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The influence of the diet on somatic differences and the developed power of athletes training strength sports

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Abstract

Introduction: For strength training to be effective, proper nutrition is necessary, based on providing the right amount of energy, as well as optimally balanced macronutrients. Nutrition among bodybuilders, weightlifters and powerlifters differs because the training aims, training methodology and competition itself are different.
Objective: Strength sports athletes differ from each other in body structure, training methodology and form of competition. The aim of the study was to try to answer the question whether their diets affect somatic variables and leg power.
Materials and Methods: 60 people remained, which were divided into 4 groups, including 15 weightlifting competitors, 15 powerlifters, 15 bodybuilders and 15 men not training competitive sport
Results: The quality of the diet used had an impact on the body composition in the control group. In the group of powerlifters, there was a significantly positive correlation between the daily intake of carbohydrates and the percentage of body fat ($p < 0.05$). In the group of bodybuilders, the energy value of food consumed during a week and a day as well as the mass of daily carbohydrates and their energy value significantly correlated with the BMI index. Moreover, the energy value of consumed food expressed in kcal positively correlated with the fat content in the body expressed in kg, as well as with the chest circumference during inhalation and with the circumference of the arm. The daily amount of carbohydrates and the daily energy value of this substrate positively correlated with the circumference of the arm and the thigh. In the athletes, numerous correlations between the diet used and the developed power were demonstrated ($p < 0.05$).
Conclusion: The diet used by the respondents did not clearly affect the power developed by the respondents. Significant correlations between the quality of the diet used and somatic variables as well as the developed power were noticed only in the group of weightlifters and bodybuilders.

Key Words: sports nutrition, bodybuilding, powerlifters, weightlifting

Introduction

For strength training to be effective, proper nutrition is necessary, based on providing the right amount of energy, as well as optimally balanced macronutrients [1]. Nutrition among bodybuilders, weightlifters and powerlifters differs because the training goals, training methodology and competition itself are different. Strength sports emphasize hypertrophy, strength, and lean body mass maintenance depending on the training phase. Therefore, nutrition should be adapted to a given competition, but also to the individual requirements of a given competitor, however, for each athlete, the key will be the reconstruction of muscle glycogen and the synthesis of muscle proteins [2,3].

In the case of strength athletes, the effort is short, but very intense, especially in competitions such as weightlifting or powerlifting. Therefore, energy is derived from anaerobic processes. The energy pathways of adenosine triphosphate (ATP) production include phosphagen breakdown, non-oxidative glycolysis (anaerobic metabolism), and oxidative phosphorylation (aerobic metabolism) [1].

Timing of macronutrient intake is crucial to augment performance, reduce gastrointestinal (GI) distress, and optimize muscle protein synthesis. Preworkout meals should be high in carbohydrate (1 to 4 g/kg bw/day), lower in protein, fat, and fiber. Preworkout meals should be consumed 1 to 6 h prior to competition. Consuming roughly 1 to 1.5 g kg/bw/day of carbohydrate soon after exercise will elevate muscle glycogen resynthesis. Ideally, this should be consumed in close proximity postexercise along with roughly 0.3 g protein /kg bw. to optimize recovery. Another way to approach this would be to aim for 0.8 g carbohydrate / kg bw paired with 0.4 g protein / kg bw in the 5-h postrecovery period, which strengthens the effect of each macronutrient when compared with individual consumption [4].

Research methodology

Objective

Strength sports athletes differ from each other in body structure, training methodology and form of competition. The aim of the study was to try to answer the question whether their diets affect somatic variables and leg power.

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). 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.

Research methods

Each of the respondents in the interview provided data on his age, body height, 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.

After that, proper examinations were started, during which the body circumference was measured - cm (neck, chest on the inhalation and exhalation, hips, waist, circumference of the stronger limb (biceps circumference) and the circumference of the stronger limb (under the gluteal fold). Then, after the warm-up, a vertical jump (cm) was tested three times with the use of a specially adapted measuring device. In this study, in addition to body weight, the

following were determined: lean body mass (LBM-kg), the amount of water in the body (TBW-kg) and the amount of adipose tissue (BF -%, kg), as well as the BMI index (kg / m2).

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 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.

Discussion

The studies showed lean with percent body fat below 11 % for 17 % for men (4.1–17.0) in bodybuilders, but sometimes levels reported to be below 5 % for competition in men [5]. The caliber of bodybuilders was not well described, and fewer studies report on national or internationally representative competitors. A number also failed to nominate the phase of preparation during which the data were collected. This is likely why the studies in women appear to have an upper range of body fat lower than that of the men. Two of the six male competition week papers reported a mean body fat percentage below the estimated minimum level of body fat compatible with long-term health outcomes (5 %) [6, 7]. Rationale with the dietary intakes would also be useful to better understand how and why bodybuilders take the dietary approaches they do. A wider variety of body composition assessment methods are also now available, so these, when used in combination, may provide a better description of participant physique. Dietary survey literature relating to strength athletes suggests lifters and throwers typically report carbohydrate intakes of 3–5 g · kg^{-1} body mass, while bodybuilders maintain daily intakes equivalent to 4–7 g · kg^{-1} body mass [4]. While Spendlowe's research showed, that carbohydrate consumption in male studies fluctuated from 243 g / day (3.0 g / kg / day) to 637 g / day (7.2 g / day kg / day). The proportion of energy from carbohydrates ran aged 34 to 64%. Weighted means indicated abdissolved carbohydrate

consumption was highest in competition phase (454 g / day; 5.3 g / kg / day) and lowest during the competition phase (310 g / day; 3.8 g / kg / day) [8].

There is an ongoing debate as to what amounts of protein strength athletes should consume, but general guidelines now recommend that athletes engaging in strength training consume about 1.6-1.7 g of protein / kg bw / day [9], although even 3.3 g of protein / kg bw / day, no negative effects on the body of a healthy athlete were observed [10].

As for carbohydrates, research shows that powerlifters consume 3-5 g / kg bw / day, while bodybuilders maintain a daily intake of 4-7 g / kg bw / day [11].

The body's fat reserves are very large and allow you to draw energy from them for many days, even in conditions of total starvation. On the pace the use of fats affects the intensity as well the duration of the effort, as well as the ease of them mobilization and oxidation [12]. In sports nutrition strength disciplines, they are minimal importance in providing energy [13].

Results

Differences in the composition of the diet and somatic differences in individual study groups

The quality of the diet used had an impact on the body composition in the control group, because it was noticed that the amount of fat consumed in the diet expressed in grams, kcal and percentages (daily caloric content of the diet) positively correlated with body weight, lean body mass, the amount of basal metabolism, body water and hip circumference. Also, the daily amount of fat consumed and its daily caloric value correlated positively with the chest circumference on the inhalation and the circumference of the arm. Moreover, the percentage of caloric value of fat in the daily diet positively correlated with the chest circumference ($R = 0.542$; $p < 0.05$). In the group of powerlifters, there was a significantly positive correlation between the daily intake of carbohydrates and the percentage of body fat ($p < 0.05$). It was also observed that the percentage of carbohydrates in the diet during the day positively correlated with the fat content in the body, waist and thigh circumference. In the group of bodybuilders, the energy value of food consumed during a week and a day as well as the mass of daily carbohydrates and their energy value significantly correlated with the BMI index. Moreover, the energy value of consumed food expressed in kcal during the week and during the day positively correlated with the fat content in the body expressed in kg, as well as with the chest circumference during inhalation and with the circumference of the arm. The daily

amount of carbohydrates and the daily energy value of this substrate positively correlated with the circumference of the arm and the circumference of the thigh. There were no significant correlations between dietary and somatic variables in the group of weightlifters. It is also surprising that there were no significant correlation coefficients of the amount of consumed protein with somatic variables.

The quantity and quality of consumed food, and the height of the vertical jump and the power of the respondents developed along with it

It was shown that the absolute power value expressed in watts during a jump jump in the control group significantly ($p < 0.05$) correlated with the average amount of fat consumed per day (g) ($R = 0.633$; $p < 0.05$), with energy value of consumed fat per day (kcal) ($R = 0.633$; $p < 0.05$) and the percentage of calorific value of fat consumed in relation to the daily energy value of food ($R = 0.525$; $p < 0.05$). (Fig. 1).

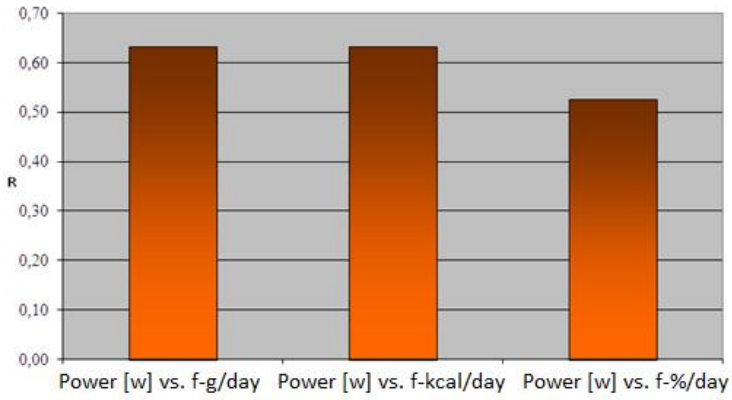

Figure 1. Significant "R" correlation coefficients of dietary variables and developed power in the control group.

Power [W] vs. f-g / day – Power in watts versus the daily amount of fat in grams

Power [W] vs. f-kcal / day – Power in watts versus the daily amount of fat in kcal

Power [W] vs. f -% / day – Power in watts versus daily percentage of calorific fat in the diet

In the group of weightlifters, there was a significant correlation between the energy value of the consumed protein expressed as a percentage of the daily caloric content of the diet and the height of the vertical jump (cm) ($R = 0.577$; $p < 0.05$), as well as the relative power developed in this jump ($R = 0.577$; $p < 0.05$). (Fig. 2).

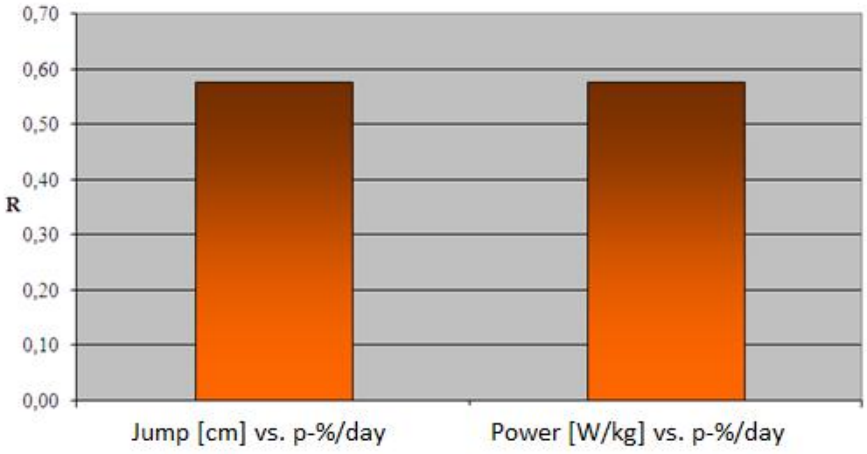

Figure 2. Significant "R" correlation coefficients of dietary variables with the vertical jump height and power developed in the group of weightlifters.

Jump [cm] vs. p -% / day – Vertical jump in cm versus daily percentage of calorific protein in the diet
Power [W/kg] vs. p -% / day – Power in watts/kg versus daily percentage of calorific protein in the diet

In the group of powerlifters, significant correlations between the height achieved during the jump (cm) and the relative power developed by the respondents during this jump (W / kg) with the daily fat content in the diet (g) ($R = 0.626$; $p < 0.05$) were revealed. , with the energy value of fat consumed during the week (kcal) ($R = 0.628$; $p < 0.05$) and the energy value of fat consumed during the day expressed as a percentage of the caloric value of the diet at that time ($R = 0.571$; $p < 0 , 05$). (Fig. 3).

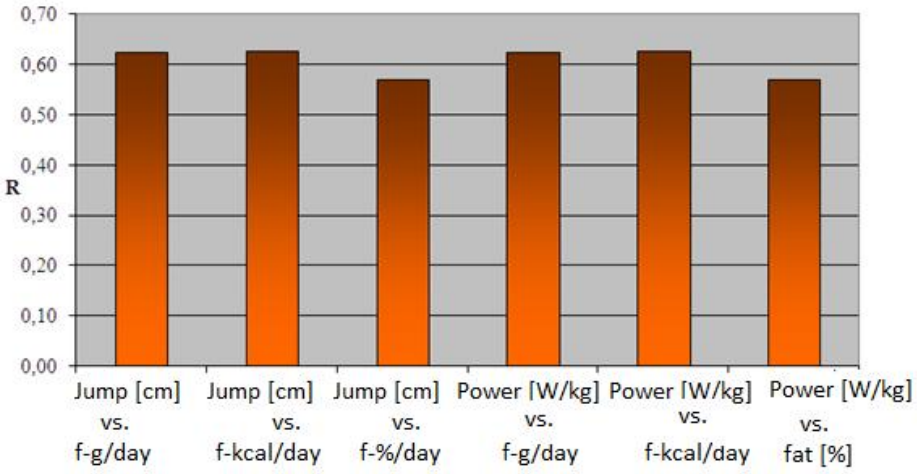

Figure 3. Significant correlation coefficients "R" of daily fat consumed and the height of the vertical jump as well as the power developed in it in the group of powerlifters.

Jump [cm] vs. f -g / day – Vertical jump in cm versus the daily amount of fat in grams

Jump [cm] vs. f -kcal / day – Vertical jump in cm versus the daily amount of fat in kcal

Jump [cm] vs. f -% / day – Vertical jump in cm versus daily percentage of calorific fat in the diet

Power [W/kg] vs. f -% / day – Power in watts/kg versus the daily amount of fat in grams

Power [W/kg] vs. f -kcal / day – Power in watts/kg versus the daily amount of fat in kcal

Power [W/kg] vs. f [%] – Power in watts/kg versus the daily amount of fat in percentage

In the group of bodybuilders, there was a statistically significant correlation between the power developed during a vertical jump (cm) with the caloric value of food consumed during the week and on average during the day (R = 0.525; p <0.05). (Fig. 4).

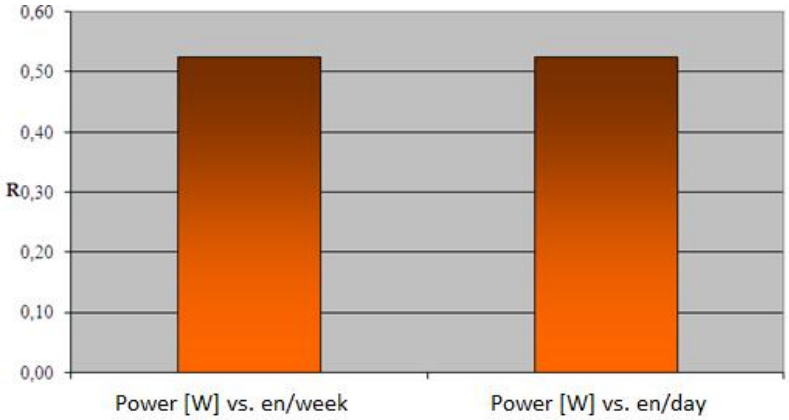

Figure 4. Significant coefficients of correlation "R" of calorific value of the diet used and the power developed during a gross jump in the group of bodybuilders.

Power [W] vs. en/week – Power in watts versus weekly energy in the diet

Power [W] vs. en/day – Power in watts versus daily energy in the diet

Conclusions

The diet used by the respondents did not clearly affect the power developed by the respondents, no statistically significant differences in this respect were noticed. On the other hand, significant correlations between the quality of the diet used and somatic variables as well as the developed power were noticed only in the group of weightlifters and bodybuilders. There was no significant effect of the baroded diet on the developed power among powerlifters.

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