

Investigations on the Effects of Intensive Combine Trainings Applied to Oil Wrestlers on Anthropometric, Biomotoric and Some Physiological Features

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SUMMARY The aim of the present study is to investigate the effects of the intensive combined trainings which are implemented on oil wrestlers on anthropometric, biomotoric and some physiological features during camp session. Fourteen (n: 14) elite wrestlers joined to the study voluntarily and participated in the research of oil wrestler's entrance on average; age 19.0 ± 1.46 years, height 176.3 ± 5.4 cm., body weights 82.2 ± 11.6 kg. and sports ages also 7.5 ± 2.0 years. In the research, anthropometric, biomotoric and physiological measurements of the wrestlers were taken. The training program was implemented as 4 weeks, 5 days a week and two hours a day. Paired t- test was used for statistical analyzes. As a result of comparing pre and post-tests of anthropometric features, biomotoric tests (strength, sprint and endurance) and physiologic tests (resting heart rate), differences were found to be statistically significant ($p < 0.05$). In conclusion; four-week intensive combine trainings affected the oil wrestlers' performances positively.

INTRODUCTION

Wrestling was an important part of the ancient Olympic Games and is still one of the most popular events of the modern Olympic Games (Ramirez-Velez et al. 2014). Historical "Kirkpinar Oil Wrestling" is the oldest wrestling festival in the world which has been continuing since the first contests in 1357 in Rumelia. "Kirkpinar Oil Wrestling", which has history with a tradition of almost 650 years, hosts persevering contests for a week, with the active participation of the media, the folk-dance groups, millions of spectators, the artists and the statesmen both from Turkey and all over the world, and these activities are made regularly every year (www.kirkpinar.com). Wrestling is a sport which all parts of the body work together, and it requires both endurance and strength (Basar et al. 2014). Wrestling is an individual sport, which is physical, mental, psychological, biomotoric, a branch containing a combination of technical and tactical characteristics. Wrestling, in comparison with other sports fields, enjoys unlimited and various situations to use different muscle groups and technique performance (Mirzai and Akbar 2008). Wrestling is a high intensity sport which requires strength and power of the upper and the lower body as well as relying heavily on isometric force for the various wrestling techniques (Utter et al.

1998; Callan et al. 2000; Kreamer et al. 2001; Mirzaei et al. 2012). The studies indicated that, general physiologic profile of successful wrestlers is high anaerobic power and capacity, muscular strength, above average aerobic power, exceptional flexibility, fat free mass, and a mesomorphic somatotype (Horswill 1992; Yoon 2002). Firstly anaerobic system is used in wrestling; strength, speed, agility, flexibility, balance, muscular and cardiovascular endurance, coordination is defined as a sport such factors affect the performance (Aydos et al. 2004; Kreamer et al. 2004). However, the effective oil wrestling aerobic and anaerobic systems are activated. Oil wrestling competitions, sometimes, take half an hour. In wrestling, as in many other sports, both anaerobic and aerobic energy systems are both used in same time. (Callan 2000; Çinar and Tamer 1994). Aerobic endurance, maximal strength, muscular endurance, and power to the line features are enabled. Thus, the sport of wrestling is one of the most demanding sports from a metabolic perspective and it is a sport where the requirement of absolute strength and power is in critical level (Kraemer 2002; Utter et al. 2002). Isometric various techniques are applied to wrestlers to power up and power is important for both the upper and the lower extremity stated (Callan et al. 2000; Kraemer et al. 2001; Utter et al. 1998). In terms of performance, all the features are considered to be important

and complex activities (Cvetkovic et al. 2005; Kiliñ 2008). Wrestling combined with the features of a branch must also include the properties such as the combination of training. Furthermore, the combination of a single property development rather than training to improve proportional covers all the features of the programme. For this, the researchers have short and intense periods of camp due to the expiration of sport scientists/coaches could be considered as a preferred training model (Bompa 1999; Kiliñ 2008). Combination of training and testing is an indispensable precondition for the data obtained through combined training plan (Holviala et al. 2012). The aim of this study, is to investigate the effects of combine trainings applied to oil wrestlers on anthropometric, biomotoric (strength, speed, endurance), and some of the physiological properties.

METHODOLOGY

In oil wrestling, it is difficult to perform the desired actions on the basis of offense and defense attacks comfortably implemented. Olive oil is difficult to put pressure on the opponent due to its lubricity. However, Greco Roman Wrestling free style or the more difficult structural features. Oil wrestling events held once a year for a combined training program is needed to be successful. Performance components made simultaneously in a short time considered important in the combined training.

Subjects

Fourteen (14) elite oil wrestlers (8 national) participated to the study voluntarily and the properties of oil wrestlers are given in Table 1. After competing in combined training Kirkpınar 13 oil wrestling, wrestler managed to enter the top 10 in their respective categories among 200 oil wrestlers. Thus, this study meets widely accepted ethical standards.

Procedures

The subjects were tested while wearing standard sportswear (sport shoes, shorts, and T-shirt), 2-3 hours after their usual breakfast and lunch. Physical, biomotoric and physiological tests were performed at 10:00 a.m., biomotoric tests at 15:00 p.m. Pretests and posttests in the

oil wrestlers were performed simultaneously in the same sport hall. The oil wrestlers did stretching and warming-up exercises before the biomotoric tests. There was no training provided when pretest or posttest was performed. The intensity and range of the sessions were adjusted according to the pretest results of the oil wrestlers. In the present study, the psychological and socioeconomic conditions of athletes were not assessed.

Height and Body Weight Measurements

The ages of all oil wrestlers were registered as the year of birth on their identity card. The height of the athletes in the research group was determined as centimeters with a height measuring SCALA 0.1 cm. accuracy of measurement. In the present research, the body weight of the athletes was measured as kg by a digital weighing machine for 1 g. accuracy of measurement with their sportswear (shorts) but without shoes (Tamer 2000).

Skinfold Measurements

Triceps, biceps, subscapula, pectoral, suprailiac, abdomen and quadriceps muscles were measured according to a standard anthropometric measurement protocol using skinfold calipers (HOLTAIN) calibrated to 10 g/mm² (Holtain Ltd., Crymmycn, UK) (Zorba and Ziyagil 1995). Lange the formula (biceps+triceps+ subscapula+ pectoral+ suprailiac+ quadriceps) $\times 0.097 + 3.64$ was used to determine body fat percentage (Açikada et al. 1991).

Circumference Measurements

An APTAMIL (Aptamil Company) brand inflexible 7 mm-wide measuring tape was used. Measured body parts were shoulder, hip, arm (full extension and elbow at 90 degrees contraction), forearm (full extension and elbow at 90 degrees contraction) and thigh (at full extension and contraction).

Maximal Strength Tests (1RM)

Maximal strength tests (1RM) were performed by condition machine PRECOR, (USA). Activation of major muscle in oil wrestler in strength tests was aimed as follows; Shoulder

presses, Triceps press down, Biceps Curl, Leg curl, Lat Pull Down, Leg Extension; the score for a one-repetition maximum (1-RM) was recorded (kg). (Anderson et al 2008; Balabinis et al. 2003; McGuigan et al. 2006).

50-100-200 m. Sprint Tests

The 50-100-200 m. sprint test was timed electronically (TECNEQUIE). The test was performed with a high start method in a sports hall and the scores were recorded as second-split second.

3000 m. Endurance Test

The test was performed according to the endurance classification, endurance (3000 m.) test. The test was performed with a high start method in a sports field and the scores were recorded as minute-second.

How to Measure the Heart Rate

The heart rates were measured with a POLAR RS 400 (FINLAND) heart rate measuring device worn on the left wrists of the athletes like a watch and an elastic band being smoothly wrapped around their chest and the heart rates were followed on device measured for 6 stop-watch registered as passive pulse before training and active (maximal) pulse after training every morning during 3 days.

The training program in Figure 1 consisting of 1 period, 1 month, 4 weeks, 18 training days, 7 training matches, 5 resting days and 80 total training hours. Two medical examinations were provided before pretest and posttest. The weekly loading intensity was increased gradually until the competition period. The intensity of week-day was increased in the same way. Figure 1 shows that as part of the loading intensity of days, pretest and posttest were performed on the 1-2 and 30 days. Thus, the loading intensity was increased on week days to enable adaptation to the demands of semi-final and final games.

Instead of focusing on only one characteristic, a combined training method was preferred to de-

velop all the necessary performance characteristics (physiological, biomotoric, technical and tactical) by changing the ratio of loading intensity.

Strength Training Plan

In oil wrestlers, the loading intensity of each athlete was identified according to maximal unit values measured before training. These values were Shoulder Press (1-RM), Leg Extension (1-RM), Triceps Press Down (1-RM), Leg Curl (1-RM), Lat Pul Down (1-RM), Biceps Curl (1-RM), Chest Press (1-RM) and Leg Press (1-RM). Training sessions were based on micro-planning and individual characteristics.

Sprint Training Plan

Sprint training designated as 20 m (10 reps).- 50 m (10 reps). 100 m (10 reps). -200 m. (5 reps). 400 m. (5 reps). 800 m (3 reps). Given full rest between sets. Training sessions were based on micro-planning and individual characteristics.

Endurance Training Plan

The values in Figure 1 (training program), based on the results of tests before training, were designed to develop aerobic endurance. Endurance training was designated as 3000 m (1 week 2 reps, 2. weeks 3 reps, 3. week 3 reps, 4 week 4 reps). Training sessions were based on micro-planning and individual characteristics.

RESULTS

Fourteen elite level oil wrestlers (8 national) volunteered to participate in the study. After competing in combined training Kirkpınar 13 oil wrestling, wrestlers managed to enter the top 10 in their respective categories within 200 people.

In comparison of pre and post tests of oil wrestlers circumference measurements (shoulder, arm contraction, forearm arm contraction, chest and hip) ($p < 0.05$), were found to be significantly different (Table 2). This difference can be considered as the effects of combined training.

Table1: Physical characteristics of oil wrestlers

Variables	n	Minimum	Maximum	Mean	Std. deviation
Age (year)	14	17	22	19	1.46
Body Weight (kg)	14	66	102	82.2	11.61
Height (m)	14	168	185	176.3	5.44
Sports Age (year)	14	4,00	12,00	7.50	2.06

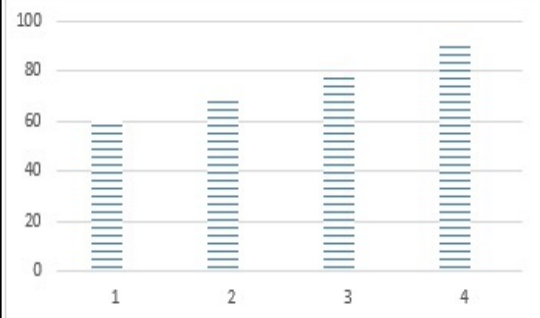
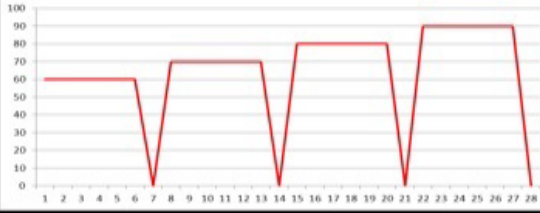
1	PERIOD		PERIOD I					
2	MOUNTH		JUNE				JULY	
3	WEEK		1	2	3	4	1	
5	HELTH CONTROLS		1	-	-	-	1	
6	PERFORMANS TESTS		2	-	-	-	2	
7	LOADING SEVERITY ACCORDING TO WEEKS	100						
		90						
		80						
		70						
		60						
		50						
		40						
8	LOADING SEVERITY ACCORDING TO DAYS	100						
		90						
		60						
		50						
		40						
9	WEEKLY TRAINING PLANNING	MONDAY	PRTest	2	2	2	PSTest	
		TUESDAY	PRTest	2	2	2	PSTest	
		WEDNESDAY	2	2	2	2	D	
		THURSDAY	2	2	2	2	D	
		FRIDAY	2	2	2	2	MATCH	
		SATURDAY	D	D	D	D	MATCH	
		SUNDAY	M	M	M	M	MATCH	
10	TOTAL	TRAINING DAY NUMBER	3	5	5	5	0	18
11		MATCH NUMBER	1	1	1	1	3	7
12		REST DAY NUMBER	1	1	1	1	2	6
13		TRAINING NUMBER	6	10	10	10	0	36
14		TRAINING TIME	13	19	19	19	0	71
15	BIOMOTORIC LOADING DISTRIBUTION (% 100)	SPRINT %	15	15	15	15	MATCH	
		STRENGTH(%)	15	15	15	15		
		ENDURANCE (%)	50	50	50	50		
		TECHNIC (%)	10	10	10	10		
		TACTIC (%)	10	10	10	10		
16	TOTAL % 100		100%	100%	100%	100%		TOTAL

Fig. 1. Combined Training Plan

Table 2: Oil wrestlers' circumference measurements comparison of pre and post tests

Variables	Pre-test (n:14)	Post-test (n:14)
Shoulder (cm)	120.3±6.9	121.5±6.6*
Arm (cm)	32.5±4.7	32.7±4.8
Arm Contraction (cm)	35.3±4.7	35.8±4.6*
Forearm (cm)	28.9±3.8	29.0±3.7
Forearm Arm Contraction (cm)	30.8±5.2	31.2±5.1*
Chest (cm)	96.3±5.6	97.3±5.5*
Abdomen (cm)	85.8±9.1	85.4±8.2
Hip (cm)	105.6±7.9	103.2±7.3*
Thigh (cm)	58.3±5.1	58.4±5.2

*p<0.05

In addition to this, there were significant difference between pre and post tests of oil wrestlers skinfold measurements (pectoralis, abdominal, suprailiac, quadriceps and body fat percentage) ($p<0.05$) (Table 3). This difference can be considered as the effects of endurance training.

Table 3: Oil wrestlers' skinfold measurements comparison of pre and post tests

Variables	Pre-test (n:14)	Post-test (n:14)
Subscapula (mm, hg^{-1})	15.3±3.2	15.0±3.3
Triceps (mm, hg^{-1})	12.5±4.1	12.0±3.9
Biceps (mm, hg^{-1})	5.2±1.7	5.1±1.6
Pectoralis (mm, hg^{-1})	9.2±2.9	8.8±2.8*
Abdominal (mm, hg^{-1})	21.4±7.1	20.7±6.9*
Suprailiac (mm, hg^{-1})	9.3±2.8	8.8±2.3*
Quadriceps (mm, hg^{-1})	15.3±5.9	14.6±5.6*
Body Fat Percentage % (Lange formula)	10.2±1.8	9.9±1.7*

*p<0.05

Differences were found significantly in comparison of pre and post tests of oil wrestlers' heart rate measurements (morning resting heart rate, evening resting heart rate, 50 m, resting heart rate, 100 m, resting heart rate and 3000 m, maximal heart rate) ($p<0.05$) (Table 4). This difference can be considered as the effects of aerobic (endurance) training.

As it is shown in Table 5, there were significant differences in comparison of pre and post tests of oil wrestlers' heart rate measurements (Triceps Press Down, Leg Curl, Lat Pull, Biceps Curl and Chest Press) ($p<0.05$). This difference can be considered as the effects of strength training.

In addition to this, pre and post tests of oil wrestlers' heart rate measurements (50 m, Sprint,

Table 4: Oil wrestlers' heart rate measurements comparison of pre and post tests

Variables	Pre-test (n:14)	Post-test (n:14)
Morning Resting Heart Rate (Beats/min)	57.6±5.8	53.4±7.1*
Evening Resting Heart Rate (Beats/min)	66.7±5.7	63.0±6.8*
50 m, Resting Heart Rate (Beats/min)	71.6±8.9	66.2±4.4*
50 m, Maximal Heart Rate (Beats/min)	164.0±5.7	165.3±4.1
100 m, Resting Heart Rate (Beats/min)	106.5±7.5	108.6±6.2*
100 m, Maximal Heart Rate (Beats/min)	176.7±5.1	178.1±5.3
200 m, Resting Heart Rate (Beats/min)	114.1±8.7	117.0±5.3
200 m, Maximal Heart Rate (Beats/min)	176.2±5.6	178.7±4.1
3000 m, Resting Heart Rate (Beats/min)	124.5±7.8	120.5±5.3
3000 m, Maximal Heart Rate (Beats/min)	181.7±10.8	182.3±3.8*

*p<0.05

Table 5: Oil wrestlers' 1RM measurements comparison of pre and post tests

Variables	Pre-test (n:14)	Post-test (n:14)
Shoulder Press (kg)	93.2±4.6	93.9±2.8
Leg Extension (kg)	110.0±0.0	110.0±0.0
Triceps Press Down (kg)	86.7±11.1	91.0±6.2*
Leg Curl (kg)	72.1±13.1	78.5±12.3*
Lat Pull (kg)	94.2±17.1	98.9±14.8*
Biceps Curl (kg)	67.5±15.1	72.8±13.2*
Chest Press (kg)	108.9±17.1	114.6±15.7*

*p<0,05

100 m, Sprint, 200 m, Sprint, and 3000 m, Endurance) were also significantly different ($p<0.05$) (Table 6). This difference can be due to the effects of sprint and endurance training.

Table 6: Oil wrestlers' sprint and endurance measurements comparison of pre and post tests

Variables	Pre-test	Post-test
50 m, Sprint (sn,sl)	6.99±6.3	6.50±4.1*
100 m, Sprint (sn,sl)	12.71±9.4	11.78±4.5*
200 m, Sprint (sn,sl)	30.39±9.5	29.09±7.2*
3000 m, Endurance (min, sn)	14.4±2.9	13.1±4.0*

*p<0.05

DISCUSSION

Ramirez-Velez et al. (2014) identified Body Mass as, 66.3 ± 10.6 kg, 61.5 ± 71.2 kg. Rahmani et al. (2007) identified fat percentage as 50 kg 6.9 ± 1.9 , 55 kg 9 ± 1.2 , 60 kg 10.4 ± 2.4 , 66 kg 9.7 ± 2.2 , 74 kg 10.3 ± 2.4 , 84 kg 10.1 ± 2.6 , 96 kg 11.9 ± 2.1 , 120 kg 20.1 ± 6 kg. In similar studies, body fat (%) 8.4 (Mirzai et al. 2011), body fat (%) 7.66 ± 3.4 (Samuel et al. 200), (%) 8.4 have determined. In other studies, fat percentage pretest (%) Preseason 8.91 ± 3.32 , Midseason 8.92 ± 2.86 Prenationals 9.62 ± 2.09 , Postseason 12.52 ± 3.65 (Thomas et al. 2008). In a previous study, it was demonstrated that fat percentage (FM %) pretest value of adolescent male wrestlers was 8.03 (Roemmich and Sinning 1997). In another study, FM percent of young male wrestlers 8.4 (Silva et al. 1981) and male wrestlers was found as 14-10 (Ransone and Hughes 2004). This value was similar to the mean FM percent values of the wrestlers of previous studies percent body fat identified as 13.6 ± 3.0 . (Ramirez-Velez et al. 2014).

Similar to the results of this study Saad (2012) found that, heart rate resting (Beats/min) 68.67 ± 2.46 , Heart rate effort (Beats/min) 181.92 ± 4.42 . In similar studies, male wrestlers have determined 61 beats min⁻¹ heart rate. 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 $220 - \text{age}$, 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 (Ahmed 2012).

In similar studies, Lightweight (n=20) warm-up 104.2 ± 11.0 bout 1 189.7 ± 9.6 bout 2 189.4 ± 7.7 bout 3 190.6 ± 9.1 5 min recovery 9.2 ± 3.2 . 8.8 ± 2.2 , 120.1 ± 7.6 middleweight (n=20) warm-up 106.6 ± 15.0 bout 1 183.9 ± 8.7 , bout 2 188.1 ± 5.7 , bout 3 188.5 ± 7.4 , 5 min recovery 122.5 ± 6.6 heavyweight (n=20) warm-up 106.6 ± 12.7 , bout 1 188.8 ± 5.8 , bout 2 191.0 ± 8.0 , bout 3 189.2 ± 8.2 5 min recovery 124.9 ± 8.1 have been determined (Karninciae et al. 2013). Widermans and Hagen (1982) determined, rest hearth rate 56-54-52 beats. min⁻¹, maximum exercise 196-200-188 beats.min⁻¹. Harbili et al. (2007) determined the heart rates in active and passive resting as 69.9 ± 5.5 pulse/min. heart rate, in the end of the test as 69.9 ± 5.5 pulse/min., as 141.7 ± 14.3 pulse/min 10 mins later for the active resting group; the heart rates for the passive rest-

ing group as 72.5 ± 5.6 pulse/min, in the end of the test as 178.4 ± 11.5 pulse/min., as 118.8 ± 10.9 pulse/min. 10 mins. In a study on Canadian Olympic free style wrestlers, found the average of the total numbers of heart rates as a result of maximal hard training as 187 ± 8 pulse/min (Song and Garvie 1980). In a study about the comparisons of the threshold values obtained from lactate minimum test and standard incremental exercise tests, Carter et al. (2000) registered the number of heart rate as 167 ± 15 pulse/min, 168 ± 11 pulse/min. In a study about comparing MaxVO₂ and the lactate values and two different incremental treadmill protocol on elite athletes, Özgür (2005) found the maximal heart rates of the athletes as 191.14 ± 8.18 pulse/min).

Aydos et al. (1991) determined one maximum repetition bench press of the basketballers as 79.5 ± 14.0 kg, of the volleyball players as 72.0 ± 10.2 kg, of the wrestlers as 94.2 ± 20.1 kg, of weightlifters as 109.5 ± 10.3 kg. (Saad 2012). In similar studies bench press 1 RM 85 kg (Mirzai et al. 2008), bench press 1RM 105 kg. (Mcguigan et al. 2006). It has previously been shown that absolute strength and power are the important components of wrestling (Kraemer et al. 2004). In similar studies 40 yd 4.57 s, Greco roman wrestlers 4.90 s, freestyle 5.12 s, have determined (Mirzai et al. 2008).

CONCLUSION

Oil wrestlers are applied to the camp period of intensive training to be (have) effective features that combine one-way instead of training is important for the development of all features were observed. Training program can be provided as a model.

RECOMMENDATIONS

Performance of Oil Wrestlers are influenced by many factors. We think that continuation in strength training will be beneficial, especially intended for arm, abdomen and quadriceps areas in strength trainings. Planning the endurance trainings two months in advance can be efficacious for neurologic adaptation.

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REFERENCES

- Açıkada C, Ergen E, Alpar R, Sarpyener K 1991. Investigation of body composition parameters of male athletes. *Hacettepe University Journal of Sport Sciences*, 2(2): 11.
- Anderson CE, Sforzo GA, Sigg JA 2008. The effects of combining elastic and free weight resistance on strength and power in athletes. *Journal of Strength and Conditioning*, 22(2): 567-74.
- Aydos L, Pepe H, Karakus H 2004. Some team and individual sports to investigate the relative strength value. *Kirsehir Gazi University Faculty of Education*, 5(2): 305-315.
- Balabinis CP, Psarakis CH, Moukas M, Vassiliou MP, Behrakis PK 2003. Early phase changes by concurrent endurance and strength training. *Journal of Strength and Conditioning Research*, 17(2): 393-401.
- Basar S, Duzgun I, Guzel NA, Cicioglu I, Çelik B 2014. Differences in strength, flexibility and stability in freestyle and Greco-Roman wrestlers. *Journal of Back and Musculoskeletal Rehabilitation*, 27(3): 321-330.
- Bompa T 1999. *Periodization Theory and Methodology of Training*. Champaign, IL: Human Kinetics.
- Callan SD, Brunner DM, Devolve KL, Mulligan SE, Hesson J, Wilber RL, Kearney JT 2000. Physiological profiles of elite freestyle wrestlers. *Journal of Strength and Conditioning Research*, 14: 162-169.
- Carter H, Jones AM, Doust JH 2000. Changes in blood lactate and pyruvate concentrations and the lactate-to-pyruvate ratio during the lactate minimum speed test. *Journal of Sports Sciences*, 18(3): 213-225.
- Cinar G, Tamer K 1994. Lactate profiles of wrestlers who participated in 32nd European free-style wrestling championship. *J Sports Medicine and Physical Fitness*, 34: 156-160.
- Cvetkovic C, Maric J, Marelic N 2005. Technical efficiency of wrestlers in relation to some anthropometric and motor variables. *Kinesiology*, 37(1): 74-83.
- Harbili E, Inal AN, Gökbel H, Harbili S, Akkus H 2007. Elimination of active recovery after intense exercise effects on blood lactate. *Journal of General Medicine*, 17(4): 191-196.
- Holviala J, Kraemer WJ, Sillanpää E, Karppinen H, Avela J, Kauhanen A, Häkkinen A, Häkkinen K 2012. Effects of strength, endurance and combined training on muscle strength, walking speed and dynamic balance in aging men. *Eur Journal of Appl Physiol*, 112(4): 1335-1347.
- Horswill CA 1992. Applied Physiology of Amateur Wrestling. *Sports Med*, 14(2):114-143. From <<http://www.kirkpinar.com/home.php?link=yaglamaan-ddil=en>>
- Karnineic H, Krstulovic S, and Baic M 2013. The influence of body weight on chosen physiological parameters in wrestling. *Journal of Human Kinetics*, 37(1): 119-127.
- Kilinc F 2008. An intensive combined training program modulates physical, physiological, biomotoric, and technical parameters in women basketball players. *The Journal of Strength and Conditioning Research*, 22(6): 1769-1778.
- Kraemer WJ 2002. *Periodized Training Programmes for Athletes*. In: WH Kraemer, K Hakkinen (Eds.): *Strength Training for Sport*. Oxford: Blackwell Science, pp. 101-108.
- Kraemer WJ, Fry AC, Rubin MR, Triplett-Mcbride T, Gordon SE, Koziris LP, Lynch JM, Volek JS, Meuffels DE, Newton RU, Fleck SJ 2001. Physiological and performance responses to tournament wrestling. *Medicine and Science in Sports and Exercise*, 33: 1367-1378.
- Kraemer WJ, Vescovi JD, Xon Di P 2004. The physiological basis of wrestling: Implications for conditioning programs. *Journal of Strength and Conditioning*, 26: 10-15.
- McGuigan MR, Winchester JB, Erickson T 2006. The importance of isometric maximum strength in college wrestlers. *Journal of Sports Science and Medicine*, 5(CSSI): 108-113.
- Mirzaei B, Akbar NA 2008. A skill profile of elite Iranian Greco-Roman wrestlers. *World Journal of Sport Sciences*, 1(1): 08-11.
- Mirzaei B, Curby DG, Barbas I, Lotfi N 2011. Anthropometric and physical fitness traits of four-time World Greco-Roman Wrestling Champion in relation to national norms: A case study. *Journal of Human Sport and Exercise*, 6(2): 406-413.
- Mirzaei B, Rahmani-Nia F, Moghadam MG, Ziyaolhagh SJ, Rezaei A 2012. The effect of Ramadan fasting on biochemical and performance parameters in collegiate wrestlers. *Iran J Basic Med Sci*, 15(6): 1215-1220.
- Ozgür T 2005. *VO₂ Max Lactate Levels in Elite Athletes and Two Different Step-Up (Incremental) Treadmill Protocol Comparison with*. PhD Thesis, Unpublished. Kocaeli: University of Kocaeli.
- Rahmani-Nia F, Mirzaei B, Nuri R 2007. Physiological profile of elite Iranian Junior Greco-Roman wrestlers. *International Journal of Fitness*, 3: 49-54.
- Ramirez-Velez R, Argothayd R, Meneses-Echavez JF, Sanchez-Puccini MB, Lopez-Alban CA, Cohen DD 2014. Anthropometric characteristics and physical performance of Colombian elite male wrestlers. *Asian J Sports Med*, 5(4): e23810, 1-4.
- Ransone J, Hughes B 2004. Body-weight fluctuation in collegiate wrestlers: Implications of the National Collegiate Athletic Association Weight-Certification Program. *Journal of Athletic Training*, 39(2): 162-165.
- Roemmich JN, Sinning WE 1997. Weight loss and wrestling training: Effects on nutrition, growth, maturation, body composition, and strength. *Journal of Applied Physiology*, 82: 1751-1759.
- Saad AH 2012. Physiological profile of the young Egyptian wrestlers world. *Journal of Sport Sciences*, 6(1): 45-50.
- Samuel DC, Diane MB, Kevin L, Devolve S, Mulligan E, Hesson J, Randall LW, Jay TK 2000. Physiological profiles of elite freestyle wrestlers. *Journal of Strength and Conditioning Research*, 14(2): 162-169.
- Silva JM, Shultz BB, Haslam RW, Murray DA 1981. Psychophysiological assessment of elite wrestlers. *Research Quarterly for Exercise and Sport*, 52: 348-358.

- Song TM, Garvie GT 1980. Anthropometric, flexibility, strength, and physiological measures of Canadian wrestlers and comparison of Canadian and Japanese Olympic wrestlers. *Canadian Journal of Applied Sport Sciences. Journal canadien des sciences appliquées au sport*, 5(1): 1.
- Tamer K 2000. *Sports Physical-Physiological Performance Measurement and Evaluation*. Improved 2 Printing. Ankara: Publishing Bagirgan.
- Thomas WB, Douglas BS, Matthew SO, Aric JW, Stephen RJ 2008. Seasonal changes of body mass, body composition and muscular performance in collegiate wrestlers. *International Journal of Sports Physiology and Performance*, 3: 176-184.
- Utter A, Stone M, O'bryant H, Summinski R, Ward B 1998. Sport-seasonal changes in body composition, strength and power of college wrestlers. *Journal of Strength and Conditioning Research*, 12: 266-271.
- Utter AC, O'Bryant HS, Haff GG, Trone, GA 2002. Physiological profile of an elite freestyle wrestler preparing for competition: A case study. *The Journal of Strength and Conditioning Research*, 16(2): 308-315.
- Wideman PM, Hagan RD 1982. Body weight loss in a wrestler preparing for competition: A case report. *Medicine and Science in Sports and Exercise*, 14(6): 413-418.
- Yoon J 2002. Physiological profiles of elite senior wrestlers. *Sports Med*, 32(4): 225-233.
- Zorba E, Ziyagil MA 1995. *Body Composition and Measurement Method*. Trabzon, Turkey: Erek Publishing.