



## SEASONAL CHANGES IN BODY FAT RATIOS OF ELITE ATHLETES\*

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### Abstract

In this study, the changes in the body fat percentage (BFP) of 38 athletes prepared for Kyrgyzstan National Team qualification competitions before 2016 Summer Olympic Games have been examined within the scope of the Project (BAP) during one season training period. The study has been applied out on 35 male and 3 female national athletes including 9 male Greco-Roman style wrestlers (24±4.5 years), 10 male freestyle wrestlers (22.10±3.21 years), 8 male judokas (23.6±1.89 years), 8 male athletes (29±2.87 years) and 3 female athletes (21.67±2.08 years). The body fat ratios (BFRs) of the participating athletes have been measured totally 3 times, immediately before the 6 month training period, 3 months later and 6 months after the period. In order to determine body fat percentage, skinfold thicknesses have been measured with HOLTAIN brand skinfold caliper and the body fat percentages have been determined according to the LANGE formula. The statistical evaluation of the findings has been carried out by SPSS 21.0 computer package program and the arithmetic mean and standard deviation of all parameters have been calculated. Differences in (P<0.05) level were accepted as significant. BFRs in Greco-Roman wrestling, free style wrestling, judo and male athletes haven't shown statistical difference according to measurement times (P>0.05). However, each measurement has been determined numerically lower than the previous one. The lowest average of women athletes has been observed in the second measures.

Conclusion; Although each measure in body fat percentages of wrestlers and judokas has not been found statistically significant with respect to the previous measurement, the low reflectance has been interpreted as a conscious body weight loss for adjusting the weight for the athletes who were competitors as they approached the competition period.

**Keywords:** Body Fat Ratio, Seasonal Change, Wrestling, Athletics, Judo.

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## 1. Introduction

There are two types of fat in our body. The first one is visceral fat and the second is subcutaneous fat stored under the skin. Subcutaneous fat is the fat layer stored just beneath the skin that covers the entire surface of body. Subcutaneous fat forms the large percentage of whole body fat. Two muscles with the same size and volume can produce different forces due to their fat tissue. It has been stated that the excess body fat in athletes limits the contraction strength and speed of muscle fibers contraction (Morehouse and August, 1973). In addition, it has been observed that the body composition of the sport is also important in terms of disability. In athletes with excess body fat the risk of injury and the incidence rates of recurrent injuries are higher (McHugh et al., 2006).

One of the factors that affect performance is the bodily structure or in other words the physical characteristics. It has been stated that it is impossible to reach the desired performance level unless having appropriate physical structure for the sports field (Akyüz et al., 2010). In addition, it is known that regular exercise is effective in preventing negative fatigue in the body (Demirel et al., 2017).

Subjects such as body fat percentage and body mass index have become the focus of attention in the physical education and sports fields for a long time and brought along the interest in the studies on this subject by training programs which applied under different conditions on different sports branches, gender and ages. In some sport branches, body fat percentage has been observed as a determining factor of performance (Açıkada, 1990).

In all sport branches that require aerobic and anaerobic work, excess adipose tissue and lack of lean muscle mass negatively affect the performance. The effect of body composition on the athletes' performance is one of the reasons that causes concentration of body composition on the athletes. Since factors such as strength, quickness and heat balance are related to the amount of body fat, it is very important to determine the body fat percentage (Açıkada, 1990; Suveren, 2009). Fat is a structural part of the human body. Not all human being have the same body fat percentage. The biggest problem for the athletes is the body fat they have without affecting their performance. In durability sports, overweight is disadvantageous for the athletes as it will reduce the oxygen uptake per kilogram (Yüksel, 2003; Martin and Drinkwater, 1991).

As a result of analyzing muscle and fat tissues, 70 % of the muscle cells has been found as water, 7 % fat and 22 % proteins. Excess fat cells in the body will have a braking effect on the muscles, so the movements will be limited because the muscles cannot perform their tasks efficiently and effectively (Yorulmaz, 2005).

The presence of a certain amount of body fat in the organism is essential. Each person has different percentage of body fat. Fat tissue is inactive and affects performance negatively. Low body fat percentage allows individuals to do much physical performance. Depending on training type, fat mass is reduced. As the duration of the training is longer, the source of energy which is used by body will change its direction through the fat and body fat will become active. It is known that there is a decrease in body fat depending on the usage of fats. (Yorulmaz, 2005) Researches on body fat percentage conducted on active athletes showed that the average values of body fat between 6% and 15% are considered as acceptable (Houtkooper and Going, 1994; Sinning, 1996; Pense and Turnagöl, 2006).

In this study, the seasonal changes in body fat ratios of Kyrgyzstan National Team athletes from four different branches who prepared for 2016 Summer Olympic Games have been analyzed.

## **2. Method**

38 Kyrgyzstan National Team athletes from 4 different branches, who were recommended by Kyrgyzstan Ministry of Sports Olympic Games Committee, have been included in this research. (Table1). The body fat percentage (BFP) of the athletes were measured three times in total of three monthly intervals; immediately before 6 months training period, after 3 months and 6 months and the values were recorded.

### **2.1. Height and Body Weight Measurements**

The subjects have been weighed in up to 20-gram sensitive weighbridge (Angel) with bare feet and shorts only. Length measurements have been taken with the Holtain slide calipers while the subjects were standing in upright position having the calipers that slide along the scale adjusted so that they can touch the heads and read with an accuracy of 1 mm in length.

### **2.2. Body Fat Percentage Measurement**

For the determination of Body fat percentage skinfold thickness has been properly measured with the Holtain skinfold caliper and the body fat percentage has been determined by the Lange formula. Total Body Fat Percentage is a sum of the measurements taken from 6 regions (biceps, triceps, scapula, suprailiac, chest, thigh) \* 0,097) + 3,64 (Özer, 1993).

### **2.3. Statistical Evaluations**

Statistical evaluation of the findings has been performed with SPSS 21.0 computer package program, and the arithmetic mean and standard deviation of all parameters were calculated. The “Single Sample Kolmogorov-Smirnov” test has been used to determine the homogeneity of the data. To determine the difference between the groups the “Repeated

measures Analysis of variance” test has been applied. Differences at  $P < 0,05$  level have been considered significant.

#### 2.4. Ethical Approval

Detailed information about the study was given to the subjects before the measurements and the voluntary confirmation form get signed. The study protocol was approved by the ethics committee of Kyrgyzstan State Sports Academy no 2017/115.

### 3. Result

**Table 1.** Demographic characteristics of Athletes

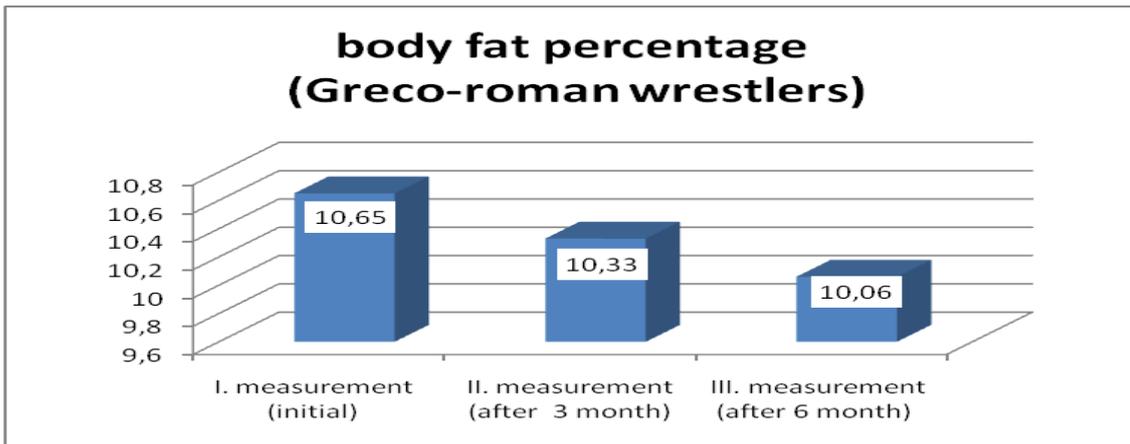
Branches	n	Age (year) Mean±sd	Height (cm) Mean±sd	Body Weight(kg) Mean±sd
Greco-Roman wrestlers (Male)	9	24,00±4,50	169,60±9,44	72,02±11,80
Freestyle wrestlers (Male)	10	22,10±3,21	164,31± 4,75	64,75 ±6,34
Judo athletes (Male)	8	23,6±1,89	175,7 ± 36,87	86,2 ± 20,27
Athleticism (Male)	8	22,29±2,87	177,88 ± 6,31	64,98 ± 2,72
Athleticism (Female)	3	21,67±2,08	171,66 ± 2,51	56,5 ± 8,58

**Table 2.** Seasonal changes in body fat percentage of athletes (%)

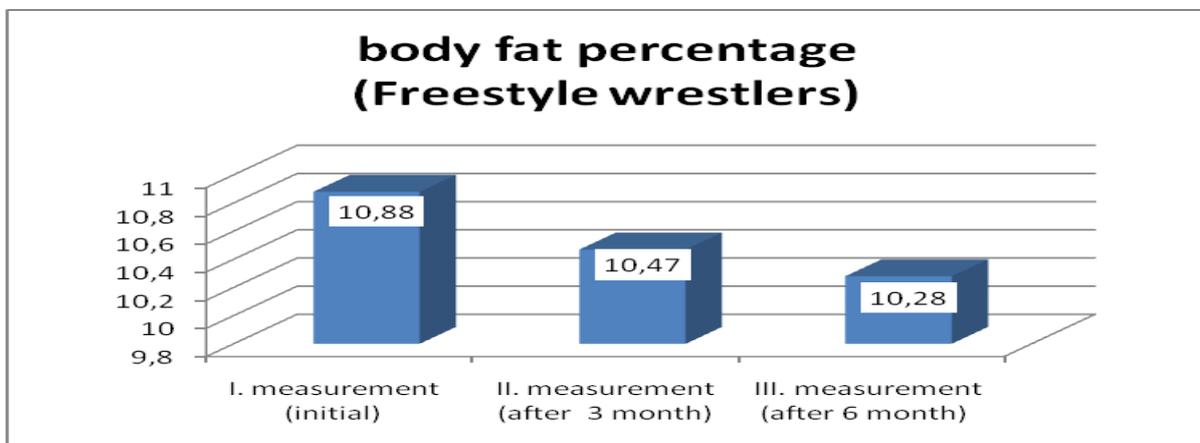
Branches	n	I. measurement (Initial) Mean±sd	II. Measurement (after 3 month) Mean±sd	III. Measurement (after 6 month) Mean±sd
Greco-Roman wrestlers (Male)	9	10,65±0,56 <sup>A</sup>	10,33±0,61 <sup>A</sup>	10,06±0,58 <sup>A</sup>
Freestyle wrestlers (Male)	10	10,88±1,10 <sup>A</sup>	10,47±0,55 <sup>A</sup>	10,28±0,53 <sup>A</sup>
Judo athletes (Male)	8	11,25±1,14 <sup>A</sup>	10,93±1,32 <sup>A</sup>	10,88±1,26 <sup>A</sup>
Athleticism (Male)	8	10,07±0,44 <sup>A</sup>	9,80±0,27 <sup>A</sup>	9,70±0,26 <sup>A</sup>
Athleticism (Female)	3	10,86±0,96 <sup>A</sup>	10,52±0,08 <sup>A</sup>	10,67±0,55 <sup>A</sup>

The difference between different letter-carrying averages on the same line is significant ( $P < 0,05$ ).

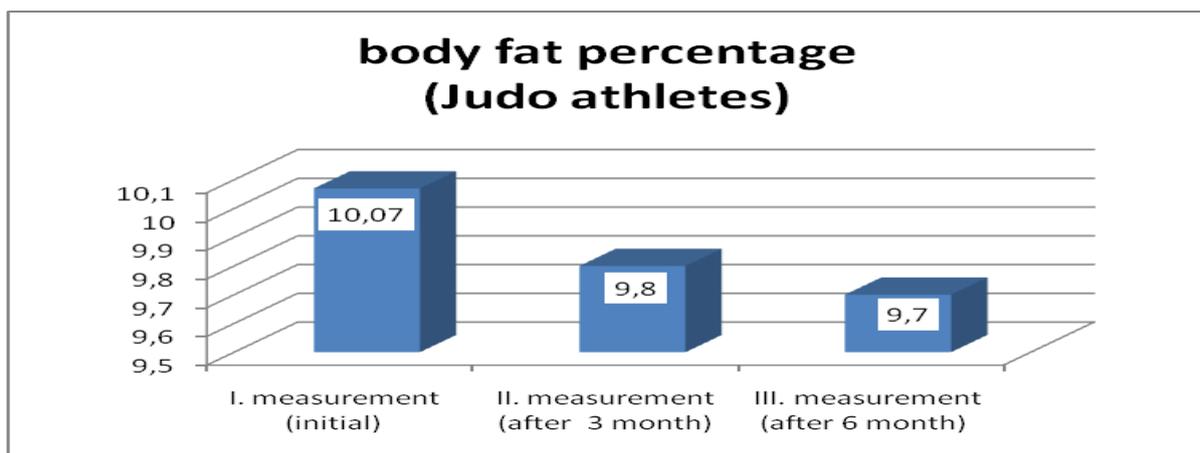
Body fat percentage of Greco-Roman wrestlers, freestyle wrestlers, judokas and male athletes did not reflect any statistical difference between measurement times according to time of measurement made at three-month intervals. However, each measurement was numerically lower than the previous one. The lowest averages in women athletes were observed in the second measures.



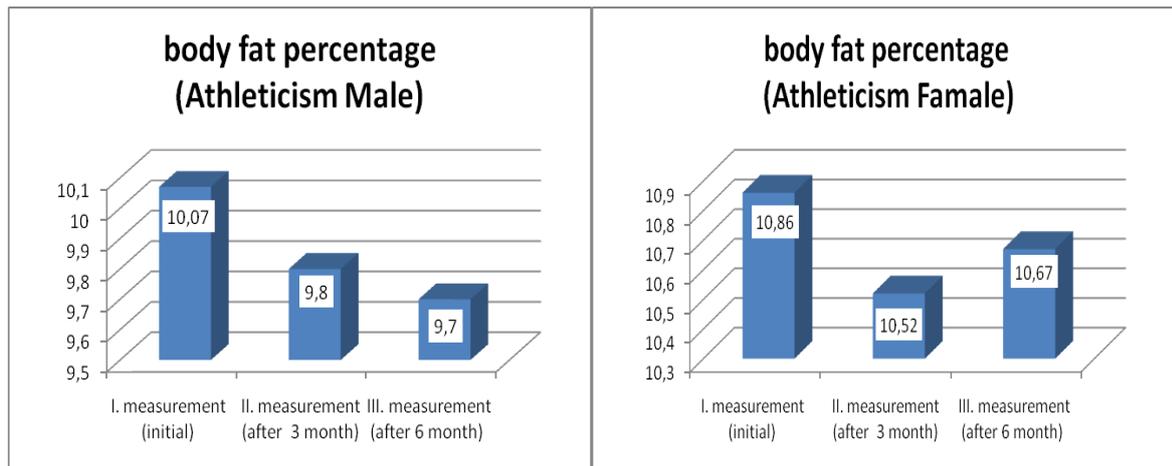
**Graph 1.** The Graph of seasonal changes in body fat percentage of Greco-roman wrestlers



**Graph 2.** The Graph of seasonal changes in body fat percentage of Freestyle wrestlers



**Graph 3.** The Graph of seasonal changes in body fat percentage of Judo athletes



**Graph 4.** The Graph of seasonal changes in body fat percentage of Athleticism athletes

#### 4. Discussion and Conclusion

In some sport branches, body fat percentage has been observed as a determining factor of performance. In all sport branches that requires aerobic and anaerobic work, excess adipose tissue and a lack of lean muscle mass negatively affects the performance. One of the reasons of concentration of body composition trainings on athletes is the major effect of body composition on performance. Since factors such as strength, quickness and heat balance are related to the amount of body fat, it is very important to determine the body fat percentage (Açıkada, 1990; Suveren, 2009).

In this study, the body fat percentage of Greco-Roman wrestlers has been identified as  $10,65 \pm 0,56$  at the first measurement (initial),  $10,33 \pm 0,61$  at the second measurement (after 3 month) and  $10,06 \pm 0,58$  at the last measurement made six month later. Body fat percentage of Freestyle wrestlers was recorded as  $10,88 \pm 1,10$  at the beginning,  $10,47 \pm 0,55$  at the measurements made three months later and  $10,28 \pm 0,53$  after 6 months. It has been observed that the body fat percentage of Freestyle and Greco-Roman wrestlers has been found similar.

It has been shown through various researches that the mean body fat values for wrestlers should be between 6 % and 15 % (Houtkoper and Going, 1994; Sinning, 1996). It is seen that the body fat percentage of Freestyle and Greco-Roman wrestlers obtained in this research have averages given in literatures. Indeed, in the research on elite Turkish wrestlers conducted by Doğu et al (1994), the body fat percentage of wrestlers was determined as 10.9 %. In another research, Alpay et al (2015) found that elite wrestlers have a body fat percentage of 10.61 %. Schmidt et al (2005) observed that middle level wrestlers in the NCAA DIII group had higher body fat percentage  $12,0 \pm 3,4$ . However, in his research on elite senior wrestlers Yoon (2002) stated that wrestlers ranging from 54 to 130 kg in the National

Team generally have fat percentage of (10 %). In another research Parwinder and Ashok (2018) have determined the fat ratio of 150 young freestyle wrestlers as  $1.93 \pm 1.05$ . The percent of body fat recommended by the American College of Sports Medicine Position (1976) as at least 7 % and at most 10 % for wrestlers, BFP of athletes obtained in our research and values of another studies on elite wrestlers showed similar results.

Obtained data and values are at the limit of recommended normal body fat percentage for elite athletes. Although, results of each measurement of wrestlers' body fat percentages measured at three months intervals during the preparation season was not statistically significant with respect to the previous measurement percent. The reflection of low values was explained as conscious body weight loss for weight adjustment as they approached the competition period. As a matter of fact, when the competition schedules are taken into consideration, the third measures which have the lowest values included the data obtained near the competition time of the athletes.

Body fat percentage of Judokas was 11.25 % after the initial measurement, 10.93 % after 3 months and 10.88 % after 6 months. Although, the obtained data showed a decreasing tendency, it is not statistically significant. In their research on judokas, İmamoğlu and Kılıçgil (2001) found the body fat percentage of Turkish National Male Judo Team as approximately the average of 9.07 %. Franchini et al. (2011) reported that the average BFP of seven athletes from Brazil National Judo Team was 11.4- 8.4 %. In another study Callister et al. (1990) noted that the BFP of 8 American elite Judokas reached to average of  $10.8 \pm 1.9$  % Thomas et al. (1989) found the body fat percentage of 22 Canadian elite Judokas to be  $9.3 \pm 2.1$  %.

In general, the BFP that researchers have identified from elite judokas showed similarity with our findings. It is important for researcher's and our BFP results to match the values that the average values of body fat percentage of active athletes can be considered to be normal between 6% and 15 %. According to these results body fat percentage of national judo athletes of Kyrgyzstan who have been included in the research, reflected lower values than previous measurements. As mentioned before, judo is a weight sport and although the body fat ratios have not been found statistically significant while approaching to important competition period, a noticeable decrease in the body fat has been observed and the body fat ratios of Kyrgyz Judo athletes were found within the recommended body fat percentages.

When the BFPs of Athletics athletes included in the research were examined, the body fat percentage of male athletes has been found as the average of 10.07 % at the beginning, 9.80 % at the second (after 3 months) and 9.70% at the third measurement (after 6 months). The BFP of female athletes has been estimated as 10.86 % at the first measurement, 10.52 % at the second measurement (after 3 months), and 10.67 % at the third measurement (after 6 months).

As seen, no significant difference according to measurement times has been found between the BFPs of both male and female athletes ( $p < 0.05$ ). Santos and colleagues (2015) conducted a research on elite athletes and found body fat percentages of male athletes as an average of  $11.0 \pm 4.9$  and female athletes as  $22.7 \pm 5.4\%$ . The results of the male athletes in the study were partially similar to our findings. The results of female athletes are quite high in comparison with our findings. It is deduced that this may be the result of athlete populations and specific branch differences.

Body fat percentage of male and female athletes detected in our study ranged from 6 % to 15 % (Houtkooper and Going, 1994; Sinning, 1996), which is considered as the mean value of active athletes being noted in most studies. In addition, as seen in our findings, the BFPs of female athletes have been found similar to those of male athletes. Although each measurement made in male athletes was not statistically significant compared to the previous measurement, a downward trend has been observed. However, the body fat percentage of female athletes decreased in the second measurement compared to the first measurement and reflected higher values in the third measurement than the second measurement. This inconsistency is explained with the fact that female athletes have not been involved in regular trainings in this period.

The results of our research are similar to the results of studies that include body fat percentage on active athletes and studies in which mean body fat percentage values between 6 % and 15 % are considered as normal (Houtkooper and Going, 1994; Sinning, 1996; Pense and Turnagol, 2006).

As a result; Although there wasn't found statistically significant difference in measured body fat percentages of wrestlers and judokas, the low reflectance of their body fat percentages have been interpreted as a conscious body weight loss for weight adjustment at the branches they will compete as they approached the competition time. In addition, despite the fact that Athletics sport is not a weight sport, it is observed that intense work tempo of male athletes showed a tendency to decrease in body fat percentage, while female athletes were more inconsistent.

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