competitive sport. Cooper Publishing, Carmel, pp: 131-180.
2. Horswill, C.A., J.E. Miller, J.R. Scott, G. Welk and P. Van Handel, 1992. Anaerobic and aerobic power in arms and legs of elite senior wrestlers. International J. Sports Medicine, 13: 558-561.
3. Lansky, R.C., 1999. Wrestling and Olympic-style lifts: in-season maintenance of power and anaerobic endurance. Strength Conditioning J., 21: 21-27.
4. Yoon, J., 2002. Physiological profiles of elite senior wrestlers. Sports Medicine, 32: 225-233.
5. Wilmore, J.H. and D.L. Costill, 2005. Physiology of Sport and Exercise. Human Kinetics, 3rd Ed., Champaign, IL, pp: 68.
6. Beekley, M., T. Abe, M. Kondo, T. Midorikawa and T. Yamauchi, 2006. Comparison of normalized maximum aerobic capacity and body composition of sumo wrestlers to athletes in combat and other sports. J. Sports Science and Medicine, CSSI, pp: 13-20.
7. Baker, J.S. and B. Davies, 2006. Variation in resistive force selection during brief high intensity cycle ergometry: implications for power assessment and production in elite karate practitioners. J. Sports Science and Medicine, CSSI, pp: 42-46.
8. Ribeiro, J., B. Castro, C. Rosa, R. Baptista and A. Oliveira, 2006. Heart rate and blood lactate responses to changquan and daoshu forms of modern Wushu. J. Sports Science and Medicine, CSSI, pp: 1-4.
9. Imamura, R.T., A. Hreljac, R.F. Escamilla and W.B. Edwards, 2006. A three-dimensional analysis of the center of mass for three different judo throwing techniques. J. Sports Science and Medicine, CSSI, pp: 122-131.
10. Hübner-Woïniak, E., A. Kosmol, G. Lutoslawska and E.Z. Bem, 2004. Anaerobic performance of arms and legs in male and female free style wrestlers. J. Science and Medicine in Sport, 7: 473-480.
11. Hübner-Woïniak, E., G. Lutoslawska, A. Kosmol and S. Zuziak, 2006. The effect of training experience on arm muscle anaerobic performance in wrestlers. Human Movement, 7: 147-152.
12. Cinar, G. and K. Tamer, 1994. Lactate profiles of wrestles who participated in 32nd European free-style wrestling championship in 1989. J. Sports Medicine and Physical Fitness, 34: 156-160.
13. Callan, S.D., D.M. Brunner, K.L. Devolve, S.E. Mulligan, J. Hesson, R.L. Wilber and J.T. Kearney, 2000. Physiological profiles of elite freestyle wrestlers. J. Strength and Condition Res., 14: 162-169.
14. Seiler, S., 2002. Understanding intervals: matching training characteristics to physiological changes. Sitio web: The Institute for Sport, Kristiansand. Norway. Stephen Seiler Site.
15. Mitchell, J.H., W. Haskell, P. Snell and S.P. Van Camp, 2005. Task Force 8: classification of sports. In: B.J. Maron and D.P. Zipes, (eds.) 36th Bethesda Conference: eligibility recommendations for competitive athletes with cardiovascular abnormalities. J. Am. Coll Cardiol., 45: 1364-1367.
16. Kennedy, G., V.A. Spence, M. McLaren, A. Hill, C. Underwood and J.J.F. Belch, 2005. Oxidative stress levels are raised in chronic fatigue syndrome and are associated with clinical symptoms. Free Radical Biology and Medicine, 39: 584-589.

17. Binanay, C., R.M. Califf, V. Hasselblad, C.M. O'Connor, M.R. Shah and G. Sopko, 2005. Evaluation study of congestive heart failure and pulmonary artery catheterization effectiveness: the ESCAPE trial". JAMA, 294(13): 1625-1633.
18. Casikar, V., E. Mujica, M. Mongelli, J. Aliaga, N. Lopez, C. Smith and F. Bartholomew, 2010. Does Chewing Coca Leaves Influence Physiology at High Altitude. Association of Clinical Biochemists of India, 25: 311-314.
19. Wasserman, K., J. Hansen, D.Y. Sue, R. Casaburi and B.J. Whipp, 1999. Principles of exercise testing and interpretation. Lippincott, Williams & Wilkins, 3rd Ed., Philadelphia, pp: 558.
20. Palatini, P. and S. Julius, 1997. Heart rate and the cardiovascular risk. J. Hypertens, 15: 3-17.
21. McArdle, W.D., F.I. Katch and V.L. Katch, 2006. Essentials of Exercise Physiology. Lippincott Williams and Wilkins, 3rd edition, Philadelphia, pp: 443.
22. Abdel Fattah, A., 1997. Sports training, physiological basis. Dar Alfikr Elarby, Cairo, pp: 133.
23. Selma, A.V., 2007. The relationship between body composition and anaerobic performance of elite young wrestlers. J. Sports Science and Medicine, 6: 34-38.
24. Allawy, M.H. and A. Abdul Fattah, 1984. Physiological of sports training.Dar Alfkr Elarby, first edition, Cairo, pp: 148-251.
25. Bell, C., 2008. Cardiovascular physiology in exercise and sport. Churchill Livingstone Elsevier, St. Louis, Mosby, pp: 80-85.
26. Brooks, G. and M. Thomas, 1984. Exercise physiology, human Bioenergetics and application. John wiley and sons Inc., New York, pp: 816.
27. Robergs, R. and S. Roberts, 1997. Exercise physiology, exercise performance and clinical applications. Mosby, New York, pp: 373.