

Analysis of the use of nutritional supplements in gyms in Coquimbo, Chile

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Summary

Nutritional science is a crucial component for improving health and sports performance. The use of nutritional supplements (NS) has increased considerably in recent years. Studies show high consumption of nutritional supplements that lack scientific evidence and could be putting the health of the population at risk. The objective was to analyze the use of NS in clients of a gymnasium franchise in the Coquimbo Region of Chile during 2016. Was applied to 359 clients (191 men and 168 women) a previously validated survey in four locations of a gymnasium franchise in the Coquimbo Region. The median age of the sample population was 28 ± 10.1 years and 43.2% of the population had used NS. The main goal of the NS users was to increase muscle mass (32%); the most commonly used NSs were whey protein (72.9%), branched-chain amino acids (21.9%), and glutamine (9.7%). Of the 26 types of NS consumed, 50% are classified as type C, that is, there exists little evidence regarding their benefits. Two variables showed statistical significance for the use of NS: hours of training, and the person who had recommended the NS to the user. This information supports the importance of specialized nutritional assessment for the population to avoid ineffective and harmful products.

Key words:

Sports medicine. Sports nutrition sciences. Whey protein. Athletic performance. Doping in sports.

Análisis del uso de suplementos nutricionales en gimnasios de la Región de Coquimbo, Chile

Resumen

La ciencia de la nutrición actualmente es considerada un componente crucial para la mejora de la salud y del rendimiento deportivo. El uso de suplementos nutricionales (SN) ha aumentado considerablemente en los últimos años. Estudios evidencian que en gimnasios, existe un alto consumo de productos que carecen de evidencia científica y que pueden poner en riesgo la salud de la población. El objetivo del estudio fue analizar el uso de SN en usuarios de una cadena de gimnasios de la Región de Coquimbo, Chile durante el año 2016, para este fin se aplicó una encuesta previamente validada a 359 usuarios (191 hombres y 168 mujeres) en cuatro sedes de una cadena de gimnasios de la Región de Coquimbo. La edad media de la muestra fue de $28 \pm 10,1$ años, el consumo de SN fue del 43,2%. El principal objetivo de uso de SN fue aumentar masa muscular (32%), los SN más consumidos fueron proteína de suero de leche (72,9%), aminoácidos de cadena ramificada (21,9%) y glutamina (9,7%). De los 26 diferentes tipos de SN consumidos, el 50% se clasificó como tipo C (existe poca evidencia acerca de sus efectos beneficiosos). Las variables; horas de entrenamiento y quien recomienda el uso de SN mostraron significancia estadística para el uso de SN. Esta información respalda la importancia de asesoría nutricional especializada en esta población, con el fin de evitar el uso de productos inefectivos y/o que puedan perjudicar su salud.

Palabras clave:

Medicina deportiva. Nutrición deportiva. Proteína de suero de leche. Rendimiento deportivo. Dopaje en el deporte.

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Introduction

Physical activity increases the need for energy and nutrients¹. For this reason, nutrition science is considered to be a crucial component in the improvement of sports performance, playing an important role in training adaptations, energy reserves, fatigue delay and recovery, among other factors².

It is with this perspective that Martínez-Sanz *et al.* in 2013 explained that those persons performing physical exercise must cover their requirements for energy, macronutrients, vitamins, minerals and water, based on a balanced diet through food intake and, only if necessary, the use of nutritional supplements (SN)³. However, over the last few years, various studies have shown that a low level of knowledge in the area of sports nutrition among gym-goers is associated with low sports performance^{4,5}, revealing the importance of getting proper advice on diet and supplements applied to sport.

Supplements and meals for athletes not only need to provide nutrients that meet the nutritional requirements to optimize daily training or competition performance, but must also contain a sufficient amount of nutrients to cover specific deficiencies, while also containing adequate quantities of nutrients or other components to increase sporting performance, maintain and/or restore health and the immune function. Furthermore, such nutritional supplements must be based on scientific evidence^{6,7}. This latter point is fundamental, given the fact that a large amount of nutritional supplements currently used for different goals, actually have no ergogenic effect⁸. Among these goals, we could mention, for example: muscle mass gain, strength improvement, disease prevention and sporting performance improvement⁹. It is worth mentioning that, as a result of the widespread use of these products, the NS industry has become an industry that is globally valued at billions of dollars¹⁰. Another issue regarding this problem is that a large number of NS are recommended by sources that are not suitably qualified to do so^{11,12}. This increases the risk of giving a positive result in a doping test, given that the products may be contaminated with prohibited substances, such as steroids or other toxic substances such as heavy metals^{13,14}. Added to this, scientific evidence indicates that the abuse of any type of substance to improve sporting performance has extended to regular gym-goers, for example for aesthetic purposes, without considering the potential harmful effects that the abuse of substances of this type may entail¹⁵.

With regard to the evidence available on the use of nutritional supplements in gyms, the results are variable, with prevalences at an international level of between 36.3% to 84.7%^{8,16–20}. In Chile, there is limited information on this subject. In a study conducted in 2011, Rodríguez *et al.* assessed the intake of supplements in gyms in the city of Viña del Mar, finding that, of the 314 respondents, 54.5% used NS²¹, while in 2106, in gyms in the city of Santiago de Chile, Jorquera *et al.* found, a prevalence of use of 28.6%. Furthermore, this study detected that, the greater the gym attendance time, the greater the use of NS. This same situation occurs when the weekly training frequency is greater²².

Given the limited information available in Chile on the use of NS, the goal of this study was to analyse the use of NS in users of a gym chain in the Region of Coquimbo throughout the year of 2016. This would allow us to establish the general and training characteristics of gym users, to describe the NS used and to identify the nutritional assessment mechanisms that determine their use, in order to obtain relevant information for the tasks of the sports and healthcare professionals in Chile.

Material and method

This study has a non-experimental, cross-sectional design with a quantitative approach and analytical scope.

The participants in the study were active users of all the branches (four) of a chain of gyms in the Region of Coquimbo, Chile. Those going to the gym at least once a week during the month prior to the data collection were considered to be active members.

A randomized cluster sampling was taken with non-proportional allocation, giving a sample of 359 persons, including men and women aged between 18 and 65 years in the study. It should be mentioned that the study sampling size was defined from the total universe of registered members on the data collection start date (3950).

The instrument used was a structured questionnaire with 18 closed alternative questions and 2 open questions, adapted and validated by experts and by a pilot study based on the NS consumption instrument of Jorquera *et al.* in 2016²². The questions were directed at obtaining information on the subjects' characteristics, such as age, years of training, occupation, level of education, and other specific questions related to the use of NS, consumption goals, frequency, prescription of the use of NS and the perception of the results obtained in relation to use, among other variables. All the questions were oriented so that the respondents gave answers related to the last month.

The instrument was applied by professional nutritionists and previously trained students of nutrition and dietetics, at the peak gym attendance hours, in a place on the premises that was suitable for this task, subject to the signing of the informed consent by each anonymous participant.

The NS used by the participants were grouped together based on their principal ingredient, in the case of NS with more than one principal ingredient, their generic name was used. The NS were subsequently classified according to the ABCD system of the Australian Institute of Sport²³, in order to assess the scientific evidence on the efficacy and safety of the consumption of NS.

The data analysis firstly comprised an exploratory data study, to correct missing, incorrectly tabulated or out-of-range data. A descriptive analysis of the data was subsequently made and, finally, a bivariate analysis of the data was made, considering the consumption of NS as a result variable, through Fisher's test and a multivariable logistic regression to determine potentially confounding variables. The SPSS software (21st edition) was used for the analyses.

It should be mentioned that this investigation was approved by the scientific ethics committee of the Faculty of Medicine of the Universidad Católica del Norte, based in Coquimbo, Chile.

Results

Of the 359 participants, 191 were men (53.2%) and 168 women (46.8%). The mean age of the sample was 28 ± 10.1 years. When analysing the sample according to age range, it is noteworthy that the age of the majority of the sample was between 18 to 29 years, with 54.9%. With regard to the level of education, 64.3% corresponded to university level, while the main occupation of participants was that of a worker with 59.3% (Table 1). It should be mentioned that, in the bivariate analysis, no significant differences were found for any of these variables based on the use of NS (sex p=0.455; occupation p=0.739; level of education p=0.768).

In relation to the time spent at the gym (p=0.455), 41.5% of the total number of respondents had been going to the gym regularly for less than a year. With regard to training frequency, most went to the gym four or more times a week (68%) (Table 2); for this variable, significant differences were found in the bivariate analysis for the use of NS (p=0.001). On the other hand, with regard to the duration of each training session, the behaviour of men and women is similar. Of the total sample, a duration of less than 2 hours predominated with 67.4% (p=0.004).

Questions on the training goal revealed that the three key goals of the men were, in descending order: gain muscle mass, lower body fat and improve health with 21.6%, 19.5% and 18.3% respectively. According to the women respondents, training is primarily to lower body fat,

Table 1 General characterisation of the sample according to age, level of education and occupation. Each variable is also shown in relation to the total for each sex.

Characteristics	Total n (%)	Men n (%)	Women n (%)
Total	359 (100)	191 (53.2)	168 (46.8)
Age groups (years)			
18 to 29	197 (54.9)	116 (60.7)	81 (48.2)
30 to 39	86 (24)	40 (20.9)	46 (27.4)
40 to 49	56 (15.6)	27 (14.1)	29 (17.3)
50 to 59	17 (4.7)	7 (3.7)	10 (6)
60 to 69	3 (0.8)	1 (0.5)	2 (1.2)
Level of education			
School	71 (19.8)	38 (19.9)	33 (19.6)
Vocational training	57 (15.9)	27 (14.1)	30 (17.9)
University	231 (64.3)	126 (66)	105 (62.5)
Occupation			
Student	105 (29.2)	59 (30.9)	46 (27.4)
Worker	213 (59.3)	122 (63.9)	91 (54.2)
Unemployed	39 (10.8)	8 (4.1)	31 (18.5)
Professional athlete	2 (0.6)	2 (1)	0 (0)

improve health and improve physical condition with 24.9%, 24.1% and 18.4% respectively (Table 2).

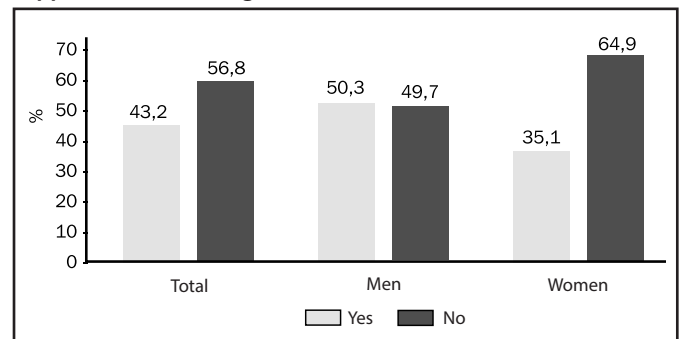
With regard to the consumption of NS, 43.2% of respondents declared that they had taken NS in the last month, while 56.8% said that they had not done so. Men show a greater intake of NS than women, represented by 50.3% of men versus 35.1% of women (Figure 1).

When detailing this information, we detected the intake of 26 different types of NS used by respondents, where the most-consumed NS

Table 2. Characterisation of the sample based on gym attendance time, frequency, duration and training goals. Each variable is also shown in relation to the total for each sex.

Characteristics	Total n (%)	Men n (%)	Women n (%)
Gym attendance time			
Less than 1 year	149 (41.5)	72 (37.7)	77 (45.8)
1 to 3 years	105 (29.2)	55 (28.8)	50 (29.8)
3 to 5 years	39 (10.9)	23 (12)	16 (9.5)
More than 5 years	66 (18.4)	41 (21.5)	25 (14.9)
Training frequency			
≤3 times a week	115 (32)	50 (26.2)	65 (38.7)
≤4 times a week	244 (68)	141 (73.8)	103 (61.3)
Training duration			
< 2 hours	242 (67.4)	133 (69.6)	109 (64.9)
≥2 hours	117 (32.6)	58 (30.4)	59 (35.1)
Training goals			
Lower body fat percentage	170 (22.1)	78 (19.5)	92 (24.9)
Improve health	162 (21.1)	73 (18.3)	89 (24.1)
Gain muscle mass	135 (17.6)	86 (21.6)	49 (13.3)
Improve physical condition	132 (17.2)	64 (16)	68 (18.4)
Improve athletic performance	72 (9.4)	48 (12)	24 (6.5)
Maintain physical condition	68 (8.9)	38 (9.5)	30 (8.1)
Other	29 (3.8)	12 (3)	17 (4.6)
Total	768 (100)	399 (100)	369 (100)

Figure 1. Percentage distribution of the use of nutritional supplements according to sex.



for the total sample were: milk whey protein (72.9%), branched amino acids (21.9%), glutamine (9.7%), lipolytic agents (9%) and multivitamins (7.1%). When analysing the data by sex, the men preferred, in descending order, milk whey protein (80.2%), branched amino acids (27.1%) and glutamine (11.5%), while the intake of women was preferentially milk whey protein (61%), branched chain amino acids (13.6%) and lipolytic agents (13.6%) (Table 3).

The main reasons for the intake of NS in the total of the sample was to gain muscle mass (31.6%), improve recovery (21.1%) and lower body fat (14.3%), finding similar results in men and women (Table 4).

In relation to the sources of information used by the respondents when deciding on which NS to use, the most important sources were: trainer (34.1%), friend (17.7%) and other (15.9%). If analysed according to sex, it is important to note that, in the case of men 35% used NS recommended by their trainer, followed by 20.4% recommended by a friend and 14.6% who obtained the information through the Internet.

Table 3. Consumption of nutritional supplements by sex and classification grouping according to the ABCD system of the Australian Institute of Sport.

Nutritional supplements	Total n (%)	Men n (%)	Women n (%)	Classification ABCD
Milk whey proteins	113 (72.9)	77 (80.2)	36 (61)	A
Branched-chain amino acids	34 (21.9)	26 (27.1)	8 (13.6)	C
Glutamine	15 (9.7)	11 (11.5)	4 (6.8)	B
Lipolytic agents	14 (9)	6 (6.3)	8 (13.6)	C
Vitamin complex	11 (7.1)	5 (5.2)	6 (10.2)	A
Liquid meals	9 (5.8)	2 (2.1)	7 (11.9)	A
Pre-training	7 (4.5)	7 (7.3)	0 (0)	C
Caffeine	5 (3.2)	3 (3.1)	2 (3.4)	A
Creatine	5 (3.2)	5 (5.2)	0 (0)	A
Spirulina	5 (3.2)	2 (2.1)	3 (5.1)	C
Green tea	4 (2.6)	1 (1)	3 (5.1)	C
Weight gainer	3 (1.9)	3 (3.1)	0 (0)	C
Proteins (meat)	3 (1.9)	2 (2.1)	1 (1.7)	C
Omega 3	3 (1.9)	2 (2.1)	1 (1.7)	B
Vitamin C	3 (1.9)	2 (2.1)	1 (1.7)	B
Proteins (Casein)	3 (1.9)	2 (2.1)	1 (1.7)	C
Collagen	3 (1.9)	1 (1)	2 (3.4)	C
Proteins (vegetable)	2 (1.3)	1 (1)	1 (1.7)	C
Energy drink	2 (1.3)	2 (2.1)	0 (0)	C
Guarana	2 (1.3)	0 (0)	2 (3.4)	C
Vitamin B complex	2 (1.3)	1 (1)	1 (1.7)	B
Arginine	2 (1.3)	2 (2.1)	0 (0)	C
Testosterone production booster	1 (0.6)	1 (1)	0 (0)	D
Magnesium	1 (0.6)	0 (0)	1 (1.7)	A
Calcium	1 (0.6)	0 (0)	1 (1.7)	A
L-carnitine	1 (0.6)	0 (0)	1 (1.7)	B
Total	254	164	90	

Table 4. Characterisation of the goals of NS intake, source of information or recommendation for NS intake and perception of the efficacy of use in relation to the goals.

Characteristics	Total n (%)	Men n (%)	Women n (%)
Goal of NS intake			
Gain muscle mass	84 (31.6)	52 (33.1)	32 (29.4)
Improve recovery	56 (21.1)	38 (24.2)	18 (16.5)
Reduce body fat	38 (14.3)	20 (12.7)	18 (16.5)
Obtain energy	33 (12.4)	17 (10.8)	16 (14.7)
Improve athletic performance	26 (9.8)	18 (11.5)	8 (7.3)
Improve health	20 (7.5)	6 (3.8)	14 (12.8)
Other	9 (3.4)	6 (3.8)	3 (2.8)
Total	266 (100)	157 (100)	109 (100)
NS intake recommended by:			
Trainer	56 (34.1)	36 (35)	20 (32.8)
Friend	29 (17.7)	21 (20.4)	8 (13.1)
Other	26 (15.9)	14 (13.6)	12 (19.7)
Healthcare professional	25 (15.2)	12 (11.7)	13 (21.3)
Internet	19 (11.6)	15 (14.6)	4 (6.6)
NS salesperson	9 (5.5)	5 (4.9)	4 (6.6)
Total	164 (100)	103 (100)	61 (100)
Perception of the efficacy of use of NS			
Yes	141 (90.9)	93 (96.9)	48 (81.4)
No	14 (9)	3 (3.1)	11 (18.6)

For their part, in descending order, the women’s intake of NS as recommended by the trainer, healthcare professional and “other” was 32.8%, 21.3% and 19.7% respectively. It should be mentioned that only 15.2% of the total number of respondents referred to the intake of NS as a result of recommendations given by a healthcare professional (Table 4).

When classifying the 26 different types of NS used by the respondents, based on the Sports Supplement Program of the Australian Institute of Sport, it was found that 30.8% were type A (supported for use in specific situations in sport), 15.4% as type B (further investigation required), 50% as type C (little meaningful proof of beneficial effects) and 3.8% as type D (Banned or with a high risk of contamination that could lead to a positive test for illegal substances) (Table 3).

It should be mentioned that participants indicated an average investment of 72±65 USD a month in the purchase of NS, with no significant differences between the amount invested by sex.

With regard to the perception of the efficacy of the NS intake in relation to the goals, Table 4 shows that 96.9% of men and 81.4% of women report that the intake of NS enabled them to achieve their goals.

With regard to nutrition, 59.9% of respondents stated that they followed a healthy meal plan based on their training goals (p=0.001), with the principal sources of information being, healthcare professional, “other” and internet with 32.7%, 25.7% and 17.7% respectively (p=0.018) (Table 5).

The multivariate logistic regression analysis included all the variables in the study, making it possible to identify those variables that showed no significant differences. Finally, the variables “hours of training” and “who indicated or recommended the use of NS” were considered to be confounding, highlighting the fact that, the greater the number of weekly training hours the greater the probability of taking NS (p=0.005), controlling the variable of who recommends the use of NS. With regard to the variable for who indicates or recommends the use of NS, associated with a greater use of NS, this was the seller, followed by a friend and healthcare professional, as shown in Table 6.

Discussion

This investigation made it possible to analyse the use of NS for gym-goers at all the branches of a chain of gyms in the region of Coquimbo, Chile, where it was found that the variables for hours of training and who indicates or recommends the use of NS are confounding and are directly related to the use of NS (statistically significant).

With regard to the variables for gym attendance, training duration and the following of a nutrition plan, these are statistically associated with the intake of NS. In contrast, the variables for age, sex, level of

education, occupation, gym attendance time, number of training targets and who recommended the nutrition plan, showed no significant differences using the Fisher test for the use of NS.

With regard to the prevalence of intake of NS, this was 43.2%. Although the results obtained are similar to those presented in other investigations, the figure mentioned is greater than those reported in prior studies conducted in Beirut, Lebanon (36.3%), Belo Horizonte, Brazil (36.8%), Tanta, Egypt (38.2%), and Athens, Greece (41%) and lower than those found in Riyadh, Saudi Arabia (47.9%), Sevilla, Spain (56.1%) and New York, USA (84.7%)^{8,16-19,24}. Likewise, when compared to similar studies conducted in Chile, the result is greater than the prevalence found in the city of Santiago with 28.6% and is lower than that found in the city of Viña del Mar, with 54.5%^{21,22}.

With regard to the NS intake characteristics. Of the total of 26 substances used by the gym goers, the five most used were: milk whey protein, branched chain amino acids, glutamine, lipolytic agents and multivitamins. Similar results were reported in studies conducted on active gym goers in Chile and Saudi Arabia^{17,21,22}, which found a high use of proteins, amino acids and multivitamins.

Although the prevalence of use of NS in the gyms evaluated in the Region of Coquimbo could be considered to be high, studies of elite athletes show that the prevalence in this population is even greater, as reported by Jongkyu et al, who studied Korean Olympic athletes from different disciplines, finding an 80% intake of NS. However, when analysing the most-used NS, certain similarities can be found with other investigations. In the case of the Korean elite athletes, the three most-used NS were vitamins (63%), oriental supplements (mainly infusions) (58%) and amino acids (25%)²⁵, a similar situation was reported by Omeragić *et al*, in a study conducted on elite athletes from Bosnia and Herzegovina, where use of amino acid supplements and single vitamins or multivitamins were the most prevalent²⁶. Another study, made on Dutch elite and sub-elite athletes revealed that 84.7% of respondents had used NS in the last 4 weeks, highlighting multivitamins and minerals (42.9%), isotonic drinks (44.1%) and caffeine (13%)²⁷. This is in line with what Maughan et al reported, who mentioned that the more years of experience, the greater the belief that diet is insufficient to cover the requirements associated with exercise²⁸. This indicates the relationship that could exist between the years of training and the use of NS, a similar situation to that shown by gym-goers in this present study.

Table 5. Following of a nutrition plan based on training goals and source of information.

Characteristics	Total n (%)	Men n (%)	Women n (%)
Following of a nutrition plan			
Yes	215 (59.9)	125 (65.1)	90 (53.9)
No	144 (40.1)	67 (34.9)	77 (46.1)
Total	359 (100)	192 (100)	167 (100)
Suggestion or recommendation of a nutrition plan			
Healthcare professional	74 (32.7)	37 (28.9)	37 (37.8)
Other	58 (25.7)	35 (27.3)	23 (23.5)
Internet	40 (17.7)	27 (21.1)	13 (13.3)
Trainer	36 (15.9)	20 (15.6)	16 (16.3)
Friend	18 (8)	9 (7)	9 (9.2)
Total	226 (100)	128 (100)	98 (100)

Table 6. Multivariate logistic regression analysis of the intake of nutritional supplements.

Variables	Coefficient	Standard Dev	Confidence interval	P Value	
Hours of training	0.64	0.22	0.19	1.09	0.005
Prescription of seller in comparison with:					
Healthcare professional	-1.36	0.47	-2.29	-0.43	0.004
Trainer	-1.81	0.66	-3.12	-0.49	0.007
Friend	-1.04	0.52	-2.07	-0.01	0.047
Internet	-1.28	0.49	-2.25	-0.32	0.009

When analysing the reason why the respondents consume NS, these were principally to gain muscle mass (32%), improve recovery (21%) and reduce body fat (14%). These results show that, in most cases, participants are seeking to meet goals that are more associated with fitness and aesthetics rather than sport performance. These results are in line with those found in other, similar investigations^{17,22}.

The fact that almost 50% of respondents use NS raises the question whether, in actual fact, so many individuals actually have an unbalanced diet, making it necessary to ingest NS in order to cover the nutrient deficiency, as there is sufficient evidence to indicate that the physically active population does not require additional nutrients to those provided by a balanced diet²⁹ or whether, in actual fact, marketing and a lack of knowledge, leads them to ingest products that they probably do not need. This aspect is relevant, considering the fact that the respondents state that they invest an average of 72 USD a month in the purchase of NS, of which only 30.8% correspond to NS with solid scientific evidence of their efficacy and safety. Added to the above, only 15% of respondents state that the use of NS was recommended by a professional in the area of healthcare or nutrition. This scenario could contribute to a greater use of NS with little scientific evidence or, even worse, the use of NS could represent a health risk. This question takes on even more importance if it is considered that 50% of the NS consumed by respondents are classified as type C (little meaningful proof of beneficial effects), according to the sports supplement programme of the Australian Institute of Sport, a result that is lower than the 57.9% reported by Jorquera et al in a study conducted in Santiago de Chile²².

In relation to the above, a study conducted by Shaw on Australian elite swimmers is worth mentioning. This study evaluated the influence that the sports supplement programme of the Australian Institute of Sport had on the NS practices of these athletes. This showed that swimmers taking part in this programme reported that their principal advisers were dietitians and sports physicians, and this was related to a greater use of NS with evidence of its ergogenic effect, compared to those that were not part of the sports supplement programme, who tended to consume NS primarily recommended by other athletes and the NS consumed by these athletes tended to have little scientific evidence with regard to efficacy³⁰. These results are in line with those found in this present investigation. This is relevant, if it is considered that it has been observed that the use of NS is greater in athletes, regardless of the potential risk to health involved³¹.

On the other hand, of the 60% of respondents reporting that they followed a nutrition plan to achieve their goals, it should be highlighted that 59.3% reported that they did not consult a dietician or healthcare professional to define what changes needed to be made to their eating habits. This would probably cause them to have inadequate habits, largely due to the fact that the sources of information selected are neither suitable nor the right ones to give scientifically supported nutritional recommendations, which could negatively affect the achievement of goals, physical performance or even their health.

The results of this present investigation show that 43% of the users of a chain of gyms in the region of Coquimbo report use of nutritional

supplements. Within the variables directly influencing the use of NS are the hours of training and who recommends the use of NS. In relation to the other variables studied, no significant differences were found based on the use of NS.

With regard to the most-used NS type, it should be emphasised that only 30.8% are classified as type A, revealing a high use of NS with little scientific evidence to support its efficacy and safety. This is relevant information for science of nutrition applied to sport and performance, considering that the maintenance of the energy and nutritional balance is fundamental in order to improve sport performance and permit the changes caused by training³². In view of the foregoing, this study is of great significance for applied sports and performance nutrition, as it supports the importance of specialist advice for gym goers in order to avoid the use of ineffective products and/or that could be harmful to health, thereby promoting the use of nutrients in suitable doses, times and frequencies in order to achieve the goals of each user²⁸.

Finally, this study establishes a baseline for future investigations related to the use and intake of nutritional supplements. For this, we would suggest an evaluation of the use of NS in the sports area, considering variables such as: different sports disciplines, both in formative and competitive stages, training periods, seasonality, among others.

Conflict of interests

There was no conflict of interests in this investigation.

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