



## Trabajo Original

### Exercise dependence and its relationship with supplementation at gyms in Brazil *Dependencia de ejercicio y su relación con la administración de suplementos en los gimnasios de Brasil*

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#### Abstract

**Introduction:** Brazil is the second country in the world with the largest number of gyms, currently accounting for approximately 30 thousand units. There is increasing evidence that a significant part of gym-goers develop excessive commitment to practicing physical exercises, which may even generate pathological dependence.

**Aim:** To determine the association between physical exercise addiction (ED) and supplement intake among gym-goers.

**Method:** The exercise addiction scale was employed for gym-goers older than 19 years of both sexes. Individual interview was made by using nutritional history to determine supplement intake profile; data related to anthropometry and participation in the gym were also assessed.

**Results:** The frequency of ED at gyms was 66.5% and the prevalence of supplementation was 51.5%, while the chances for an exercise addict to be a supplement consumer were estimated at 4.53.

**Conclusion:** The relationship between ED and supplement intake was proven, constituting an alert for health professionals, who should consider the risk factors for the development of more severe signs and symptoms, including obsessive weight control by means of excessive practice of exercises, diets with no nutritional basis and unnecessary supplementation. It is recommended to include nutritional assessment among the instruments to detect ED and supplementation so that, if necessary, campaigns can be promoted to elucidate diets, healthy body composition patterns and drastic changes in eating patterns, as well as other issues related to nutritional care.

#### Key words:

Dietary supplements.  
Gyms. Dependence.  
Exercise.

#### Resumen

**Introducción:** Brasil es el segundo país del mundo con el mayor número de gimnasios y actualmente representa aproximadamente 30 mil unidades. Cada vez hay más evidencias de que una parte significativa de los practicantes de actividad física desarrollan un compromiso exagerado con esta actividad, que incluso pueden generar dependencia patológica.

**Objetivo:** determinar la asociación entre la práctica exagerada de ejercicio físico (ED) y el consumo de suplementos entre los practicantes.

**Método:** se utilizó la escala de adicción al ejercicio en practicantes mayores de 19 años, de ambos sexos. Fue realizada una entrevista individual para determinar históricamente el consumo de suplementos; también se evaluaron los resultados de antropometría y la frecuencia de participación en el gimnasio.

**Resultados:** la frecuencia de la práctica en el gimnasio fue del 66,5% y la prevalencia de la suplementación fue de 51,5%, la posibilidades de un adicto al ejercicio ser un consumidor de suplemento se estima en 4,53.

**Conclusión:** la relación entre la adicción al ejercicio y el consumo de suplemento fue comprobada, constituyendo una alerta para los profesionales de la salud, que deben tener en cuenta los factores de riesgo para el desarrollo de los signos más graves y síntomas, incluyendo el control de peso obsesivo por medio de la práctica intensa de ejercicios físicos, consumo de dietas inadecuadas y uso de suplementos nutricionales. Se recomienda que la evaluación nutricional se complemente de otras determinaciones para detectar la adicción al ejercicio y el uso de suplementación nutricional. Si es necesario, se pueden promover campañas para avalar las dietas consumidas, la composición corporal ideal y detectar los cambios drásticos en la alimentación, así como otras cuestiones relacionadas con el cuidado nutricional en general.

#### Palabras clave:

Suplementos  
dietéticos. Gimnasios.  
Dependencia.  
Ejercicio.

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## INTRODUCTION

Gyms can be defined as fitness centers that provide environment and guidance for the practice of physical exercise programs. Brazil is currently the second country in the world with the largest number of gyms, approximately 24 thousand units; the USA ranks first with 30 thousand establishments (1). Although there has been a transition in management and philosophy from the fitness to the wellness model, a large number of gyms still propagate in their environments the cult to thin and athletic body, diets with no nutritional basis and uncontrolled supplement intake (2,3,4). In the Brazilian market, there are small and medium gyms with poor administrative management, although investments are high; on the other hand, the USA ranks first in number of the largest gyms in the Americas, followed by Mexico, Canada, Chile and Argentina (5).

In Brazil, the National Health Surveillance Agency (ANVISA) is responsible for establishing the classification, designation and requirements for the composition and labeling of foods for athletes. Its most recent publication (April 2010) is a Resolution from its Board of Directors (RDC no. 18/2010) (6), which addresses food for athletes. Although ANVISA does not regulate the nutritional practice and the activity of supplement prescription, it is clear that the liberation of these supplements was based on the consensus by experts of several fields, supported by performance studies among a population of athletes. Therefore, their effect is doubtful for practitioners aimed only at recreational practice, health or even aesthetics (1). Prescription is restricted to nutritionists and physicians; however, there is evidence of great prevalence of supplement consumption for athletes, especially at gyms, without nutritional prescription (2). In addition, there is evidence that a significant part of gym-goers develop excessive commitment to practicing physical exercises, generating even pathological dependence named Exercise Dependence (ED) (7,8). Thus, similarly to other addictive behaviors, ED has no standard definition (9,10) and can be established as a desire to practice exercise during free time, resulting in an uncontrolled and excessive behavior, which can manifest as behavioral (e.g., pathological commitment), physiological (e.g., tolerance, abstinence) and psychological damage (e.g., anxiety, depression). ED and its repercussions have been traditionally described for the population of athletes (11), specially marathoners (7,8), bodybuilders (12), weightlifters (13) and martial arts athletes (14,15); nevertheless, there is increasing evidence of its occurrence among physically active individuals like practitioners at gym environments (16).

Although several studies of the prevalence of supplement intake have been conducted in Brazil, none of them has related such prevalence to ED among gym-goers or has investigated the associated risk factors.

## METHODOLOGY

### SITES

Data were collected from 3 different gyms in the metropolitan region of São Paulo, which were medium (500 to 1,200 custom-

ers) to large (> 1,200 customers), offered diversified physical activities and did not commercialize supplements but provided nutritional assistance. Considering gyms in Brazil, more than 25% are concentrated in the cities of Rio de Janeiro and São Paulo, additional 25% in the South Region and the remaining ones are in the North, Northeast and Central-West Regions, which demonstrates the importance of studies involving gyms in the South region of the country (1,17).

## SUBJECTS

Participants were physically active gym-goers, over 19 years, of both sexes, regardless of their attendance, permanence or loyalty. After hearing explanations about the study, its relevance, risks and benefits, the individuals were asked to sign a free and informed consent term according to the model approved by the Ethics Committee of the Faculty of Pharmaceutical Sciences of the University of São Paulo under the number 632,237.

## SAMPLE

The sample size  $n$  was obtained by inverting an approximate confidence interval of the estimated proportion  $\hat{p}$  of individuals who consume supplements (2,18). Considering the relationship  $n = \hat{p} \times (1 - \hat{p}) \times \frac{z^2}{e^2}$  where  $z = 1.96$  is the percentage corresponding to 95% confidence level; we stipulated an expected margin of error  $e$  of 6.5% for the study and considered the most unfavorable case in which  $\hat{p}$  is equal to 50%, obtaining a sample size  $n$  of 227 individuals.

## DATA COLLECTION AND VARIABLES

The nutritional questionnaire included personal information (name, birth date and sex) and data related to supplement intake (type and indication). A supplement consumer was considered every individual who had been using any type of supplement for a period superior to 4 months (17); for tabulation and data analysis, we considered the Supplements for Athletes, according to ANVISA RDC no. 18 (6). The RDC establishes the description of Food for Athletes by ANVISA, whose scope are "food specially formulated to help athletes meet their specific nutritional needs and assist in the performance" classified into supplements: a) hydroelectrolytic, b) energy, c) protein, d) partial meal replacement, e) creatine and f) caffeine.

Concerning the practiced physical activities, the following data were requested regarding their profile of participation in the gyms: a) diversification: record of the physical exercises practiced during the week; b) frequency or attendance: number of days of exercise practicing in the week; c) permanence: total minutes of practicing for each exercise in the week divided by the frequency; and d) loyalty: total time, in years, of participation in the gym. Data about self-reported anthropometric measures (19) of body

mass (BM: kg) and height (E: cm) were also requested and used to calculate the body mass index (BMI: kg/m<sup>2</sup>), and the nutritional status was classified according to WHO (20).

To evaluate Exercise Dependence (ED), we employed the version of the Commitment Exercise Scale (22) translated and validated for the Brazilian population by Teixeira and collaborators (21). The questionnaire included eight questions that investigate psychological commitment related to exercise. To this end, there is a continuous millimeter scale up to 155 mm, in which the individual chooses the response that best describes his/her position from two bipolar adjectives. Addicted individuals were considered those who obtained a total sum of questions greater than 62 cm.

## STATISTICAL ANALYSIS

Results were organized as sampling summaries of central tendency and variability or as sampling fractions, when appropriate. Two types of hypothesis tests were used for data analysis. For comparison among groups of categorized data, Fisher's exact test was employed. The remaining comparisons were made according to Wilcoxon non-parametric paired tests. For all tests, the standard significance level was set at 5% for rejection of the underlying null hypothesis. The adopted statistical software was R (R Development Core Team [2011]) (23).

## RESULTS

The sample was composed of 227 gym-goers, mostly men (51.1%). The frequency of ED individuals of both sexes was 66.5% and that of supplement consumers, 51.5%.

On average, gym-goers of both sexes were 32.2 (11.2) years old, weighed 71.3 (14.0) kg, were 170.2 (9.4) cm tall and had body mass index (BMI) of 24.5 (3.1) kg/m<sup>2</sup>, which characterized them as eutrophic; the same was true for women and overweighted men according to the nutritional status (20). Average ED score was 74.7 (43.5) cm and diversification included, on average, the performance of 1.9 (1.0) different types of exercises at a frequency of 4.6 (1.4) days a week, permanence of 81.7 (32.2) minutes and loyalty of 75.1 (88.6) months. All differences between sexes were statistically significant, except for permanence. Considering participation in the gym, diversification (number of exercises) was significantly greater for women than for men, to whom frequency and loyalty values were greater. There was not any difference between sexes for permanence at the gym. Men had significantly higher ED scores than women (Table I).

Data in table II are separated for ED and non-ED individuals who use supplements or not; according to Fisher's exact test, there was a highly significant association ( $p < 10^{-6}$ ) between the two variables. Chances of being an addict were estimated at 4.53-fold greater for a supplement user than for a non-user.

**Table I.** Analysis of anthropometric and participation data according to the sex of gym-goers

	Sample n = 227	Men n = 116	Women n = 111	p
Age (years)	32.2 (11.2)	33.0 (10.0) #	31.4 (12.3)	0.0397
Body mass (kg)	71.3 (14.0)	80.3 (12.0) #	62.0 (8.7)	0.001
Height (cm)	170.2 (9.4)	176.7 (7.2) #	163.3 (5.8)	0.001
BMI (kg.m <sup>2</sup> )	24.5 (3.1)	25.6 (2.8) #	23.2 (2.9)	0.001
Diversification (no. exercises)	1.9 (1.0)	1.7 (0.8) #	2.1 (1.1)	0.0077
Frequency (days/week)	4.6 (1.4)	4.9 (1.3) #	4.2 (1.4)	0.0005
Permanence (min/day)	81.7 (32.2)	85.6 (34.3)	77.7 (29.3)	0.0714
Loyalty (months)	75.1 (88.6)	91.6 (99.3) #	57.8 (72.3)	0.0022
ED score (cm)	74.7 (43.5)	81.6 (56.6) #	67.4 (20.8)	0.0008

#Statistically significant difference between sexes.

**Table II.** Practitioners in the sample classified according to exercise dependence or not and as supplement users or not

	Exercise dependence no. (% sample)	Non-exercise dependence no. (% sample)	OR (CI 95%)	p
Users	96 (42.3%)	21 (9.3%)	4.53	
Non-users	55 (24.2%)	55 (24.2%)	(2.41; 8.79)	10 <sup>-6</sup>

Analyzing ED population according to their sex (Table III), every individual had 2.59-fold greater chances of being a man than a woman ( $p = 0.0011$ ) and 3.21-fold greater chances of practicing bodybuilding separately or in association than of practicing other activities ( $p = 0.0018$ ). As regards ED and non-ED individuals, there was a statistically significant association with the variables frequency ( $p = 0.0038$ ) and supplement quantity ( $p < 10^{-5}$ ). It is estimated that the majority of ED population, relative to the total population, shows the following characteristics: frequency  $> 5$  days a week for 42.7% and consumption of 1-3 supplements for 33.9%.

To characterize the supplement intake pattern among ED and non-ED individuals at the gyms, figure 1 was elaborated with the frequency of consumption of the classes of supplements for athletes (6) and respective associated products.

Figure 2 shows the major sources of indication and/or prescription reported by supplement users at the gyms.

As mentioned in the inclusion criteria, we considered gyms that provided nutritional assistance without commercialization of supplements. The highest percentage of indication/recommendation was by nutritionists (31.6%); however, when added to sources different from health professionals and/or professionals not qualified for this practice, an expressive total of 55.6% is found.

## DISCUSSION

The frequency of supplementation at the investigated gyms was 51.5%. In supplementation studies carried out at different regions of Brazil, the supplementation frequencies recorded for São

**Table III.** Characteristics of gym-goers dependence to physical exercises

	<b>Dependence (151 - 66.5%) no. (% sample)</b>	<b>Non-dependence (76 - 33.4%) no. (% sample)</b>	<b>OR (CI 95%)</b>	<b>p</b>
<i>Sex<sup>#</sup></i>				
Men	89 (39.2%)	27 (11.9%)	2.59 (1.41; 4.81)	0.0011
Women	62 (27.3%)	49 (21.6%)		
<i>Age (years)</i>				
< 30	61 (26.9%)	42 (18.5%)		0.1081
30-45	69 (30.4%)	25 (11.0%)		
≥ 45	21 (9.2%)	9 (4.0%)		
<i>Loyalty (months)</i>				
≤ 1	1 (0.4%)	1 (0.4%)		0.172
2-6	17 (7.5%)	17 (7.5%)		
7-12	19 (8.4%)	11 (4.8%)		
13- 24	21 (9.3%)	7 (3.1%)		
> 24	93 (41.0%)	40 (17.6%)		
<i>Diversification (no. exercises)</i>				
1-2	122 (53.7%)	64 (28.2%)	0.78 (0.34; 1.72)	0.5871
≥ 3	29 (12.8%)	12 (5.3%)		
<i>Frequency (days/week)<sup>#</sup></i>				
< 3	5 (2.2%)	9 (4.0%)		0.0038
3- 4	49 (21.6%)	33 (14.5%)		
> 5	97 (42.7%)	34 (15.0%)		
<i>Permanence (min/day)</i>				
< 60	14 (6.2%)	9 (4.0%)		0.8540
60-120	107 (47.1%)	52 (22.9%)		
> 120	30 (13.2%)	15 (6.6%)		
<i>Quantity of supplements<sup>#</sup></i>				
0	55 (24.2%)	55 (24.2%)		< 10 <sup>-5</sup>
1-3	77 (33.9%)	18 (7.9%)		
> 3	19 (8.3%)	3 (1.3%)		
<i>Bodybuilding<sup>**</sup></i>				
Without bodybuilding	136 (59.9%)	56 (24.7%)	3.21 (1.45; 7.29)	0.0018
	15 (6.6%)	20 (8.8%)		

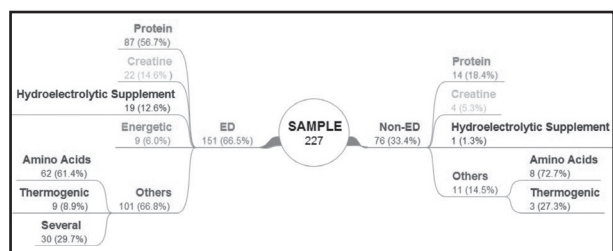
<sup>#</sup>Statistically significant association with addiction to exercises; <sup>\*\*</sup>Separate or associated practice.

Paulo (10), João Pessoa (17) and Minas Gerais (2) were 61.2%, 58.3% and 36.8%, respectively. Such discrepancy is probably due to sampling recruiting, different types of gyms, definition of supplements, under or over consumption record and other factors related to the sampling design (2). Studies have recorded up to 50% supplementation at gyms, which make up 55.3% of the total in the country, corroborating the obtained results.

ED individuals constituted 66.5% of the sample and had 2.59-fold greater chances of being a man than a woman and 3.21-fold greater chances of practicing bodybuilding instead of other activities. Also considering characteristics associated with participation in the gyms, there were statistically significant associations between frequency being greater than 5 days a week and consumption of 1 to 3 nutritional supplements. The most prevalent supplements included those for muscular growth, of the protein class (56.7%), and the motivator was hypertrophy, consistent with the desire to improve aesthetically.

This was the first study that analyzed and identified the association between ED and supplement intake among gym-goers. In the literature, so far only one study evaluating ED at gyms was found, which used a different methodology and recorded frequency of 42.0% ED among Parisians; however, associations were not made with nutritional supplement intake but with compulsive shopping, bulimia and hypochondria (16).

The binomial between psychological factors and adhesion to exercise has been a profitable source of debate due, in part, to its relevance for implications to the health and well-being of the population but also due to the increasing manifestation of lack of consistent results from different studies (10,24). Davis et al. (22) confirmed associations with body weight concern for the female public by employing the ED scale but these were not associations with frequency or quantity of practiced exercises. For men, there is increasing evidence that they have become readers of books related to diets, supplement consumption, low-calorie food and weight-loss programs and have therefore become more concerned with body image and physique (22,25). Adhesion to strenuous exercises like running, cycling or weightlifting is considered by this group the most efficient means to reach a thinner and muscular body, a symbol of the cultural pattern of sexual appeal (25,26). It is also possible that exercise is a more salient health-related behavior for men than for women due to the greater incidence of coronary diseases



**Figure 1.** Diagram of supplement intake pattern at gyms among ED and non-ED individuals.

among men and to the clear evidence that physical activity provides some protection (22).

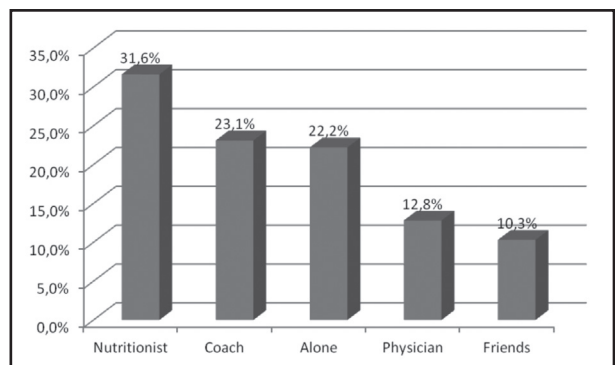
There is strong evidence that consumption of the supplement class is associated with the objective of practicing physical activity. In our sample of supplement users, bodybuilding practice was reported by 100% of individuals of both sexes, which was consistent with the increased risk of supplementation in addition to the possible development of body image change related to muscle dysmorphia (4).

Our results agree with the preferential consumption by men of protein (91.1%) and creatine supplements (26.6%) (4,17,22,27). Corroborating our results, Goston and Correia (2) recorded greater use of supplements rich in proteins, carbohydrates and branched-chain amino acids for men than for women; when associated with the objective of reaching hypertrophy, the authors found 4.1 chances of consumption by young individuals ( $p < 0.01$ ).

With regard to women, the greatest consumption was recorded for protein (56.7%) and hydroelectrolytic supplements (42.1%). This result also agrees with uncountable others that highlight supplementation specific to each sex (2,28,29). Silva and collaborators (17), in line with the present investigation, found high prevalence rate of protein supplement intake for the total sample (74.3%), men (72.3%) and women (83.3%), while the self-reported adverse effects of supplement use were acne, insomnia, aggressiveness, headache and tachycardia, indicating that excess supplements of the protein class can lead to health problems (27).

There were no significant differences for the variables age, quantity of supplements and those that describe the profile of participation in the gym (loyalty, diversification, frequency and permanence) between men and women, recommending caution as to extrapolation and comparison with studies that employ only descriptive statistics for discussing associations between supplementation patterns and sexes at the gyms.

In Brazil, there is a higher percentage of indication/prescription of supplement intake by sources not related to health professionals qualified for this practice like nutritionists and physicians. The study of Goston and Correia (2), in particular, recorded that 28.1% of the total prescription at gyms were from nutritionists; Pereira et al. (29) found 11.1% and Fayh et al. (28) 9.1%.



**Figure 2.** Sources of indication of supplements for athletes at gyms.

At Brazilian gyms the percentage of participation of different professionals involved in the prescription/indication of supplements is highly variable, but the expressive number of self-prescription and indication by professionals unqualified for this practice is still alarming, which indicates that monitoring and denunciation of such unauthorized practice should be promoted. Nevertheless, nutritional education about potential risks of improper supplementation must be directed to this population.

## CONCLUSION

The vast majority of gym-goers are men, young (< 30 years) and consumers of > 2 supplements, especially of the class of protein supplements for athletes, associated with other supplements (amino acids, thermogenic, etc.) but with the main aim of reaching muscular hypertrophy. ED profile at gyms shows an individual with score given by PEC > 62 cm, with 2.59-fold greater chance of belonging to the male than to female sex, going to the gym > 5 times a week, consuming 1-3 types of supplements, especially those of the protein class, with the objective of reaching hypertrophy, and with 3.21-fold greater chance of practicing bodybuilding than other activities at the gym. It was proven for the first time that gym-goers, supplement users, are in their majority ED. The importance of this finding lies on the fact that Brazil is the second country in the world with the largest number of gyms and presents an annual expressive increase of units.

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