

FREQUENCY OF CONSUMPTION OF FOOD PRODUCTS BY A GROUP OF POLISH ATHLETES IN RELATIONSHIP TO THE QUALITATIVE RECOMMENDATIONS INCLUDED IN THE SWISS FOOD PYRAMID

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Abstract

Objective: To estimate of nutritional behaviors, especially of the chosen food products consumption frequency among Polish athletes compared with the qualitative recommendation of the Swiss food pyramid and according to gender.

Methods: Research was taken among 141 persons of the age of 21-30 years (70 women and 71 men) on the basis of the authors' questionnaire of dietary behaviors. All those questioned were advanced athletes practicing different sports.

Results: The athletes from the examined group most frequently consume fruits, juices, vegetables, low fat dairy products and cereal products of high grist. Statistical analysis shows, that definitely more often women consume vegetables and low fat dairy products ($P < 0.05$) and on the other hand, men consume meat ($P < 0.05$) and sweetened carbonated or plain drinks ($P < 0.001$). However, valuation of the frequency of food products group consumption demonstrates the limited scale of implementation of the nutritional recommendations for athletes, especially in restriction of intake of high fat dairy products (21.3%), pastry (20.6%), as well as consuming fish at least once a week (19.1%) and everyday consumption of brown bread (24.1%), oils and nuts (24.8%) and vegetable juices (19.9% of the sample). It was shown that women declare, considerably more often than men, reducing the consumption of sweetened carbonated drinks (67.1% vs. 32.4%) and sweetened beverages (60% vs. 29.5%) ($P < 0.001$) and also daily vegetables consumption (57.1% vs. 36.6%) ($P < 0.05$).

Conclusions: Examined groups of athletes did not fulfill the qualitative recommendations included in the Swiss food pyramid, particularly in regards to the frequency of consumption of vegetables, fruits, whole grain cereal products, low-fat dairy products, fish, oils, nuts and pastry.

Key words: *nutritional recommendations, dietary habits, athletes*

Introduction

An adequate, balanced diet that satisfies the requirements for energy, protein, content of vitamin B complex, antioxidants and certain minerals, improves both the health potential and exercise abilities; therefore, optimizing the effects of training. In the case of athletes, these requirements are increased due to higher levels of physical activity [1-3]. Satisfying the physiological requirements for nutrients requires planning a variable dietary intake, including an assortment of products belonging to various food groups, and following the recommendations for individuals characterized by high levels of physical activity. Adequate nutrition of specific population groups can be achieved with an aid of specialized food pyramids, such as the Food Pyramid for Swiss Athletes. This pyramid was presented in 2008 in Lausanne and proposed as a new model for sportsmen and sportswomen [4,5]. It was designed on the basis of the pyramid for healthy individuals published by the Swiss Society for Nutrition [6]. Non-sweetened beverages constitute the base of this pyramid, whereas its top is formed by sweets, salted snacks and sweetened beverages. These two

groups are separated by vegetables and fruits, whole grain cereal products and legumes, protein products, oils, fats and nuts; all differing in terms of recommended amount of dietary intake and the frequency of ingestion. This pyramid represents a new tool facilitating nutritional education and enabling rational dietary choices, adequate to support the current training burden of an athlete by specifying the frequency and number of servings of each product group [4,5].

Necessity of monitoring dietary habits in individuals characterized by higher physical activity levels constituted a rationale for this study aimed at the assessment of selected nutritional habits, in particular the frequency of consumption of selected foods product in a group of Polish sportspersons and comparing them to qualitative recommendations included in the Food Pyramid for Swiss Athletes.

Methods

This study included 141 professional athletes aged between 21 and 30 years of age (mean 25.5 years; 70 women and 71 men) practicing various sport disciplines, such as cross-country skiing, football, handball,

volleyball, basketball, rowing, race walking, kayaking, mountain climbing, judo and hockey. In this group athletes with at least 7 years of experience in volleyball (17.0%), handball (16.3%) cross-country skiing (13.5%), judo (12.0%), and football (11.3%) were the majority. All participants completed an original questionnaire examining their dietary habits and assessing the frequency of consumption of various food products on a 7-grade scale: several times a day (7), once a day (6), 4-5 times a week (5), twice a week (4), several times a month (3), once a month (2), and never (1).

Statistical analysis

Statistical analysis of gender-specific differences was performed with the Student's t test and the fraction U test. Confidence level was defined at 95%, and all calculations were carried out using MS Excel and Gretl statistical packages. Student's t test was used to compare the average frequency of consumption of food products, a fraction U test to compare the percentage distribution of food choices between male and female athletes.

Results

The highest frequency of consumption (usually at least 4-5 times a week) pertained to fruits, fruit juices,

vegetables, low-fat dairy products, and cereal products of high grist. Also, pastry and high-fat dairy products were ingested several times a week, while whole grain cereal products, poultry meat and poultry sausages, non-carbonated sweetened and carbonated sweetened beverages, pork meat, and legumes were consumed twice a week on average. These groups of products were followed by vegetable juices and oils, plant fats and nuts, usually consumed slightly more frequently than several times a month. Fast food, groats, fish meat and pork delicatessen were ingested up to several times a month. The least frequently consumed products were alcoholic beverages, ingested slightly more frequently than once a month. Statistical analysis revealed that sportswomen consumed vegetables and low-fat dairy products significantly more frequently ($P < 0.05$), while sportsmen more frequently declared ingestion of pork meat ($P < 0.05$), and carbonated and non-carbonated sweetened beverages ($P < 0.001$) (Table 1).

Dietary recommendations that were most frequently followed by examined athletes included, reducing consumption of high (95.0%) and low (83.7%) alcohol content beverages, preference of poultry meat and poultry delicatessen over pork delicatessen (76.6%), a reduced consumption of fast food products (75.2% consumed these not more than several times

Table 1. Average frequency of consumption of selected groups of food products in sportspersons in relation to their gender

Food products	TotalX±SD	WomenX±SD	MenX±SD
Fruits	5.39±1.10	5.33±1.09	5.45±1.11
Fruit juices	5.18±1.25	5.16±1.21	5.21±1.28
Vegetables	5.16±1.23	5.37±1.11	4.96±1.31*
Low-fat dairy products	4.97±1.58	5.23±1.44	4.71±1.68*
Cereal products of high grist	4.96±1.74	4.68±1.69	5.24±1.76
High-fat dairy products	4.56±1.55	4.41±1.56	4.70±1.53
Pastry	4.51±1.10	4.51±1.27	4.51±1.64
Whole grain cereal products	4.36±1.51	4.27±1.48	4.45±1.54
Poultry meat	4.18±1.20	4.13±1.20	4.22±1.20
Poultry delicatessen	4.12±1.36	4.08±1.35	4.15±1.39
Non-carbonated sweetened beverages	3.87±1.79	3.16±1.77	4.57±1.53***
Pork meat	3.87±1.34	3.61±1.37	4.13±1.27*
Legumes	3.83±1.53	3.85±1.69	3.80±1.39
Carbonated sweetened beverages	3.71±1.73	3.07±1.71	4.43±1.53***
Vegetable juices	3.57±1.89	3.73±1.74	3.42±2.03
Oils, fats and nuts	3.27±1.86	3.31±1.63	3.23±2.03
Fast Food	2.94±1.19	2.94±1.36	2.93±1.02
Groats	2.89±1.39	2.96±1.32	2.82±1.45
Fish	2.88±1.18	2.86±1.15	2.9±1.21
Pork delicatessen	2.85±1.13	2.86±1.18	2.84±1.10
Low alcohol content beverages	2.49±1.16	2.46±1.00	2.53±1.30
High alcohol content beverages	2.13±0.91	2.09±0.91	2.17±0.92

Significant gender-related differences:*** $P < 0.001$, * $P < 0.05$

Table 2. *Frequency of rational nutritional choices in sportspersons in relation to their gender (%)*

Nutritional habits	Total	Women	Men
Proper fluid repletion	69.5	70.0	69.0
Vegetables everyday	46.8	57.1	36.6*
Vegetable juices everyday	19.9	15.7	23.9
Fruits everyday	54.6	51.4	57.7
Fruit juices everyday	48.2	45.7	50.7
White bread everyday	48.9	41.4	56.3
Brown bread everyday	24.1	22.8	25.3
Low-fat dairy products everyday	45.4	48.6	42.2
High-fat dairy products ≤ several times a month	21.3	25.7	16.9
Poultry meat ≥ several times a week	76.6	75.7	77.5
Poultry delicatessen ≥ several times a week	76.6	77.1	76.0
Pork meat ≤ several times a month	41.1	48.6	33.8
Pork delicatessen ≤ several times a month	75.9	72.9	78.9
Oils and/or nuts everyday	24.8	25.7	23.9
Fish ≥ once a week	19.1	20.0	18.3
Pastry ≤ several times a month	20.6	17.1	23.9
Fast food ≤ several times a month	75.2	72.9	77.5
Carbonated sweetened beverages ≤ several times a month	49.6	67.1	32.4***
Non-carbonated sweetened beverages ≤ several times a month	44.7	60.0	29.5***
Low alcohol content beverages ≤ several times a month	83.7	87.1	80.3
High alcohol content beverages ≤ several times a month	95.0	92.8	97.2

Significant gender-related differences:*** $P < 0.001$, * $P < 0.05$

a month), and proper fluid repletion (69.5%). Everyday consumption of fruits, fruit juices, vegetables, and low-fat dairy products was declared on average by every second participant. Detailed analysis of the intake of various groups of food products suggests that respective recommendations are followed to a limited extent, particularly in regards to reduced consumption of high-fat dairy products (21.3%), pastry (20.6%), as well as to consuming fish at least once a week (19.1%), and everyday consumption of brown bread (24.1%), oils and nuts (24.8%) and vegetable juices (19.9%). Compared to men, women more frequently declared a reduced consumption of carbonated (67.1% vs. 32.4%) and non-carbonated sweetened beverages (60.0% vs. 29.5%; $P < 0.001$), and a daily consumption of vegetables (57.1% vs. 36.6%; $P < 0.05$) (Table 2).

Discussion

This study revealed that the participants followed quantitative recommendations included in the Swiss food pyramid for sportspersons to a limited extent, and that several nutritional choices were modulated by participants' gender.

Most of our subjects (69.5%) followed recommendations pertaining to fluid repletion, drinking 1-2 liters of non-sweetened beverages in the form of mineral water or fruit tea, and additionally consuming

400-800 ml of isotonic drinks per one hour of training. Proper repletion of fluids is vital to maintaining water-electrolyte balance, preventing dehydration and optimizing physical fitness of an athlete [3]. Only in the case of approximately one half of examined athletes daily dietary intake included fruits and vegetables, these being moderate- and low-glycemic index sources of assimilated carbohydrates, dietary fiber, minerals and vitamins, including antioxidant vitamins. Of note, daily consumption of vegetables was significantly more common in women than in men (57.1% vs. 36.6%; $P < 0.05$). A comparison of our results to recommended levels of vegetable (3 portions daily) and fruit (2 portions daily) consumption revealed an insufficient ingestion of these products [4,5]. Vegetables were consumed 4-5 times per week on average, more frequently by women than by men (5.37 vs. 4.96; $P < 0.05$). Average consumption of fruits was slightly higher (5.39) and not statistically influenced by participants' gender. The fraction of athletes who replaced one portion of fruits and vegetables with one portion of fruit and vegetable juice amounted to 19.9% and 48.2% ($P < 0.001$), respectively; this corresponded to a lower average consumption of vegetable juices when compared to fruit juices (3.57 vs. 5.18). Complex carbohydrates, predominating in potatoes, cereal products and legumes, should be the main source of

energy in an adequate diet. Whole grain cereal products and legumes have a unique nutritional value due to a high content of various fractions of dietary fiber and a lower glycemic index score. This latter parameter should be considered in planning nutrition for sportspersons during peri-exercise period. Amongst starch products, examined athletes most frequently (4-5 times per week on average) consumed cereal products of high grist (4.96), followed by whole grain cereal products (4.36), legumes (3.83), and groats (2.89). This observed frequency of consumption was insufficient, since products from this group should be included in all main daily meals, particularly during intense physical exercise when energetic requirements increase. Additionally, the athletes were found to prefer white over brown bread (48.9% vs. 24.1%; $P < 0.001$) and this was also found to be an unfavorable aspect of their daily dietary intake.

Generally, physical exercise is characterized by an increased requirement for protein, and according to the Swiss food pyramid, athletes should choose between one portion of meat, fish, eggs, cheese or other sources of protein (e.g. tofu) daily, and additionally enrich their diets with three portions of low-fat dairy products [4,5]. Low-fat dairy products were more frequently preferred by women than by men (5.23 vs. 4.71; $P < 0.05$), and high-fat dairy products (4.56) predominated amongst protein-rich products that were most frequently consumed by our subjects. Poultry meat and poultry sausages were consumed twice a week on average (4.18-4.12), similar to pork meat (3.87). Fish and pork sausages were consumed least frequently, approximately several times a month. In summary, our study revealed an insufficient consumption of low-fat dairy products (only 45.4% of participants consumed them every day). Furthermore, a low percentage of participants reduced the ingestion of high-fat dairy products (21.3%), pork meat (41.4%) and consumed fish at least once a week (19.1%). These nutritional deviations can result in deficiency of calcium and omega-3 polyunsaturated fatty acids. Reduced consumption of high-fat dairy products and pork meat, and a higher ingestion of marine fish promote the proper composition of fatty acids in dietary intake, positively influencing the lipid profile of blood and playing a vital role in the prevention of coronary heart disease [7]. Optimizing blood lipid profile also favors a diet rich in vegetable oils and nuts, that the Swiss pyramid recommends for daily consumption in moderate amounts [6]. Our results indicate however a limited share of these products in the usual diet of athletes. Pastry, consumed several times a week on average (4.51), predominated amongst products from the top of the Swiss food pyramid, i.e. those whose consumption should be reduced. Only 20.6% of our participants declared a decreased consumption of

these products. Excessive consumption of sweets is generally inconsistent with dietary recommendations but in the case of sportspersons can cover higher energy requirements [4,8]. Sportsmen consumed non-carbonated sweetened and carbonated sweetened beverages significantly more frequently (more than twice a week) than sportswomen (several times a month on average) ($P < 0.001$). Reduced consumption of sweetened beverages was declared by approximately 2/3 of women and less than 1/3 of men ($P < 0.001$). Previous studies confirmed a significant involvement of sweetened non-alcoholic beverages in increased energetic value of dietary intake of young Belgian sprinters [9]. Amongst alcoholic beverages, examined athletes preferred low alcohol content rather than high alcohol content drinks (2.49 vs. 2.13); however, only 29.8% of our participants declared abstinence of high alcohol content drinks consumption. In the case of sportspersons, drinking alcoholic and low-sodium beverages can delay biological regeneration [4,5].

Nutritional abnormalities and qualitative mistakes observed in our subjects were consistent with the results reported by other authors from Polish and foreign centers, who examined professional athletes engaged in various sport disciplines. Moreover, these studies revealed an insufficient frequency of consumption of several groups of food products, such as whole grain cereal products, vegetables, fruits, dairy products and fish [9-13]. Additionally, other dietary abnormalities observed in our study, namely excessive consumption of pastry and sweetened beverages confirmed previous findings reported from professional athletes [9,14]. Low consumption of fruits and vegetables, frequently reported in sportspersons, is reflected by an inadequate supply of several antioxidant vitamins [10,11,15]; this in turn is unfavorable during intense physical exercise, due to the associated oxidative stress. Furthermore, athletes' exercise abilities, reported in various groups of sportspersons, can be restricted as a result of vitamin B complex deficiencies [16-18]. Studies of various populations, including athletes, revealed that low frequency of consumption of dairy products promotes calcium deficiency [10,15,16,18-22] and unfavorable calcium to phosphorus ratio. Another qualitative nutritional mistake observed in various groups of athletes has been found to relate to the unbalanced supply of energy, specifically a low partaking of carbohydrates and an excessive input of fats [9,10,23,24]. Furthermore, low consumption of whole grain cereal products, fruits and vegetables promotes a deficiency of dietary fiber, which has also been often reported in physically active individuals [9,19,22,23].

As suggested by the results of many previous studies, an incomplete implementation of qualitative nutritional recommendations by participants possibly

resulted in unbalanced supply of several nutrients, potentially decreasing the effectiveness of training.

Conclusions

1. Examined groups of athletes did not fulfill the qualitative recommendations included in the Swiss food pyramid, particularly in regards to the frequency of consumption of vegetables, fruits, whole grain cereal products, low-fat dairy products, fish, oils, nuts and pastry.
2. The preferred feeding behavior in the group of athletes were related to limiting the consumption of pork meat, fast food products and alcoholic beverages and proper fluid resuscitation.
3. Several nutritional choices were modulated by participants' gender; the recommendations included in the Swiss food pyramid were more frequently followed by sportswomen than by sportsmen.

Declaration of interest

The authors report no conflicts of interest.

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