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A literature survey study on dietary supplement use for athletes

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Abstract

Dietary supplementation is a common strategy to achieve a specific health status or performance benefit. Several investigations have focused on the prevalence of dietary supplement use by athletes. However, information on how athletes manage the use and purchase of dietary supplements is scarce. Methods: Five hundred and twenty-seven high-performance athletes (346 males and 181 females), participating in individual and team sports, completed a validated questionnaire about use and purchase patterns of dietary supplements. The dietary supplements were categorized according to the International Olympic Committee (IOC) consensus. In given Results Sixty four percent of the athletes (n = 337) used dietary supplements (median = 3; range 1 to 12). Age, sex, type of sport, level of competition, and professionalism influenced the prevalence of dietary supplement use (all $p < 0.05$). The most prevalent dietary supplement consumed was proteins (41%; n = 137), followed by amino acids/BCAA-based supplements (37%; n = 124). Additionally, as per group of supplements according to IOC consensus, 18% of the supplements were rated as having a low level of scientific evidence (e.g., glutamine, HMB, L-carnitine, etc). Most athletes (45%, n = 152) purchased dietary supplements in a store and 24% (n = 81) obtained them from a sponsor. Most athletes also (42%, n = 141) reported a self-organization of supplementation and did not consult with any professional. Last, 81% (n = 273) of athletes consuming supplements did not know any platform to check supplement safety/quality. For those who do not use dietary supplements (36% of the total sample, n = 190), most reported that they do not consider supplements necessary (72%, n = 137). Conclusions draws Dietary supplementation appears to be widely used in sport with a considerable proportion of athletes consuming supplements with low level of scientific evidence. Additionally, athletes seem to rely on inadequate sources of information and may be largely unaware of sources to detect supplement contamination.

Keywords: Dietary supplement, ergogenic aid, athletic performance, elite athlete background

1. Introduction

The quest for optimal nutrition has been gaining importance among athletes as the level of sport competition has become more demanding ^[1]. At the elite level, the constant quest for excellence is obtained through regular and planned training, while the advances in nutrition and supplementation can aid to improve athlete's performance, recovery, health and well-being ^[2]. A dietary supplement is a commercially available product that is ingested in addition to the habitual diet. Athletes often use dietary supplements as a strategy to achieve a specific health outcome or exercise performance benefit ^[3, 4]. Although some consider that the use of nutritional supplements is unnecessary when athletes have a well-balanced diet ^[5], dietary supplement use has grown significantly in the past years ^[6]. Dietary supplements are available for the general population, but the use of these supplements is higher in elite athletes than in non-athletes or recreationally active individuals ^[3]. The overemphasis of dietary supplement use, as along with the efforts of nutritional supplement companies to sponsor remarkable athletes ^[7] have aided at increasing the use of these products worldwide. In 2017, global sales of supplements reached US \$128 billion ^[8].

2. Related work

Although the use of supplements varies across different sports, its usage is generally higher in men than in women and increases with age ^[4]. In addition, the athletes involved in short sprint-based activities typically consume less dietary supplements than athletes competing in

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Endurance-based activities ^[9]. The prevalence of dietary supplement use by athletes has been the topic of several investigations ^[10, 11] and their results have been recently reviewed and systematically analyzed ^[4]. Overall, the prevalence of supplement consumption ranges from approximately 48 to 81% ^[12-17] while proteins and multivitamins are the most popular supplements. The reasons reported by athletes for using dietary supplements are diverse although are mainly related to health-related issues ^[16], physical and mental performance improvement ^[18], and increased rate of recovery ^[1]. However, the patterns of use and purchase of supplements have not been well investigated. Athletes often rely on their coaches ^[15], family ^[16], and friends/teammates ^[19] as their preferable sources of reliable information for their use of dietary supplements. However, sports nutritionists or scientists are rarely the main source of information to plan a supplementation program ^[20], even at the elite level. This may lead athletes to an excessive and/or incorrect use of dietary supplements along with possible adverse interactions due to polypharmacy ^[21]. In addition, there are significant risks associated with the use of dietary supplements, such as the absence of active ingredients, the presence of harmful substances, or even the presence of doping agents ^[22]. With rates of contamination between 12 and 58% ^[23], the likelihood of unintended doping with the use of supplements is high. Lastly, athletes are not always aware of the risks associated with purchasing supplements and rarely inform themselves to confirm the quality and safety of the selected supplement ^[20]. The internet has become a preferable site to purchase supplements and thus, the easy access to contaminated nutritional supplements and “black market” products might constitute a risk for public health. Since athletes often use dietary supplements with no clear understanding of their effects and risks ^[24], it becomes critical to provide information about the patterns of use and purchase of dietary supplements in samples of elite athletes. This information might help to provide nutritional education approaches that reduce the risk associated with dietary and nutritional supplementation through better informed the athletes. Taking into account the lack of research in Spanish athletes ^[25, 26], the present study aimed to determine the prevalence of supplement use by elite athletes while describing how athletes manage dietary supplements use. Methods Participants Five hundred and twenty-seven athletes (346 males and 181 females) volunteered to participate in this investigation by filling out a validated and standardized questionnaire about the use of dietary supplements ^[27]. The athletes were considered elite because all of them were training and competing in high-performance programs of different national sports federations. Specific information about the study sample can be obtained from data. The questionnaire was provided by email to athletes with the help of staff from different national federations and announcements in sport performance centers. Thus, it was unfeasible to record the number of athletes solicited for this investigation. Forty-five athletes were excluded from the study because they did not complete the questionnaire and 4 questionnaires were not considered valid because they contained duplicate information in all questions. Informed consent was obtained with the questionnaire. The questionnaire used in this investigation has been previously validated to assess the prevalence of dietary supplement use and to obtain information about the individual consumption patterns in the last year ^[27]. The questionnaire also assessed information on socio demographic variables, sport level, and

professionalism.

This questionnaire was developed by a group of experienced sport scientists, its construct validity was verified by a group of six experts in nutrition, sports sciences and chemistry (Aiken's $V = 0.97$ for pertinence and 0.82 for relevance of the questions) and its reliability has been measured by a test-retest performed 4 weeks apart. The questionnaire contained a definition of a dietary supplement according to the latest consensus statement of the International Olympic Committee (IOC) ^[3]. Through 81 questions, it also asked participants about the use of performance enhancing substances, supplements for weight control, supplements to increase the rate of recovery, medicaments, and other substances. The questionnaire allowed athletes to report the total number, type of supplement used, and season of consumption (pre-season, competitive periods, or all year). The questionnaire also had a section to be filled out only by those who did not report any supplement use in order to ascertain the reasons for their lack of use. Baltazar-Martins *et al.* The questionnaire was organized to obtain information about a) sociodemographic information, sport discipline, and level of competition; b) prevalence and frequency of dietary supplement usage; c) reasons for the use of supplements, sources of information about supplementation, and contamination and purchase conditions. Participants filled out the questionnaire between July 2017 and May 2018.

3. Performances Enhancement

In order to help athletes to identify supplements, examples for each category were provided. Analysis of dietary supplements by group To improve the applicability of the results, each supplement was individually notated and grouped according to the groups of the IOC consensus statement ^[3], as follows: 1. “Performance enhancement”, which included caffeine, beta alanine, creatine, sodium bicarbonate, carbohydrate foods, and carbohydrate powders. 2. “Immune health”, which included antioxidant supplements, probiotics, and vitamin C. 3. “Micronutrients”, which included iron supplements, magnesium, folic acid, calcium, zinc, selenium, multivitamin supplements, and electrolytes. 4. “Improve recovery & injury management”, which includes joint support supplements (glucosamine, chondroitin, collagen), recovery supplements (mixes of carbohydrate and protein powders labelled as a “recovery product”), omega- 3 &- 6 polyunsaturated fatty acids, and curcumin. 5. “Body composition changes”, which includes protein powders (whey protein mixes, casein, calcium caseinate, plant/meat/egg-based protein powders). 6. “Low level of evidence supplements”, which includes: glutamine, single amino acids/branchedchain amino acids (BCAA), beta-hydroxy betamethylbutyrate (HMB), L-carnitine, spirulina, royal jelly, citrulline, probiotics, taurine, conjugated linoleic acid, co-enzyme Q10, and fat burners, among others. It is important to clarify that some dietary supplements may be included in different categories, as reported in the IOC consensus ^[3]. However, we have selected the most pertinent category based on scientific evidence. This is the case of “carbohydrate powders” (including maltodextrin, amylopectin, and powdered isotonic blends) and “carbohydrate foods” (energy bars, energy gels, and other miscellaneous carbohydrate-rich products) which have been included in the “performance enhancement” category. Although the IOC consensus also considers them as supplements for immune health, the evidence so far mainly supports their role in the maintenance of exercise intensity in endurance sports ^[28]. Similarly, other dietary supplements

reported to have a low level of evidence have been included in a category of their own (“low level of evidence supplements”). Although some of these supplements may be in a specific category in the IOC consensus statement, these are reported in said document as having a low level of evidence (e.g. glutamine and HMB). Finally, Socio-demographic characteristics of the participants and distribution of athletes who reported use/not use of supplements in the last year

Total	Frequency	%	(n)	Yes	No	P value	
Gender Male*	346	67%	(232)	33%	(114)	0.04	
Female*	181	58%	(105)	42%	(76)		
Total	527	64%	(337)	36%	(190)		
Age Range < 15–20 years*	111	30%	(33)	70%	(78)	< 0.01	
21–25 years	123	65%	(80)	35%	(43)		
26–30 years*	106	77%	(82)	23%	(24)		
31–35 years	58	74%	(43)	26%	(15)		
36–40 years*	62	79%	(49)	21%	(13)		
> 41 years	66	74%	(49)	26%	(17)		
Sport Body Building*	38	95%	(36)	5%	(2)	< 0.01	
Cycling	36	86%	(31)	14%	(5)		
Athletics	238	77%	(184)	23%	(54)		
Triathlon	75	77%	(58)	23%	(17)		
Aquatics	31	77%	(24)	23%	(7)		
Weightlifting	16	75%	(12)	25%	(4)		
Football	8	75%	(6)	25%	(2)		
Volleyball	8	75%	(6)	25%	(2)		
Others	112	74%	(83)	26%	(29)		
Canoe/Kayaking	11	73%	(8)	27%	(3)		
Field Hockey	11	64%	(7)	36%	(4)		
American Football*	68	57%	(39)	43%	(29)		
Golf*	29	55%	(16)	45%	(13)		
Gymnastics*	17	53%	(9)	47%	(8)		
Basque pelota (jai alai)*	15	53%	(8)	47%	(7)		
Level of competition National*	262	71%	(262)	29%	(77)	< 0.01	
International*	265	57%	(265)	43%	(113)		
Professional	Yes*	85	75%	(64)	25%	(21)	0.02
No*	438	61%	(269)	39%	(169)		

(*)The distribution was different from the value expected at $p < 0.05$ Baltazar-Martins *et al.* Journal of the International Society of Sports Nutrition (2019) 16:30 Page 3 of 9 athletes from 23 different sport disciplines filled out the questionnaire, but sport disciplines with less than 8 participants were grouped in the “others” category. Statistical analysis After the data collection, data was organized, checked and analysed with the statistical package SPSS 20 (SPSS Inc., Chicago, IL). Participants and quantitative data of dietary supplements are expressed by frequencies and percentages. Because the number of supplements used followed a non-normal distribution, median and range have been calculated for this variable. The 16 most-used supplements have been presented for clarity. The differences in the distribution of dietary supplements use across the groups made by sociodemographic variables were tested with crosstabs and the Chi Square test, including adjusted standardized residuals. The significance level was set at $p < 0.05$. Results From the total sample, 64% of the athletes ($n = 337$) reported habitual use of at least one dietary supplement in the last year during any point of the season. The remaining 36% of the sample ($n = 190$) did not report any supplement use in the last year. Overall, male athletes reported a higher use of dietary supplements than women ($p = 0.04$; while age was another variable that significantly modified the prevalence of use ($p < 0.01$). Although all sports showed a supplement usage frequency of at least 50%, body building was the discipline with the highest self-reported use of supplements. Cycling, athletics, triathlon, and aquatics were also sport disciplines with high proportions of athletes using supplements). American football, golf, gymnastics, and Basque pelota had lower than expected frequencies in the proportion of athletes that used supplements ($p < 0.01$).

4. Results

The use of supplements was higher in athletes that had national-level standings than athletes with international-level standings ($p < 0.01$) while professionalism increased the use of

supplements ($p = 0.02$). In total, 1056 supplements were reported; most of the supplements were categorized as low level of evidence substances, followed by micronutrients and performance enhancement supplements. In the sample of supplements users, a median consumption of 3 supplements per athlete was found with a range from 1 to 12 supplements. 2). Still, 6% of athletes reported a use of ≥ 8 supplements in the last year. From the subsample of supplement users, 47% reported consumption during the whole season, 43% reported consumption only during competitive periods, and 10% reported consumption only during the pre-season. Proteins, amino acids/ BCAA, and multivitamins were the most consumed supplements in the sample of supplement-users. A total of 36 different supplements were identified in the questionnaire. Most of the athletes that consumed supplements reported relying on him/herself for the obtaining of valid and accurate information about the efficacy of the supplements and they did not consult any professional for this matter. The remaining athletes reported seeking advice through physicians, nutritionists, and coaches as alternative sources of information. The most common site of purchase were physical supplement stores while a high proportion of athletes directly obtained supplements from sponsors or internet websites. Although 85% of the sample indicates that they only used certified supplements free of doping agents, 81% were not aware of any platform to verify supplement safety/quality. This is because 92% of the sample considered that supplements are safe and controlled by the supplement company/brand. Only 40% of athletes had knowledge of a Spanish national-based application that certified permitted supplements and identified doping agents (i.e., NoDop App). Among the athletes that did not report any use of supplements ($n = 190$), the main reason was that they did not consider them necessary to maintain their level of fitness. A low proportion of athletes did not consume supplements because their family/coach did not allow this practice.

5. Conclusion

In conclusion, the results of this questionnaire demonstrate a widespread use of dietary supplements in elite athletes. Socio-demographic factors that include age, sex, type of sport, level of competition, and professionalism might influence the prevalence of dietary supplement consumption. Although proteins and amino acids were the most consumed supplements, substances with a low scientific basis for their consumption were the most predominant group of supplements. This is mainly due to the high number of commercially-available dietary supplements that fulfill this definition. Furthermore, athletes seem to rely on inadequate sources of information when acquiring and using supplements, with a considerable proportion of athletes engaging in self-prescription and purchase without consulting an accredited professional. Additionally, a high proportion of athletes are unaware of the contamination risks that dietary supplements may pose, which expose them to possible inadvertent doping. Urgent nutritional education and consulting should be made available to athletes and coaches, emphasizing the role of the nutritionist, sport scientists, and the acute and long-term side effects of incorrect plans of supplementation.

6. References

- Sousa M, João Fernandes M, Moreira P, Teixeira V. Nutritional supplements usage by Portuguese athletes. *Int J Vitam Nutr Res.* 2013; 83:48-58.

2. Thomas DT, Erdman KA, Burke LM. Position of the academy of nutrition and dietetics, dietitians of Canada, and the American College of Sports Medicine: nutrition and athletic performance. *J Acad Nutr Diet.* 2016; 116:501-28.
3. Maughan RJ, Burke LM, Dvorak J, Larson-Meyer DE, Peeling P, Phillips SM, *et al.* IOC consensus statement: dietary supplements and the highperformance athlete. *Br J Sports Med.* 2018; 52:439-55.
4. Knapik JJ, Steelman RA, Hoedebecke SS, Austin KG, Farina EK, Lieberman HR. Prevalence of dietary supplement use by athletes: systematic review and meta-analysis. *Sports Med.* 2016; 46:103-23.
5. Van Thuyne W, Van Eenoo P, Delbeke FT. Nutritional supplements: prevalence of use and contamination with doping agents. *Nutr Res Rev.* 2006; 19:147-58. Baltazar-Martins *et al.* *Journal of the International Society of Sports Nutrition* (2019) 16:30 Page 8 of 9
6. Garthe I, Maughan RJ. Athletes and supplements: prevalence and perspectives. *Int J Sport Nutr Exerc Metab.* 2018; 28:126–38. <https://doi.org/10.1123/ijsnem.2017-0429> Human kinetics.
7. Mooney R, Simonato P, Ruparella R, Roman-Urrestarazu A, Martinotti G, Corazza O. The use of supplements and performance and image enhancing drugs in fitness settings: a exploratory cross-sectional investigation in the United Kingdom. *Hum Psychopharmacol Clin Exp.* 2017; 32:e2619 John Wiley & Sons, Ltd.
8. 2018 Global Supplement Business Report. *Nutr Bus J* 2018. Cited 15 Mar 2019. Available from: <https://www.nutritionbusinessjournal.com/reports/2018-global-supplement-business-report/#>
9. Maughan R, Depiesse F, Geyer H. The use of dietary supplements by athletes. *J Sports Sci.* 2007; 25(Suppl 1):S103-13.
10. Tscholl P, Alonso JM, Dollé G, Junge A, Dvorak J. The use of drugs and nutritional supplements in top-level track and field athletes. *Am J Sports Med.* 2009; 38:133-40. <https://doi.org/10.1177/0363546509344071> SAGE Publications Inc STM.
11. Muwonge H, Zavuga R, Kabenge PA, Makubuya T. Nutritional supplement practices of professional Ugandan athletes: a cross-sectional study. *J Int Soc Sports Nutr.* 2017; 14:41.
12. Schroder H, Navarro E, Mora J, Seco J, Torregrosa JM, Tramullas A. The type, amount, frequency and timing of dietary supplement use by elite players in the first Spanish basketball league. *J Sports Sci.* 2002; 20:353-8 Routledge.
13. Petróczi A, Naughton DP, Pearce G, Bailey R, Bloodworth A, McNamee M. Nutritional supplement use by elite young UK athletes: fallacies of advice regarding efficacy. *J Int Soc Sports Nutr.* 2008; 5:22 BioMed Central.
14. Sousa M, Fernandes MJ, Carvalho P, Soares J, Moreira P, Teixeira VH. Nutritional supplements use in high-performance athletes is related with lower nutritional inadequacy from food. *J Sport Health Sci.* 2016; 5:368-74.
15. Nieper A. Nutritional supplement practices in UK junior national track and field athletes. *Br J Sports Med.* 2005; 39:645 LP-649.
16. Braun H, Koehler K, Geyer H, Kleiner J, Mester J, Schanzer W. Dietary supplement use among elite young German athletes. *Int J Sport Nutr Exerc Metab.* 2009; 19:97-109.
17. Nunes CL, Matias CN, Santos DA, Morgado JP, Monteiro CP, Sousa M, *et al.* Characterization and Comparison of Nutritional Intake between Preparatory and Competitive Phase of Highly Trained Athletes. *Medicina (Kaunas).* 2018; 54:41. MDPI.
18. De Silva A, Samarasinghe Y, Senanayake D, Lanerolle P. Dietary supplement intake in National-Level Sri Lankan Athletes. *Int J Sport Nutr Exerc Metab.* 2010; 20:15-20.
19. Erdman KA, Fung TS, Doyle-Baker PK, Verhoef MJ, Reimer RA. Dietary supplementation of high-performance Canadian athletes by age and gender. *Clin J Sport Med.* 2007; 17:458-64.
20. Tsarouhas K, Kioukia-Fougia N, Papalexis P, Tsatsakis A, Kouretas D, Bacopoulou F, *et al.* Use of nutritional supplements contaminated with banned doping substances by recreational adolescent athletes in Athens, Greece. *Food Chem Toxicol.* 2018; 115:447-50