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# Body composition characteristics vs a subjective assessment of body mass and eating habits by female wrestlers using the example of the Polish national youth team

**Authors' Contribution:**
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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## Abstract

**Background & Study Aim:** Controlling the body mass in long-term career of combat sports athletes is one of the most important health strategies. The aim of the study was the relationship between body weight and body fat level and correlation of body mass and composition with the subjective assessment of body weight and eating habits of the wrestlers.

**Material & Methods:** The mass measurement and body composition analysis were performed using the TANITA BC-418MA analyzer. Fifteen female athletes from Poland's inventory of 20.26 ±1.43 years of age participated in the study, with body weight 61.75 ±8.10 kg, body fat 18.36 ±5.07%. The assessment of the subjective assessment of body weight and eating habits was made on the basis of a questionnaire.

**Results:** S trong, positive correlation between the level of body fat (%) and body weight (kg), (R Spearman = 0.8, $t(n-2) = 4.81$, $p = 0.0003$). Lack of connection between body composition and subjective assessment of body weight, training experience and compliance with specific nutritional rules by the tested female athletes.

**Conclusions:** The wrestlers with a higher body weight are also characterized by a higher (%) level of body fat. The inter-individual comparison of the level of muscle mass measured in kg and adipose tissue measured kg is not justified in disciplines in which weight categories exist. In contrast, the percentage of body fat should remain at a similar level regardless of the current weight category. Increasing the level of fatness does not contribute to the improvement of motor skills important in wrestling. At the same time, the study did not show the relationship between body composition and compliance with specific nutritional principles and subjective assessment of body weight. Therefore, it is likely that the behaviour of lower body fat level is affected by behaviours that athletes do not perceive as conscious compliance with nutritional principles.

**Key words:** adipose tissue • dietetics • nutrition • psychodietetics



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## INTRODUCTION

**Body composition analysis** – *noun* a method of testing the proportions of different fat and lean tissues that make up a person's body. Abbreviation **BCA** [24].

**Bioimpedance analysis** – a method of estimating body composition [24].

**Body fat** – *noun* tissue in which the cells contain fat that replaces the fibrous tissue when too much food is eaten [24].

**Body water content** – *noun* the amount of water in body tissues [24].

**Body weight** – *noun* a measure of how heavy a person is [24]; synonym of **body mass**.

**Skinfold** – *noun* a test for subcutaneous fat deposits that measures how much skin and tissue can be 'pinched' at various sites on the body [24].

**BIA** – *abbreviation* bioelectrical impedance analysis [24].

**Nutritional therapy** – *noun* the alleviation of symptoms by dietary changes, sometimes using vitamin and mineral pills [24].

**Physical activity** – *noun* exercise and general movement that a person carries out as part of their day [24].

**Modern pentathlon** – *noun* an athletics competition in which the contestants compete in five different events and are awarded points for each to find the best all-round athlete. The events are swimming, horse riding, cross-country running, fencing and pistol shooting [24].

A direct analysis of body composition takes into account the following five components: skin, fat, internal organs, nervous tissue, muscles and skeleton. An analysis of the body composition of a living organism is based on indirect methods. Photon absorptiometry (including DEXA), computed tomography and magnetic resonance imaging are considered the most precise of these methods. They do, however, remain largely unavailable and expensive. Therefore, the optimal methods enabling constant monitoring of changes in the tissue components of the body are anthropometric methods (measurements of circumferences or skinfold thickness) and the bioelectrical impedance analysis (BIA) [1-8].

The BIA analysis is based on a measurement of impedance, which comprises the reactance and resistance of soft tissues through which low-intensity but high-frequency electric current is passed. On the basis of the knowledge of the electrical properties of the human body and taking into account the height of the tested person's body as well as statistical data for a given population, race, age and gender, the impedance value is transformed through an algorithm, which produces the result of the measurement of water content in the body [9-14]. These are input data for the remaining elements of the analysis (including adipose tissue or lean body mass). The BIA analysis is used in the studies of combat sport athletes [15-17].

To date, not much research has been performed on the relationship between body mass and composition and a subjective assessment of body mass and eating habits. In the case of physically inactive people, it has been proved that certain personality traits are linked to body mass. People with a high level of neuroticism have a problem with maintaining a minimum body mass, while obese persons are characterised by a low level of conscientiousness. Body mass also increases with the level of impulsiveness [18, 19].

Understanding the psychological mechanisms of athletes' nutrition in disciplines with a division into weight categories could contribute to minimising, often unnecessary, fluctuations in body mass during a season.

The aim of the study was the relationship between body weight and body fat level and correlation of body mass and composition with the subjective assessment of body weight and eating habits of the wrestlers.

## MATERIAL AND METHODS

### Participants

The study was conducted in Poland, in March 2016, at the Central Sport Centre in Szczyrk during the team's training camp. Fifteen athletes from the Polish national youth female wrestling team participated in the study (20.26 ±1.43 years of age). Thirteen of the athletes tested had a master sport class and two of them had a 1st sport class. Detailed characteristics of the subjects are presented in Table 1.

### Study design

The mass measurement and body composition analysis were performed using the TANITA BC-418MA analyzer. Fifteen female athletes from Poland's inventory of 20.26 ±1.43 years of age participated in the study, with body weight 61.75 ±8.10 kg, body fat 18.36 ±5.07%.

The subjects were tested while wearing light clothing, not earlier than 60 minutes after food intake and liquid consumption. They had not performed any intensive physical exercises for 12 hours prior to the test. They also did not show any signs of infectious diseases that might have an impact on the content of electrolytes and fluids. The height measured was entered into the analyser with an accuracy of 1 cm. Before the measurement the analyser was degreased and cleaned.

The evaluation of the subjective assessment of body mass and eating habits was made on the basis of a survey questionnaire.

**Table 1.** Results of body composition analysis of the female wrestlers (n = 15) tested.

| Code person | Body mass (kg) | Body fat (%) | Fat-free mass (%) | Total body water (%) |
|---|---|---|---|---|
| W1 | 74.2 | 25.4 | 70.8 | 54.7 |
| W2 | 72.3 | 23.2 | 72.8 | 56.2 |
| W3 | 70.7 | 28.6 | 67.8 | 52.3 |
| W4 | 71 | 22.3 | 73.7 | 56.9 |
| W5 | 66.5 | 19.1 | 76.8 | 59.2 |
| W6 | 64.6 | 14.2 | 81.4 | 62.8 |
| W7 | 61.5 | 19.3 | 76.6 | 59 |
| W8 | 61.2 | 18.6 | 77.1 | 59.6 |
| W9 | 60.9 | 15.1 | 80.6 | 61.1 |
| W10 | 58.7 | 15.3 | 80.4 | 62 |
| W11 | 57.8 | 18.9 | 77 | 59.3 |
| W12 | 56 | 18.6 | 77.3 | 59.6 |
| W13 | 51.9 | 9 | 85 | 66.7 |
| W14 | 49.7 | 13.5 | 82.1 | 63.4 |
| W15 | 49.3 | 14.3 | 81.3 | 62.9 |
| **Mean & SD** | **61.75 ±8.10** | **18.36 ±5.07** | **77.38 ±4.64** | **59.71 ±3.68** |
| **Min÷max** | **49.3÷74.2** | **9÷28.6** | **67.8÷85** | **÷66.7** |

### Statistical analysis

The statistical analysis was carried out using the Statistica 13.1 software, which made it possible to analyse the basic descriptive statistics and the Spearman's rank correlation coefficient. The significance level adopted was 0.05.

## RESULTS

A statistical analysis of the correlation between body mass (kg) and body fat (%) of the female athletes tested showed a strong, positive correlation between the level of adipose tissue (%) and body mass (kg) – Spearman's rho = 0.800, t(n – 2) = 4.819, p = 0.0003.

The study showed a lack of correlation between the level of body fat and a subjective assessment of body mass by the female athletes tested – Spearman's rho = 0.154, t(n – 2) = 0.563, p = 0.582 (statistically insignificant values). Also: a lack of correlation between the level of body fat and the training experience of the female athletes tested – Spearman's rho = 0.179, t(n – 2) = 0.656, p = 0.523 (statistically insignificant values); a lack of correlation between the level of body fat and the observance of specific nutritional principles by the female athletes tested – Spearman's rho = −0.248, t(n – 2) = −0.923, p = 0.372 (statistically insignificant values).

## DISCUSSION

The study did not show a relationship between body composition and the observance of specific nutritional principles as well as subjective body mass assessment. Therefore, it is likely that the maintenance of a lower level of adipose tissue is influenced by behaviours that female athletes do not perceive as a conscious observance of nutritional principles. As it has been demonstrated, the lack of a tendency to accumulate adipose tissue does not necessarily implicate a conscientious observance of specific nutritional principles, being due, instead, to a behaviour consistent with natural eating habits that serve the body well in specific conditions. Moreover, habits are among the most important aspects of nutrition.

To date, not much research has been conducted on the nutrition psychology (nutritional therapy) of physically active persons (in a sense, from the borderline of this problem is the work of Durkalec-Michalski et al. [20]) and the authors

were the first to engage in a study of subjective body composition assessment in correlation with a person's nutrition and body composition. Most of the research conducted so far has been based on information on the body mass, the body height or the length of extremities of the test subjects. However, no studies have yet been carried out on the characteristics of tissue components of the body of combat sport athletes .

In addition, when analysing available studies, special attention should be paid to the methodology of body composition analysis. The measurement should be performed using analysers that provide the possibility to select the 'sport' function. In this mode the impedance value is transformed through an algorithm using information on water content in the body, which provides input for the remaining elements of the analysis. Otherwise indicators such as adipose tissue may be overstated and incorrect. It should also be taken into account that in the majority of analysers the 'sport mode' may only be used for athletes aged 18 and over. In order to obtain a more reliable analysis, in the case of athletes aged 16-17 one must enter an age that will allow for an analysis in the appropriate mode.

An interesting research perspective is to compare the body composition of combat sports athletes, including those disciplines in which there is no division into weight categories – fencing, sumo. There are two aspects to the uniqueness of these studies. First of all, the authors use the little-known Perkal's [21] method. Secondly, they also analyse the athletes of modern pentathlon [22, 23], where fencing is one of the five competitions.

## CONCLUSIONS

The tested female wrestlers with a higher body mass are also characterised by a higher percentage level of body fat. A comparison of athletes in terms of muscle mass levels measured in kg and body fat levels measured in kg is not advisable in disciplines with weight categories. On the other hand, body fat levels should remain similar regardless of the weight category – an increase in the level of body fat does not contribute to an improvement of those motor skills that are important in wrestling.

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