

ASSOCIATION BETWEEN GENERAL SELF-EFFICACY LEVEL AND USE OF DIETARY SUPPLEMENTS IN THE GROUP OF AMERICAN FOOTBALL PLAYERS

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ABSTRACT

Background. Increased nutritional demands of athletes should be covered with a variable well-balanced diet, supported by dietary supplements stimulating synthesis of energy, development of muscle mass and strength, and improving physical capacity.

Objective. The aim of this study was to analyze an association between the level of general self-efficacy and dietary supplement use among Polish athletes practicing American football on a competitive basis.

Material and methods. The study included the group of 100 athletes (20-30 years of age, mean 24.27±2.76 years) who practiced American football on a competitive basis. The popularity of various dietary supplements was determined with an original survey, and the level of general self-efficacy with General Self-Efficacy Scale (GSES) by Schwarzer et al. Statistical analysis, conducted with Statistica 10.0 PL software, included intergroup comparisons with the *Chi*-square test.

Results. Isotonic drinks (74%), vitamin (65%) and mineral supplements (50%) and protein concentrates (53%) turned out to be the most popular ergogenic supplements among the American footballers. The group of less popular supplements included caffeine and/or guarana (44%), joint supporting supplements (40%), BCAA amino acids (39%), creatine (36%), carbohydrate concentrates (30%) and *omega*-3 fatty acids (30%). Analysis of a relationship between the popularity of ergogenic supplements and general self-efficacy showed that the athletes presenting with lower levels of this trait used multivitamin supplements significantly more often than did the persons characterized by lower self-efficacy levels ($p<0.05$).

Conclusions. The popularity of some dietary supplements varied depending on the general self-efficacy level of the athletes; the popularity of vitamins was significantly higher among the sportsmen who presented with lower levels of this trait.

Key words: ergogenic substances, athletes, American football, general self-efficacy

STRESZCZENIE

Wstęp. Różnorodna i zbilansowana dieta powinna służyć pokryciu zwiększonych potrzeb żywieniowych sportowców, a jej uzupełnieniem mogą być żywieniowe środki wspomagające, stymulujące generowanie energii, rozwój masy i siły mięśniowej oraz poprawiające wydolność fizyczną.

Cel. Celem badań była ocena zależności między poczuciem własnej uogólnionej skuteczności a stosowaniem żywieniowych środków wspomagających w grupie polskich sportowców uprawiających futbol amerykański.

Material i metody. Badania przeprowadzono w grupie 100 polskich zawodników (20-30 lat, średnia 24,27±2,76) wyczerpująco trenujących futbol amerykański. Stosowanie żywieniowych środków wspomagających oceniono w oparciu o przygotowany kwestionariusz. Do pomiaru poczucia uogólnionej skuteczności wykorzystano standaryzowaną Skalę Uogólnionej Własnej Skuteczności (GSES) wg Schwarzera i wsp. Analizę wyników przeprowadzono za pomocą testu *Chi*² w programie Statistica 10.0 PL.

Wyniki. Spośród środków ergogenicznych, polscy zawodnicy wyczerpująco trenujący futbol amerykański najczęściej przyjmowali: napoje izotoniczne (74%), preparaty witaminowe (65%) i mineralne (50%) oraz odżywki białkowe (53%). W mniejszym odsetku stosowali: kofeinę i/ lub guaranę (44%), środki ochraniające stawy (40%), aminokwasy BCAA (39%), kreatynę (36%), odżywki węglowodanowe (30%) oraz preparaty *omega*-3 (30%). Ocena stosowania środków ergogenicznych w zależności od poczucia własnej skuteczności wykazała, że mężczyźni o niskim nasileniu samoskuteczności istotnie częściej przyjmowali preparaty multiwitaminowe niż zawodnicy o wysokim jej nasileniu ($p<0,05$).

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Wnioski. Stosowanie niektórych żywieniowych środków wspomagających było zróżnicowane w zależności od poczucia własnej uogólnionej skuteczności zawodników, ze wskazaniem na częstsze przyjmowanie preparatów witaminowych przez sportowców o niższym nasileniu samoskuteczności.

Słowa kluczowe: *środki ergogeniczne, sportowcy, futbol amerykański, poczucie własnej uogólnionej skuteczności*

INTRODUCTION

Increased demand of athletes, associated with their enhanced metabolism and exposure to oxidative stress, should be covered with a well-balanced diet containing appropriate amounts of energetic, structural and regulatory compounds. Greater demand for protein, especially in athletes practicing speed/strength and purely strength disciplines, and for carbohydrates, specific for endurance sports, is associated with increased requirements for vitamin B complex, antioxidants and some minerals. Equally important is adequate repletion of fluids, being a significant determinant of exercise capacity [5, 31, 40].

Rational diet can also include supplements stimulating synthesis of energy, development of muscle mass and strength, and improving physical capacity [32]. Sodium bicarbonate, caffeine and creatine are supplements with scientifically proven efficiency, both according to the classification of the Medical Commission of the International Olympic Committee [24] and the Australian Institute of Sport [5]. Moreover, caffeine, creatine, isotonic drinks, proteins and carbohydrates are recommended as supplements by the Medical Commission of the Polish Olympic Committee [44]. Other compounds are classified as substances with limited or non-proven scientific efficiency [24, 44]. The list of supplements with established efficiency published by the Australian Institute of Sport includes isotonic drinks, liquid meals, sport gels and bars, antioxidants, zinc with vitamin C, multivitamin and mineral supplements (among them iron and calcium), glycerol and glucosamine [5]. Due to its buffering properties, supplementation with sodium bicarbonate is efficient in athletes practicing strength/endurance and speed/endurance disciplines [26, 35, 42]. In turn, caffeine was shown to modulate function of the central nervous system and prevent fatigue [1], and creatine is known to promote muscle mass and strength gains, and improves physical capacity [4, 9].

Health-oriented behaviors, including nutritional behaviors, are determined by a wide spectrum of socioeconomic, cultural and personality-related factors [39]. The sense of general self-efficacy is one of the personality-related determinants of health culture [8, 25]. It is self-efficacy which allows one to predict his/her intentions and activities in various spheres, including health- and nutrition-related behaviors [8, 25]. In this context, self-efficacy should be considered a key component of a modern, processual model of change in

health-oriented behaviors, among them in dietary habits. Consequently, this study was undertaken to determine the role of general self-efficacy as a predictor of dietary supplement use in a group of Polish athletes.

The aim of this study was to analyze an association between the level of general self-efficacy, an important personality trait, and dietary supplement use among Polish athletes practicing American football on a competitive basis.

MATERIAL AND METHODS

The study included the group of 100 young men (20-30 years of age, mean 24.27 ± 2.76 years) who practiced American football on a competitive basis in three Polish clubs: 'Warsaw Eagles', 'Krakow King' and 'Wilki Łódzkie'. The participants were either students (45%) or professionally active employees with higher (23%), secondary (28%) or vocational education (4%). They have been practicing American football for three years on average and declared being in very good (70%) or good health (30%). The athletes participated in 1-2 training sessions per day, five times per week on average; mean duration of a single training session was two hours. The analysis of recently determined somatic parameters of the athletes showed that their mean body mass index (BMI) and body fat mass were 27.14 kg/m^2 (± 2.06), and 14.5% (± 2.13), respectively.

The study was based on an original dietary supplement use questionnaire. Use of dietary supplements was evaluated in following categories: yes (regularly or periodically) and no (never). Prior to the proper study, the questionnaire was validated in a group of 23 individuals, with a retest after 6 weeks. Psychometric assessment revealed high reproducibility of results obtained with the instrument. McNemar's *Chi-square* test did not show significant differences between the test and retest results for any of the statements ($p > 0.05$). The level of general self-efficacy was determined with General Self-Efficacy Scale (GSES) by Schwarzer et al. [25]. The scale includes 10 statements that are scored in such way that the higher the global GSES score (ranging from 10 to 40 points), the stronger the sense of self-efficacy. Based on the median of the raw GSES score for our sample, we classified the participants as presenting with lower ($n=50$) and higher ($n=50$) levels of self-efficacy. Median stands at 31. Other descriptive

statistics in GSES scale have shown that: $X=31.25$; $SD=3.15$; $Min=22$; $Max=40$. Statistical analysis was conducted with STATISTICA 10.0 PL software. The distributions of dietary supplements use among the individuals with higher and lower self-efficacy levels were compared with the *Chi*-square test. The results were considered significant at $p<0.05$.

RESULTS

Isotonic drinks (74%), vitamin (65%) and mineral supplements (50%) turned out to be the most frequently (regularly or periodically) used ergogenic supplements in our group. Approximately a half of the athletes used protein concentrates (53%), and somewhat lower fraction (39%) declared using branched-chain amino acids (BCAA). Similarly high percentages of the respondents used creatine (36%) and carbohydrate concentrates (30%). The use of protein-carbohydrate concentrates was declared by 25% of the surveyed sportsmen, and the use of carbohydrate-protein and carbohydrate bars by 18% and 17%, respectively. Supplements containing *omega*-3 fatty acids were used by 30% of the footballers,

joint support supplements by 40%, and caffeine and/or guarana by 44%. The group of the least popular supplements included ginseng (14%), L-carnitine (8%), CLA (8%), sodium bicarbonate (6%), HMB (4%) and MCT (4%). It should also be highlighted that majority of athletes were using dietary supplements periodically (90%), and only for 10% of them it was regular habit.

Analysis of a relationship between the popularity of ergogenic supplements and general self-efficacy showed that the athletes presenting with lower levels of this trait used multivitamin supplements significantly more often (regularly or periodically) than did the persons characterized by lower self-efficacy (76.0% vs. 55.5%; $p<0.05$). The popularity of other dietary supplements among the examined footballers was not modulated significantly by their self-efficacy levels ($p>0.05$) (Table 1).

DISCUSSION

Our study revealed that dietary supplements are quite popular among athletes who practice American football on a competitive basis. Furthermore, we showed that the popularity of various supplements varies considerably. Isotonic drinks, vitamin and mineral supplements turned out to be the most often used supplements in our group. Importantly, the popularity of vitamin supplements, the most important group of ergogenic substances, varied depending on the general self-efficacy of the athletes.

High popularity of ergogenic supplements among sportspersons was previously documented both in Poland [11, 16] and abroad: in Australia (87.50% of the athletes) [12], Canada (88.40%) [14], Iran (66.70%) [41] and other countries [3, 23].

The use of isotonic drinks, that turned out to be the most popular ergogenic supplements in our group of athletes, is justified taking into account their important role in fluid repletion, maintenance of water-electrolyte and acid-base balance during physical exercise, and stimulation of post-exercise regeneration of glycogen [5, 33, 40]. Also the frequent use of vitamin and mineral supplements by our respondents seems reasonable in the context of the vital role they play in sports nutrition [40]. Vitamin B complex is involved in the metabolic processes associated with regeneration of protein structure and glycogen reserve, as well as in the synthesis of energy. This makes it an important determinant of psychophysical capacity of the athletes [40]. In turn, antioxidant vitamins increase antioxidative potential of cells and protect them against the consequences of enhanced oxidative stress. The latter results from peroxidation of lipids and is frequently observed in sportspersons, especially among the representatives of endurance disciplines. The important role of minerals

Table 1. Use of ergogenic supplements (%) (regularly or periodically) among Polish athletes practicing American football on a competitive basis, stratified according to their general self-efficacy level

Supplement type	Overall	General self-efficacy (GSES)		<i>Chi</i> ²	<i>p</i>
		High	Low		
Vitamin supplements	65.0	55.5	76.0	4.69	0.0303
Mineral supplements	50.0	42.5	58.7	2.58	0.1076
Protein concentrates	53.0	55.5	50.0	0.30	0.5790
Carbohydrate concentrates	30.0	33.3	26.0	0.62	0.4293
Protein-carbohydrate concentrates	25.0	27.7	21.7	0.48	0.4856
Isotonic drinks	74.0	68.5	78.2	1.86	0.1724
Carbohydrate-protein bars	18.0	16.6	19.5	0.14	0.7072
Carbohydrate bars	17.0	16.6	17.3	0.009	0.9234
Amino acids (BCAA)	39.0	44.4	32.6	1.47	0.2251
Creatine	36.0	40.7	30.4	1.15	0.2831
L-carnitine	8.0	5.5	10.8	0.95	0.3287
HMB	4.0	5.5	2.1	0.78	0.3768
<i>Omega</i> -3 fatty acids	30.0	31.4	28.2	0.12	0.7258
Joint support supplements	40.0	40.7	39.1	0.62	0.8698
Caffeine and/or guarana	44.0	40.7	47.8	0.50	0.4768
CLA	8.0	5.5	10.8	0.95	0.3287
Sodium bicarbonate	6.0	3.7	8.7	1.10	0.2932
MCT	4.0	3.7	4.3	0.02	0.8700
Ginseng	14.0	9.2	19.5	2.19	0.1381

p – significance of differences between the subsets of athletes presenting with different self-efficacy levels (high vs. low), determined on the *Chi*-square test

stems from their involvement in regulation of water-electrolyte and acid-base balance, neuromuscular excitability and hematopoiesis [5, 32, 40]. Increased demand of athletes for some vitamins and minerals, vital role of the latter during strenuous exercise, and previously documented deficiency of specific regulatory components, such as calcium [17, 36, 43], iron [30], magnesium [10] and some elements of the vitamin B complex [34, 43] among sportspersons, justify their periodical supplementation in this group. Also the other recently published studies showed that vitamins and minerals are the most popular supplements among sportspersons [13, 16, 41]. Many of our American footballers declared using supplements promoting muscle mass and strength gains, such as protein concentrates, BCAA and creatine. The popularity of these supplements among our respondents likely reflected their attempts to optimize the training effects, since previous studies showed that the abovementioned substances are vital for exercise capacity [2, 22]. Similar fraction of the examined athletes declared using caffeine-based supplements. In contrast, carbohydrate concentrates were less popular in our group. The relatively high popularity of caffeine, a known modulator of psychophysical capacity, should be interpreted positively, especially taking into account the efficiency of this supplement documented in previous studies [1]. Beneficial effects of caffeine, including improvement of precision, were previously observed in a group of football players [15]. Also the use of carbohydrate and carbohydrate-protein concentrates, as well as carbohydrate bars, is reasonable due to the established role of carbohydrates in energetic processes, post-exercise regeneration of glycogen reserve and improvement of exercise capacity, especially during long training sessions [6, 27]. The relatively low popularity of these supplements among our American footballers might reflect their limited knowledge with regards to effective methods of supporting physical exercise. This observation is consistent with the data published by other authors, who observed that the content of carbohydrates in the energetic pool of athletes is relatively low [37]. Previous studies showed that amino acids play an important role in supporting exercise capacity [2, 7, 22, 29]. The relatively high popularity of amino acids among our athletes is consistent with the results published previously by other authors [41].

Furthermore, this study showed that general self-efficacy determines the popularity of some ergogenic supplements among American footballers. We showed that the athletes presenting with lower self-efficacy levels significantly more often used vitamin supplements, a group of ergogenic substances with established efficiency. Taking into account that in previous studies the athletes characterized by lower self-efficacy were demonstrated to undertake less rational dietary choices

[18], the fact that such persons showed a tendency to more frequent use of vitamin supplements should be interpreted positively, as a way to counterbalance potential deficiency of these nutrients. The association between lower self-efficacy and less rational dietary choices was observed not only among athletes [18, 21], but also in other population groups [19, 20, 28, 38].

Rationalization of a diet and dietary supplement use among athletes requires monitoring thereof, and should be adjusted for personality traits of the subjects, including their general self-efficacy.

CONCLUSIONS

1. American football players were shown to use dietary supplements, especially isotonic drinks, vitamin and mineral supplements.
2. The popularity of some ergogenic substances varied depending on the general self-efficacy of the athletes; the popularity of vitamins was significantly higher among the sportsmen who presented with lower levels of this personality dimension.

Conflict of interest

The author declares no conflict of interest.

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