

ANALYSIS OF RESULTS OF RESEARCH OF THE FUNCTIONAL INFLUENCE OF THE FOOD PRODUCT ON THE BODY OF ATHLETES

Halyna Sienohonova✉

Lecturer

Department of International Cooperation

«KROK» University

30-32 Tabirna str., Kyiv, Ukraine, 03113

tonagwa@gmail.com

Lyudmila Sienohonova

PhD, Associate Professor

Department of Commodity Science, Trade Entrepreneurship and Commodity Examination

Luhansk Taras Shevchenko National University

1 Gogol sq., Starobilsk, Ukraine, 92703

✉ **Corresponding author**

Abstract

The aim of the work is to describe and analyze the study of the functional effect of bran bars “Sport Slim”. To study the functional effectiveness of food for athletes to control body weight, performance and recovery processes in the body of athletes. Anthropometric, physiological, psychophysiological and biochemical research methods were used to study the consumption impact of a food product Sport Slim for athletes. As a result of the research, it has been found, that the course consumption of the bar “Sport Slim” affected the weight and body composition of athletes, decreased body weight and body fat percentage. Consumption of the bar has accelerated the recovery process in the body and increased the rate of operational thinking. Course consumption of the bran bar “Sport Slim” can be recommended for use in the training of qualified athletes to adjust the daily diet to correct body weight, to speed up recovery, to increase the effectiveness of training and competitive activities.

Keywords: world food market, food for athletes, bran bars, body weight control.

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1. Introduction

At the beginning of the XI century, the development of new diagnostic techniques has revealed a direct relationship between the problem of overweight and the development of many serious diseases. At the same time, the concept of “metabolic syndrome X” was introduced in medicine. It combines diseases, such as hypertension, type II diabetes, atherosclerosis and coronary heart disease, which are among the most common causes of death worldwide. One of the main factors in the development of all these dangerous diseases is the problem of overweight. Some time ago, the number of deaths due to overweight was 2.5 million. At the moment, the numbers are growing steadily. According to the analysis of existing official statistics, we can safely imagine that if humanity could overcome the problem of overweight, the life expectancy of people around the world would increase by 5–10 years. For comparison – the treatment of all inhabitants of the planet from cancer would increase life expectancy by only one year. Scientists continue to sound the alarm, constantly signaling in their reports about the lack of attention to the problem of overweight [1–3]. According to the World Health Organization, the problem of overweight has become one of the most common chronic diseases in our time – today this pathology is really becoming a global epidemic, covering almost all countries and peoples [4–6].

The issue of overweight is becoming a natural disaster. A clear confirmation of this is the fact that it is beginning to become a serious global problem. The issue of overweight is even in developing

countries – the same ones whose people have traditionally suffered from malnutrition. Every year, more and more states that have recently fought hunger are now struggling with overweight.

The COVID-19 pandemic has been one of the leading causes of overweight and obesity worldwide. This is probably due to the growth of a sedentary lifestyle, stress and problems, such as job and income loss, which complicate a healthy diet. But the issue of overweight during the COVID-19 pandemic in modern sports became especially acute. The global pandemic COVID-19, the rapid spread of which began in the spring of 2020, has changed the pace of life around the world and has greatly affected world sport [7, 8]. Many current and planned sporting events were postponed or canceled. Athletes were forced to comply with the conditions of quarantine, to train at the usual pace became impossible, as a result, began hypodynamics and, consequently, a surplus of calories. And already in the periods of weakening of the quarantine regime, on the contrary – athletes must quickly restore their physical shape, return to training with high physical activity, maintain a professional sports level and increase the record level. Athletes' nutrition plays a crucial role in achieving rapid recovery and adaptation to extremely high physical and psycho-emotional loads [9, 10].

In the current development of sports in a period of constant fluctuations in the severity of quarantine measures due to the global pandemic COVID-19 the organization of nutrition of athletes plays an important role in maintaining physical fitness. The high degree of physical and neuropsychological stress that occurs during training and competition in modern conditions is accompanied by a significant restructuring of metabolic processes that cause an increased need of athletes for energy and nutrients. Of particular importance is the rationalization of athletes' nutrition, which provides an adequate supply of potential energy sources and biologically active substances, which contributes to the realization of genetic capabilities of the organism and creates conditions for improving sports results [11].

It is known, that the use of various means (mainly artificial synthesis), which can significantly increase the effectiveness of an athlete in competitions by increasing physical endurance, performance and strength, has negative consequences for the health of athletes. Therefore, at present in the world of sports and sports nutrition much attention is paid to the development and implementation of non-doping drugs in the diet of athletes to increase their physical potential.

Rational nutrition can reduce the recovery time of athletes, increase physical performance, adjust body weight and general condition of athletes. This in the complex allows to make the training of athletes more effective and safe for health. It is necessary to understand and take into account the negative objective factors that are the result of deteriorating food quality, modern specifics of living conditions, employment of modern human, the inevitable deterioration of the environment and many other reasons [12].

One of the negative manifestations in the life of modern human is a significant change in food quality and nutrition structure. The reasons are largely the intensive use of herbicides, pesticides and chemical fertilizers. Their use has increased yields, but significantly reduced the quality of plant products that contain fewer minerals, carbohydrates, amino acids and vitamins (approximately 25–45 %). Modern products contain more heavy metals, pesticides and nitrates [13].

A positive factor in nutrition is the consumption and production of traditional for the region dishes, fruits and vegetables, grown in the natural conditions of the region, to which the human body is adapted since childhood.

The living conditions of modern human are burdened by the decline in food quality, the abandonment of traditional nutrition and a factor in modern life – hypodynamia. This situation is a trigger for a number of chronic diseases, including metabolic syndrome. This also applies to athletes.

The strategy of nutrition of athletes is based on the general principles of healthy eating, but also pursues special objectives:

- activation of metabolic processes, especially significant in the performance of increased physical activity;
- creation of a metabolic background, optimal for the biosynthesis of humoral regulators of their action;

- increase of the rate of building muscle mass and strength;
- weight adjustment;
- increase of the functionality of an athlete without the use of doping agents;
- acceleration of recovery after extreme physical exertion;
- prevention of alimentary-dependent diseases characteristic of professional athletes [14].

Means and methods of restoring the physical fitness of athletes should be based on the nature of the work performed. One of the first and main means of recovery is nutrition, it is primarily able to expand the limits of adaptation of the athlete's body to extreme physical activity.

Currently, a medical and biological approach to the development of diets for athletes, which is based on the study of biochemical and physiological processes, occurring in the body during exercise and recovery, is used. Also, the peculiarities of the sport, the stage of training, climatic conditions, as well as gender, age, anthropometric and other individual indicators of a particular athlete are taken into account [15, 16].

Among the current food products for athletes, the leading position is occupied by bars. This is due to the fact that bars are an integral part of food for athletes, in the current time, marked by the global fight against coronavirus, which is expressed in the maximum isolation of people from each other, preventing accumulation in everyday life. The need to isolate athletes leads to problems with daily training and competitions. One of the negative manifestations in the current situation for athletes is the lack of physical activity, hypodynamics. At the same time, due to the “human” factor – habits, the traditional amount and caloric intake of an athlete is not adjusted, remain unchanged. All this leads to a violation of the physiology of the process of assimilation of food, which is expressed in an increase in the fat layer on the muscles and internal organs. We have all heard about the negative consequences of the abrupt “departure” of power athletes from big sports. But this is an “old” problem for ordinary people, residents of megacities, who often struggle with excess weight, not doing sports and not following a proper diet [17, 18].

According to the World Health Organization (WHO), more than 1.4 billion adults worldwide are overweight and obese. This problem is becoming more relevant every day, but at the same time it remains neglected. According to WHO experts, if the current incidence rate increases the same way, by 2030 more than 50 % of the adult population of the planet will be obese or overweight [19].

From the business side – food for athletes is one of the most exciting and dynamic food markets. Companies are constantly diversifying, new innovative market participants are emerging. The global sports nutrition market is currently estimated at \$ 10.7 billion in 2020 and is expected to grow at an average annual growth rate of 10.9 % from 2021 to 2028. It is expected, that by 2028 its value will increase to approximately 81.5 billion US dollars [20] (Fig. 1).

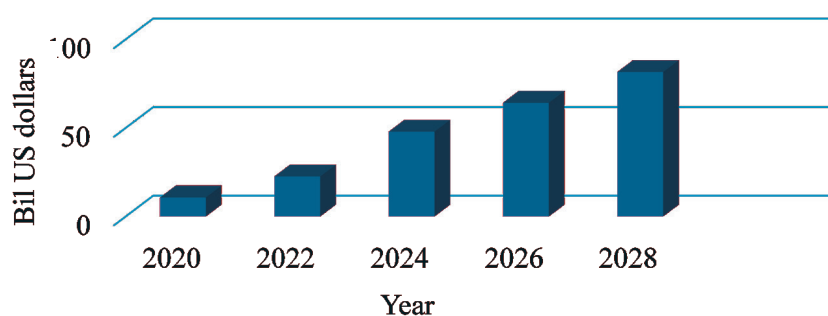


Fig. 1. Dynamics of market value of food for athletes

All of the above led to the creation of a food product for athletes – bran bars.

The aim of the work is to describe and analyze the study of the functional effect of bran bars “Sport Slim”.

2. Materials and Methods

“Sport Slim” bran bars contain oat and wheat bran, flax seed meal, fructose, glycerin and a functional composition “Sport Slim”. The structure of the functional composition “Sport Slim” – coenzyme Q10, conjugated linoleic acid, L-carnitine, green tea extract.

In order to identify the impact of systematic consumption of bran bars “Sport Slim” with the functional composition on the human body during exercise, clinical studies were conducted in the laboratory of ergogenic factors in sports at the State Research Institute of Physical Culture and Sports (Kyiv, Ukraine). The study involved athletes who specialize in rowing, qualification – Candidate Master of Sports (CMS) and Master of Sports (MS), 20–25 years. After receiving oral and written explanations about the purpose and procedures of the study, respondents gave their written consent to participate in the study. All experimental procedures were approved by the Commission on Bioethics of the State Research Institute of Physical Culture and Sports, Kyiv, Ukraine (Minutes No. 1 of 05.07.2006). The research involved 89 respondents from the National University of Physical Education and Sport of Ukraine and the Kyiv National University of Trade and Economics, 42 – men and 47 – women. According to the calendar dispensary examinations, all respondents were practically healthy at the time of the research. The testing was performed in the morning on an empty stomach.

It is known, that one of the factors that can affect the effectiveness of sports activities is the composition of the body of athletes. The normal amount of fat in the body of athletes who specialize in rowing, according to various authors, averages 6–14 % of body weight for men [21, 22]. The increase in body weight due to the fat component is accompanied by a decrease in maximum oxygen consumption and maximum power and, as a consequence, a decrease in the aerobic capacity of athletes. It is known, that an increase in the percentage of body fat by more than 15 % is accompanied by a decrease in the special capacity of skilled athletes. Therefore, weight loss, primarily due to the fat component, creates positive conditions for improving athletic performance.

To study the impact of the course consumption of the bran bar “Sport Slim” on physical performance and recovery processes in the body, athletes were divided into two groups: experimental and control. Athletes of the experimental group consumed bran bars “Sport Slim” for 14 days according to the following scheme: one hour before training – 35 g, but not more than 70 g per day.

Anthropometric measurements were performed as follows: a height meter was used to determine body length. The following rules were followed: the subject stands straight, barefoot, on a flat surface, abdomen relaxed, arms lowered along the torso, heels together and touching the wall. The head of the athletes is in the horizontal position of the “Frankfurt line” (conditional line, connecting the lower edge of the orbit and the upper edge of the earlobe).

Compositional body structure of athletes was determined by impedancemetry on professional body weight analyzers Tanita BC545 (Japan). Bioelectric impedance determines the resistance (impedance) of the current, flowing through the body. This method is based on the properties of tissues to conduct different electric currents of different frequencies. Tissues that contain a lot of fluid and are electrolytes (such as blood) are characterized by high electrical conductivity, and adipose and bone tissue, lungs have high resistance or are dielectrics. To determine the body composition of athletes used the following indicators: body mass (kg), percentage of water and fat in the body (%), visceral fat and lean body mass (kg).

Lean body mass was calculated by the formula:

$$LBM=BM-FM,$$

where *LBM* – lean body mass, kg; *BM* – body mass, kg; *FM* – fat mass, kg.

Individual typological characteristics of higher nervous activity and sensorimotor reactions (neurodynamic properties) of the athlete were studied using the computer system “Diagnost-1” [23].

The optimal mode (determination of simple and complex visual-motor reactions) and the mode of imposed rhythm (determination of the level of functional mobility and strength of nervous processes) were used for the research.

The memory function was studied using a short-term memory test, which consists of determining the number of correctly reproduced two-digit numbers out of 12, which are displayed on the screen for 30 seconds. The amount of short-term memory is determined as a percentage.

The use of various methods of assessing the perception of time in a person in professional activities has prospects in the diagnosis of fatigue and is used in sports to assess the emotional tension of an athlete [24].

Perception of time was investigated using a modified F. Halberg test “Individual minute”. The error from the given time interval of 30 s was estimated [25, 26].

A study of the functional effectiveness of a product for special dietary consumption – a bran bar “Sport Slim”, showed that the bran bar is designed for people who control body weight. Also, to determine the impact of the course application of the bran bar on weight control, performance and recovery processes in the body of athletes.

3. Results

The research was aimed at determining the influence of the course consumption of the “Sport Slim” bran bar on anthropometric indicators. As a result of the research, it has been found, that the course consumption of the bar “Sport Slim” affected the weight, mass and composition of the body of athletes (**Table 1**). Thus, the athletes of the experimental group probably decreased both body weight and body fat percentage by 5 and 11 %, respectively. In the control group, these indicators remained almost unchanged.

The dynamics of the emotional state of athletes was expressed in indicators of well-being, activity and mood (WAM) during a period of intense training activities. The observation showed that the main group of athletes probably felt better, while activity and mood tended to improve compared to baseline. And in the athletes of the control group, the activity indicator during the period of intense training activity tended to deteriorate (**Table 2**).

Table 1

Influence of the course consumption of the “Sport Slim” bran bar on body composition

Parameter	Experimental group, n=7		Control group, n=7	
	Start of research	End of research	Start of research	End of research
Height, cm	185.78.29±		187.0±5.58	
Body mass, kg	92.69±3.26	88.27±2.29*	90.19±2.44	91.10±2.82
Fat percentage, %	16.03±2.47	14.27±2.78*	16.16±1.93	16.30±2.47
Water percentage, %	62.73±3.04	64.52±5.06	65.78±5.07	63.21±4.33
Lean body mass, kg	77.78±1.80	75.48±1.56	75.60±2.17	76.23±2.73

Notes: * $p < 0.05$ relative to the original data $n=7$; n – number of respondents

Table 2

Influence of the course consumption of the “Effect” bran bar on emotional state (WAM method – well-being, activity, mood) of athletes (14 days)

Parameters	Experimental group, n=7		Control group, n=7	
	Start of research	End of research	Start of research	End of research
Well-being	5.5±0.34	7.4±0.52	5.44±0.29	5.08±0.47
Activity	6.83±0.56	7.20±0.70	7.48±0.38	6.66±0.74
Mood	5.80±0.17	6.2±0.62	5.44±0.29	5.22±0.20

Notes: * $p < 0.05$ relative to the original data $n=14$; n – number of respondents

This positive effect of the course consumption of the bran bars can be used by athletes to adjust body weight by reducing the percentage of body fat.

Thus, the results of the study suggest that the course consumption of the bran bar “Sport Slim” can be recommended for use in the training of qualified athletes. Consumption of the bar “Sport Slim” affects the correction of the daily diet, body weight, increases the frequency of nutri-

tion in conditions of physical and emotional stress, accelerates the recovery process in the body of athletes to increase the effectiveness of training and competitive activities.

The results of the study indicate the feasibility of introducing a bar of bran “Sport Slim” in the diet of professional athletes and amateurs in the conditions of regular physical activity. It is recommended to consume 70 g of bran per day, 35 g of each bar for an hour and a half – an hour before training and the second bar (35 g) for one hour after training. It is also advisable to produce the bran bar to expand the range of national nutrition market for athletes.

A clinical study of the bran bar “Sport Slim” showed that the action of the functional composition promotes weight loss, because at the same time in the human body after consuming the bar begins:

- intensification of metabolism;
- increase of the physical activity by increasing calorie expenditure during exercise;
- increase of the endurance of the organism;
- acceleration of the recovery period.

Due to the specially selected composition, the systematic consumption of bran bars will have a positive effect only in the conditions of physical activity. Unsystematic consumption, non-compliance with the recommendations and lack of physical activity will not lead to satisfactory results (weight loss will not occur).

Further research will focus on a more detailed study of the bran food product for athletes in playing sports in order to correct the body weight and its implementation in the practice of training athletes.

4. Conclusions

According to the results of the data obtained, it has been found, that the course consumption of the bar “Sport Slim” affected the weight and body composition of athletes. Thus, the athletes of the experimental group probably decreased both body weight and body fat percentage by 5 and 11 %, respectively. In the control group, these indicators remained almost unchanged. The results of the research show that the course of food consumption of bran bars “Sport Slim” helps to correct body weight, has a positive effect on the recovery processes in the body of athletes after strenuous exercise and their psycho-emotional state.

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