

THE INFLUENCE OF DIET ON SPORTS PERFORMANCE IN JUNIOR SKIERS 15-17 YEARS

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Abstract: *One of the balance factors of the body is a rational diet that ensures a normal metabolism and perfect health necessary to support sports performance. Correction of unhealthy habits from a nutritional point of view, for the athletes of two targeted clubs: CSS Baia Sprie, respectively CS Alpina Baia Mare. The research of the effects was carried out for a period of 6 months, from October 2018 to March 2019, to correct unhealthy eating habits on the parameters, anthropometric to performance skiers, applying specific nutrition. Given the specificity of the pilot study performed, on the two samples equal in size, for the data analysis we applied the Wilcoxon test. Three of the determined parameters underwent significant changes (fat, water and bones), so the results of the Wilcoxon test indicate that the null hypothesis (H₀) is rejected, so the measured values of these variables differ significantly.*

Key words: *performance, nutrition, sports.*

1. Introduction

One of the balance factors of the body is a rational diet that ensures a normal metabolism and perfect health. In order to ensure the proper functioning of the body and the nervous system, diet is a fundamental condition, its application in the case of athletes, largely ensures the achievement of valuable performance, as

well as the correction of unhealthy habits from a nutritional point of view.

Most of the time, athletes do not know what healthy foods are, which is why they make eating mistakes with repercussions on performance. One of them is related to the consumption of foods rich in trans fatty acids, which are obtained by partial hydrogenation of vegetable oils. Their consumption is associated with an

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increased risk of cardiovascular disease. They are generally found in foods that are rich in refined carbohydrates, so they are a source of weight gain and the onset of type 2 diabetes.

To correct these choices, experts recommend the consumption of whole milk which is argued by the fact that they are rich in vitamin A and D which are fat soluble. The essential role of vitamin D in the assimilation of calcium and phosphorus in the small intestine has already been studied and demonstrated. In addition, this vitamin is responsible for fixing them in the bones and teeth. Vitamin A ensures the proper functioning of the whole body by being necessary for the production of rhodopsin - the pigment responsible for twilight and night vision. Vitamin A has a strong antioxidant effect. It is associated with maintaining a constant level of cholesterol and thus with a low incidence of cardiovascular disease. It contributes to the development of bones, protects the immune system, and in case of inflammation or infection helps us to heal faster. If the products are defatted, they are deprived of these vitamins essential for the proper functioning of the human body. Moreover, according to the American Heart Association, diets high in monounsaturated plant fats can reduce the risk of death from cardiovascular disease. Monounsaturated fats also reduce the risk of cancer. Among the sources rich in monounsaturated fatty acids we have: avocado, nuts, seeds, olive oil. Polyunsaturated fatty acids also have beneficial effects on the body. Omega-3 fatty acids have a beneficial role on cardiovascular diseases: they reduce triglyceride levels (proposed mechanisms: decreased hepatic synthesis of VLDL particles, increased lipoprotein lipase

activity) [5]. The sources that contain these acids are: flaxseed oil, rapeseed, marine fish. Omega-6 fatty acids are known for their anti-inflammatory properties. According to Health aging administration, nutrition suppresses the production of adhesion molecules, chemokines and interleukins, which are the key mediators of the atherosclerosis process. They are found in sunflower oil and corn oil. Omega-9 fatty acids can reduce cardiovascular risk, including the risk of heart attack. They lower the concentration of low-density lipoproteins in the blood-LDL and increase the concentration of HDL. In addition, a study published in the American Journal of Nutrition found that oleic acid (omega-9 acid) has the ability to reduce anger. It seems that aggression can be combated by eating, if it is rich in Omega 9. A healthier diet, composed mainly of healthy fats, proteins and a low level of carbohydrates, will positively influence the sports performance of skiers [18].

The aim of our study was to correct their unhealthy nutritional habits.

2. Methods Research period and the subjects

This study started from the hypothesis of increasing the performance in terms of nutrition, finding a specific correction of unhealthy habits or behaviors. Following the application of nutrition and physical activity questionnaires, we tried to find out how children feed themselves in their daily lives. From the subjects' answers we could see that their diet is not suitable for their lifestyle, and it is not healthy for a growing and developing organism.

Carrying out the preliminary study, at the athletes of two targeted clubs: CSS

Baia Sprie, respectively CS Alpina Baia Mare, for a period of 6 months, from October 2018 to March 2019. Initial and final tests were performed, correcting unhealthy habits in from a nutritional point of view, applying a specific diet, on groups of subjects from the two sports clubs, with the aim of testing the whole system to correct or modify any errors, thus analyzing anthropometric parameters: BMI, Weight, Percentage of fat and muscle mass.

The Wilcoxon test was applied for data analysis. This type of statistical test is mainly used to identify the statistical significance of the differences identified for the variables in the dependent samples (repeated measurements of the same respondents) and measured using ordinal scales. Thus, for each respondent in each sample, the body composition elements such as fat mass (fat) and non-fat mass (bones, muscle, water) were measured at 6 months.

3. Results and Discussions

The first measure applied to the eating behavior of athletes was the replacement of foods containing refined carbohydrates (cakes, chocolate, candy, pastries) with foods rich in complex carbohydrates (called good carbohydrates). It is important to know that complex carbohydrates are first converted into

simple carbohydrates and only later are they absorbed. Thus, they are absorbed in a longer time. This produces a number of benefits for the body: prolonged satiety, avoidance of sudden increase in blood sugar. Moreover, over time it positively influences the synthesis of high-density lipoproteins - HDL, and thereby contributes to reducing the incidence of cardiovascular disease. It has also been tried, even if there is currently a real debate on healthy vs. unhealthy fatty acids, to advise athletes to consume as much healthy fat as possible.

The second measure was to replace foods rich in industrially obtained trans fats (such as fats used in the manufacture of biscuits, pastries, margarines, spreads) with foods rich in saturated fatty acids and especially unsaturated fatty acids. In addition, we suggested that subjects replace skimmed milk products with whole milk products.

Following the results presented in tables 1 and 2, recommendations were given for healthy eating, alternatives for daily food choices. The food recommendations were offered nominally, customized for each athlete, depending on their diet, lifestyle and special preferences. Each child in the control group has agreed to follow the nutritionist's healthy suggestions, and will give up harmful or unhealthy foods for the 6 months of study shown in the table below:

Crt. No.	Sports initials	OCTOBER 2018							MARCH 2019						
		Height CM	Weight KG	Fat %	Water %	Muscle %	Bone KG	Index Mass	Index CM	Height KG	Weight %	Water %	Muscle %	Bone KG	Index Mass
1	F.I	1.6	36	15	65	46	9	14.6	1.64	44.4	10.4	66.9	46.2	10	16.73
2	H.A.	1.85	76.1	8.5	61.5	45.9	13.4	22.2	1.9	77.7	6.7	63.8	47.8	13.8	21.88
3	R.J.	1.65	56	17.1	58.2	41.9	11.1	20.6	1.68	60.8	14.8	58.5	41.3	11.7	21.26
4	T.R.	1.62	46.9	8.6	62.7	48.1	10.2	17.9	1.68	58.7	7.4	64.6	49.3	11.4	20.9
5	B.A.	1.63	54.6	17.9	56.9	41.3	10.9	20.6	1.68	57.2	17.9	53.3	37.6	11.2	20.94
6	H.I	1.53	51.1	21.7	54.4	38.9	10.3	21.8	1.57	52.7	15.7	59	41	10.7	21.5
7	B.I	1.45	43.8	22.1	54.6	39.2	9.3	20.8	1.47	45	13.8	70	50.6	9.5	20.82
8	B.M.	1.75	54.2	6.3	65.7	49.7	11.2	17.7	1.8	56.1	5.6	6.8	51.6	11.7	17.59
9	T.P.	1.43	30.4	13.8	68	17.8	8.2	14.9	1.45	33.8	10.2	70	49.3	8.9	15.95
10	C.R.	1.5	33.3	5.7	70	57.7	8.7	14.8	1.53	35	5	72	58	8.8	14.95

Crt. No.	Sports initials	OCTOBER 2018							MARCH 2019						
		Height CM	Weight KG	Fat %	Water %	Muscle %	Bone KG	Index Mass	Index CM	Height KG	Weight %	Water %	Muscle %	Bone KG	Index Mass
1	M.I.	1.35	26.4	13.8	70	50.6	7.5	14.9	1.39	27.6	12	70	50	7.9	14.8
2	N.A.	1.41	28.5	7.8	65	58	6.9	14.08	1.45	33.8	10.2	70	58.3	6.9	15.95
3	L.Z.	1.4	35.5	9.2	67.7	52.9	8.4	18.1	1.45	36	15.8	68	53	8.5	17.18
4	B.D.	1.58	42.4	17.6	58.2	41.3	9.7	17	1.63	45.9	20	57.1	40.7	10.2	17.31
5	P.C.	1.3	37.5	20.6	59.4	43.2	8.3	22.2	1.33	39.2	18	62.8	43.7	8.6	19.9
6	B.M.	1.57	50.7	18.8	56.7	40.8	10.2	20.6	1.57	52.7	20	60	41	10.7	21.5
7	B.M.	1.45	40	6	68	53.5	8.9	19.02	1.48	40	9	70	61.5	9	18.26
8	N.V.	1.44	42.4	8.1	67.2	51.8	9.2	20.4	1.45	44	15	68	50	9.2	20.93
9	B.C.	1.43	35	5.7	70	54	9.2	20.93	1.47	41.1	8.3	70	54.5	9.2	19.4
10	B.A.	1.47	35.8	5.8	70	57.1	8.8	16.2	1.5	35	10	71	58	8.8	15.79

The 2 hypotheses of the Wilcoxon test are expressed as follows:

H0: There are NO significant differences between the two variables.

H1: The two variables differ significantly. (H1) or whether there are no significant differences between them (H0).

As can be seen from the two tables, the differences between the two groups are not statistically significant in terms of the

preliminary study. After the correction of unhealthy habits, a statistically significant reduction in the percentage of fat is observed (tables 3, 4 and 12).

This is somewhat normal because refined carbohydrates are responsible in the long run for increasing this parameter.

Statistical results Wilcoxon test, CSS Baia Sprie, "Fat" indicator/ Fat test summary.

Hypothesis Test Summary

Table 3

	Null Hypothesis	Test	Sig	Decision
1	The median of differences between FAT_OCT2018 and FAT_MART2019 equals 0.	Related Tamples Wilcoxon Signed Rank Test	.008	Reject the null hypothesis

Asymptotic significances are displayed. The significance level is .05

The obtained result indicates that the null hypothesis is rejected, so the H1 hypothesis is accepted, the two variables

differ significantly, in other words there is a significant change between the 2 variables on the group of subjects in the experiment.

Ranks

Table 4

		N	Mean Rank	Sum of Ranks
FAT_MAR2019	Negative Ranks	9 ^a	5.00	45.00
	Positive Ranks	0 ^b	.00	.00
FAT_OCT2018	Ties	1 ^c		
Total		10		

- a. FAT_MAR2019 < FAT_OCT2018
- Significant reduction in fat
- b. FAT_MAR2019 > FAT_OCT2018
- c. FAT_MAR2019 = FAT_OCT2018

Contrary to what we expected, our results (Table 5) show that hydration decreased statistically insignificantly towards the end of the experiment.

A possible explanation could be given by the intense trainings at the end of the period compared to the beginning of the experiment period, in which the athletes were less trained (intercompetitive period).

Statistical results Wilcoxon test, CSS Baia Sprie, "Water" indicator:

Water test summary Hypothesis Test Summary

Table 5

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between Water_OCT2018 and Water_MART2019 equals 0.	Related Tamples Wilcoxon Signed Rank Test	.047	Reject the null hypothesis

Asymptotic significances are displayed. The significance level is .05

The obtained result indicates that the null hypothesis is rejected, so the H1 hypothesis is accepted, the two variables differ significantly, in other words there is a significant change between the 2 variables on the group of subjects in the experiment.

Ranks

Table 6

		N	Mean Rank	Sum of Ranks
WATER_MAR2019 - WATER_OCT2018	Negative Ranks	1 ^a	8.00	8.00
	Positive Ranks	9 ^b	5.22	47.00
	Ties	0 ^c		
	Total	10		

- a. WATER_MAR2019 < WATER_OCT2018
- b. WATER_MAR2019 > WATER_OCT2018 – improved hydration
- c. WATER_MAR2019 = WATER_OCT2018

As we can see in Tables 7, 8 and 13 there was a significant difference in muscle mass between the initial and final period of the experiment. These results are confirmed by the previous ones, because

when the percentage of fat decreases, it is normal for the muscle mass to increase (tab. 8). There is an inversely proportional relationship between the two. Another explanation can be given by the more intense workouts that are known to increase muscle mass. Statistical results Wilcoxon test, CSS Baia Sprie, "Musculature" indicator.

Muscle test summary /Hypothesis Test Summary

Table 7

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between MUSCLE_OCT2018 and MUSCLE_MART2019 equals 0.	Related Tamples Wilcoxon Signed Rank Test	.092	Retain the null hypothesis

Asymptotic significances are displayed. The significance level is .05

The result obtained indicates that the null hypothesis H0 is accepted in other words there is no significant change between the 2 variables on the group of subjects in the experiment.

Ranks Table 8

	N	N	Mean Rank	Sum of Ranks
2 ^a	Negative Ranks	2 ^a	5.50	11.00
8 ^b	Positive Ranks	8 ^b	5.50	44.00
0 ^c	Ties	0 ^c		
10	Total	10		

- a. MUSCLE_MAR2019 < MUSCLE_OCT2018
- b. MUSCLE_MAR2019 > MUSCLE_OCT2018
– significant increase in the indicator
- c. MUSCLE_MAR2019 = MUSCLE_OCT2018

deposition of calcium in the bones. And this result confirms that the subjects were responsible and faithfully adopted a healthy eating behavior. It is possible that this increase was also due to the fact that the subjects were teenagers and some of them grew in height. This explanation could be enhanced by the very significant increase in muscle mass.

As we expected, the bone mass increased, most likely due to a healthy diet, but also to the increase of physical activity which is known to enhance the

Bone test summary/ Hypothesis Test Summary Table 9

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between BONE_OCT2018 and BONE_MAR2019 equals 0.	Related Tamples Wilcoxon Signed Rank Test	.005	Reject the null hypothesis

Asymptotic significances are displayed. The significance level is .05.

The result obtained indicates that the null hypothesis is rejected, so the H1 hypothesis is accepted, the two variables differ significantly, in other words there is

a significant change between the variables on the group of subjects in the experiment.

Ranks Table 10

		N	Mean Rank	Sum of Ranks
BONE_MAR 2019 - BONE_OCT 2018	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	10 ^b	5.50	55.00
	Ties	0 ^c		
	Total	10		

- a. BONE_MAR2019 < OASE_OCT2018
- b. BONE_MAR2019 > OASE_OCT2018
– significant increase of the indicator
- c. BONE_MAR2019 = OASE_OCT2018

Even if we did not expect, the BMI increased at the end of the experiment.

This change may be due to an increase in muscle mass, bone mass or even the development of subjects, given that they were teenagers.

BMI test summary/ Hypothesis Test Summary

Table 11

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between IMC_OCT2018 and IMC_MART2019 equals 0.	Related Tamples Wilcoxon Signed Rank Test	.093	Reject the null hypothesis

Asymptotic significances are displayed. The significance level is .05

The result obtained indicates that the null hypothesis H0 is accepted, in other words there is no significant change between the

2 variables on the group of subjects in the experiment.

Ranks

Table 12

		N	Mean Rank	Sum of Ranks
IMC_MAR 2019 - IMC_OCT 2018	Negative Ranks	3 ^a	3.67	11.00
	Positive Ranks	7 ^b	6.29	44.00
	Ties	0 ^c		
	Total	10		

- a. IMC_MAR2019 < IMC_OCT2018
- b. IMC_MAR2019 > IMC_OCT2018
– significant increase in the indicator
- c. IMC_MAR2019 = IMC_OCT2018

(fat, water and bones) the results of the Wilcoxon test indicate that the null hypothesis (H0) is rejected, so the measured values of these variables differ significantly.

It can be seen in Table 12 that among the variables considered, for three of them

CSS Baia Sprie statistical descriptors

Table 13

Nr crt	Minimum	Maximum	Mean	Std. Deviation
1	5.70	22.10	13.6700	6.12156
2	5.00	17.90	10.7500	4.58215
3	54.40	70.00	61.7000	5.53273
4	53.30	72.00	64.6100	6.02614
5	17.80	57.70	42.6500	10.40067
6	37.60	58.00	47.2700	5.99167
7	8.20	13.40	10.2300	1.52902
8	8.80	13.80	10.7700	1.53047
9	14.60	22.20	18.5900	3.00867
10	14.95	21.88	19.2520	2.63626

Observation: Comparatively, there is a significant decrease in the amount of fat

and a major increase in muscle mass in the sample studied.

4. Conclusions and proposals

The general conclusion is to increase the performance of skiers through the applied nutrition, the explosive force increases for the athletes, the strength in speed regime and implicitly the sports performance will also increase.

The data can be used scientifically through articles and a guide for skiers (with the help of the Federation and the Ministry of Youth and Sports, given that there is currently no such thing).

Athletes demonstrated performance in increasing sports performance through the visible results observed after the application of the diet, according to the convention schedule made to the subjects accessed, category Juniors, athletes from CSS Baia Sprie - alpine skiing from the Pilot Sample analyzed, by comparison sports before and after the applied diet.

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