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The level of consumption of magnesium and iron by women and men training karate

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Introduction: The aim of the study was to evaluate the consumption of magnesium and iron in the group of women and men training karate.

Methods and material: 59 women and 110 men, regularly training contact karate, were examined. The basic anthropometric parameters: body height and body mass were measured, and the body composition was assessed using the bioelectric impedance method. Consumption of energy, macronutrients as well as magnesium and iron were measured using the computer program Diet 5.0, based on prepared food interviews. Statistical analysis was based on the T-student method.

Results: Men were characterized by lower fatness and higher lean body mass than women. Their intake of energy, macro and micronutrients was also higher. The amount of consumed magnesium in the group of women was 75.1% RDA, in men 90% RDA. However, iron consumption was 51.2% and 152.3% RDA in the group of women and men, respectively.

Conclusions: Iron intake in the group of women and magnesium in all subjects group was too low, which may affect their physical performance as well as health. However, in the group of men the amount of iron consumed was too high. In addition, both groups had low energy intake and abnormal amounts of fat and carbohydrates, and in the group of women also proteins.

Keywords: physical activity; magnesium; iron; women; men

Introduction

Properly selected nutrition is one of the most important elements of a healthy lifestyle, which is confirmed by numerous population studies [1, 2]. It also plays an important role in physically active people, able to affect their efficiency and exercise capacity [3,4]. Physical activity is a situation that requires increased energy expenditure, exacerbating oxidative stress and catabolic reactions in the body [5]. In addition, oxygen uptake, metabolic rate and heart rate are increased [6]. Dietary management in physically active people should not only focus on the appropriate number of calories or macronutrients consumed, but also take into account the appropriate amounts of vitamins and minerals [7].

Magnesium (Mg) is one of the most frequent ions in the human body, more than half of which is stored in bone tissue and skeletal muscles [8]. Although it is quite often found in food, mainly in plant products, every year the number of people exposed to its deficiency increases [9]. First, because of excessive amounts of fat consumed, excessive stress, physical exertion or taking certain medications [10]. Magnesium takes part in many processes taking place in the body, inter alia, it participates in DNA replication, protein and fatty acid metabolism [11]. It is needed to perform over 300 enzyme reactions of the organism, and its deficiencies can cause serious health consequences, eg heart rhythm disorders or kidney stones [12].

Like magnesium, iron (Fe) is responsible for many reactions in the human body. It is primarily a component of hemoglobin and myoglobin, thanks to which oxygen transport is possible [13]. Additionally, it is involved in the proper action of the immune and nervous system [14]. Two forms of iron can be found in food: non-heme (Fe3 +) - found in vegetable

and heme products (Fe2 +) - found in animal products [15]. Iron deficiencies in the diet are very common and may affect up to one third of the human population, resulting primarily in anemia [16].

Purpose of research

The main nutritional errors of the inhabitants of Poland are related to excessive consumption of fat and simple carbohydrates [17]. Hence, the intake of micronutrients is not sufficient for a healthy, adult subject. Due to the significant importance of magnesium and iron in the functioning of the body, their increased intake should characterize people who are physically active. Taking into account the above statements, an attempt was made to evaluate all-day food rations of regularly active men and women in terms of the content of these elements.

Material and methods

Characteristics of the subjects

The study involved 59 women and 110 men training regularly in contact karate, in sports clubs in Warsaw and Płock. Participants of the study were involved in additional physical activity of about 8 hours / week. They were healthy people who did not take any drugs, non-smokers, aged 18-26. Before the examination they were informed about the course of procedures and expressed their written consent.

Anthropometric measurements

The basic anthropometric parameters were measured - height with an accuracy of 0.5 cm and body mass with an accuracy of 0.5 kg. BMI (body mass index) body mass index (kg) / body height2 (m) was calculated based on these parameters. The body composition of the subjects was assessed using the BIA electro-electrical impedance method in the tatrapolar version using the BC-418 device (Tanita Co., Japan).

Evaluation of the diet

Evaluation of the diet was carried out on the basis of nutritional notes prepared by each participant of the study, who were instructed on the correct method of recording. Notes included meals, drinks and dietary supplements for 4 days (2 days of the week, 2 days of the weekend). A properly trained employee verified the size of meals with the use of the "Photo album of products and dishes" [18]. The content of selected nutrients and energy calculated

using the computer program "Diet 5.0", developed at the Institute of Food and Nutrition in Warsaw. The results of magnesium and iron consumption were compared with Polish consumption standards (RDA) [19].

Statistical analysis

Normality of distributions was analysed using the Shapiro-Wilk test. Significance of differences between the highlighted groups was tested by the student's T-test. The results are presented as means ± SD. The differences were taken as significant at $p < 0.05$. The analysis was carried out using the Statistica v.10 program. (StatSoft, USA).

Results

Table 1 presents the results of anthropometric measurements of the studied women and men. There were statistically significant differences in all anthropometric parameters. The studied men were characterized by bigger weight, body height, BMI index and lean body mass. On the other hand, the content of body fat in kilograms and percentage of body weight was lower.

Table 1. Anthropometric measurements

Parameter	Women n=59	Men n=110
Age [years]	19.8 ± 1.13[a]	22.1 ± 1.61
Body height [cm]	167.6 ± 5.46[a]	182.7 ± 6.10
Body mass [kg]	60.3 ± 7.51[a]	81.0 ± 12.30
BMI *	21.5 ± 2.33[a]	24.2 ± 2.95
Body fat [kg]	14.1 ± 4.32[a]	11.6 ± 5.02
Body fat [%]	23.0 ± 4.51[a]	14.0 ± 4.26
Lean body mass [kg]	46.2 ± 4.26[a]	69.6 ± 9.24

*****Body Mass Index

[a-] Significantly statistically differences vs. Men, p<0,001

Table 2 presents the total energy intake and macro and microelements in the studied groups. It was found that the higher intake of energy and macronutrients is characteristic for the Men group, and these differences were statistically significant. However, similar intake values were observed in the percentage consumption of macronutrients. When comparing the

density of macro intake and micronutrients, statistically significant differences are characteristic only for the consumption of magnesium (Table 3).

Table 2. Energy consumption (mean ± SD)

	Women n=59	Men n=110
Energy [kcal]	1643.9 ± 408.2[a]	2977.9 ± 757.8
Protein [g]	57.4 ± 14.9[a]	105.2 ± 28.5
Protein [%]	13.9 ± 2.6	14.1 ± 2.7
Carbohydrates [g]	216.6 ± 58.7[a]	387.3 ± 104.7
Carbohydrates [%]	52.7 ± 6.4	52.1 ± 6.2
Fat [g]	64.9 ± 21.6[a]	122.1 ± 37.8
Fat [%]	33.4 ± 7.2	36.9 ± 6.1
Magnesium [mg]	233.1 ± 159.4[a]	360.5 ± 101.0
Iron [mg]	9.21 ± 2.9[a]	15.23 ± 4.5

a- Significantly statistically differences vs. Men, p<0,001

Table 3. Density of consumption (mean ± SD)

	Women n=59	Men n=110
Protein [g / 1000 kcal]	35.4 ± 6.5	35.8 ± 6.8
Carbohydrates [g / 1000 kcal]	131.7 ± 15.9	130.4 ± 15.5
Fat [g / 1000 kcal]	39.6 ± 8.0	40.9 ± 6.8
Magnesium [mg / 1000 kcal]	146.5 ± 105.3[a]	122.4 ± 25.0
Iron [mg / 1000 kcal]	5.37 ± 1.2	5.12 ± 1.2

a- Significantly statistically differences vs. Men, p<0,001

Discussion

The study found that all-day food rations in both groups provide too little energy as for physically active people. Interpreting the results obtained on the basis of standards for the Polish population, it was noted that the energy expenditure declared by women was sufficient

only for people with low physical activity. In contrast, in men for people with moderate physical activity [19]. It is worth emphasizing that a long-lasting energy deficit in physically active people may interfere with the functioning of the endocrine system, cause a decrease in bone density or loss of muscle tissue, but also increases the risk of injury, reduces concentration, and in women may also cause menstruation disorders [20]. Also, in the available literature, the situation of insufficient energy intake among physically active people is so frequent that the term "RED-S syndrome" has been used (relative energy deficiency in sport) in relation to health problems [21].

Analysing the way of feeding in the studied groups in terms of supply of microelements, insufficient supply of carbohydrates was noticed. Both men and women did not meet the latest recommendations of dieticians for physically active people [7]. The low intake of this macronutrient can be explained by the process of weight reduction, which is also found among the available literature [22]. Both studied groups provided too much energy derived from fatty acids, which is characteristic for the Polish population [17]. However, it should be remembered that a diet rich in too much fat can lead to the development of serious diseases, even in physically active people [23]. In addition, in the group of women, too low amount of protein delivered (in grams) was noticed. People who are physically active should deliver 1.2-2g of protein per kilogram of body weight, that is, women should be about 72-120g in women (in women the supply was 54.7g). Too little protein in the diet may cause problems with the immune, nervous, hormonal and circulatory systems, and in active people, the reduction of lean body mass [24]. In contrast, the percentage distribution of macronutrients in the diet in both groups was similar.

The main objective of the study was to evaluate the intake of two elements: magnesium and iron, which have a large impact on the proper functioning of the human body [25]. The average magnesium intake in the study groups was 75.1% RDA in the group of women and 90% in the group of men. None of the groups did not meet the daily requirement for magnesium, what is more, in the group of women surveyed only 7 people consumed enough of this element. Deficiencies in the diet, in addition to significant health significance, can also affect the course of physical exercise. Significantly reduced levels of magnesium in the blood serum may cause tremors, muscle spasms or paresthesia, which may contribute to the interruption of physical activity [26]. Comparing the results of the research with available literature, it can be noticed that the situation of insufficient magnesium intake occurs frequently, regardless of the age group, sex or physical activity examined [27, 28].

Iron consumption in women was also low and amounted to 51.2% of RDA, while the norm in the entire examined group was realized by only two of them. The appropriate amount of this element is very important especially in women, because with monthly menstruation they are exposed to greater losses [29]. Also, the greater amount of iron consumed should be characteristic of women in childbearing age (a group of women surveyed) so as not to expose their offspring to health problems [30]. However, the average intake of this element in the studied men was 152.3% RDA. Both too high and low iron consumed are not safe for health. Excess free iron causes oxidative stress that causes damage to cells and tissues [31]. Similar results were obtained by other authors in both women and men [27, 32].

It should also be noted that the consumption per 1000 calories (intake density) in both women and men was approximate. This means that the nutrition in both groups is similar, and the differences occur only in the number of calories consumed.

Conclusions

Based on the study, many abnormal nutritional habits that could result in serious health problems were found. The obtained results should not be characterized by physically active people who are more characterized by taking care of their own health.

The evaluation of the diets showed a significant erroneous way of feeding in a group of physically active women and men. As evidenced by the insufficient amount of energy supplied, macros and micronutrients.

It is also necessary to increase knowledge among physically active people about the proper diet.

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