ORGINAL SCIENTIFIC PAPER

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UDK: 797.2.015 : 547.495.9
DOI: 10.7251/SIZEN0119012G

CREATIN AS A SUPPLEMENT IN NUTRITION AND EFFECTS ON SWIMMING

Abstract

The subject of the study is the effect of creatine on swimming speed. In previous studies, creatine monohydrate was thought to be an effective nutritional supplement currently available related to improving exercise results. Almost 70% of these studies report a significant improvement in exercise capacity, while in the other studies, no significant improvement in results was generally observed.The test was performed on a sample of 60 swimmers, members of the Academic Swimming Club "April 22" divided into three groups and ages from 21-25. All examinees are male and in good health. Examinees belonging to this population are at the zenith of their morphological and motor development and are well motivated to advance in swimming. The subjects were divided into three groups and engaged in recreational swimming until the application of this research.All three groups of swimmers performed a specific amount of swimming, which was accompanied by the plan for the development of swimming in recreation, with the first group of swimmers taking creatine in addition to swimming, the second group of swimmers doing fitness in addition to swimming, and the third group only swimming. The measurement was carried out at the end of May and half of June 2008 at the premises of the Recreation Center SrpskeToplice (water temperature 28 degrees C).Variablessemple referred to swimming speed at 50 m freestyle technique (both measurements and time differences) were used. Descriptive statistics indicators were used. The main objective of the study is to determine whether, with creatine ingestion, with a duration of three weeks, there are significant differences in the increase in swimming speeds compared to the training of strength and swimming training models. The results of the study, analyzed by t-test, show that the difference in swimming time of 50 m freestyle technique is statistically significant.

Keywords:*creatine monohydrate, nutrition, swimming, training, t-test*

INTRODUCTION

Creatine as a dietary supplement and physical exercise

The use of creatine as a supplement in sports has been accompanied by debate and misconceptions since it became very popular in the early 1990s. There have been anecdotes and media articles that have often claimed that creatine use is harmful and unnecessary; creatine use has often been associated with the harmful effects of anabolic steroids (Metzl, Small, Levine &Gershel, 2001).Many athletes and experts in the field have stated that the use of creatine as a dietary supplement is not only beneficial to the results achieved by athletes as well as various medical conditions, but is also clinically safe (Kreider, 1998). Although creatine has recently been accepted as a safe and useful ergogenic aid, several myths have spread about creatine as a dietary supplement:

1. Any weight gained while taking this supplement is due to water retention.
2. Taking creatine as a dietary supplement causes kidney fatigue / pain.
3. Taking creatine as a dietary supplement causes cramps, dehydration, and / or alteration the status of the electrolyte.
4. The long-term effects of taking creatine as a dietary supplement are completely unknown.
5. Creatine made using newer formulas is more useful than creatine monohydrate (CM) and causes fewer side effects.
6. Taking creatine as a dietary supplement is non-ethical and / or illegal.

While these myths are refuted by scientific research, the public is still exposed to mass media that may or may not have accurate information. Due to such harmful information combined with the fact that creatine has become one of the most popular dietary supplements on the market, it is very important to research the basic literature on creatine supplementation as a supplement to the human diet. The purpose of this review is to determine the current state of creatine-related knowledge as a dietary supplement so that reasonable guidelines can be established and less grounded fears may be exercised regarding its use.

BASIC FACTS

Creatine has become one of the most studied and scientifically evaluated nutritional ergogenic aids for athletes. In addition, creatine has been evaluated as a potential therapeutic agent for various medical conditions such as Alzheimer's and Parkinson's disease. Biochemically speaking, the energy transferred to adenosine diphosphate (ADP) and to adenosine triphosphate (ATP) during and after intense exercise depends largely on the amount of phosphocreatine (PCr) stored in the muscle (Chanutin, A 1926). As PCr supplies are consumed during intense exercise, the energy remaining available is reduced due to the inability to re-synthesize ATP at the rate required to support high intensity physical exercise.As a consequence, the ability to keep the workout level under maximum strain decreases. The availability of PCr in the muscles can significantly affect the amount of energy that is generated during short periods of high intensity exercise. Moreover, it is hypothetically thought that increasing creatine content in muscle, through the intake of creatine as a dietary supplement, can increase the ability to dispose of, allowing accelerated ATP re-synthesis during and after very intense, short exercises (Chanutin, A 1926). Theoretically, taking creatine as a dietary supplement during training can lead to greater adaptation to training due to the increased quality and volume of the exercises performed.When it comes to potential medical use, creatine is closely linked to numerous metabolic processes. For this reason, the potential therapeutic role of creatine supplementation in nutrition in a wide variety of patients has been explored in medicine. Creatine is chemically known as non-protein nitrogen; a mixture containing nitrogen but not in itself a protein(Brunzel, 2003). Its synthesis is performed in the liver and pancreas from the amino acids arginine, glycine, and methionine. Approximately 95% of creatine in the body is stored in skeletal muscle. In addition, small amounts of creatine are also found in the brain and testes (Hultman, Soderlund, Timmons, Cederblad&Greenhaff, 1996).About two thirds of the creatine contained in skeletal muscle is stored as phosphocreatine (PCr), while the remaining amount of creatine is stored as free creatine. The total amount of creatine (PCr + free creatine) in skeletal muscle averages about 120 grams per person weighing 70 kg. However, the average person has the ability to store up to 160 grams of creatine in the body under certain conditions.The body breaks down about 1-2% of the total amount of creatine per day (about 1-2 grams / day) in creatinine skeletal muscle. Creatinine is then excreted in the urine. Creatine supplies can be supplemented with creatine from food or through the endogenous synthesis of creatine from glycine, arginine, and methionine. Foods that are creatine sources include meat and fish.To obtain one gram of creatine, large quantities of fish and meat would have to be consumed. In contrast, creatine as a dietary supplement is an inexpensive and effective means of increasing the amount of creatine available without excessive intake of fat and / or protein.

The effect of supplementation on exercise and training results

The average improvement in results reported by surveys typically ranges between 10 and 15% depending on the variable of interest. For example, taking CM as a dietary supplement in the short term reports say that it improves maximal strength / stamina (5-15%), work done in sets of maximal effort muscular contractions (5-15%), single-effort sprint results (1- 5%), and work done during repetitive sprinting (5-15%). When taking CM as a dietary supplement for a long time, the overall quality of the workout seems to increase, giving a 5 to 15% greater increase in strength and results. Almost all studies indicate that "properly" taking CM increases body weight by about 1 to 2 kg in the first week of "supplementing".

The large amount of literature confirming the effectiveness of CM as a dietary supplement far exceeds the scope of this review. In short, reports indicate that after adapting to short-term CM supplementation as a dietary supplement, cyclical power, overall bench press work and jump squat increase, while also improving athletic performance in sprinting, swimming and (American) soccer (soccer). Results after adaptation to long-term CM uptake when CM combined with training include increases in creatine and PCr content in muscle, lean body mass, strength, sprint results, driving power, speed of power development, and muscle diameter (Preen, D, B Dawson , C Goodman, S Lawrence, J Beilby, S Ching 2001).

In long-term studies, it was typical that subjects taking CM received almost twice their body weight and / or fat-free mass (ie, an additional 2 to 4 pounds of muscle mass over 4 to 12 weeks of training) compared to subjects who were taking a placebo. Increased muscle mass appears to have been the result of an improved ability to perform high-intensity exercises via increased available PCr and enhanced ATP synthesis, allowing the athlete to train harder and further increase muscular hypertrophy via an increase in marked myosin heavy chain, probably due to an increase in myogenic (myogenic) regulatory factors of myogenin MRF (Willoughby, DS and JM Rosene 2003).

The huge number of research that has shown positive results from taking CM as a dietary supplement leads us to conclude that it is the most effective nutritional supplement available today to increase the ability to perform high-intensity exercises and build lean body mass.

METHOD

Subject of research

The subject of the study is the influence of creatine supplementation on swimming speed. In all likelihood, CM seems to be the most effective nutritional supplement currently available in relation to improving lean muscle mass and anaerobic capacity. To date, several hundred related studies have been performed to evaluate the effectiveness of CM as a dietary supplement to improve exercise results. Almost 70% of these studies report a significant improvement in exercise capacity, while in the other studies, no significant improvement in results was generally observed. No study has reported an ergolytic effect on results, although it has been suggested in some that weight gain, which is associated with CM taking, can be detrimental in sports such as swimming.

According to the problem and in accordance with the subject of the research, the main aim of this paper is to determine whether taking creatine supplement, lasting three weeks, has significant differences in the increase of swimming speeds compared to the power training and swimming training models.

In order to realize such a defined research goal, it is necessary to do the following tasks:

- Select an adequate sample of respondents whose characteristics will enable them to obtain valid data.
- Perform an initial measurement of swimming speed,
- Provide the experimental group with exactly the specified amount of creatine supplement for three weeks,
- Conduct training models for all three groups of three weeks of training in a defined scope of work,
- Conduct strength training on one group of subjects,
- Identify differences in swimming speed and body weight between groups of subjects after creatine supplementation (first group), strength training (second group), and the implemented swim training model (third group).

On the basis of the subject, purpose and tasks of the research, as well as on the results of previous research, it is possible to make the following hypotheses:

Hypotheses

1. H0 - no statistically significant changes in swimming speeds
2. H1 - there are statistically significant changes in swimming speeds

Sample of respondents

The test was performed on a sample of 60 swimmers members of the Academic Swimming Club "April 22" divided into three groups and ages 21-25. The examination was conducted on a voluntary basis. All examinees are male and in good health. Examinees belonging to this population are at the zenith of morphological and motor development and are well motivated to advance in swimming. Examinees engaged in recreational swimming until the application of this research.All three groups of swimmers performed a specific amount of swimming, which was accompanied by the plan for the development of swimming in recreation, with the first group of swimmers taking creatine supplementation in addition to swimming, the second group of swimmers doing fitness in addition to swimming, and the third group only swam.

Test description

The measurement was performed twice, at the end of May and half of June 2008, respectively, before and after taking creatine supplementation at the object of the Recreational Center SrpskeToplice (water temperature 28 degrees C).

Sample variables

All subjects were weighed in body weight and swimming time at 50 meters free style. After that, the first group of subjects used creatine, the third group subjects had fitness, and the second group subjects did not receive any additional therapies or training. After three weeks (21 days), all subjects were re-measured body weight and swimming time at 50 meters free style.

In addition to the variables mentioned, changes in body weight and swimming time were subsequent

Free style technique

Free Style is the fastest and most efficient swimmingtechnique in the competition. By creating continuous propulsive movements, the swimmer can move in the most uniform way through the water.

A way to take creatine

The order of magnitude of the increase in creatine content in skeletal muscle is important because studies have shown that changes in results achieved are correlated with this increase. The schedule of taking creatine as a dietary supplement in the literature is most commonly referred to as the "supplement" schedule. It is characteristic of this schedule that CM is taken at approximately 0.3 grams / kg / day for 5 - 7 days (eg ~ 5 grams taken four times daily) and later at 3-5 grams / day. Studies have shown that taking this schedule results in an increase of 10-40% of creatine in muscle and PCr in stocks.

RESULTS WITH DISCUSSION

Statistical data processing

Regarding statistical processing, descriptive statistics indicators (arithmetic mean, median, mode) were used to represent body weights (on the first measurement, on the second measurement and differences in weight) and time on the 50 m free style (on both measurements and differences in time),extreme values, rank, quartiles, variance, standard deviation, coefficient of variation).

Qualitative data (general changes in severity/weight and time) are presented through frequency

of occurrence and percentage representation.Student's t -tests for paired samples (within one group) and for independent samples (between different groups) were used to compare the mean values of the characteristics.A$\chi 2$ (hi square test) contingency test was used to compare the frequency of features between different groups.

Pearson's parameter correlation was used to determine the degree of correlation between the different variables for weight and time on the 50 m free style.All results, in addition to the table, are represented by graphical chart (histograms, box-plot diagrams and bar graphs).

The following were used for statistical processing, preparation and presentation of results: statistical software SPSS 16.0 for Windows; then Microsoft Office Excel 2007 and Microsoft Office Word 2007.

Table 1. Basic indicators of descriptive statistics throughout the sample

Total	time (before)	time (after)	time (difference)
Arithmetic mean	41.37	39.06	-2.31
High	57.83	53.95	5.52
Third Quartile	45.45	41.31	-0.64
Median	40.23	37.99	-1.82
First Quartile	37.02	35.53	-3.88
Low	28.28	28.84	-11.12
Rank	29.55	25.11	16.64
Mod	-	37.97	-4.06
Variance	36.77	25.10	8.69
Standard deviation	6.06	5.01	2.95
Coefficient of variation	14.66	12.83	-127.63

Table 1 shows that the average swim time per 50 m freestyle on the first measurement was 41.37 s. Half of the subjects swam 40.23 s or faster on the first measurement of the 50 m free style. The difference between the slowest (57.83 s) and the fastest examinee (28.28 s) is 29.55 s. Half of the subjects had a time of between 37.02 and 45.45 s in the 50 m free style. On the second measurement, the average time improved to 39.06 s, and at least half of the subjects had a time of 37.99 s or faster. On the second measurement, the difference between the slowest (53.95 s) and the fastest (28.84 s) was reduced to 25.11 s. 50% of the examinees had a time of between 35.53 and 41.31 s for the 50 m freestyle section. At least two subjects had a time of 37.97 s.

So, on average, examinees improved the time by 2.31 s. At least half of the examinees improved time by 1.82 s or more. The greatest progress was made by the examinees, who improved his time by 11.12 s, and the largest decrease from the first measurement was 5.52 s. 50% of examinees improved their time between 0.64 s and 3.88 s. At least two subjects improved time by exactly 4.06

Table 2. T-test (paired sample)

Total	**t**	**df**	**p**
Weight (before) - Weight (after)	-2.374	59	***0.021***
Time (before) - Time (after)	6.069	59	***0.000***

The T-test (Table 2) shows that the difference in swimming times of 50 m free style between the two measurements is extremely statistically significant.

Table 3. Pearson's correlation coefficient between the observed variables for the entire sample

Total		Time (before)	Time (after)	Time (difference)
Time (before)	r	1.000	***0.875***	***-0.569***
	p		***0.000***	***0.000***
Time (after)	r	***0.875***	1.000	-0.101
	p	***0.000***		0.444
Time (difference)	r	***-0.569***	-0.101	1.000
	p	***0.000***	0.444	

The parameter r in Table 3. represents Pearson's correlation coefficient showing the linear relationship between the variables.On the basis of the results shown in Table 4, a positive correlation is concluded, at the time of 50 m freestyle on the first and second measurements.

The time at 50 m freestyle on the first measurement is in the mean negative correlation with changes in the time between the two measurements.

So, in a very large number of cases, the subjects who swam faster on the first measurement were also faster on the second measurement.

Also, less regularity was observed that subjects who were heavier on the first measurement lost more weight between the two measurements. The correctness is that the respondents who had slower times on the first measurement improved their time after the second measurement.

Table 4. Basic indicators of descriptive statistics during the first group

Group I + Creatin	Time (before)	Time (after)	Time difference)
Arithmetic mean	40.63	39.59	-1.04
High	51.18	52.35	1.56
Third Quartile	43.45	40.99	0.59
Median	38.44	38.07	-0.86
First Quartile	36.95	36.74	-2.76
Low	35.08	32.36	-4.74

Rank	16.10	19.99	6.30
Mod	-	37.97	-
Variance	26.83	25.44	3.95
Standard deviation	5.18	5.04	1.99
Coefficient of variation	12.75	12.74	-191.88

Regarding the swimming time of the first group at 50 m free style (Table 4), we see that the average time at the first measurement was 40.63 s. Half of the examineesswam this distance in 38.44 seconds or faster. The difference between the slowest (51.18 s) and the fastest examinee (35.08 s) was 16.10 s on the first measurement. Half of the subjects in the first group recorded a time between 36.95 s and 43.45 s on the first measurement.The average swimming time of the first group was improved to 39.59 s on the second measurement, and at least 50% of the examinees had a time of 38.07 s or faster. At least two subjects had the same time - 37.97 s. The difference between the slowest (52.35 s) and the fastest (32.36 s) was increased to 19.99 s. Half of the subjects in the first group had a time between 36.74 s and 40.99 s.

So, after creatine therapy, subjects in the first group improved on average by 1.04 s, but half of the subjects improved their time by less than 0.86 s. The highest improvement was achieved by the examinee who improved his time by 4.74 s, and the highest recorded regression in the first group was 1.56 with a lower time compared to the first measurement.

Table 5. T-test (paired sample)

Group I	t	df	p
Weight (before) - Weight (after)	-5.742	19	***0.000***
Time (before) - Time (after)	2.331	19	***0.031***

The t-test (Table 5) shows that the difference in swimming time at 50 m free style in the subjects of the first group between the two statistically significant measurements.

Table 6. Pearson's correlation coefficient between the observed variables for the first group

Group I		Weight (before)	Time (before)	Weight (after)	Time (after)	Weight (difference)	Time (difference)
Weight (before)	r	1.000	***0.515***	***0.981***	***0.449***	*-0.367*	-0.205
	p		***0.020***	***0.000***	***0.047***	*0.112*	0.386
Time (before)	r	***0.515***	1.000	***0.487***	***0.925***	-0.280	-0.260
	p	***0.020***		***0.029***	***0.000***	0.232	0.269
Weight (after)	r	***0.981***	***0.487***	1.000	***0.446***	-0.180	-0.137
	p	***0.000***	***0.029***		***0.049***	0.448	0.564
Time (after)	r	***0.449***	***0.925***	***0.446***	1.000	-0.137	0.127
	p	***0.047***	***0.000***	***0.049***		0.565	0.593
Weight (difference)	r	-0.367	-0.280	-0.180	-0.137	1.000	0.382
	p	0.112	0.232	0.448	0.565		0.096
Time (difference)	r	-0.205	-0.260	-0.137	0.127	0.382	1.000
	p	0.386	0.269	0.564	0.593	0.096	

From Table 6 we can see that the weights on the first and second measurements, as well as the time on the first and second measurements, are in a very strong positive correlation.

Thus, examinees who were heavier on the first measurement were also heavier on the second measurement. Likewise, subjects who swam faster on the first measurement also swam faster on the second measurement.Also, the weight of the subjects on the first and second measurements correlated with a medium positive correlation with the time on the first and second measurements. Thus, subjects who were overweight swam more slowly at 50 m free style.

Table 7. Basic indicators of descriptive statistics during the second group

Group II	Time (before)	Time (after)	Time (difference)
Arithmetic mean	41.68	39.41	-2.27
High	57.83	53.95	5.52
Third Quartile	46.19	42.26	-0.53
Median	41.24	38.68	-1.74
First Quartile	36.69	35.62	-3.72
Low	28.28	28.84	-11.12
Rank	29.55	25.11	16.64
Mod	-	-	-
Variance	53.02	34.48	13.13
Standard deviation	7.28	5.87	3.62
Coefficient of variation	17.47	14.90	-159.75

In terms of swimming time at 50 m free style, the subjects of the second group (Table 7) averaged 41.68 s on the first measurement, and at least half of them swam this section by 41.24 s or faster. The difference between the slowest (57.83 s) and the fastest (28.28 s) was 29.55 s on the first measurement.On the second measurement, the subjects of the second group averaged 39.41 s, and at least 50% of them swam 50m for 38.68 s or faster. The difference between the fastest (28.84 s) and the slowest (53.95 s) was reduced to 25.11 s.

So, the subjects of the second group improved the time by 2.27 s on average between the two measurements, but half did not improve the time by more than 1.74 s. The time improvement average is increased by the examinees who improved their time by as much as 11.12 s. The most declining examinee spoiled his time by 5.52 s.

Table 8. T-test (paired sample)

Group II	t	df	p
Weight (before) - Weight (after)	3.199	19	***0.005***
Time (before) - Time (after)	2.799	19	***0.011***

The t-test (Table 8) shows that the difference in the time of the second group subjects between the two measurements is statistically significant.

Table 9. Pearson's correlation coefficient between the observed variables for the second group

Group II		Weight (before)	Time (before)	Weight (after)	Time (after)	Weight (difference)	Time (difference)
Weight (before)	r	1.000	-0.107	***0.995***	0.099	-0.398	0.374
	p		0.654	***0.000***	0.679	0.082	0.104
Time (before)	r	-0.107	1.000	-0.116	***0.870***	-0.050	***-0.600***
	p	0.654		0.625	***0.000***	0.833	***0.005***
Weight (after)	r	***0.995***	-0.116	1.000	0.101	-0.304	0.398
	p	***0.000***	0.625		0.672	0.193	0.082
Time (after)	r	0.099	***0.870***	0.101	1.000	-0.011	-0.127
	p	0.679	***0.000***	0.672		0.962	0.593
Weight (difference)	r	-0.398	-0.050	-0.304	-0.011	1.000	0.083
	p	0.082	0.833	0.193	0.962		0.729
Time (difference)	r	0.374	***-0.600***	0.398	-0.127	0.083	1.000
	p	0.104	***0.005***	0.082	0.593	0.729	

Table 9 shows that the weight on the first and the weight on the second measurement are in a very strong positive correlation, as well as the time on the first and second measurements. So, subjects who had more weight on the first measurement were heavier on the second measurement as well. Also, the examinees who swam 50m faster in swimming on the first measurement, generally repeated this on the second measurement.

In addition, there is a strong negative correlation between the time at the first measurement and the time difference between the two measurements, ie. subjects who swam slower on the first measurement improved their time more to the second measurement.

Table 10. Basic indicators of descriptive statistics during the third group

Group III + Fitness	Time (before)	Time (after)	Time (difference)
Arithmetic mean	41.81	38.18	-3.63
High	53.65	48.26	-0.78
Third Quartile	46.54	39.41	-1.48
Median	40.63	37.40	-3.21
First Quartile	37.32	35.45	-4.88
Low	33.46	32.50	-9.36
Rank	20.19	15.76	8.58
Mod	-	-	-3.21
Variance	33.45	16.78	6.39
Standard deviation	5.78	4.10	2.53
Coefficient of variation	13.83	10.73	-69.67

In the first measurement (Table 10), the subjects of the third group of 50 m free style swam for an average of 41.81 s, and at least half of them had a time of 40.63 s or faster. The difference between the slowest (53.65 s) and the fastest (33.46 s) was 20.19 s on the first measurement. 50% of the third group subjects had a time between 37.32 and 46.54 s.

On the second measurement, the average time of the third group subjects was improved to 38.18 s, and at least half of the subjects had a time of 37.40 s or faster. The difference between the slowest (48.26 s) and the fastest (32.50 s) was reduced to 15.76 s. Half of the subjects (medium-fast) had a time between 35.45 and 39.41 s.So, the third group of examinees improved their average time by 3.63 s, and at least half of them improved their time by at least 3.21 s. The most advanced subjects improved time by 9.36 s, and the least advanced subjects improved time by 0.78 s. It is noted that only in this group did all examinees improve their swimming time on the second measurement.

Table 11. T-test (paired sample)

Group III	t	df	p
Weight (before) - Weight (after)	-2.101	19	***0.049***
Time (before) - Time (after)	6.419	19	***0.000***

The t-test (Table 11) shows that the difference in the time of the third group subjects between the two measurements is extremely statistically significant.

Table 12. Pearson correlation coefficient between the observed variables for the third group

Group III		Weight (before)	Time (before)	Weight (after)	Time (after)	Weight (difference)	Time (difference)
Weight (before)	r	1.000	-0.067	***0.996***	0.015	0.024	0.178
	p		0.779	***0.000***	0.948	0.919	0.452
Time (before)	r	-0.067	1.000	-0.030	***0.925***	0.419	***-0.789***
	p	0.779		0.901	***0.000***	0.066	***0.000***
Weight (after)	r	***0.996***	-0.030	1.000	0.054	0.112	0.156
	p	***0.000***	0.901		0.820	0.637	0.511
Time (after)	r	0.015	***0.925***	0.054	1.000	***0.444***	***-0.496***
	p	0.948	***0.000***	0.820		***0.050***	***0.026***
Weight (difference)	r	0.024	0.419	0.112	***0.444***	1.000	-0.238
	p	0.919	0.066	0.637	***0.050***		0.313
Time (difference)	r	0.178	***-0.789***	0.156	***-0.496***	-0.238	1.000
	p	0.452	***0.000***	0.511	***0.026***	0.313	

Table 12 shows that the subjects of the third group had very strong positive correlation on the first and second measurements, as well as the time on the first and second measurements. So, the examinees who weighed more on the first measurement, generally had more than the others on the second measurement. Likewise, examinees who were faster on the first measurement were generally faster on the second measurement as well.We note that for the examinee of this group, the difference in weight between the two measurements is in the strong positive correlation with the time on the second measurement, i.e. subjects who had better time on the second measurement, in many cases, lost less weight between the two measurements.

In the medium-strong negative correlation, the time on the second measurement and the difference in time between the two measurements, i. respondents who were slower on the second measurement in many cases improved their time on the second measurement more.

Also, in the very strong negative correlation are the time on the first measurement and the difference in measurement between the two measurements. So, examinees who were slower on the first measurement generally improved more on the time on the second measurement.

CONCLUSION

The test was performed on a sample of 60 swimmers members of the Academic Swimming Club "April 22" divided into three groups and ages 21-25. All examinees are male and in good health. Examinees belonging to this population are at the zenith of morphological and motor development and are well motivated to advance in swimming. The subjects were divided into three groups and engaged in recreational swimming until the application of this research.

All three groups of swimmers did a specific amount of swimming, which was accompanied by the plan for the development of swimming in recreation, with the first group of swimmers taking creatine in addition to swimming, the second group of swimmers doing fitness in addition to swimming, and the third group just swimming . The measurement was carried out at the end of May and half of June 2008 at the premises of the Recreation Center SrpskeToplice (water temperature 28 degrees C).A sample of variables referred to swimming speed at 50 m by the free technique (both measurements and time differences) were used. Descriptive statistics indicators were used.

The subject of the study is the effect of creatine on swimming speed. In previous studies, creatine monohydrate was thought to be an effective nutritional supplement currently available related to improving exercise results. Almost 70% of these studies report a significant improvement in exercise capacity, while in the other studies, no significant improvement in results was generally observed.The main objective of the study is to determine whether, with creatine ingestion, with a duration of three weeks, there are significant differences in the increase in swimming speeds compared to the training of strength and swimming training models. The results of the study, analyzed by t-test, show that the difference in swimming time of 50 m by the free style technique is statistically significant.

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e-mail:goran,grahovac@ffvis.unibl.org Translation into english: PhD. Jelena Grahovac pp. 12-22