Original Article

CONSUMPTION OF PROTEIN SUPPLEMENTS AND ANGER EXPRESSION IN BODYBUILDERS

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ABSTRACT
This study aims to verify the relation between the consumption of hyper protein nutritional supplements and anger expression among bodybuilders. A total of 127 bodybuilders who reportedly consume protein supplementation were selected. Data was collected by the following tools: State Trait Anger Expression Inventory (STAXI) and an interview form with questions about the intake of food rich in protein on regular diet, and about the type and frequency of nutritional supplement use. On average, subjects showed anger score and anger expression above Brazilian population's average levels and, reinforcing that, presented anger management and inward anger scores below the average. There was an association between anger expression and weekly protein intake (diet + supplements). The results suggest that hyper protein diets in bodybuilders might elevate their aggressiveness expression and make anger difficult to manage.
Keywords: Bodybuilding. Diet. Aggressiveness. Anger.

INTRODUCTION

Among the several factors that affect strength training, one of the most frequently associated with the increase in muscle strength is the nutritional aspect, more specifically the intake of proteins. Proteins are molecules formed by long linear chains of their own constituent elements: the amino acids (LEMON, 1997; WILLIAMS, 2002; KAZAPI; TRAMONTE, 2003).

According to Brouns (2005), free amino acids or those in form of specific proteins are the organic materials that perform the largest number of functions in the cells of all living beings. Thereby, they are part of the basic structure of the tissues (muscles, tendons, skin, nails, etc.) and perform metabolic and regulating functions (assimilation of nutrients, transport of oxygen and fats in the blood, inactivation of toxic or harmful materials, neurotransmission, etc.).

The tryptophan (TRP) is the least abundant essential amino acid in the conventional diet. It is the key element for the synthesis of one of the most important neurotransmitters for the good cerebral functioning: the serotonin (5-Hidroxitriptamina, 5 HT). The deficit of 5-HT is related to a series of problems, such as depression, anxiety, alcoholism, insomnia, obsessive-compulsive disorder, schizophrenia, anorexia and bulimia nervosa, impulsive-aggressive disorders, among others. Low levels of 5-HT are frequently found in depressive and impulsive-aggressive patients (SANDYK, 1992; WILLIAMS et al., 1999; KAPCZINSKI;QUEVEDO; IZQUIERDO, 2003; ROSSI; TIRAPEGUI, 2005). In addition, epidemiological studies reveal that there is an inverse association between aggressiveness and health; impulsive-aggressive people are three times more likely to suffer from a heart attack when compared to less aggressive ones (BALLONE, 2005; NEWSHOLME; BLOMSTRAND, 1995).

The synthesis of 5-HT is a result from a carboxylation and hydroxylation reaction of the LTRP catalyzed by two enzymes called tryptophan hydroxylase 1 and 2, being modulated basically by three factors: amount of total TRP in the blood plasma; transport of free TRP through the blood-brain barrier against its competitors (branched-chain and aromatic amino acids); and the activity of the TRP hydroxylase enzyme (ROSSI; CASTRO; TIRAPEGUI, 2003).

There is evidence that a hyper protein diet may reduce the production of cerebral serotonin, due to the greater competition between the TRP and the branched-chain amino acids (valine, leucine and isoleucine) and aromatic amino acids (tyrosine and fenilanine) (ROSSI, 2001; ROSSI et al., 2003; ZHANG et al., 2004). In this sense, gym goers may be especially vulnerable to this process, due to the increase in protein intake, boosted by the intake of nutritional supplements and stimulated by the strength training, which, consequently, could elevate the levels of their aggressiveness, because of the greater difficulty in managing their angry feelings.

According to Hokino and Casal (2001), anger is an emotional state that comprehends feelings ranging from slight annoyances to fury and rage. In this sense, several authors (BECKER JÚNIOR, 2000; HOKINO; CASAL, 2001; MENEZES JÚNIOR, 2004; BALLONE, 2005) admit that aggressiveness, aggression and violence are destructive behaviors toward other people, objects or even the person himself and, ultimately, are forms of anger expression.

Van der Vegt et al. (2001) found evidence that lower levels of cerebral serotonin may elevate the sensitivity of the 5HR receptor (1A). This variety of postsynaptic receptor is more active in aggressive animals, which agrees with the theory that low levels of serotonin in human beings relate to the increase in the capacity of controlling the display of angry feelings. In this sense, Olivier and Van Oorschot (2005) affirm that the theory that the activity of the serotoninergic system is inversely related to the aggressive behavior is currently obsolete.

The review of several clinical experiments, including in animal models, led to the conclusion that there is no consensus yet among researchers regarding the role of the serotonin in the modulation of aggressiveness; however, studies seem to demonstrate that the deficiency of serotonin relates to the increase in the levels of anger expression, whereas the increase in the levels of serotonin do not cause a decrease in the levels of anger in subjects without serotonin deficiency.

As for the consumption of nutritional supplements, a research conducted by Pereira, Lajolo and Hirschbruch (2003) with gym goers in São Paulo revealed that 23.9% consumed some type of nutritional supplement; the most consumed ones were amino acids or other protein concentrates. Around 38.9% of the interviewees admitted consuming protein supplements, 90.3% of them did so in a daily basis.

Castillo (1999) analyzed the content of amino acids in five nutritional supplements and compared them with the nutritional recommendations of the World Health Organization. Said study revealed that such supplements present elevated doses of branched-chain and aromatic amino acids, among others, whereas they present low doses of tryptophan. Based on the context presented above, this study aimed to verify the relation between the consumption of hyper protein nutritional supplements and anger expression among bodybuilders.

METHODOLOGY

The sample was composed of 127 male bodybuilders from 11 gyms in the cities of São Francisco do Sul and Joinville, in the state of Santa Catarina, Brazil – 99 participants from Joinville's gyms, and 28 participants from São Francisco do Sul's gyms. The participants were aged between 17 and 44 years old and were selected in a non-probabilistic and non-intentional way (THOMAS; NELSON, 2002).

The main criteria for inclusion in the study were: systematic consumption of nutritional supplements, practice of bodybuilding (at least 6 months) and being male. The study excluded those bodybuilders who: only tried supplements (a few doses), had started or restarted consuming supplements less than one month ago, sporadically used supplements and began the practice of bodybuilding less than six months previously to the study.

Data collection was carried out by Physical Education undergraduate students from the Lutheran Educational Association Bom Jesus – IELUSC – and by Production

Engineering students from Santa Catarina State University – UDESC, dully trained during two meetings of two hours each, for one week. Besides, to guarantee higher levels of standardization, a manual of basic instructions was used to guide the procedures of the interview. There were also previous visits to contact the owners and coordinators of the gyms, in order to obtain permission for the conduction of the research. Data collection was carried out by means of two different instruments: a self-applied questionnaire and a pre-structured interview.

The questionnaire consisted of three blocks. The first one sought to collect information about demographic and economic characteristics, such as age, education, housing conditions, personal income and the protocol of socioeconomic classification of the National Association of Market Research Companies – ANEP; in the second block, there was a set of questions about risk behaviors, such as tobacco smoking, alcohol consumption, perception of stress, and information on the practice of bodybuilding in terms of time of practice, weekly frequency and hours dedicated to this activity per session; the third block was composed of the State Trait Anger Expression Inventory (STAXI).

According to Marcelli (1998) and Becker Júnior (2000), aggressiveness is a characteristic of the personality that may manifest interdependently, or linked to an emotional expression (anger reaction) or to an attitude of attack (violence). In this study, aggressiveness was defined operationally by its emotional expression, in order to enable its cross-sectional mensuration.

The STAXI test was taken from the Manual of the State Trait Anger Expression Inventory, by Charles D. Spierlberger, which was translated and standardized for the Brazilian population by Ângela Biaggio, serving as a parameter of comparison for the data of this investigation. The STAXI is composed of 44 statements that are answered in 4-point scales, representing the perceptions of frequency and agreement of the individual in relation to the statements (SPIELBERGER; BIAGGIO, 1994). The protocol forms six scales and two subscales of anger manifestations described in Chart 1.

Angry state	Measures the intensity of angry feelings in a given moment.
Angry trait	Measures the individual differences in the disposition for experiencing anger.
Angry temperament	Measures the general propension for experiencing and expressing anger without specific provocation.
Angry reaction	Measures individual differences in the disposition for expressing anger when criticized or treated unfairly.
Inward anger	Measures how often angry feelings are repressed or hidden.
Outward anger	Measures how often the individual express his anger toward other people or objects of the environment.
Anger management	Measures how often the individual tries to control the anger expression.
Anger expression	Provides an overall index on the frequency anger is expressed, without taking into account the direction: inward, outward or controlled.

Chart 1 – Description of the scales and subscales of the STAXI.

The pre-structured interview was applied with the assistance of a guidance tool composed of three blocks, and followed the procedures adopted by the Brazilian Institute of Geography and Statistics (IBGE) for population surveys. The first block asked for the anthropometric data of the respondents; the second one was composed of questions taken from the "Diet Module", of the instrument for data collection validated for the conduction of the Household

Inquiry on Risk Behaviors and Reported Morbidity of Non-communicable Aggravations (INSTITUTO NACIONAL DO CÂNCER, 2005). All 29 questions used in this research were selected to measure the daily frequency and volume of consumption of foods rich in proteins and other nutrients that can reduce the bioavailability of the tryptophan in the brain; and the third block consisted of questions related to the consumption of nutritional supplements regarding the frequency and volume of such consumption, besides the type of supplement ingested. The dietary supplements were classified into groups according to the definition described in the literature and explained in Chart 2 (PORTER, 1995; ROCHA; PEREIRA, 1998).

Hyper protein	Products composed of proteins and amino acids, like *Whey protein*, *Whey pro, Simple protein, Natubolic,Aminofluid, BCAA, Aminopower,* etc.
Metabolite	Products composed of protein metabolites, like L-carnitine, Carnitine, Creatine, etc.
Vitaminic	Products composed of vitamins and minerals, like Cebion, Provit, Vit B, etc.
Stimulant	Products composed of botanic extracts and herbs, like *ginseng*, powder guarana, etc.
Pro-hormonal	*Anabolic extreme, GH max, Melaton age, HGH ergogel, etc*.
Mixed products	*Megamass*, mass, beer yeast, etc.

Chart 2 – Classification of the dietary supplements.

To estimate the daily consumption of macronutrients, tables of food composition were used, especially to determine the protein load of each food reported. These loads were multiplied by the volume of food consumed, and divided by the subject's body weight. These calculations were made in the software Diet pro, version 2.0. The consumption of anabolic steroids was not assessed in this study because these substances are not considered dietary supplements.

Because of the questions addressed by the research instruments and the objective of decreasing as much as possible eventual resistances, the anonymity of the self-applied form and of the interview was preserved; the bodybuilder was not asked to identify himself. The Ethics and Research Committee of the IELUSC approved such procedure, under legal opinion 017/2007.

After reading, signing a returning the informed consent form (TCLE), the participants were interviewed in each of the gyms.

The statistical analysis was carried out through the software SPSS 10.0 for Windows (*SPSS*©, USA). The measures of central tendency and dispersion were calculated for the description of the variables. Pearson's correlation test was applied to identify possible associations between variables, since their normality criterion was confirmed by the Shapiro-Wilk test (BARBETTA, 2003). The results were regarded as statistically significant when the level of probability was inferior or equal to 5% ($p \leq 0.05$).

RESULTS AND DISCUSSION

As expected, the gym goers are, in general, individuals with a good level of schooling, with motivation and resources to practice physical activities and to maintain a healthy diet, and have access to information on nutrition and physical activity. It is also observed that most of them are single and have not completed higher education (they are college students), and that most of them belong to the socioeconomic classes A2 and B1; however, ten of them declined to reveal their individual income band.

These characteristics are similar to those described by Pereira, Lajolo and Hirschbruch (2003) among gym goers from São Paulo. Table 1 displays the sociodemographic characteristics of the participants of the study.

Table 1 – Sociodemographic characteristics of the bodybuilders from eleven gyms in the cities of Joinville and São Francisco do Sul.

	Frequency	Percentage
Marital status		
Married	42	33.07%
Single	85	66.93%
Total	127	100%
Schooling		
Secondary education	33	25.98%
Incomplete Secondary Education	19	14.96%
Higher Education	25	19.68%
Incomplete Higher Education	52	40.94%
Total	127	100%
Socioeconomic class		
A2	24	18.89%
B1	70	55.12%
B2	14	11.02%
C	19	14.96%
Total	127	100%
Income band		
R$301 - R$1,040	34	29.06%
R$1041 - R$1,800	21	17.95%
R$1801 - R$7,400	62	52.99%
Total	117	92.13%

It was observed that, in relation to the risk behaviors of individual lifestyle, the irregular consumption of cigarettes, mentioned in the literature as the main factor of health risk (MALCON; MENEZES; CHATKIN, 2003) was reported by 11.54% of the participants. It was verified that the smokers participating in this research are High School and college students, and this percentage is above the one found by De Bem (2003) among High School students from the state of Santa Catarina. That study found prevalences of tobacco smoking of 7.1% and 6.4% for worker and non-worker students, respectively.

In the case of alcohol, the cutoff aspects preconized by the U.S. Department of Health and Human Services (2000) are: intake of more than five doses per occasion, and/or consumption of 14 doses or more during the week. This study observed that 55.56% of the participants reported that they are used to ingest more than five doses of alcoholic drinks at least once a month, and 11.54% of them ingest fourteen doses or more during a typical week. These percentages are superior to those found by De Bem (2003) and Barros (2001) among High School students (30.2%) and industry workers (48.1%) from Santa Catarina, respectively. A percentage of 11.11% of the participants declared excessive levels of stress to justify the excessive consumption of alcohol or the habit of smoking irregularly.

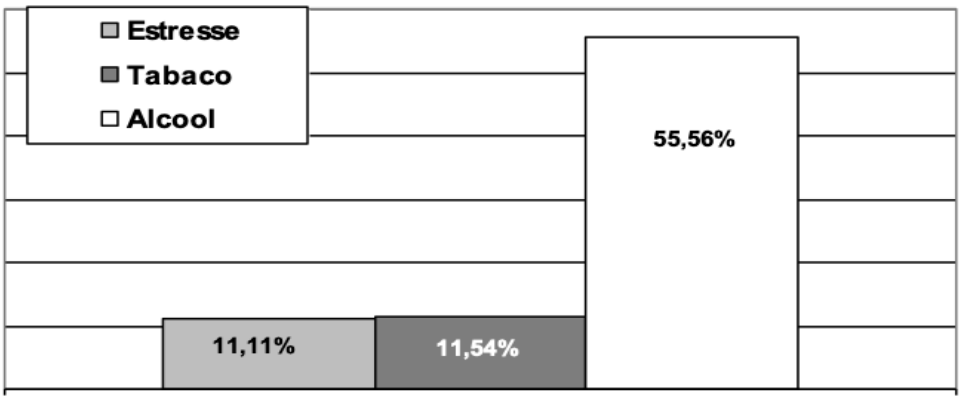

Figure 1 – Prevalence of Health-Risk Behaviors Related to Lifestyle.

Although they had been practicing bodybuilding for 22.4 months, on average, with an average frequency of four training sessions per week, average duration of 107.4 minutes each, a relatively low average age, and consumption of nutritional supplement for muscle mass gain, the participants presented anthropometric characteristics similar to the Brazilian average. The characterization of the anthropometric aspects and of training habits of the participants of the research is displayed in Table 2.

Table 2 – Characteristics referring to the anthropometric and training aspects of the participants by city.

Characteristics	Joinville (n = 99)	São Francisco do Sul (n = 28)
Age (years)	24.11 ± 8.5	21.3 ± 3
Weight (kilograms)	72.2 ± 5.06	79.7 ± 7.89
Height (centimeters)	177.89 ± 5.55	179 ± 9.1
Body Mass Index	22.87±1.65	24.81±3.13
Time of training (months)	26.1±10.89	18.7±13.9
Weekly frequency (days)	4.12±2.11	4.33±1.97
Training duration (minutes)	103.62±25.54	111.25±20.91

Regarding the diet habits, this investigation sought to identify whether the consumption of proteins met the recommendations of the Food and Drug Administration (FDA). To do so, the habitual intake of proteins without supplementation was estimated through the frequency and volume of the intake of foods rich in proteins. It was observed a consumption of 1.83±0.3 grams of protein daily per kilo of body weight in the following foods: red and white meats, milk, dairy products, cold cuts and grains. The intake of such foods, at this dosage, configures a hyper protein diet, because it is in the superior threshold of the recommendations of the FDA for athletes, that is, between 1.5 and 1.8 grams per kilo of body weight (WILLIAMS, 2002; KAZAPI; TRAMONTE, 2003; BROUNS, 2005).

Table 3 – Dietary consumption of macronutrients adjusted to the body mass of the participants of the study

Habitual diet	Mean (g/Kg)	Standard deviation (g/Kg)	Var. Coef (%)
Carbohydrates	8.27	5.71	53.08
Fats	3.98	1.12	25.55
Proteins without	1.83	0.26	14.21
Proteins with supplements	3.33	1.13	21.37

Among all 127 participants of the research from both cities, 89 consumed more than one type of nutritional supplement, and 22 of them ingested five different types of supplement. The use of hyper protein supplement was reported by 51.8% of the participants, in such a way that these were the most consumed ones among these bodybuilding practitioners. Among the hyper protein supplements, the most consumed one was the whey protein, consumed by 25.02% of the participants. These results are similar to those found by Lobo; Pereira (2005) among bodybuilders from Criciúma, Santa Catarina, out of which 54.5% admitted using hyper protein supplements. Another study, conducted by Guerra et al. (2005), reported energetic supplements (55%), followed by hyper protein (45%) as the most consumed among roar athletes in São Paulo. This small difference may be a fruit of the athletic objectives clearly different from the objectives of gym goers.

The special supplements of pro-hormonal and mixed classes were consumed by 14.81% and 35.26% of the participants, respectively. The pro-hormonal are popularly known as natural anabolic steroids for, allegedly, being the precursors of the testosterone and elevating the production of this hormone in the body and, thereby, accelerating the results of resistance training (CLARKSON, 1999; BROUNS, 2005). The other types of supplements were consumed by 7.4% of the participants of this study.

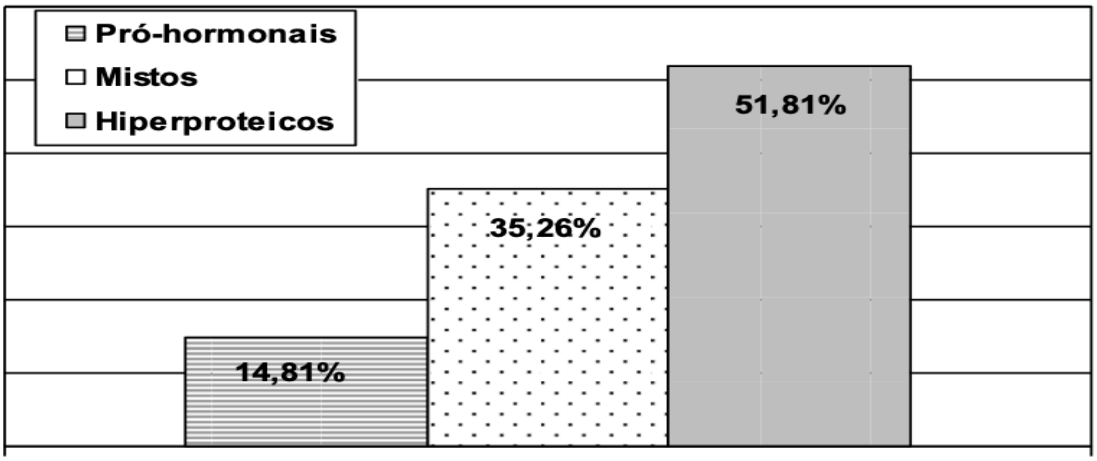

Figure 2 – The most consumed types of supplements

Among the participants of this study, the daily use of supplements was reported by 81.48% of them. That may be a result from the instructions of use presented on the packages of these products, which usually suggest daily consumption. The hyper protein supplements, besides being more common among the participants, were also the most used in a daily basis (37.04%). Among the respondents, 18.52% consume hyper caloric products twice a day five days a week, and 14.81% used combinations of amino acids and hyper caloric products. A study conducted by Krumback, Ellis and Driskell (1999) with college students practitioners of sports in the USA observed that 29.8% of the consumers of supplements ingested them five times or more per week.

In this context, one of the possible effects of the indiscriminate use of nutritional supplements, which expressively increase the dietary proportion of amino acids, is the reduction in the production of neurotransmitters responsible for controlling impulsive and aggressive behaviors. According to Prado-Lima (2009), there is a plenty of evidence confirming the direct relation between the production of serotonin, catecholamine and anabolic steroids and the increase in the frequency and intensity of aggressive behaviors.

The aggressive behavior is one of the factors that have most generated conflicts in our society, due to its ambivalence in our culture delineated by the model of capitalist relationships. On one hand, many are those who admire it, especially when it presents itself as initiative and proactivity. On the other hand, many are those who condemn and

repudiate it when it presents itself as transgression of conducts socially accepted, such as the diverse types of violence against people, animals, the environment and the patrimony (BECKER JÚNIOR, 2000; KAPCZINSKI; QUEVEDO; IZQUIERDO, 2003).

The diversity of theoretical conceptualizations about the origins of aggressiveness, its functions and the changeability of its trait, and the difference between these conceptualizations result in confusion as for what should or should not be done when we are before an aggressive behavior that violates the conventions of the good sociability (HOKINO; CASAL, 2001; SANZ MARTINEZ et al., 2008).

According to Werner; Nixon (2005), the aggressive behavior has been considered a risk to health, because it would be related to several disorders of adaptation to the interpersonal environment, which may be related to elevated levels of vulnerability to stress. Such situation is often associated to cardiovascular and mental diseases.

Pressa (2002) states that, from Spierlberger's perspective, the anger expression consists of three major dimensions: *outward anger*, which involves the display of anger toward other people or objects of the environment; *inward anger*, involving the repression of anger feelings, that is, is directed to the inside of the person himself; and *anger management*, which is the individual differences referring to the degree at which a person tries to control anger expression. Table 4 presents the raw results standardized by the T score of the participants of the study in the different anger scales.

Table 4 – Means, standard deviations and average T scores adjusted to the Brazilian population for the scales of outward anger, inward anger, anger management and anger expression among the individuals investigated in the study

Anger scale	Raw score	Standard deviation	Standard score (T)
Outward anger	12.7	4.27	54.29*
Inward anger	14.8	3.12	43.6*
Anger management	23.0	5.1	41.27*
Anger expression	20.5	7.31	55.81*

- Significant at a level of $p \leq 0,05$

With the adjusted T scores it is possible to observe that the participants present levels of inward anger and anger management below the average for the Brazilian population, whereas the levels of outward anger and anger expression stands above the average, with statistically significant differences in relation to the population.

When it comes to the level of incidences, only 8.3% of the individuals presented level of aggressiveness regarded as low, that is scored between 4.4 and 8.7 points in the raw score, whereas 17.7% of the subjects presented level of aggressiveness regarded as average, with scores up to 13.1, and 74% presented high scorings for aggressiveness. These results show that, although the practice of bodybuilding is not involved with aggressive behaviors, like the martial arts, the scores of aggressiveness of its practitioners are qualitatively worse than those of fighters (HOKINO; CASAL, 2001; MENEZES JÚNIOR, 2004).

A study conducted by Menezes Júnior (2004) with 24 practitioners of jiu-jitsu from three gyms in Florianópolis, Santa Catarina, did not find any scores above 13.1 points in the STAXI, and the mean of all dimensions of aggressiveness was classified as inferior to the population mean.

Authors quoted by Becker (2000) affirm that the practice of physical activities boosts the self-esteem, self-concept and self-confidence of its practitioners. Such results may relate to the greater capacity of expressing feelings, which reduces the levels of intra-punished aggressiveness. Because the participants of this study have been training for a good time, they possibly present lower tendency to direct their feelings of anger and hostility.

According to Diamond and Hicks (2005) and Sanz Martinez (2008) the different forms of expressing anger seem to be influenced by factors related to the dietary preferences and to the frequency of consumption of certain foods that may reduce organic stocks of tryptophan, thus

affecting the production of serotonin. Although there are no studies relating specific foods to the forms of anger expression in humans, several animal models have been confirming this hypothesis. Moreover, clinical studies of observation have been evidencing that alteration in the diet of patients substantially affects their mood.

Alvarenga (2008) reports a study recently published that showed the relation between the decrease in the level of serotonin, derived from the dietary reduction of tryptophan, and the aggressive impulse. The researchers controlled the diet of the participants and divided them into two groups. One group was subjected to a diet poor in tryptophan, whereas the other one maintained a diet with the recommended levels of this amino acid. The results of the work showed that those participants whose diet was poor in tryptophan presented lower levels of serotonin and had greater difficulty in controlling their aggressive reactions.

Table 5 displays the correlation coefficients between the levels of anger of the different scales, the weekly frequency of nutritional supplements ingested and the weekly volume of protein intake in terms of habitual and supplemental diet.

Table 5 - Correlation coefficients between the levels of outward anger (oa) and inward anger (ia), anger management (am) and anger expression (ae), number of different nutritional supplements ingested (ns), weekly frequency of protein supplements intake (wfpsi) and total volume of weekly protein dietary intake (tvpi).

	RD	***RF***	***CR***	***ER***	***NS***	***FCS***
RD	1					
RF	-0,33	1				
CR	0,30	-0,40	1			
ER	0,03	0,72*	-0,81**	1		
NS	-0,15	0,34	-0,09	0,20	1	
FCS	-0,36	0,14	-0,28	0,12	0,18	1
VTIP	0,32	0,62*	-0,69*	0,73*	0,12	0,52*

* Statistically significant at a level of $p \leq 0.05$ ** Statistically significant at a level of $p \leq 0.01$

Table 5 evidences that there are statistically significant correlations between the total volume of weekly protein intake (diet + supplement) and three forms of anger expression. The outward anger and the anger expression presented positive correlations with the total frequency of weekly protein intake, whereas the anger control presented negative correlation with this variable. This may be a sign that the subjects with hyper protein diet have greater difficulty in dealing with their anger feelings and present greater tendency to lose control in stressful situations.

Several researches show that anger increases the risk for heart attack and stroke; therefore, it is good to express it moderately (STEWART et al., 2007; KAPCZINSKI; QUEVEDO; IZQUIERDO, 2003; SUAREZ, 2003; BALLONE, 2005). Harburg (2003) conducted a prospective research with 696 patients from 1971 to 1988 and attempted to verify the behavioral causes that led these patients to death from cardiovascular diseases. He observed that the risk for death from cardiovascular diseases among the patients who moderately expressed their anger was 44% lower when compared with that of patients who little expressed their anger. This result is consistent, because confusion factors like questions of health, use of psychotropic drugs, unemployment and social integration were dully controlled.

Many studies reveal evidence that the tryptophan, precursor of the neurotransmitter serotonin, is the least abundant amino acid in the typical diet of western peoples (SANDYK, 1992; CASTILLO, 1999; YOUNG et al., 2002). The deficiency of tryptophan or the increase in the number of the amino acids that compete against it to cross the blood-brain barrier seem to be a crucial factor for the decrease in the levels of cerebral serotonin. Hyper protein diets

appear to reduce the cerebral serotonin, which may trigger depression and impulsive-aggressive behaviors (SCHMECK et al., 2002; YOUNG et al., 2002; HUGHES et al., 2003).

Other studies evidence that a hyper protein diet may also elevate the bioavailability of the tyrosine, an amino acid precursor of the catecholamine, especially of the neurotransmitter dopamine. The elevation in the levels of cerebral dopamine is a factor that activates the dopaminergic system and inhibits the serotoninergic system. This combination has been associated with aggressive and hostile behaviors (HARMER et al., 2001; GIJSMAN et al., 2002; KAPCZINSKI; QUEVEDO; IZQUIERDO, 2003; MONTGOMERY et al., 2003; STEWART et al., 2007).

None of the possible variables of confusion of this study (marital status, socioeconomic class, schooling, income band, stress, and tobacco and alcohol consumption) presented significant association with some anger score. These results reinforce the association between the pronounced intake of protein and the expression of outward anger.

CONCLUSION

The practitioners of bodybuilding who frequently consume nutritional hyper protein supplements do not need said supplements, because their habitual diet already has an elevated intake of protein, even above the maximum values recommended in the literature.

The levels of outward anger and anger expression presents scores above the average levels of the Brazilian population. These same subjects present scores of management of angry feelings inferior to the average levels of the Brazilian population.

The levels of anger presented low correlation with the weekly frequency of use of hyper protein supplements, but presented significant correlations with the total volume of weekly intake of protein. Because this last variable is the sum of the habitual protein intake and of the consumption of supplements, it is possible to conclude that there is evidence that these hyper protein diets are associated with the increase in the anger expression outward, toward objects and/or other people.

Data also show statistically significant associations between the total volume of weekly intake of protein and the difficulty in maintaining the control of anger, an essential psychological quality for the prevention of hostile and violent behaviors, showing a negative linear relation, that is, the higher the protein intake, the lower the capacity of controlling anger.

In general, the users of nutritional supplements seem to be misinformed about the content of the supplements and the consequences of excessively ingesting them. Many of these products still do not have their effects scientifically tested, so their cost-benefits relation has not been clarified yet, especially when it comes to long-term consumption. In addition, they are sold and prescribed by non-specialized professionals and many times they are indiscriminately prescribed by bodybuilder instructors, who do not consider the biological individuality of the customer and the possible risks to their health; for this reason, the inadvertent consumption of supplements might represent a problem of public health.

As a suggestion, further studies about the influence of hyper protein supplements on health and on the cerebral functioning of physically active people should be conducted, preferably with more sophisticated and broader methodologies, since anger and depression are closely linked to chronic-degenerative diseases and, demonstrably, affect interpersonal relationships and the quality of life of individuals.

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