Polyunsaturated fatty acids and amino acids for athletes: impact on physical activity

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Abstract

Objective of the study was to examination of the effectiveness of polyunsaturated fatty acids (PUFA) and branched side chain amino acids (BCAA) in physical education.

Methods and structure of the study. The process of locating relevant literary information involved utilizing the publicly accessible electronic repositories of scholarly publications, PubMed and eLibrary.

Results and conclusions. The findings suggest that the use of dietary supplements containing polyunsaturated fatty acids (PUFA) and branched-chain amino acids (BCAA) in the context of physical training can effectively enhance muscle performance and resilience.

The literature suggests that the optimal duration of PUFA supplementation is eight weeks, with a daily dose of 4-5 grams. For BCAA, the recommended duration is no more than 16 weeks, with a daily dose of 2-10 grams.

When these supplements are combined, they can work together to accelerate muscle recovery after exercise.

Keywords: *polyunsaturated fatty acids, amino acids with branched side radicals, sports nutrition, mode of application, physical activity*

Introduction. Improving the health and quality of life of the general population is a priority task of physical culture and mass sports [1]. Currently, there is a search for effective health improvement technologies, as well as means and methods for optimizing those already in use. Among the methods being developed for optimizing health technologies, nutraceutical support occupies a significant place. In this area, a fairly large number of works are devoted to assessing the use of biologically active substances (vitamins, provitamins, etc.), including polyunsaturated fatty acids (PUFA) and amino acids with branched side chains (BCAA) – leucine, isoleucine and valine [6, 11]. At the same time, if the schemes for using these supplements are sufficiently developed within the framework of sports training [12], then data on the rational choice of schemes for using nutraceutical support for individuals involved in physical culture are quite scarce [3].

Objective of the study was to examination of the effectiveness of polyunsaturated fatty acids (PUFA) and branched side chain amino acids (BCAA) in physical education.

Methods and structure of the study. The literature search was conducted using open electronic databases of scientific literature PubMed and eLIBRARY. The following search query was used for the search: «fitness», «sports nutrition», «polyunsaturated fatty acid AND fitness», «BCAA AND fitness». For the analysis of literature data, full-text sources and/or sources with structured abstracts were evaluated. Abstracts of reports, unpublished works and experimental studies on animals were not analyzed.

Results of the study and discussion. The conducted analysis of the literature data demonstrates that the use of PUFA-based food supplements in the practice of physical education and sports is considered as an ergogenic means demonstrating certain abilities to modulate mus-

cle responses to exercise by stimulating muscle hypertrophy, increasing their endurance, strength characteristics, and power [14]. In addition, due to their anti-inflammatory properties, PUFA supplements can minimize muscle damage caused by physical exercise [15]. However, some authors do not find the effects of PUFA use described in their studies [7]. The reason for this, in our opinion, is that the daily dose and duration of use of PUFA-based supplements vary significantly from study to study, and there are no clear application schemes. In this regard, for the selection of such optimal PUFA application schemes among all the literature material found, two systemic reviews [4, 9] deserve attention, which contain information on the comparative effectiveness of various schemes for the use of PUFA-based supplements in the practice of physical education. The results of the most evidence-based studies noted in these reviews have been summarized and presented in a table.

In most of the studies we reviewed, the authors assessed the effectiveness of PUFA use by three indicators: muscle mass gain, muscle strength and power gain, and increased muscle recovery rate after exercise. In the table, we indicate the PUFA use regimens (daily dose in grams and duration) that showed a significant increase in the effectiveness indicators in the groups of men and women (18-50 years old) taking PUFA, as opposed to the groups that did not take this supplement. The table shows that the course duration of PUFA intake in the target group varied from 7 (1 week) to 90 days, with the daily prescribed dose fluctuating from 0,86 to 6 g. It is also obvious that the main effect of PUFA use concerned increased muscle strength and increased muscle recovery rate after exercise. In the largest number of studies, in which the effect was developed for both men and women, the duration of PUFA use was eight weeks at a daily dose of 4-5 g. In our opinion, these values can be considered basic for the use of PUFA-based dietary supplements by mature individuals involved in physical education.

Separately, we found a study that showed the effectiveness of using PUFA in combination with vitamin E at a dose of 10 g per day for at least 21 days in highly qualified athletes [2]. According to the results of the study, such a complex use contributed to an increase in the target contingent's performance in the load power zone, an immunoreactive effect was noted. These data make the use of PUFA in combination with fat-soluble vitamins promising.

The effects of BCAA use described in the literature, in contrast to PUFAs, which have a wider range of effects, are associated with the ability of BCAA to minimize the effects of muscle loads by increasing the rate of post-load recovery of muscle fibers [8]. It should also be noted that, unlike the PUFA application schemes used, the BCAA application schemes we found in available sources are quite similar. First of all, all studies have noted the effectiveness of BCAA in the proportion of L-leucine, L-isoleucine, L-valine - 2:1:1, with a daily dose for mature individuals of both sexes from 2 to 10 g with a duration of use of up to 16 weeks [10]. Moreover, for BCAA, the optimal time of administration is also noted - before the start of training or exercise [5]. It is important to note that we also came across a study that studied the effectiveness

Scheme of application of PUFA-based supplements in physical education practice based on data from [9, 10]

Gender	Muscle mass growth (daily dose, g/duration of use)	Increase in strength, power (daily dose, g/duration of use)	Increase in the rate of muscle recovery after exercise (daily dose, g/duration of use)
Men (18-50 years)	4-5 g / 6-8 weeks	0,86 g / 8 weeks 1,2 g / 26 days 4 g / 6 weeks 2,4 g / 8 weeks 4,5 g / 10 weeks	0,86 g / 8 weeks 1,2 g / 26 days 1,8 g / 4 weeks 2,4 g / 8 weeks
Women (18-50 years)	4-5 g / 6-8 weeks	2 g/90 days 6 g/1 week 6 g/12 weeks 5 g/8 weeks	3 g /9 days 2 g /6 weeks 5 g /8 weeks

of the combined use of a PUFA and BCAA complex [13]. Positive effects are noted in the use of 0,86 g per day of PUFA for eight weeks and 9,6 g per day for eight days on the rate of muscle recovery in young men who do not play sports after eccentric loads. In general, our assessment of the literature suggests that the use of PUFAs and BCAAs can promote increased physical performance in mature individuals involved in physical exercise. The main expected effect of using both PUFAs and BCAAs is an increase in the rate of skeletal muscle recovery after physical exertion. Moreover, the combined use of these supplements can have a synergistic effect, the basis for this is the results of the above-mentioned work [13].

An important conclusion from all the studies we analyzed is also that the authors of the presented studies do not provide data on any adverse events in the subjects that could be associated with the use of food supplements, which indicates their acceptable safety for the health of those exercising.

Nevertheless, the results of the literature analysis allow us to identify some limitations in the use of these supplements. Thus, the use of PUFAs, due to the possibility of their accumulation in the body, should be limited in duration and / or dosage. In particular, the literature data (table) showed that the longer the course of PUFA use, the lower the daily dose. In turn, for BCAA, long-term use can contribute to the development of side effects associated with the need to utilize the amino nitrogen of the consumed amino acids, increasing the load on the liver and kidneys. The latter circumstance, in our opinion, requires limiting the intake of BCAA to no more than 10 g/day.

Conclusions. Thus, the analysis of literary data allows us to determine that the basic scheme for the use of PUFAs for both men and women involved in physical education can be considered the use of the supplement for 8 weeks at a daily dose of 4-5 g, the use of BCAA (in the proportion: L-leucine, L-isoleucine, L-valine 2: 1: 1) – no more than 10 g / day. The complex use of these supplements, providing a synergistic effect of their use, is promising.

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