PROTEIN CONSUMPTION BY BODYBUILDING PRACTITIONERS AIMING MUSCLE HYPERTROPHY

EXERCISE AND SPORTS MEDICINE CLINIC

ORIGINAL ARTICLE

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ABSTRACT

The high demand for health clubs is often related to aesthetics and in most cases to increase of muscle mass, especially by practitioners of bodybuilding. There is a belief among athletes that additional protein (LWA) increases strength and improves performance. This study aimed to evaluate the protein consumption of bodybuilding practitioners aiming muscle mass increase, in a health club from Rio Grande do Sul. The sample consisted of 23 male bodybuilding practitioners, aged between 19 and 33 years. Bodybuilding practitioners who trained to gain muscle mass with minimum frequency of three times per week and had experience in endurance training for at least twelve weeks participated in the study. A form with personal information and some specific data concerning training and nutrition was filled out. Food record was held for three days. The anthropometric measurements were taken from the physical evaluation software database of the health club. Nutritional status was also assessed by the calculation of the Body Mass Index (BMI). Average protein intake was 1.7 g / kg. The current lean mass (61.7 kg) presented values higher than the initial lean mass (59.9 kg), which was lower for the three LWA intake classifications (low, recommended and above recommended). Statistically significant difference was detected for the classifications within the recommended range ($p < 0.001$) and higher than recommendation ($p < 0.05$), where, in both situations, the current lean mass was significantly higher than the initial lean mass. The findings in this study suggest that the sample is not characterized by the consumption of LWA above or below the recommendation, and presents hyperprotein diet feature.

Keywords: health clubs, food intake, hypertrophy, food supplements.

INTRODUCTION

While aiming an"aesthetically perfect" body, many people test diets of any kind, hoping that a new level of wellness or physical performance is reached[1]. Body building practitioners many times risk their health in order to get a perfect body, exaggerating in physical exercises which can lead to lifetime damage, since there is a genetic limit to muscular development[2].

The food consumption of an athlete is differentiated from the rest of the individuals due to their relatively high energetic cost as well as the need for nutrients which range according to the type of activity, the training stage and ingestion moment[3].

Specialists state that food consumption is a crucial element for mass can reach up to 60% in importance[4,5]. However, there is lack of information from the part of the general public that a balanced and good-quality diet, except for in special situations, meets the nutritional needs of a physical exercises practitioner, including athletes of competitive level[6].

There is an old popular belief among athletes that additional protein (LWA) increases strength and improves performance; however, there is no support from research to this premise and it is observed that a small amount of the necessary protein for the muscular development is easily reached with a regular balanced diet[1].

It is scary to see the belief in the mythology that increased needs for protein in the diet among bodybuilders and individuals interested in increasing muscle mass.Weightlifters ingest around 1 to 3.5g of protein per body weight a day and most of this protein is presented as supplements[1].

The use of commercial protein and amino acids supplements has increased among athletes and sports people, with the purpose to substitute protein fromdiet, the use to increase the biological value of the proteins from diet as well as for their anticatabolic and anabolic effects[7].

Thus, the present study had the aim to verify whether the food consumption of the bodybuilding practitioners who aim muscular hypertrophy is rich in protein (derived from eating and/or supplementation).

METHODS

This is a transversal study. Data collection was performed in the period between January and April, 2009, in the School Health Club of the Caxias do Sul University (UCS) in Caxias do Sul, Rio Grande do Sul state. Male volunteers, bodybuilding practitioners aged between 18 and 40 years, who aimed at muscle hypertrophy and have trained for three months or more, with minimum frequency of three times per week, were selected. The mean was of 100 individuals within these criteria, with 42 of them being volunteers and 23 out of these effectively participated in the sample.19 participants were excluded for failing in handing in the eating record.

The present study was approved by the Ethics in Research Committee of the Caxias do Sul University Foundation (CEP/FUCS) of Caxias do Sul, in Rio Grande do Sul state,protocol number 088/08. The individuals agreed on participating in the research and signed the Free and Clarified Consent Form (TCLE) in two copies.

After having signed the form, the participants were leaded to a reserved room, where they were interviewed and told by the researcher herself about the three-day eating record filling, two days during the week and one day on the weekdays, where the interviewee took note of all the food, supplements and drinks ingested with their respective quantities, specifying the manufacturers and amount in home measures[8]. The book "Practical Methods for Calculation of Diets" was used for portions visual effect[9]. These eating records were calculated through the Dietwin professional nutritional assessment software, version 2008. In this same room a form on personal information and some specific data about the training and food consumption was filled out.Concerning the training, the weekly frequency and duration time of the bodybuilding activity were inquired about, while the food consumption was investigated through question about supplementation use and daily mount ingested.

The anthropometric measures, the calculation of the initial and current lean mass were taken from the physical evaluation form which are available on the database of the computer physical evaluation software Physical Test, version 4.1 for Windows, 1994-2003, where the used method follows the Pollock and Jackson protocol, 1984, which uses the following seven skinfolds (subscapular, tricipital, chest, medial axillary, supra iliac, abdominal and thigh). The initial lean mass used corresponded to three to six months prior to the current lean mass performance. The body mass index (BMI) was calculated with the weight and height measures, through the following formula: BMI = weight (kg) / height^2 (m); the cohort points adopted were: low weight BMI< 18.5), eutrophic (BMI = 18.5 to 24.9), overweight (BMI = 25 to 29.9) and obesity (BMI ≥ 30)[10].

The results were presented through the position (mean and median) and dispersion (standard deviation and interquartile amplitude), positions as well as through the distribution of the simple and relative frequencies. The symmetry of the distribution of the variables was investigated by the Kolmogorov-Smirnov test ($p > 0.200$). The chi-square test was used for the comparison of proportions, considering the theoretical distribution of homogeneity among the compared categories. Considering the comparison of the variables concerning the total energetic value ingestion (TEV), protein (LWA), carbohydrate (CHO) and lipids (LIP), and concerning the use or absence ofLWA supplement, the Mann-Whitney test was used. Initial and final lean mass was compared using the Student's t test for paired data. The Statistical Package to Social Sciences software for Windows 13.0, with significance level of (α) 5% was used.

RESULTS

Table 1 demonstrates the characterization of the studied sample composed of 23 individuals. Regarding age, variation amplitude of 19 to 33 years, with mean of 25.8 years (SD = 3.7) was observed. Mean height found was of 1.75m (SD = 0.06) and for weight the mean found was of 69.6kg (SD = 8.5 kg).

Data concerning the BMI presented mean of 22.7 (SD = 2.8).

Table 1. Descriptive measures for the general characterization of the sample.

Variables	(n = 23)
Age	
Mean± standard deviation	25.8 ± 3.7
Median (P_{25} – P_{75}) ∇	26 (24 – 29)
Minimum – maximum	19 – 33
Height	
Mean ± standard deviation	1.75 ± 0.06
Median (P_{25} – P_{75}) ∇	1.75 (1.71 – 1.78)
Minimum – maximum	1.62 – 1.89
Current weight	
Mean ± stadandard deviation	69.6 ± 8.5
Median (P_{25} – P_{75}) ∇	70.2 (63.0 – 75.9)
Minimum – maximum	56.1 – 83.8
Current BMI	
Mean ± standard deviation	22.7 ± 2.8
Median (P_{25} – P_{75}) ∇	23.2 (21.2 – 25.3)
Minimum– maximum	16.7 – 27.7
Classification *	
Low weight	2 (8.7)
Eutrophic	15 (65.2)
Overweight	6 (26.1)

* Values presented in n (%); **∇**: P_{25} concentrates 25% of the sample with values lower or equal to the defined by P_{25}; P_{50} = median: concentrates 50% of the sample with values lower or equal to the defined by P_{50}; P_{75}: concentrates 75% of the sample with values lower or equal to the defined by P_{75}.

When the BMI approach was through classification the eutrophic 'status' was the most frequent, characterizing 65.2% (n = 15) of the sample. The proportion of eutrophic individuals was significantly higher ($p < 0.003$) than with low weight, 8.7% (n = 2) and overweight, 26.1% (n = 6).

The information regarding the food ingestion is described in table 2. In the daily meals, the mean was of approximately five meals (SD = 1). Concerning the energetic value (TEV) ingested, the mean ingestion was of 35.7kcal/day (SD = 11.1). Considering the recommendation for the TEV (37-41kcal/day), it was verified that 52.2% (n = 12) ingested below the recommendation (from 18 to 35kcal/day), 26.1% (n = 6) ingested above the recommendation (from 42 to 64kcal/day) and21.7% (n = 5) ingested the TEV according to the recommendations (from 37to 41kcal/day). Comparing the presented proportions for the ingestion, no significant statistical difference has been found ($p = 0.154$).

Considering the results concerning the LWA, the mean ingestion was 1.7g/kg of weight/day (SD = 0.7g/kg). Regarding the ingestion observed according to the recommended LWAlimit (1.6-1.7g/kg weight/day), it was verified that 30.4% (n = 7) ingested below the recommendation (from 0.6 to 1.5g/kg weight/day), 43.5% (n = 10) ingested above the recommendation (from 1.8 to 3.4g/kg weight/day) and 26.1% (n = 6) ingested the LWA according to the recommendation (from 1.6 to 1.7g/kg weight /day). Comparing the presented proportion for the protein ingestion, significant difference has not been observed ($p = 0.568$).

Concerning the CHO results, it was observed thatthe mean

Table 2. Measures of central tendency and variability for the number of daily meals, TEV, LWA, CHO and LIP.

Variables	(n = 23)
Daily meals	
Mean ± standard deviation	4.6 ± 1.1
Median (P_{25} – P_{75}) ∇	5 (4 – 5)
Minimum – maximum	3 – 7
Ingested TEV (kcal/kg)	
Mean ± standard deviation	35.7 ± 11.1
Median (P_{25} – P_{75}) ∇	35 (28 – 42)
Minimum – maximum	18 – 64
Recommended TEV (37 to 41kcal/kg)*	5 (21.7)
Ingested LWA (g/kg)	
Mean ± standard deviation	1.7 ± 0.7
Median (P_{25} – P_{75}) ∇	1.7 (1.3 – 1.9)
Minimum – maximum	0.6 – 3.4
Recommended LWA (1.6 to 1.7g/kg)*	6 (26.1)
Ingested CHO (g/kg)	
Mean ± standard deviation	4.5 ± 1.6
Median (P_{25} – P_{75}) ∇	4.4 (3.2 – 5.2)
Minimum – maximum	2.4 – 9.0
Recommended CHO (5.0 to 8.0g/kg)*	6 (26.1)
Ingested LIP (g/kg)	
Mean ± standard deviation	1.2 ± 0.4
Median (P_{25} – P_{75}) ∇	1.2 (1.0 – 1.4)
Minimum – maximum	0.6 – 2.3
LIP equal to or above the recommendation 1.0g/kg)*	5 (21.7)

* Values presented in n (%); ∇: P_{25} concentrates 25% of the sample with values lower or equal to the defined by P_{25}; P_{50} = median: concentrates 50% of the sample with values lower or equal to the defined by P_{50}; P_{75}: concentrates 75% of the sample with values lower or equal to the defined by P_{75}.

ingestion was of 4.5g/kg of weight /day (SD = 1.6g/kg). Considering the recommendation for ingestion limit for CHO (5.0-8.0g/kg weight/day), it was verified that 69.6% (n = 16) ingested below the recommendations (from 2.4 to 4.8g/kg weight/day), 4.3% (n = 1) ingested above the recommendations (9.0g/kg weight/day) and 26.1%(n = 6) ingested CHO according to the recommendation interval (from 5.0 to 8.0g/kg weight/day). Comparing the proportions presented for the ingestion, significant statistical difference has been detected (p < 0.001), showing that the proportion of the investigated individuals with ingestion of CHO below the recommendation was significantly higher in this sample.

Concerning the LIP ingestion, the mean was of 1.2g/kg weight/day (SD = 0.4g/kg). In the ingestion observed according to the limit for LIP recommendation (1.0g/kg weight/day), it was observed that 21.7% (n = 5) ingested below the recommendation (from 0.6-0.9g/kg weight/day), 56.5% (n = 13) ingested above the recommendation (from 1.0 to 2.3g/kg weight/day) and 21.7% (n = 5) ingested exactly the recommended amount. Comparing the observed proportions, it was seen that the differences were not statistically significant (p < 0.062); however, the borderline significance presented by the test (0.05 < p < 0.10) suggested that the sample's proportion with LIP ingestion above the recommendation tends to be higher in this sample.

Table 3 shows that the current lean mass presented higher values than the initial lean mass, where the initial mean was 9.9kg (SD = 6.1) and final was 61.7kg (SD = 5.9). According to the Student's t test (p < 0.001), the current lean mass mean was significantly higher than the initial lean mass.

Assessing the lean mass concerning the LWA ingestion, for each classification of the LWA ingestion the comparison between initial and current lean mass was performed. Table 4 shows that the initial lean mass was lower for the three classifications of LWA ingestion, and in the three LWA classifications the differences were statistically significant (p<0.05). Concerning the TEV ingestion presented in figure 1, the individuals who did not use supplements (N) presented median of 34kcal/kg weight/day, and the ones who used LWA supplementation presented median of 30kcal/kg weight/day; however, the difference observed was not statistically significant (p > 0.05), which shows that the use or absence of LWA supplementation is not an influence on the TEV ingestion.

Table 3. Measures of central tendency and variability for the initial and current lean mass.

Estimators	Lean mass (kg)		p (value)
	Initial	Current	
Mean ± standard deviation	59.9 ± 6.1	61.7 ± 5.9	<0.001
Median (P_{25} – P_{75}) ∇	59.7 (55.1 – 65.7)	61.1 (56.6 – 65.2)	
Minimum – maximum	49.8 – 73.1	51.9 – 76.2	

* Student's t test for paired data; ∇: P_{25} concentrates 25% of the sample with values lower or equal to the ones defined by P_{25}; P_{50} = median: concentrates 50% of the sample with values lower or equal to the ones defined by P_{50}; P_{75}: concentrates75% of the sample with values lower or equal to the ones defined by P_{75}.

Table 4. Measures of central tendency and variability for theinitial and current lean mass, according to the classification of ingestion of LWA.

Estimators and classification of the LWA ingestion	Lean mass		p (value)
	Initial	Current	
LWAIng below recommendation (LWA < 1.6)			
Mean ± standard deviation	63.2 ± 3.3	63.7 ± 3.4	0.039
Median (P_{25} – P_{75}) ∇	63.7 (60.5 – 66.2)	63.2 (59.8 – 67.2)	
Minimum – maximum	58.1 – 66.7	59.8 – 68.8	
Recommended LWAIng (1.6 – 1.7)			
Mean ± standard deviation	60.5 ± 4.6	63.0 ± 4.5	0.003
Median (P_{25} – P_{75}) ∇	60.5 (57.1 – 64.9)	63.2 (59.6 – 66.3)	
Minimum– maximum	53.2 – 66.2	56.5 – 69.3	
LWAIng above the recommendation (LWA > 1.6)			
Mean ± standard deviation	57.3 ± 7.4	59.4 ± 7.5	0.001
Median (P_{25} – P_{75}) ∇	55.1 (51.6 – 60.5)	57.3 (53.9 – 62.8)	
Minimum– maximum	49.8 – 73.1	51.8 – 76.2	

* Student's t test for paired data; ∇: P_{25} concentrates 25% of the sample with values below or equal to the ones defined by P_{25}; P_{50} = median: concentrates 50% of the sample with values lower or equal to the ones defined by P_{50}; P_{75}: concentrates 75% of the sample with values lower or equal to the ones defined by P_{75}.

Figure 2 demonstrates the ingestion of protein-based supplementation (LWA) which the individuals who did not use supplements (N) presented median ingestion of 1.6g/kg weight/day, while among the ones who used LWA, median ingestion was of 1.7g/kg weight/day, which implies in absence of statistically significant difference ($p > 0.05$) between the two groups.

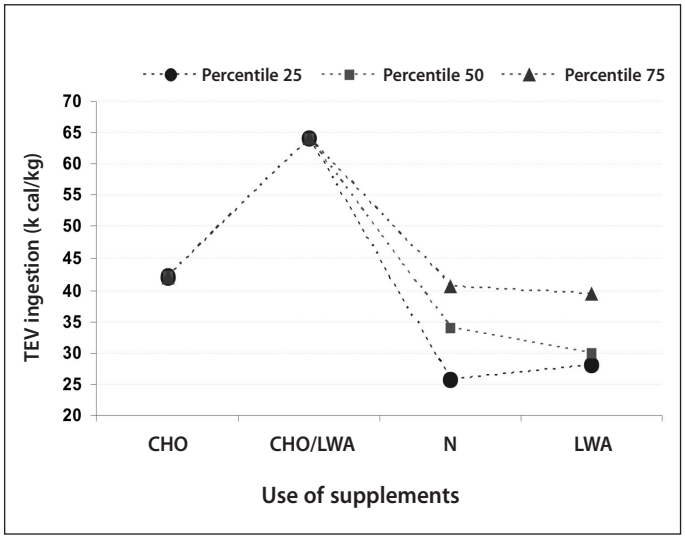

Figure 1. Median and interquartile amplitude for the TEV ingestion according to the use of supplements.

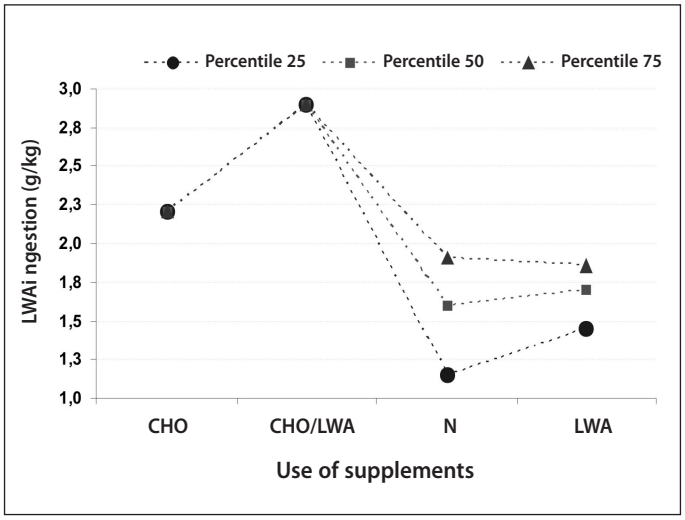

Figure 2. Median and interquartile amplitude for the LWA ingestion according to the use of supplements.

DISCUSSION

Strength training is considered the most efficient physical activity for alteration of body composition by muscle mass increase. Such alterations in body composition occur after many weeks of training[11]. Marciniket al.[12], when following 10 young adults for 12 weeks during a training program with weights, found significant increase in lean mass (1.3kg or 2%). Similar results were found in the present study when the initial and current lean mass was compared at the moment of the assessment. In the study by Wilmore[13], alterations in the body mass of men submitted to 10 weeks of weight training were not found; however, significant alterations were found in the lean mass (+2.4%) and fat mass (-7.5%).

According to the Guidelines by the Brazilian Society of Sports and Exercise Medicine[6], the suitable ingestion of protein for strength athletes would be from 1.6 to 1.7 grams per kilo of body weight per day. In the present study, the mean of ingestion of the sample was within the daily protein recommendations, but the majority was ingesting values above the recommendation. In a study carried out with 11 male individuals from Cascavel city, PR, practitioners of bodybuilding with muscle hypertrophy as aim, the majority (63.6%) of them ingested more than 2g/kg/day a hyperprotein diet in the majority of the individuals[14]. According to Duran et al.[15], some studies showed that health club goers usually have a hyperprotein diet due to fashion and lack of information and suitable guidance.

In an observational prospective study, six male bodybuilding athletes whose protein offer of 2.5g/kg weight/day did not bring additional benefit to 1.5g/kg/day to increase the protein flow and synthesis as well as positive nitrogen balance, were investigated. Increase in protein offer (2.5g/kg de weight/day) was not different concerning muscle gain[16]. Cyrinoet al.[17], in a similar study with six male bodybuilders suggest that protein ingestion between 1.5 and 2.5g of protein/kg body weight/day, associated with weight training, can significantly contribute to the strength and muscle mass increase In the present study, similar results were found in which the three classifications of LWA ingestion were statistically significant, current lean mass was higher than the initial lean mass in all groups; however, concerning the LWA ingestion within the recommended range and above recommendation, greater significant result was observed. Once again, the discussion is about the difficulty in stating the real protein needs of a population of health club goers[18].

The nutritional needs in caloric terms correspond to consumption between 37 and 41kcal/kg/ weight/day for bodybuilding practitioners. Depending on the aims, the calorie rate may present broader variations, with calorie amount ranging between 30 and 50kcal/kg/weight/day[6]. In the present study the total calorie value was below the recommendation.

In order to optimize the muscular recovery, it is recommended that the carbohydrate consumption is within 5 and 8g/kg weight/day. In long duration activities and/or intense training, there is need of up to 10g/kg weight/day for suitable recoveryof muscular glycogen and/or increase of muscle mass[6]. In the present study, the CHO consumption was below the recommendation, a result corroborated in the study by Oliveira et al.[14] where 90.9% of the bodybuilding practitioners with hypertrophy aim presented glycid consumption below the recommendation. Moreover, in a study carried out in 2004 in Cotia, metropolitan region of São Paulo, with 32 students who had been practicing any physical exercise for at least three months, with frequency equal or above three times a week, the carbohydrate consumption obtained higher percentage of unsuitability, with almost half of the population (46.9%) presenting a hypoglycidic diet[15].

Hernandez et al.[6] suggest that an adult has a daily need of about 1g of fat per kg/body weight, which means 30% of the total caloric value (TCV) of the diet. The athletes have the same nutritional recommendation of the general population. In this sample, the lipids ingestion was higher thanthe recommendation. These data were also found in the study by Oliveira et al.[14] and corroborated by Garcia[19]bodybuilders.

Therefore, having this study as a starting point, it can be concluded that the sample is not characterized by LWA consumption below or within the recommendation; the majority of the individuals presented characteristics of hyperprotein diet. Nevertheless, the protein consumption within all the recommendation ranges was effective in the muscle mass gain in the bodybuilding practitioners, with ingestion within and above the recommended value presenting more remarkable increase. The analysis of the calories and other macronutrients consumption evidenced that for calories and carbohydrate in the sample in general, ingestion was below the recommended values, but for lipids, values above the recommendation were found in the daily intake of the sample.

All authors have declared there is not any potential conflict of interests concerning this article.

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