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Evaluation of Protein Content in the Diet of Amateur Male Bodybuilder

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Abstract

Public gyms and fitness clubs promote active lifestyles. At the same time, numerous nutritional errors and the phenomenon of incorrect supplementation are being observed among the given study group. Behavior can lead to malaise, injury, or lack of progression. One of the most serious mistakes is the incorrect level of protein in the diet. The aim of the study is to assess the quantity and quality of protein consumed by men undertaking recreational strength training in Szczecin. The study involved 35 men aged 18–35, practicing amateur strength training, from Szczecin (Poland). The author's questionnaire collected information on supplementation, physical activity, and subjective assessment of nutritional knowledge. The obtained test results were subjected to statistical analysis performed in the Statistica12 program. On average, respondents consumed 1.8 g of protein/kg, with the highest recorded conversion rate of 3.7 g of protein/kg of body weight, and the lowest of 0.9 g/kg of body weight. Total protein consumption ranged from 70.2 to 295.7 g, and the average value was 147.8 g (22%), which differs from the study group, that is, 129–133 g, which gives 14% energy proteins. It was found that the protein supplementation, on average, provided 31% of the total protein intake of the study group. The results show inappropriate dietary behavior regarding food supplementation among the examined group. Further education on the nutritional value of the food and a healthy and balanced diet is being recommended for the individuals practicing strength sports.

Keywords

sports nutrition, amateur bodybuilders, strength training

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Background

In times of "body worship," men's interest in strength training and nutrition is increasing. Public gyms and fitness clubs promote active lifestyles. Often, physical activity alone is not the final goal of men and women "gym-goers". Among fitness club regulars, there is an increasing focus on body appearance and proportions. In every 10th man, this phenomenon takes the form of a disease known as bigorexia (Cella et al., 2012; Cerea et al., 2018; Eichstadt et al., 2020; Mitchell, Murray, et al., 2017; Mosley, 2009). Many authors in their research on athletes indicate numerous nutritional errors and the phenomenon of incorrect supplementation, which can lead to malaise, injury, or lack of progression (Iraki et al., 2019; Lenzi et al., 2019; Mitchell, Hackett, et al., 2017; Panansiewicz and Grochowicz, 2016; Wrzosek et al., 2016). One of the most serious mistakes is the incorrect level of protein in the diet. Too little protein leads to impaired tissue growth and development as well as malnutrition and even death. Too much protein in the diet causes an increase in body fat, burdening the kidneys and liver, as well as increasing the loss of water and calcium (Frączek et al., 2019; Górska-Kłęk et al., 2008; Merino et al., 2013; Paddon-Jones, 2017; Phillips et al., 2007). Too much protein supplied to the body can lead to weight gain, dehydration, kidney malfunction, gout, digestive problems, and a sense of depression. Too much protein is

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associated with an increased amount of calcium excreted in the urine (Lentine and Wrone, 2004; Malhotra et al., 2016). Too much protein supply can also affect a young and healthy body. Scientists have observed that a high-protein diet used in childhood on healthy children may have a negative impact on the development of their skeleton and lead to metabolic diseases and kidney damage (Bonjour, 2016; Fenton et al., 2006; Lentine and Wrone, 2004; Linn et al., 2000; Mangano et al., 2015). For an athlete, protein is one of the most important nutrients, because it is a muscle-building material, and it is necessary for the regeneration of degraded muscle cells and the reconstruction of muscle glycogen or creatinine synthesis (Celejowa, 2008; Gawęcki and Mossor-Pietraszewska, 2005). In addition, it is a basic component of blood, lymph, biological compounds (hormones, enzymes), and immune bodies and acts as a buffer substance that maintains the proper reaction of body fluids and digestive tract content. It acts as a carrier of some minerals and vitamins and is involved in regulating blood pressure. In addition, the protein is important in thought processes in the brain (Celejowa, 2008). Daily protein turnover is about 3% (300 g) of protein, and so it is very important to control the proper amount of protein consumed by the athlete (Garibotto and Verzola, 2016). The need for protein, like other nutrients, depends on the age, weight, height of the body, physical effort, and the physiological state of the body. An adult, healthy person with a normal body weight should take daily allowance (recommended dietary allowance) for protein 0.8–1 g/kg body weight (Antonio et al., 2020; Bray et al., 2015; Lemon, 1995; Phillips, 2012). The greater demand for protein results from the progressive period in ontogenetic development, increased physical activity or pregnancy, and lactation in women. Energy from protein accounts for 12%–14% of daily energy needs (Jeszka, 2003). The body can absorb 30–50 g of protein during one meal, while daily demand depends on age, gender, and sport. In the case of speed-strength and endurance-strength training, the daily demand for protein in the diet increases to 1.4–1.8 g/kg of body weight. In the case of reduction training—fat loss and weight gain program—the amount of protein in the diet should be doubled in relation to the reference values for a healthy person (Bandegan et al., 2017; Gawęcki and Mossor-Pietraszewska, 2005; Paddon-Jones, 2017). Excessive amounts of protein provided with a meal, not used for synthesis, play an energy role and are transformed in the liver to glucose, fatty acids, and ketone compounds (Frączek et al., 2019; Merino et al., 2013). Increased protein catabolism is associated with the formation of unnecessary metabolism products (e.g., urea), which must be excreted from the body. Increased urine output combined with intense exercise can promote chronic dehydration. Long-term use of a high-protein diet, even in healthy young people, may lead to kidney and liver overload, acidification of the body, and excessive urinary calcium excretion, which is associated with bone decalcification and an increased risk of calcium oxalate nephrolithiasis. Gastrointestinal disorders may also occur, manifested by excessive gas, which is troublesome especially for an athlete during the training period (Celejowa, 2008; Te Morenga and Mann, 2012).

In the daily demand for protein, not only the quantity but above all, the biological quality of the consumed products is important. Everyone's diet should consist of 40%–60% proteins with high biological content, the so-called wholesome proteins and proteins with low biological content, that is, incomplete proteins, characterized by a low concentration of one or several exogenous amino acids that are necessary for the proper functioning of the body. The wholesome proteins include the proteins of hen's egg, human milk, and proteins of milk, cheese, poultry, fish, and meat of slaughter animals. Among proteins with low biological content, we can distinguish legume proteins with the highest biological value and proteins of cereals, vegetables, and potatoes (Frączek et al., 2019). For athletes who care about building muscle mass, the most favorable ratio is 1:1.5, that is, approximately 2/3 of animal protein and 1/3 of vegetable protein (Celejowa, 2008).

Factors that must be taken into account when determining the amount of protein in an athlete is increasing energy expenditure, increased metabolism and increased production of enzymes, the advantage of anabolic processes over catabolic processes caused by tissue growth, and their continuous renewal, stress, and loss of nitrogen (Celejowa, 2008). During intense physical work on synthesis, protein breakdown processes prevail and muscle protein content is lowered. In addition, an important aspect that the athlete has a greater need for protein is the fact that the amino acid alanine plays a very important role in maintaining a stable glucose level in the working muscle. Glucose synthesis from alanine is a very efficient process and can ensure long-term muscle work (Frączek et al., 2019).

Strength sports are characterized by a short physical effort performed in an anaerobic form. During this form of training, the body draws energy from glycogen and then from adipose tissue. The biochemical reaction that occurs without the use of oxygen produces lactic acid in the muscles, which requires a healthy regenerative diet rich in carbohydrates and protein. During this type of effort, significant hypoxia occurs, and therefore, it is recommended that the ratio of protein, fat, and carbohydrate mass be 1:0.99:3.9, which gives 14% protein, 31% fat, and 55% carbohydrates (Celejowa, 2008; Cermak et al., 2012; Iraki et al., 2019; Kreider and Campbell, 2009; Krysztofiak et al., 2012; Potgieter, 2013). For this

Table 1. Anthropometric Measurements of the Study Group.

	Min	Max	Average ± SD	Standard for men
Body height (cm)	163.0	199.0	180.0 ± 6.9	
Body weight (kg)	60.2	111.2	81.8 ± 9.3	
Body mass index (kg/m^2)	22.66	28.08	25.25 ± 3.01	18.5–24.99
WHR	0.829	0.868	0.864 ± 0.003	>0.8

Note. WHR = waist–hip ratio.

group of athletes, protein energy is recommended at the level of about 15% (1.4–1.8 g/kg of body weight) (Celejowa, 2008).

Due to the high demand for protein in athletes, and at the same time providing low-volume and slightly digestible food, protein nutrients with easily digestible hydrolysates are of great importance (Celejowa, 2008; Chappell et al., 2019; Kowaluk and Sacharuk, 2004; Mitchell et al., 2018).

The aim of the study was to assess the quantitative and qualitative content of protein in the men's menu for recreational strength training in Szczecin.

Materials and Methods

The study was conducted on a group of 35 men practicing strength sports. The average age of the surveyed men was 26.4 years (18–35 years). The average body weight of the subjects was 81.8 ± 9.3 kg, average height 180.0 ± 6.9 cm, average body mass index (BMI) 25.22 ± 4.75 kg/m^2. The anthropometric measurements of the study group are presented in Table 1.

In the questionnaire concerning the undertaken physical activity, 23 (65%) of the respondents reported training experience over 3 years, and only five (14%) had trained for less than 12 months. On the basis of the survey, it was found that 34 (97%) respondents independently set their own training program both in terms of intensity and diet supplementation. Protein intake was determined on the basis of dietary diaries and calculated in the diet program "Dieteica 5." The subjects recorded the consumed products in a 24-hr questionnaire for 5 days, including at least three training days and one day-off (weekend). The respondents received a paper version of the food diary and guidelines on how to record meals with conversion to grammage. The food diary contains information about the type of meal (breakfast, lunch, dinner, snack, supper), time of its consumption, consumed products with grammage (g, ml), and the method of preparation (boiled, baked, fried). The menu also includes supplementation used by athletes and the duration and intensity of physical exertion used on a given day. Among the respondents, a proprietary survey was conducted consisting of 15 questions regarding physical activity, eating habits, and the level of knowledge about dietary supplementation. The body composition analyzer X-Contact 350 using the impedance method was used to assess body mass and body composition (body fat percentage [FatP], fat-free mass[FFM], total body water percentage [TBW]). The respondents were informed that they should take body composition measurements before training (a break from the last physical activity at least 12 hr) and on an empty stomach (the previous meal at least 4 hr earlier). For 24 hr before the body composition measurement, the subjects did not consume alcohol, drank no more than 2.5 L of water a day, had no contraindications to bioimpedance (cancer, edema, pacemaker, metal inserts—screws, bone plates), and did not undertake intense activity physical. The dermal fat folds of the thigh were measured using a Harpenden. The study used the measurement of skin and fat folds at the thigh level. The measurement was taken vertically along the front of the thigh and in the middle of the thigh. The subject for measurement stood slightly apart on both legs. The measurement was performed several times on the dominant leg; the average measurement for each athlete was used for the calculations. In the study group, 63% had an adequate amount of body fat compared with the norms for men with moderate activity, and only 34% met the norms recommended for bodybuilders. The lowest content of adipose tissue was 10.2% and the highest was 27.2%. Among the respondents, 43% met the norms of lean mass content for the average man, 26% of people had too little weight, and 31% too high. The mean value for a given group was 82.3%. There were 57% of men with a normal proportion of adipose tissue, and most of them (31%) had an increased lean mass. The mean content of the hydration of the subjects was 60.2% and is not within the normal range.

The Statistica 13.1 package was used to analyze the obtained results. The mean value and SD for a given sample, as well as the minimum and maximum for each value, were determined. The Rang Spearman correlation was used to assess the knowledge about nutrition and protein consumption and the dependence of anthropometric values on the consumed protein. A significance level of $p < .05$ was assumed.

The research project, conducted with the permission of the Commission of Bioethics at the Wroclaw Medical University No. 487/2006 of November 2, 2006, and the Senate Committee on Ethics of Scientific Research at the

Table 2. Protein in the Analyzed Per Day menus Along With Norms for Men Doing Bodybuilding.

Variable	Average ± SD	Coefficient of variation	Standards	Average % energy
Amount of protein g/kg body weight/day	1.8 ± 0.55	30%	1,6 g/kg mc	22%
Total protein (g/day)	147.8 ± 44.39	30%	129–133 g; 14%	
Protein (g/day) menu	132.0 ± 44.54	34%		
Protein (g/day) supplements	46.5 ± 15.97	34%		

University School of Physical Education No. 19/2019 of March 15, 2019. The research was carried out and financed as part of statutory research conducted as part of employment University School Physical Education in Wroclaw. The study was conducted in accordance with the principles of the Helsinki Declaration. All participants gave written informed consent on the forms, after thoroughly explaining the procedures related to them.

Results

On average, respondents in the nutritional interview consumed 1.8 g of protein/kg, with the highest recorded conversion rate of 3.7 g of protein/kg of body weight, and the lowest of 0.9 g/kg of body weight. Total protein consumption was in the range of 70.2–295.7 g, and the average value was 147.8 g (22%). Protein supplements provided 31% of protein on average (Table 2).

All respondents indicated chicken and turkey as the main source of protein in the diet and 29 (83%) eggs. Protein supplements are used as the basic basis in their daily diet by 20 men (57%). Fish as a source of protein in their diet is used by only 14 (40%) respondents, and legumes are a source of protein for only five (14%) athletes. Only 11 (31%) of the surveyed men control the caloric content of their diet, and 18 (51%) pay attention to the amount of protein they absorb from the diet. In 15 (42%) respondents, the quantitative values of protein consumed in the questionnaire were the same as those calculated on the basis of the diet presented by the athletes. To determine the protein in the diet, 19 (55%) men use a protein ratio of 1.5–2.0 g/kg body weight, six (17.5%) respondents use a protein ratio above 2.0 g/kg body weight, and six (17.5%) of the examined men use a protein ratio of 1–1.5 g/kg body weight. Among the respondents declaring the use of a protein converter, only 10 (28%) agree with the 24-hr interview, and in the remaining 25 (72%), it differs in the protein content in the menu; 17 (49%) respondents overstate their indicator in daily consumption and eight (22%) understates. For the amateur athletes surveyed, protein is the most important preworkout and postworkout nutrient. Protein supplements are always consumed by 25 (71%) of the surveyed men before starting physical activity and by 18 (51%) before training but in the form of protein supplements. Similar protein consumption statistics appeared in the question about nutrients or supplements consumed after training—27 (77%) of the surveyed men consumed protein nutritional products and 19 (51%) protein supplements. One after the other, all the surveyed men who train in the gym as an amateur arrange their own training plan and 29 (83%) use dietary supplementation. Protein supplements are consumed by 26 (74%) respondents, while 17 (49%) respondents consumed carbohydrate supplements or bars or sports drinks or cocktails or vitamin and mineral preparations. On average, every fourth respondent consumed thermoregulatory slimming preparations. Only two (6%) used complex protein–carbohydrate supplements. None of the respondents mentioned steroid supplements in the menu or in the survey. Among those surveyed, 30 (86%) declare that they eat two or more nutrients at the same time, ignoring the duplication of certain supplements, which results in an even greater increase in protein intake during the day.

A statistically significant positive correlation was observed between the state of knowledge about nutrition and the amount of consumed protein (Table 3).

An important element of individual control of the effectiveness of training are measurements of body composition using the bioimpedance method (BIA), as well

Table 3. Subjective Knowledge Assessment and Protein Consumption by Surveyed Men.

	Assessment of your knowledge about nutrition in strength sport according to the respondents
Total amount of protein/kg body weight (menu + supplements)	0.680
Amount of protein/kg body weight from the menu	0.338
Total protein (g) (diet + supplement)	0.680
Protein (g) from the menu	0.338

Table 4. Average Values of Fat Folds and Body Composition Component in the Tested Amateur Bodybuilders.

	Average ± SD	Coefficient of variation	Normative value for all men in a given age	Normative value for bodybuilders
Skin-fat fold of the thigh (mm)	18.6 ± 6.19	33%		
Body fat percentage (%)	17.7 ± 4.15	23%	15%–18%	6%–16%
Fat-free mass (%)	82.3 ± 4.15	5%	80%–85%	89%–91%
Total body water (%)	60.2 ± 3.40	6%	55%–65%	

Table 5. Dependence of Anthropometric Measurements on the Amount of Protein Consumed.

	Total protein (g)	Protein (g) supplements
Skin-fat folds thigh (mm)	0.396	–
Body fat percentage (%)	–	0.484

as measurements of skin-fat folds made as part of the tests; the results obtained are presented in Table 4.

On the basis of body composition studies, it was found that 12 (34%) subjects had the percentage of body fat in line with the norms for bodybuilders (6%–16%), and 22 (63%) were appropriate for men in this age range (15%–18%). The mean value of the total amount of water in the body (TBW) in the subjects was 60.2% and was within the normal range for men. In the case of athletes whose normative FFM value is higher than in nontraining ones and amounts to 89%–91%, the amount of TBW should be higher and amount to 65%–75%. Among the respondents, only two (6%) had a TBW (>65%) correct for athletes but not more than 66.4%. When determining the relationship between the consumed protein and anthropometric values, Spearman's rank-order correlation was used. A statistically significant average correlation (strength of correlation according to the Guilford scale) was observed between the consumed protein levels and the amount of total adipose tissue estimated by the BIA method and thigh fatness using the measurement of skin and fat folds. The correlation results are presented in Table 5.

There is a statistically significant positive correlation between the measures of skin-fat folds on the thigh and the amount of protein consumed by amateur bodybuilders, which means that a higher skinfold measure was associated with higher protein intake. The fat mass is influenced by the consumption of protein from supplements, and if the respondents consumed more protein from nutrients, their fat mass increased (Table 5).

Discussion

According to respondents, the most important nutrient is protein. The respondents base their diet on such sources of protein as meat with a predominance of poultry meat, eggs, dairy products, and protein supplements. Panansiewicz and Grochowicz (2016) in their studies on 50 bodybuilders obtained similar results in terms of dietary protein sources. Among the respondents, 45% chose white meat (poultry), 31% red meat, and 24% eggs. Such important sources of wholesome protein like legumes and fish, which are rich in branched-chain amino acids (BCAA), important in strength training due to increased muscle regeneration are consumed in minority. The amount of protein consumed by the surveyed men is completely different than they actually consume. On the basis of dietary diaries, higher protein intake in the form of nutritional products and supplements was determined than in the survey responses, which proves the lack of ability to distinguish the correct sources of protein. In this study, as in the study of Wilczek et al. (2013), high energy supply from protein was observed, which amounted to 22%, which is not within the range indicated for amateur men practicing strength training. A daily protein requirement of 129–133 g is recommended for this study group, which gives 14% energy. There are still debates about the right amount of protein in the athlete's diet. Many specialists say that one should not increase the amount of protein in food as energy expenditure increases, but the amount of fats and carbohydrates (Celejowa, 2008; Jäger et al., 2017; Jeszka, 2003; Morton et al., 2018; Thomas et al., 2016). However, many studies show the need to increase protein in sports nutrition (Cermak et al., 2012; Fillon et al., 2020; Iraki et al., 2019; Kreider and Campbell, 2009; Krysztofiak et al., 2012; Potgieter, 2013). Research conducted on Polish trucks showed that the daily energy expenditure of competitors reaches 6000 kcal (25.10 MJ) and proves that they should consume a minimum of 150 g/24 hr of protein, which gives 1.9 g/kg body weight (Kerksick et al., 2013). Then the criterion with a protein energy value of 10% would be met, and most authors recommend consuming 15% protein from food energy. In this case, it would be 900 kcal (4.37 MJ), or 225 g protein/24 hr, that is, 2.8 g/kg (Cermak et al., 2012; Iraki et al., 2019; Kreider and Campbell, 2009; Krysztofiak et al., 2012; Potgieter, 2013).

The nitrogen balance indicates the degree of coverage of protein demand and is a relation of assimilated to excreted nitrogen. The correct nitrogen balance should be in equilibrium. A negative or positive balance indicates

too little or too large protein take. Irregularities may also result from the body's nitrogen retention when stored for muscle renewal and growth, as well as increased amino acid utilization for energy purposes. Nitrogen retention is a natural phenomenon observed in professional athletes, and phenomena such as exfoliation, breathing, and sweating affect the maintenance of normal nitrogen balance. According to FAO/WHO experts, nitrogen loss with sweat can reach 3.8 g/24 hr, while other studies even indicate a rate of 3.1–9.1 g/24 hr. On average, the correlation is 6.25 g of protein/g of nitrogen, and hence it would amount to 19.4–56.6 g of protein equivalent. It turns out that there is a relationship between the nitrogen loss with sweat and energy expenditure and the amount of sweat released. This conclusion was reached by a group of scientists after carrying out research on the Olympic team of weightlifters (Giannopoulou et al., 2013). It is very important that in the case of low-intensity or moderate-intensity exercises (<50 VO^2 max), no significant increase in protein demand has been proven (Frączek et al., 2019) and it is within 0.8–1.2 g protein/kg of body weight per day. Extreme athletes should consume 1.8–2.2 g protein/kg body weight daily. In 1991, in Lausanne, Consensus found that the average protein requirement for sports was 1.4–1.9 g/kg (Cermak et al., 2012; Iraki et al., 2019; Kreider and Campbell, 2009; Krysztofiak et al., 2012; Potgieter, 2013). A balanced nitrogen balance gives us information about the correct use of the consumed proteins. It also allows us to determine the amount of protein demand depending on the intensity of physical effort. The paper presents research on this method as a way to individualize an athlete's diet. This is important information because the amount of protein demand depends on the intensity of physical effort.

Concluding, the use of a larger supply of protein is justified for professional and competitive bodybuilders, due to a large degradation of muscle fibers through enormous effort loads; however, it is not justified for casual and amateur bodybuilders. Studies indicate that such action does not enhance the effects and may promote the development of osteoporosis, hypertension, kidney disease, and strain the cardiovascular system (Cermak et al., 2012; Kwaśniewska, 2011; Te Morenga and Mann, 2012). Analyzing the patient's case, Guardia et al. concluded that prolonged oversupply of protein may lead to dysfunction of the intestinal mucosa (Della Guardia et al., 2015). In the intestinal lumen, food protein (amino acids) can be metabolized by microflora to ammonia and short-chain fatty acids. Ammonia (at millimolar concentrations) is likely to interfere with the metabolism of colon epithelial cells, thus disrupting physiological processes (Andriamihaja et al., 2010; Conlon and Bird, 2014; Cremin et al., 2003; Michalska et al., 2016).

In the world, 40% to over 88% of people practicing sports use supplements and nutrients for athletes (Petróczi et al., 2008; Williams, 2008). Thirty-seven percent of men who do strength training take nutritional supplements because it is common and fashionable, without believing in any effects. The main motive for using supplements in surveyed men undertaking weight training is to improve the appearance of their figure and increase maximum power and muscle strength, that is, improving athletic performance (Kerksick et al., 2013; Wilczek et al., 2013). The motive of 46% of people was to supplement the diet, despite most amateur bodybuilders had numerous nutrient deficiencies. This condition is the result of acquiring knowledge from unreliable sources and the lack of consultation with a dietitian or doctor. The most common erogenous agent used by amateur bodybuilders is protein preparations (BCAA, creatinine). Similar results were obtained by other researchers analyzing in their works the popularity of nutrients among active people (Frączek and Grzelak, 2012; Górska-Kłęk et al., 2008; Kerksick et al., 2013; Krejpcio et al., 2011; Skop-Lewandowska et al., 2013). Men chose supplements without referring to the Australian Institute of Sport, which identifies supplements with proven supportive effect (Rodriguez et al., 2009).

Protein aides are very popular among the studied group and are used by up to 74% of amateur bodybuilders declaring the use of supplementation. It happens more and more often that the amount of protein preparations taken is inadequate to the demand. In their research, Chappell et al. (2019) showed that amateur bodybuilders do not follow the recommended guidelines, especially in the preparation period for the competition. In their research, they observed that a short period of supplementation, used by amateurs, especially with increased protein dosing, gives less positive results than the long-term one used by professionals—bodybuilders, in accordance with dietary recommendations (Chappell et al., 2019). Protein-based supplements may contain as a protein source: whey, casein, soy, or eggs. The most popular is whey protein, which has a higher biological value than milk, is digested and absorbed fairly quickly, which helps in postworkout regeneration. In addition, it has a higher content of exogenous amino acids including BCAA. Casein is absorbed more slowly than whey and also has a high concentration of BCAA as well as glutamine and arginine (Gawęcki and Mossor-Pietraszewska, 2005). Proper selection of protein preparations is very important. Whey protein hydrolysates, like easily digestible amino acids connected by peptide bonds, are suitable as regenerative products after training. Preparations that are not subject to full digestion, with a full set of amino acids are absorbed faster from the cryovascular system into the

muscle cells, should be used in the preworkout period. The most important during training, however, are BCAA, necessary for building and rebuilding muscle proteins. They are an energy substrate that counteracts the destruction of muscle tissue after depletion of muscle glycogen (Kurylas et al., 2017). Kurylas et al. in her research, observed that 80% of the surveyed bodybuilders take BCAA products, but only 20% of them notice positive results of supplementation (Kurylas et al., 2017). Such a low percentage of people satisfied with the effects of using protein preparations may be affected by the composition of these supplements. Most of the protein preparations also contain carbohydrates, most often sugar or stevia glycosides. By using this product, athletes only control the level of protein, not carbohydrates, which may be the basis for the lack of the expected results. Ribeiro et al. (2019) emphasize in their research that professional bodybuilders may use higher doses of protein than recommended because they are controlled by nutritionists, and amateurs should follow general recommendations. The most commonly used high-protein preparations among amateurs is creatinine (Frączek and Grzelak, 2012; Krejpcio et al., 2011; Kurylas et al., 2019). Protein preparations should be consumed separately from consumed protein products, that is, between meals. The only exception to this rule is when the protein preparation is to replace protein products in a postworkout meal (Frączek et al., 2019).

One of the most important aspects of the study is the fact that the average BMI of the study group was above normal. This phenomenon may be due to the increased lean body mass of most amateur bodybuilders studied, caused by an increase in muscularity, or an increased percentage of body fat that occurred in 43% of people surveyed and may be due to excessive protein quantities in the diet and incorrect supplementation.

This and other studies have exposed a limited dietary and nutritional and supplementation products knowledge of amateur men undertaking strength training, proving a strong indication for a revision of the educational program, with the emphasis put on the sportspeople in regard to nutrition and dietary supplements, and their safe use (Frączek and Grzelak, 2012; Kerksick et al., 2013; Krejpcio et al., 2011; Skop-Lewandowska et al., 2013). Lack of knowledge about proper nutrition and supplementation during physical activity is not only a problem of this research. Wilczek et al. in their research on a group of 99 amateur athletes stated that 60% of them use supplementation by introducing at least 3–4, some up to 10 products during training (Wilczek et al., 2013).

At the same time, Michalska et al. (2016) and Wilczek et al. (2013) emphasize that the lack of knowledge about proper nutrition, excessive concentration on one's own appearance, and striving for a perfect appearance according to men may lead to nonspecific eating disorders of bigorexia or orthorexia (Michalska et al., 2016; Wilczek et al., 2013). Most of the authors dealing with dietary supplementation among bodybuilders emphasize that the respondents independently make decisions about supplements to the diet. Amateurs combine different products without controlling the recommended amount of protein and supplements, most often controlling only the content of amino acids in the supplement (Chappell et al., 2019; Frączek and Grzelak, 2012; Kerksick et al., 2013; Krejpcio et al., 2011; Kurylas et al., 2019; Michalska et al., 2016; Ribeiro et al., 2019; Skop-Lewandowska et al., 2013; Wilczek et al., 2013).

The presented research, like any questionnaire study based on the written record by the respondent, has certain limitations. The results are based on the subjective assessment made by the respondent and his reliability in estimating the consumed products. At the same time, the study group was interested in their health and deepened their knowledge about proper nutrition and training. In order to make a complete objective assessment of the diet and training in the study group, it is necessary to isolate the subjects for the training period and apply full monitoring of the consumed products; however, it is not feasible in the case of amateur athletes, because apart from practicing sports, they lead an independent life. To minimize the possibility of errors in the dietary record, a full oral and written instruction was conducted on how to fill in the food diary, and in the event of problems, the subjects could contact a dietitian from the research team.

The problem of dietary supplementation requires further research and determination of the standards for the use of individual nutrients. In the present day, with the wide availability of information, precise recommendations supported by research and scientific authority are needed.

Conclusions

The basic problem that can be noticed in the studied group of men practicing strength sports is the lack of professionalism in the field of diet. This is reflected in improper dietary supplementation and inadequate adjustment of the amount of nutrients, in particular protein, to the needs. Mistakes made by athletes can be observed in abnormalities in body composition, such as a reduced amount of TBW in relation to gender norms, an increased amount of FM compared with the norms for athletes and, consequently, a reduced amount of FFM. It is disturbing that almost 2/3 of the surveyed men aged 18–35 used dietary supplementation with nutrients without prior control of the level of their intake with the diet. Amateur bodybuilders have taken several supplements simultaneously, often with the same nutrients, for example, BCAAs

with protein supplements, leading to excess intake. The use of supplements for athletes in the group of people training amateur in the gym is a common phenomenon, despite the lack of knowledge in this field. The conducted study showed a strong need to popularize an educational program on nutrition and dietary supplements and their safe use, aimed at people practicing physical activity.

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