Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:56 Issue:01:2023
DOI 10.17605/OSF.IO/24DFK

DIFFERENCES IN NUTRITION AMONG ATHLETES COMPETING IN BODYBUILDING, POWERLIFTING, AND WEIGHTLIFTING

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Abstract

Introduction: Strength sports are usually based on gaining the greatest possible strength or muscle mass, and for this purpose, appropriate training and specific nutrition are used. Material and Methods: A total of 90 people took part in the study on the quantity and quality of calories consumed, and the final analysis included 60 people divided into 4 groups - 3 groups of athletes and a control group. Results: Regarding the daily fat intake expressed in grams, there was a statistically significant main effect between the groups with the bodybuilders consuming less fat than the control group and weightlifters. Bodybuilders consumed more of this substrate than the other groups. In terms of calorific value of daily fat consumed, an intergroup main effect was observed, with bodybuilders consuming less fat than the control group and weightlifters. Bodybuilders consume significantly more protein per day than the other groups, and powerlifters more than powerlifters. In terms of daily fat and carbohydrates expressed as a percentage of the calorific value of the diet, significant main intergroup effects were observed, and bodybuilders consumed as much less fat as carbohydrates than the other groups. Conclusions: The obtained results were subjected to statistical analysis and it was found that the composition of the diets used in the studied groups differed significantly and differed most from the rest of the bodybuilders, mainly in terms of higher protein and low fat consumption, as well as higher caloric content of the daily diet, with similar carbohydrate consumption in all groups being watched.

Keywords: Sports Nutrition, Bodybuilding, Strength Sports, Sports Nutrition, Muscles, Strength

INTRODUCTION

Nutrition in strength sports is a fundamental element, because strength training without providing the right amounts of building and energy ingredients, or sufficient water, will not bring the expected results, and may even cause undesirable health effects. When practicing strength sports, eating proteins, carbohydrates and drinking the right amount of fluids are of particular importance. An optimal sports diet requires good hydration for thermoregulation and exercise performance. Since there are many variations in fluid and electrolyte loss from person to person, monitoring urine color (optimally pale yellow) and weighing before and after exercise (optimal loss of about 1% to 2% of body weight) are good ways to ensure adequate fluid intake during training [1].

Excluding water, which is the most abundant in the body, protein makes up about 15-20% of the total human body weight and its content about 55-56% of its lean body mass. Protein, or more precisely amino acids, are primarily a building material for the human body. When practicing strength sports, which often aim to increase muscle mass, it is necessary to provide the body with increased amounts of amino acids, which can increase the synthesis of contractile proteins. Intensive strength training is often performed with too much frequency, which overloads the body, stimulating catabolic processes to such an extent that an intensive breakdown of body proteins begins with the simultaneous appearance of overtraining [26]. Increased protein intake in the diets of

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bodybuilders, powerlifters, or powerlifters can prevent these conditions. A new position by the International Society of Sports Nutrition states that protein requirements are higher in athletes and increase with high training volumes to maintain energy balance, protein balance, and muscle mass [11]. The rate of protein metabolism in certain physiological states in humans may be determined by the duration and intensity of work. Changes in muscle protein during and immediately after exercise tend to be the same in all types of exercise. Namely, in each case the synthesis process is inhibited and protein catabolism is increased [5].

The recommended dose of protein per kilogram of body weight in athletes should not exceed 2 g / kg.m.c per day [20], however, studies did not show any harmful effects of protein consumption up to 3.3 g kg - 1 d - 1 in healthy athletes. In addition, consuming casein protein (30 to 40 g) at bedtime may increase muscle protein synthesis [11].

In professional sports, the amount of energy obtained from carbohydrates, especially during high training loads, should reach 60-70% of the daily caloric value of the diet. In strength sports, the dose of carbohydrates consumed is strictly dependent on the body weight and the training period in which the athlete is located, however, it is assumed that on training days the dose of carbohydrates should be on average 6-7 g / kg b.w./day and 4 g / kg b.w. / day on non-training days [14]. In strength training, carbohydrates, mainly muscle and liver glycogen, are the source of ATP resynthesis, in addition to phosphocreatine. The amount of muscle glycogen accumulated in the body covers the energy expenditure of 1200-1300 kcal. The amount of glycogen synthesized in the body depends on the nature, intensity and duration of the exercise, as well as the degree of training, quality and quantity of consumed carbohydrates [9]. It has been shown that its amount accumulated in muscles is about 500 g, and in the liver about 100 g [12]. In supplementing carbohydrates in athletes, the time of delivery of these substrates to the body in the post-workout period is decisive, determining the rate of muscle glycogen resynthesis. To reduce the symptoms of fatigue and maintain high performance [6, 27].

It is estimated that the rate of glycogen resynthesis after exhausting exercise is limited, and the complete regeneration of these resources takes many hours. Research shows that the fastest glycogen resynthesis takes place within the first 4-6 hours after the end of exercise, especially when one consumes carbohydrate and protein meals [10, 3]. However, this time may be longer in the case of an inadequate diet before or after exercise. The post-exercise time of glycogen resynthesis depends not only on the speed of post-exercise carbohydrate consumption, their amount and type [21]. Lambert et al. propose to provide carbohydrates with a high glycemic index in the amount of 1.2 g / kg / h. every 30 minutes for 4 hours from the end of the training session [15]. It is not necessary to consume carbohydrates during exercise <60 minutes [24].

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RESEARCH METHODOLOGY

Research participants

90 men were recruited for observation, including people practicing professional strength sports, i.e. weightlifting (W), powerlifting (P) and bodybuilding (B) in leading Polish clubs, and people who were occasionally physically active - the control group (CG). These people were not using any medications at the time. Each group of surveyed athletes included selected people with more than 4 years of experience in sports, representing at least the first sports class. People who differed significantly in body weight and age, who had elevated resting blood pressure, who revealed a history of cardiovascular and respiratory diseases, diabetes, hormonal disorders and other diseases, and those who currently used dietary supplementation. Applying such selection criteria, 30 out of the pre-selected 90-person group were rejected. Ultimately, 60 people remained, which were divided into 4 groups, including 15 weightlifting competitors, 15 powerlifters, 15 bodybuilders and 15 men not training competitive sport, which made it possible to apply adequate methods of statistical procedure. Thus, the average age of the players was 21.20 years and the body weight was 88 kg. The sports level of these players was similar.

Purpose

Although strength sports seem to always focus on the development of strength and muscle mass, both training and nutritional methods differ in individual disciplines. The aim of the observation was to describe the quality and caloric value of the diet used by weight lifters, powerlifters, bodybuilders and untrained people. Apart from the comparisons of the marked variables in the performed observation, these values were correlated in order to capture the essence of the interdependencies between them.

Research methods

Each of the respondents in the interview provided data on his age, body height, and training experience, the number of training sessions per week and the length of one training unit. Each of the subjects received detailed instructions and tables helpful for describing the quantity and quality of eaten food in a food diary, in which he was to accurately describe his diet, which he maintained for 7 consecutive days. For this purpose, the respondents were given special scales intended for weighing food with an accuracy of ± 2g. Subsequently, the quantitative and qualitative dietary data obtained in the observed people (on the basis of 7-day dietary records supplemented with a detailed interview) were compiled using computer programs (including the "Aliant" program) and energy and nutrition tables developed by Kunachowicz et al. (2007), in terms of their global calorific value and the weight, percentage and caloric content of proteins, fats and carbohydrates in them. Relevant daily data was obtained from the menus prepared in this way.

Statistical methods

The collected research material was statistically processed by calculating the arithmetic mean and standard deviation. The normality of the distribution of the obtained variables

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was assessed with the Shapiro-Wilk test. The significance of differences between the arithmetic means of individual groups was calculated using the analysis of variance with a single ANOVA classification or the Kruskall-Wallis test. In the case of repeated measurements, an analysis of variance with two-fold classification with Bonferoni post hoc test was used. Data correlation was interpreted using Spearman's "R" rank order correlation coefficient, which represents the strength of the linear relationship between the two variables. P values <0.05 were considered statistically significant.

RESULTS

The characteristics of diets used by the studied diets are presented in Table 1. Energy value of consumed foods globally expressed in kcal per week and per day, weight average amounts of protein and fats expressed in grams / day, as well as the amount of energy obtained from proteins and fats (kcal / day), as well as the percentage of proteins, fats and carbohydrates in the daily diet vary significantly between groups (Table 1 and Figure 1). Analyzing the data related to the diet in detail, a significant main effect was found between the groups in terms of calorific value of weekly food consumed ($F = 10.22$; $p < 0.001$), with post hoc analysis showing that the bodybuilders consumed higher caloric foods than the other groups ($p < 0.001$). The average energy consumption of food during the day was also differentiated between groups ($F = 10.18$; $p < 0.001$), and, as in the case of the weekly diet, bodybuilders consumed more caloric foods than the other groups ($p < 0.001$). The remaining 3 groups did not differ in terms of daily and weekly energy consumption. In terms of protein consumed per day expressed in grams, there was also a statistically significant main effect between the groups ($F = 50.54$; $p < 0.001$) and the bodybuilders consumed more protein than the other groups ($p < 0.001$). Regarding the daily fat intake expressed in grams, there was a statistically significant main effect between the groups ($F = 4.43$; $p < 0.01$), with the bodybuilders consuming less fat than the control group and weightlifters ($p < 0.05$). The occurrence of the main effect between groups was observed in the range of protein consumed per day expressed as calorific value ($F = 50.54$; $p < 0.001$). Post hoc analysis showed that bodybuilders consumed more of this substrate than the other groups ($p < 0.001$). In terms of calorific value of daily fat consumed, an intergroup main effect was observed ($F = 4.58$; $p < 0.01$), with bodybuilders consuming less fat than the control group ($p < 0.01$) and weightlifters ($p < 0.001$). The amount of protein consumed per day expressed as a percentage of the total caloric value of the diet varied between groups ($F = 60.86$; $p < 0.001$) and a detailed post hoc analysis showed that bodybuilders consume significantly more than the other groups ($p < 0.001$) , and powerlifters more than powerlifters ($p < 0.01$). In terms of daily fat and carbohydrates expressed as a percentage of the calorific value of the diet, significant main intergroup effects were observed ($F = 19.15$; $p < 0.001$ and $F = 13.76$; $p < 0.001$, respectively), with post hoc analyzes showing that that bodybuilders consumed as much less fat as carbohydrates than the other groups ($p < 0.001$).

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Table 1: Characteristics of diets used by the studied subjects

Variables	Weightlifters	Powerlifters	Bodybuilders	Control Group	F	P
en/week	17846,1 ± 368,76	17656,53 ± 3158,52	24037,8 ± 5251,04	18163,2 ± 2154,1	10,22	0,00002
en/day	2550 ± 526,38	2525,4 ± 450,76	3438,4 ± 749,33	2613,2 ± 310,30	10,18	0,00002
p-g/day	74,8 ± 15,39	121,2 ± 33,49	325,47 ± 117,92	96,47 ± 24,22	50,54	0,00000
p-g/kg b.m./day	0,82 ± 0,16	1,40 ± 0,39	3,72 ± 1,34	1,10 ± 0,28	49,32	0,00000
f-g/day	70,47 ± 22,79	64,0 ± 17,79	50,93 ± 13,48	71,4 ± 13,74	4,43	0,00730
f-g/kg b.m./day	0,77 ± 0,25	0,73 ± 0,21	0,58 ± 0,16	0,82 ± 0,15	4,53	0,00789
c-g/day	390,73 ± 98,02	352,2 ± 87,79	398,93 ± 104,27	379,4 ± 45,36	0,82	0,48603
c-g/kg/b.m./day	4,31 ± 1,07	4,06 ± 1,02	4,57 ± 1,20	4,35 ± 0,63	0,79	0,49873
p-kcal/day	306,8 ± 63,19	496,67 ± 137,24	1334,53 ± 483,58	395,6 ± 99,35	50,54	0,00000
f-kcal/day	641,13 ± 207,17	585,67 ± 161,90	468,2 ± 122,18	664,07 ± 127,59	4,58	0,00618
c-kcal/day	1602 ± 402,02	1444 ± 359,97	1635,67 ± 427,59	1555,47 ± 186,10	0,82	0,48602
p-%/day	12,07 ± 1,75	20,13 ± 6,56	38,2 ± 8,94	15 ± 3,07	60,86	0,00000
f-%/day	25,13 ± 6,09	23,2 ± 5,13	13,87 ± 4,05	25,27 ± 3,47	19,15	0,00000
c-%-day	62,8 ± 7,03	56,67 ± 5,99	47,93 ± 8,57	59,73 ± 4,49	13,76	0,00000

Data are reported as x ± SD.

en / week - weekly caloric energy of the diet in kcal

en / day - daily caloric energy of the diet in kcal

p-g/kg b.m./day - the daily amount of protein in grams calculated per kilogram of body weight

p-kcal / day - daily caloric value of protein in kcal

p-g / day - the daily amount of protein in grams

f-g / day - the daily amount of fat in grams

f-kcal / day - the daily caloric value of fat in kcal

f-g/kg b.m./day - the daily amount of fat in grams calculated per kilogram of body weight

c-g / day - the daily amount of carbohydrates in grams

c-kcal / day - the daily caloric value of carbohydrates. in kcal

c-g/kg b.m./day - the daily amount of carbohydrates in grams calculated per kilogram of body weight

f -% / day - daily percentage of calorific fat in the diet

c -% / day - daily percentage of calorific value of carbohydrates. in the diet

p -% / day - daily percentage of calorific value of protein in the diet

It should be mentioned that bodybuilders consumed significantly more protein ($p < 0.001$) and less fat ($p < 0.05$) expressed in these units than the other groups.

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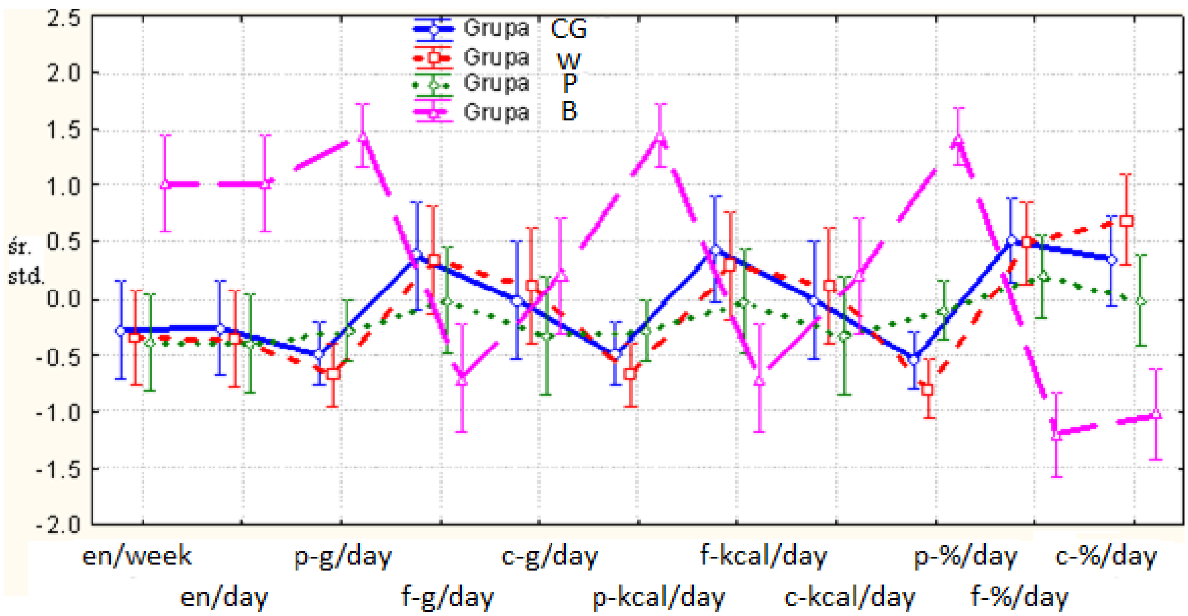
To visually highlight the dietary differences between the groups in Fig. 1 shows the nutritional profiles of the subjects expressed in mean standardized values.

Figure 1. Composition of the diet used by the study groups - (x ± 0.95% confidence interval)



DISCUSSION

Nutrition in strength sports is a fundamental element, because also professional strength training without only building components and components, and will not bring the expected results, and may even improve the powers that contain exercises. In the presented research, whether the profile will be equal by the system that it will check, and also the control group, is different for everyone, but different from a different approach by a cultural group. The first clear difference concerns the amount of weekly consumption of food equivalents in kilocalories. Means of the week bodybuilders consumed foods with a value of over 24,000 kcal, while the value was around 18,000 kcal. This time they ate 9, an average of 3,433 kcal consumed 2,550.25 kcal, weightlifters consumed 2,522.3 ± 451.29 kcal, control 2,598.3 ± 309.16 kcal. Weekly and daily calorific value of meals by bodybuilders was significantly higher than that of the study participant ($p < 0.001$). In a study by Keith et al. [13], bodybuilders consumed an average of 4469 ± 1406 kcal, and in other studies, bodybuilders consumed up to 16 MJ per kilogram of body weight. a day (ie a competitor weighing 80 kg consumed about 3820 kcal) [25]. For Canadian competitive young athletes start on average 2918 ± 927 kcal per day [18], professional figure skaters approx. 2329 kcal / day [28], volleyball players 2248 ± 414 kcal in this period [2], for Australian rigbists 17 MJ / kg m. c. day. (80 kg over 4000 kcal) [19]. According to Ziemlański et al. [29], the recommended amount of daily energy for young people practicing sports ranges from 2,800 to 3,750 kcal / ę, but it is an individual matter, which depends on the quality, age type or always good [16]. The energy expenditure of professional athletes training several hours a day for 5-6 days a week is very different, depends on the body weight and ranges between 600-1200 kcal / hour of effort [16]. Their total caloric requirement is estimated at about 2,500 kcal / day for a 50 kg athlete and even 8,000 kcal / day for an 80 kg athlete. It has also been shown that cyclists weighing 60-80 kg, participating in the Tour de France, had an energy requirement of approx. 12,000 kcal / day [4].

The macronutrient intakes of the bodybuilders were generally what was expected, with a protein intake either similar to or higher than the recommendation of 1.2–1.7 g/ kg/day for strength-training athletes [23]. Rather than an absolute need or require-ment, protein intake in athletes could be considered within the context of supporting optimal development of muscle mass, clearly a desirable outcome for bodybuilders [22]. Review on high-protein diets and renal function fails to support a detrimental effect in healthy individuals without a history of renal disease [7]. The carbohydrate intake of the bodybuilders in this review was generally lower than the sports nutrition recommendations of 6–10 g/kg/day [23]. Only one study in men exceeded the 6 g of carbohydrate/kg/day, although several in women were above this level. Muscle glycogen depletion in conjunction with aerobic exercise has been found to com- promise muscular strength performance. Therefore, resistance training performance will be enhanced when diet or supplementation allows the maintenance of intramuscular glycogen stores [17].

CONCLUSIONS

Observations on the diet used by the athletes showed that the amount of food consumed during the week, as well as on average during the day, was calorically higher in bodybuilders than in other subjects ($p < 0.001$). The same was true for the consumption of protein foods, which bodybuilders consumed significantly more than the other groups ($p < 0.001$). The amount of fat consumed in the control group and among weightlifters was significantly higher than in bodybuilders ($p < 0.01$). Moreover, bodybuilders consumed significantly less fat than powerlifters ($p < 0.05$) and significantly less carbohydrate foods than weightlifters, control group ($p < 0.001$) and powerlifters ($p < 0.01$). The composition of the diets used in the studied groups differed significantly and differed most from the rest in the bodybuilding group, mainly in terms of higher protein and low fat consumption, as well as higher caloric intake of the daily diet, with similar carbohydrate consumption in all the groups observed.

Funding

There were no external funders or sponsors.

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