TRAINABILITY OF BODY COMPOSITION, AEROBIC POWER AND MUSCULAR ENDURANCE OF CADET WRESTLERS

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Abstract. *Purpose:* The purpose of the present study was to investigate the trainability of body composition, aerobic power and muscular endurance of cadet wrestlers. *Subjects:* Fifteen cadet wrestlers (age: 15.20±0.94 years) participated in this study. *Methods:* The testing was conducted twice, before and after four-week training period. The physiological parameters included aerobic power, muscular endurance and body composition. *Results:* A significant decrease in the body fat was observed following the training ($P<0.05$). No significant changes were found in the weight, aerobic power and muscular endurance measures ($P>0.05$). *Conclusion:* Our results indicated that wrestlers experienced significant changes in their body fat percentage during four-week training period. Cadet wrestlers' aerobic power, muscular endurance and body composition are trainable, although these improvements may be less than what has been observed in junior and senior wrestlers.
Key words: cadet, wrestling, conditioning, periodization.

Introduction

Wrestling is one of the heaviest combat sports and wrestlers need to have a high level of physical, mental, technical and tactical preparation. Frequent changes in wrestling rules during last ten years, especially rules related to duration of competition has exposed various physiological requirements of this Olympic sport with a lot of challenges including interference of aerobic and anaerobic energy systems, recovery between two competitions and measuring and evaluating physical fitness factors [13]. The factor that makes this matter more complicated is considering wrestling as a sport which need weight classification.

One challenge that has attracted attention of sport coaches and specialists is identification of the physical and biological factors that affect participants' performances. Talent identification in the fields of sport, selecting young athletes who have high capacity in different sports can contribute considerably to championship achievements through spending the least amount of time and the lowest amount of the budget at the same time [20]. After identifying the talented athlete with the related potentiality, applying proper preparation and training programs are required. Sport specialists and coaches can get useful information by using fitness tests to evaluate their current conditions and identifying the type of the physical capacities of the elite athletes [14]. In addition for setting criteria to compare other with athletes, this information helps to identify their weaknesses and strengths and provides operational strategies for designing training.

Sensitivity of adolescence age is an important factor in the one hand and the lack of the proper related knowledge of the coaches on the other hand encounter the adolescents with a lot of risks and dangers [19]. The researchers have demonstrated that adolescents are not young adults and it's not reasonable to do the same amount and type of exercises with the lower intensity [10]. Lack of adequate knowledge to prepare young athletes and lack of coaches' attention to specific characteristics of adolescents prevents them from achieving success and directs them to the irreversible path of fatigue and injury at the same time. The matter which is often ignored is the physical development and maturation of these adolescents. Adolescents' bodies have enough capacity to respond even to wrong exercises and trainings. For adolescence championship in is not so important and is not the main goal in many developed countries and based on some researches championship programs need 8 to10 years of training [3], but many coaches ignore this important fact and they try to make athletes a champion in wrestling through applying unsystematic training and unfortunately they are sometimes called successful coaches. Today, it has been found that these exercises

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put the athletes at risk of health problems. Although through proper training, cadet wrestlers can be successful considerably, this success is temporary and does not last for a long time and sometimes the athlete is forced to give up wrestling because of improper training programs chosen by some coaches.

The studies relates to physiological characteristics and physical capabilities of the wrestlers and has demonstrated that physical fitness is the basis for training programs and wrestlers' success, and it has been noted that each wrestler should be exercised only with a certain percentage of his aerobic and anaerobic capacities [11]. Arabaci and Canakya (2000) investigated the effects of the training program on some physiological parameters in young wrestlers and have reported significant increase in the strength, aerobic capacity, flexibility and the anaerobic power of the wrestlers who regularly participate in the preparation period compared to those who received no training [1]. Buford et al (2006) have studied the impact of competition season on body weight, hydration and muscle performance of college wrestlers. They have reported significant increase in body weight and muscular performance of wrestlers at the end of competition season [5]. In another study, Buford et al (2008) have reported that 2.9 % increase in the amount of body fat before and after the season [6].

Published information about cadet wrestlers is limited. Wrestling training recently has been started systematically in very countries and it means that coaches are not familiar enough with the periodization of training and with factors influencing wrestling. Also, to identify the time required to effectiveness of wrestling training on physical fitness factors, the purpose of present study was to investigate the trainability of body composition, aerobic power and muscular endurance of cadet wrestlers.

Methods

Subjects

Fifteen cadet wrestlers were recruited from wrestling clubs in Iranian province of Kurdistan and served as objects in this study. They all had at least 3 years training experience and were representative of the top wrestlers of Kurdistan competing in national competitions. Before participating, the subjects' parents were informed of the potential risks and gave their written informed consent for their children to participate in this study, which was consistent with the human subject policy of the Guilan research center. Subject characteristics were as follows (mean ± SE): age (15.20±0.94 yr); height (169.07±8.38 cm); and weight (47.69±13.86 kg).

Training program

The exercise program consisted of 28 sessions (2 sessions of combat (live) wrestling, 1 session reviewing and practicing techniques, 2 sessions of interval running, 1 session of endurance training and 1 session of power training each week). Due to the possible risk of weight training for adolescent athletes, wrestling specific exercises using body weight was employed in the strength training. Between any two exercise sessions enough time was given for adequate recovery. In general, the training emphasized cardiovascular endurance and muscular strength factors.

Table 1. Weekly training program

Days	AM	PM
Monday	Interval running	off
Tuesday	off	review of techniques
Wednesday	Interval running	Power training
Thursday	off	Combat wrestling
Friday	off	off
Saturday	off	Endurance training
Sunday	off	Combat wrestling

Testing procedures

The testing was conducted twice, before and after 4-week training period. Physiological parameters included cardiovascular endurance, muscular endurance and body composition. Subcutaneous body fat was measured at 3 sites (chest, abdominal and thigh) with a Lafayette caliper. Body fat percentage was calculated with the formula developed by Jackson & Pollock (1978) [9]. Height and weight were also recorded.

12 minute run test was used to estimate VO2max. After warm up, the object runs as far as possible during 12 minutes. Tester records distance covered (kilometers, and meters). VO2max was assessed by the following formula: VO2max = (22.351 × kilometers) - 11.288 [7].

A pull-up test (with palms facing the subject) was used to assess muscular endurance and a 1-minute bent-knee sit-up test was used to assess abdominal muscular endurance. The bent-knee sit-up test required object to lock at his hands behind his head and touch his elbows to the thigh with a partner holding his ankles [15]. The testing was completed in three days in standardized order to allow adequate recovery [16]. Coaches and teammates provided verbal encouragement throughout each test.

Statistical methods

All descriptive data are expressed as means ± SD. The obtained results were analyzed using paired-samples t-test, to compare the two stages of preparation ($P \leq 0.05$). Statistical analysis was conducted using SPSS 16.0 for Windows.

Results

The values of body composition (weight and body fat), muscular endurance and aerobic capacity are presented in Table 2.

Table 2. Body composition, aerobic capacity and muscular endurance of the subjects before and after four- week preparation

	Body Weight	Body Fat (%)	VO2max	Sit-up	Pull-up
Pre-test	47.69±13.86	6.25±2.10	42.79±7.03	45.66±6.21	16.53±9.60
Post-test	51.42±7.87	5.08±2.13	44.98±7.21	48.53±5.24	18.66±10.93
t	t=-1.12	7.16	-2.38	-1.69	-2.54

The results showed that body fat percentage of the objects decreased significantly after 4 week wrestling training ($P<0.05$). Also, the result showed that body weight of the subjects decreased after 4 week wrestling training and this change was statistically significant ($P<0.05$).

The results of muscular endurance showed that the number of the sit-ups test increased after 4 week wrestling training, but this change was not statistically significant ($p>0.05$). Also, the result of chin-ups in the post test increased comparing with the pre-test measurements but the differences were not significant ($p>0.05$). Maximal oxygen uptake (VO_2Max) as an aerobic capacity index increased after 4 week wrestling training, but this change was not statistically significant ($p>0.05$).

Discussion

Measuring body fat in the untrained participants has been studied frequently and its importance in wrestling has also been considered even more. Coaches have always considered weight loss in wrestling as a main concern in the process of improving the wrestlers' performances. Fat loss after endurance training has been well accepted [3]. Also it has been indicated that body composition can have a significant effect on physiological responses [2]. In the present study, the body fat percent of the cadet wrestlers have significantly decreased after four weeks of training which is probably the result of the endurance training sessions.

A significant decrease in the body fat after endurance training is consistent with Rahimi (2006) and Fathi et al., (2009) [8, 17]. They have reported that physical activity has an effect on the body composition. The results are also consistent, with the Baer et al (1983) and Arabaci & Çankaya (2000) studies on young wrestlers [1, 2]. In contrast, Shriver et al (2009) have reported that wrestles cannot change their body fat percentage during the period of preparation [18]. This is probably due to the age of subjects and the exercise protocol.

Also, there has been a slight increase in body weight comparing with the pre-test data. It seems that slight increase in body weight is probably due to the lack of power training in preparation program (4 sessions). It should be noted that during wrestling training, performing many techniques such as reverse lift may also be considered as a part of power training.

In the present study, aerobic capacity of objects increased. However, this increase was not statistically significant. It seems that, four weeks training is not a sufficient time to make significant increase of VO_2max. This result is consistent with the results of Matos & Winsley (2007) [10]. They have reported that adolescents like adults can improve their aerobic capacity through endurance exercises. In contrast, Arabachi and Canakya (2008) have reported a significant increase of aerobic capacity in cadet wrestlers [1]. This is probably due to differences in training protocol, object's fitness level and training duration. There was no significant increase in the muscle endurance (sit-up and pull-up tests).

In contrast, Arabachi and Çanakya (2008) have reported a significant increase of upper body endurance [1]. This difference may be the result of using different tests to estimate the muscular endurance, preparation phase and fitness levels of the objects. According to recent changes in wrestling rules, it seems that in wrestling, endurance and aerobic capacity are less important comparing with anaerobic capacity. Of course, this does not mean that aerobic exercises should be removed from the fitness (preparation) schedules of wrestlers. Through well-designed and scheduled exercises, wrestlers can control their weights, and also this could be involved in faster and better recovery of wrestlers between two heavy training sessions or two wrestling matches. On the other hand, high aerobic capacity index (Vo_2max) in wrestlers will guarantee their faster recovery during competition [12].

However, no significant increase was observed in muscular endurance based on test results. It seems that aerobic capacity factor and muscular endurance have less trainability (need more practice) and require more than four weeks training to have a significant increase. Accordingly, wrestling coaches are recommended to start endurance training sooner and put more emphasis on it.

Conclusion

In general, although a lot of factors including skill, mental, genetic and other fitness factors render some influences on a wrestler's success, improvement of physical fitness plays an important role in championship. Based on results of the present study more time is needed to improve muscular and cardiovascular endurance, therefore wrestling coaches and trainers are recommended to pay special attention to these factors. It is recommended that similar studies done on more objects and other fitness factors that influencing the success of athletes.

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