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PHYSICAL FITNESS MEASURES OF CADET WRESTLERS

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ABSTRACT
The purpose of the present investigation was to describe the physical fitness profile of elite cadet wrestlers. Forty-four wrestlers (age: 15.66±0.56 years, weight: 65.75± 16.65 kg and height: 167.8±9.6 cm) who were invited to the national training camps participated in this study. The physical fitness parameters included body weight, maximal oxygen consumption (Bruce protocol), muscular endurance (pull-ups, push-ups, bent-knee sit-ups) and strength (bench press), exclusive power (Standing long jump), speed (40-yd sprint) and agility (4 × 9-m shuttle run). The major results (mean ± SD) are as follows: maximal oxygen consumption ($ml \cdot kg^{-1} \cdot min^{-1}$): 46.84±3.76; standing long jump (cm): 227.45±20.86; 1-repetition maximum bench press (weight lifted kg in relative to the body weight): 0.88±0.16; push-ups (rep/min): 53.48±10.04; pull-ups (rep): 16.32±8.14; sit-ups (rep/min): 53.41±9.82; speed (s): 6.03±0.46 and agility (s): 9.62±0.65. The present study provides baseline data that have been used in the prescription of individual training programs for these athletes. This information is also available to the coaches and can contribute to the general strategy employed by a wrestler and for a specific match.
KEY WORDS: wrestling, testing, fitness, evaluation, cadet

INTRODUCTION

Numerous specially designed training clubs exist to train and educate talented adolescent wrestlers. The main goal of these organizations is to build up a group of wrestlers who are internationally competitive. Scientific evaluations of physical capacity, preparation of training schedule together with healthy maturation are critically important for improving the performance of these athletes [7]. ‘‘Cadet’’ is an official age group designation for international competition by the international governing body of wrestling (International Federation of Associated Wrestling Styles). Cadet continental Championships are held annually for these wrestlers who are between 15 and 16 years old (have not turned 17).

In the sport of wrestling, wrestlers need to have a high level of physical, mental, technical and tactical preparation to perform successfully in national and international level competitions. With a better understanding of the physiological features in wresting, it is possible to diagnose and evaluate the performance of the wrestler and to provide suggestions for development of fitness for competition. 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 critical [5, 8, 11]. Arabaci and Çankaya (2008) reported that VO_2max and speed of cadet wrestlers were 47.5±3 $ml \cdot kg^{-1} \cdot min^{-1}$ and 5.82±0.2 s, respectively [3]. Ziagil et al (1996) indicated that the VO_2max of cadet wrestlers is 48.84 $ml \cdot kg^{-1} \cdot min^{-1}$ and their aerobic capacity increased 1.49% in a year [14]. Yoon (2002) reported that the maximal oxygen uptake of national and international wrestlers taking part in international competition has been shown to be about 53 to 56 ($ml \cdot kg^{-1}$ min^{-1}). He also indicated that the flexibility of top-level wrestlers was higher than that of lower level wrestlers [13]. Rahmani-Nia et al. (2007) determined the physiological profile of Iranian junior Greco-Roman wrestlers. They measured muscular endurance and strength, maximal oxygen uptake, agility and speed [10]. Mirzaei et al. (2009) investigated the physiological profile of Iranian junior freestyle wrestlers. They reported mean and standard deviation of body weight (kg): 77.5 ± 19.8; flexibility (cm): 38.2 ± 3.94; VO_2max ($ml \cdot kg^{-1} \cdot min^{-1}$): 50.5 ± 4.7; maximal anaerobic power (W): 455.5 ± 87.6; push-ups (rep/min): 66.9 ± 7.6; pull-ups (rep): 31.6 ± 9.7; bent-knee sit-ups (rep/min): 66.5 ± 8; speed (s): 5.07 ± 0.17; agility (s): 8.7± 0.25 and body fat (%): 10.6 ± 3.8 [9].

The information regarding profiles of cadet wrestlers is limited. Furthermore, the major use of testing is to establish the strengths and weaknesses of the athlete, and this is done by comparing test results to other athletes in the same training group, the same sport or a similar population group. Therefore, the purpose of this study was to describe the physical fitness profile of elite cadet wrestlers.

METHODS

Subjects: 44 elite Iranian cadet wrestlers who were invited to the national training camps periodically participated in this study. They all had at least 5 years' training experience. All wrestlers were assessed during the specific preparatory phase of the season. Before participating, subjects and subjects' parents (for those were under the age of 15) read and signed an informed consent statement in adherence with the human subject's guidelines of Iran's NOC (National Olympic Committee) Research Center.

Testing procedures: The tests selected were familiar to the wrestlers through previous use in training and have a history of use in the literature of wrestling profiles. The physical fitness parameters included cardiovascular endurance, muscular endurance and strength, speed, agility, and explosive power. Height and weight were also recorded. The subject performed a graded treadmill exercise test (Bruce protocol) to estimate VO_2max. A 40-yd sprint test was used to assess speed. A pull-ups test (with palms facing the subject) was used to assess muscular endurance and a 1-minute bent-knee sit-ups test was used to assess abdominal muscular endurance. The bent-knee sit-ups test required the subject to lock his hands behind his head and touch his elbows to the thigh with a partner holding his ankles. A 4 × 9-m shuttle run test was used to assess agility. The subject touched a sensor with his hand at each 9-m line [9]. Explosive power was measured with the standing long jump test where the subjects were instructed to perform a long jump from a standing position. Standardized instructions were given to subjects that permitted them to begin the jump with bent knees and swing their arms to assist in the jump. A line drawn on a hard surface served as the starting line. The length of the jump was determined using a tape measure, which was affixed to the floor. Each subject was given 3 trials, and the distance of the best jump was measured. The longest jump was used as the test score [1]. Bench press 1 repetition maximum (1RM) was estimated from a 1-3 RM effort using the equation described by Wathan [12]. Each athlete was given three to six attempts with progressively increasing weight to achieve a 1-3 RM with 3-5 minutes' rest between attempts. Experienced and certified strength and conditioning coaches supervised all testing [2]. The testing was completed in three days in a standardized order to allow adequate recovery.

RESULTS

Subject data and weight class representation in the 10 official weight classes are shown in Table 1.The performance measures of the wrestlers are presented in Tables 2 and 3. Table 2 contains testing results for maximal oxygen uptake, exclusive power, agility and speed. Muscular endurance and strength measurements are listed in Table 3.

Table 1. Subject descriptive data (means ± SD)

Weight class	N	Age (yr)	Height (cm)	Weight (kg)	BMI (kg/m^2)
42 kg	4	14.75±0.95	152±0.04	43.75±1.5	18.95±0.82
46 kg	4	15.25±0.50	154±0.01	47.25±1.5	19.92±0.73
50 kg	5	15.60±0.54	162±0.05	51.60±1.34	19.64±0.88
54 kg	3	15.67±0.57	161±0.06	54.66±1.15	21.05±1.57
58 kg	6	15.50±0.54	164±0.04	59.83±1.72	22.05±1.09
63 kg	5	16.00	172±0.04	65.60±0.54	22.10±1.19
69 kg	5	16.00	171±0.04	72.20±2.58	24.50±1.61
76 kg	4	16.00	175±0.02	79.25±0.95	25.81±0.62
85 kg	3	16.00	177±0.02	87.33±3.05	27.78±1.36
100 kg	5	15.80±0.44	179±.012	96.00±3.39	29.96±1.16
Total	44	15.66±0.56	1.67±0.09	65.75±16.65	23.15±3.66

Table 2. VO_2max, Speed, Agility and explosive power (means ± SD)

Wt class	VO_2max (ml·kg^{-1}·min^{-1})	40-yd (s)	4×9-m shuttle run (s)	Standing long jump (cm)
42 kg	45.00±3.46	6.21±0.63	9.79±0.65	208.75±15.47
46 kg	45.25±3.30	6.34±0.46	10.03±0.93	202.50±9.57
50 kg	47.00±2.34	6.25±0.25	9.33±0.54	222.00±8.36
54 kg	49.67±2.08	6.14±0.21	9.14±0.95	218.33±16.07
58 kg	49.50±4.08	5.76±0.21	9.67±0.64	228.33±10.32
63 kg	46.40±3.91	5.89±0.58	9.19±0.43	243.40±13.12
69 kg	46.20±5.16	5.61±0.22	9.30±0.64	231.60±39.62
76 kg	48.75±4.71	6.03±0.42	9.61±0.37	249.50±3.31
85 kg	47.00±2.00	5.79±0.17	9.73±0.94	235.00±21.79
100 kg	44.00±3.00	6.37±0.65	10.40±0.35	230.00±12.74
Total	46.84±3.76	6.03±0.46	9.62±0.65	227.45±20.86

Table 3. Muscular endurance and strength (means ± SD)

Weight class	Push-ups (rep/min)	Pull-ups (rep)	Sit-ups (rep/min)	Bench press ($kg.kg^{-1}$)
42 kg	60.50±12.50	16.00±4.89	56.25±8.01	1.02±0.08
46 kg	60.50±11.12	20.75±6.70	56.25±10.59	1.03±0.10
50 kg	52.00±9.74	18.60±7.76	52.00±9.74	0.92±0.19
54 kg	57.67±2.08	27.67±14.57	61.00±7.81	0.91±0.01
58 kg	50.50±6.26	17.33±5.50	50.50±6.25	0.88±0.21
63 kg	56.80±8.46	21.80±5.40	56.80±8.46	0.93±0.06
69 kg	58.40±2.70	14.80±5.35	57.20±4.32	0.91±0.11
76 kg	54.25±8.22	15.00±3.46	54.25±8.22	0.81±0.14
85 kg	47.00±4.58	8.00±2.00	51.00±11.35	0.71±0.06
100 kg	39.80±12.29	4.80±2.16	42.80±16.51	0.71±0.18
Total	53.48±10.04	16.32±8.14	53.41±9.82	0.88±0.16

DISCUSSION

The results of the current study can be used to establish a wrestlers' profile that is in alignment with the current rules. Although wrestling performance involves explosive techniques which are highly anaerobic and of a high power nature, the aerobic energy system plays a major role in successful wrestling because the energy required by muscle during break between two periods, recovery between two matches and even between points in a match comes from aerobic sources. Hence, one of the most important factors affecting wrestlers' performance is maximum oxygen uptake. The mean maximum oxygen values of the subjects participated in this study (Table 2) was very close to that reported by Ziagil et al. (1996) [14].

In the present study, subjects had a high level of explosive power. The importance of lower-body power in wrestling lies in the ability of the wrestlers to lift his opponent during certain offensive maneuvers and to resist attacks by his opponent [4]. The result of speed test was very close to that reported by Arabaci and Çankaya (2008) [3]. The results of agility and speed tests in our study were lower than the results of Mirzaei et al. (2009) [9]. This difference is possibly due to that the fact that the subjects in present study included cadet wrestlers, whereas the subjects of Mirzaei's study were junior wrestlers. However, having high levels of speed and agility help the wrestlers perform techniques quickly in competition. In push-ups and sit-ups tests, the subjects had high scores. High muscular endurance allows for good stability in attack and defensive positions.

Upper body strength is a prerequisite for the successful performance of techniques such as the gut-wrench and lifting of the opponent. In the present study, the wrestlers of 42 and 46 kg weight classes had a relative strength higher than other classes. Wrestling is a high intensity sport which requires strength and power of both the upper and lower body as well as relying heavily on isometric force for various wrestling techniques [4, 6, 8, 13].

PRACTICAL IMPLICATIONS/ADVICE FOR ATHLETES AND COACHES

It is quite useful to provide weight class specific means that can be used in evaluation of individual wrestlers, as well as providing legitimate targets that can be used in goal-setting.

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MESURES DE LA CONDITION PHYSIQUE DES LUTTEURS CADETS

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RÉSUMÉ
Le but de la présente enquête est de décrire le profil de la condition physique des lutteurs cadets d'élite. Quarante-quatre lutteurs (âge: 15,7 ± 0,6 ans, poids: 65,8 ± 16.7 kg et la hauteur: 167,8 ± 9,6 cm) invités à des entraînements nationaux ont participé à cette étude. Les paramètres de forme physique: poids corporel, consommation maximale d'oxygène (protocole de Bruce), endurance musculaire (tractions, pompes, abdominaux demi-flexion) et force (développé couché), puissance explosive (saut en longueur), vitesse (sprint de 40 yd) et agilité (4 x 9m en course-navette). Les principaux résultats (moyenne ± SD) sont les suivants: consommation maximale d'oxygène ($ml \cdot kg^{-1} \cdot min^{-1}$): 46,84 ± 3,76; saut en longueur (cm): 227,5 ± 20,9; 1-répétition maximum en développé couché (poids levés kg par rapport au poids du corps): 0,88 ± 0,16; pompes (rep / min): 53,5 ± 10; tractions (rep): 16,3 ± 8,1; abdominaux demi-flexion (rep / min): 53,4 ± 9,8 ; vitesse (s): 6 ± 0,5 et agilité (s): 9,6 ± 0,7. La présente étude fournit des données de base qui ont été utilisés dans la prescription des programmes de formation individuelle pour ces athlètes. Cette information est également disponible pour les entraîneurs et peut contribuer à la stratégie générale employée par un lutteur et pour un match spécifique.
MOTS CLÉS: la lutte, les essais, de remise en forme, d'évaluation, des cadets