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The effect of 14 days Beta-Alanin consumption on the non-aerobic power, tiredness index and blood lactate in the recovery cycle and a maximal activity among male athletes

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ABSTRACT

The main purpose of the study was to investigate the effect of 14 days Beta-Alanin supplementation on the power of the non-aerobic, tiredness index and blood lactate in the recovery cycle and the maximal activity among the male athletes. For the reason, about 20 soccer players voluntarily were taken up that they were ranging from 24.1± 5.19 years old having 4.9 ±184.9cm height and 9.30± 76.80kg for the experimental group and 4.55±22.4 years old for the control group. These participants were asked to have an intense workout before 24h and try to prevent any eating and drinking with beta-alanin ingredients before 48h. The first session had carried out only whenthe players were never taken any supplementations. After the test, the whole participants were taken blood sampling about 6min later. Also they were re-taken blood sampling after 15min recovery. After passing two weeks and the consumption of Beta-Alanin supplementation, the blood sampling achieved again over the whole participants in two shifts. The results of the study were analyzed by the use of SPSS Software and covariance analysis test along with a dependent variable (pre and post tests) in sig level equaling alpha 0.05 representing that the consumption of the Beta-Alanin with 4.8g dose for 14 days did not have any effect on the non-aerobic power, tiredness index and blood lactate during the recovery cycle after a maximal activity. Hence, the present study was not significant statistically and its hypotheses were rejected concluding that the consumption of Beta-Alanin with 4.8g dose for 14 days cannot play a key role in removing lactate during the recovery cycle after a maximal activity. Also it did not have any effects on the non-aerobic power of the whole players.

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INTRODUCTION

Usually the whole athletes try to access and reach to the highest level of their success challenging all about their performance efficiently. Strategies like the frequent practice methods, special food regime or dietary, the use of new equipments and the use of natural supplementations have been strongly applied by these athletes efficiently. Undoubtedly the genetic aptitude (congenital talent or prodigy) and the practice program are efficiently essential for the success of these athletes. The muscular tiredness is a complex phenomenon with multi-factors case that has not been recognized well yet. Some of the most apparent factors regarding to the tiredness are as following: controlling the energy-producing enzymes, the reduction of calcium (Ca++), the sensitivity of the contraction system, the reduction, release and retake of Calcium from the sarcoplasmic and the reduction of the energy savings.

During the short term workout with high intensity, the different metabolites such as adenosine di phosphate, non-organic phosphate, lactate and internal hydrogen ions can be accumulated into the muscles. Recently, the role of these metabolites has been questioned for the beginning of the muscular tiredness. Although the early observations have been shown the negative relationship between the lactate concentrations and the production of the power during the muscular tiredness, but it does not have a direct effect on the contractive performance or

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the providence of the energy in this case. Other studies have shown that the acidity can challenge the body during the sport activity and by the increase of the buffer capacity the short term sports will have the highest functions in this regard. In a high-intensity workout, glycolysis system will be acted as the early energy system producing acid lactic and H+ and as a result, the internal muscular PH will be reduced in this field. Hundreds of the energy-producing suggestive supplementations can be found in this case; anyway, little qualitative clinical experimentations have been proved the effect of these powerful or energy-producing materials yet. The application of the supplementation among the whole athletes has been strongly distributed and published. Therefore, many athletes are not aware of the scientific issues of using these energy-producing drugs. Indeed, these approaches may lead these athletes to get susceptible to the healthy problems having other dramatic and terrible consequences for their health. Hence, it is necessary to investigate these drugs before taking by athletes and coaches. The consumption of these energy-producing supplementations should be applied by a mental background recovering their sport function.There have been some benefits of using these supplements that one of them is to recover and foster the endurance and power, prevention of any tiredness and increase of the protein synthesis and glycogen. One of the most important supplementations that have been strongly taken by athletes is subjected to the consumption of Beta-Alanin. This Beta-Alanin is a non-necessary amino acid with hystidin considering a pre-requisite for Carnosin. It is shown that Beta-Alanin supplementation has some beneficent effects on the sport function variables such as cycling, ventilation threshold and tiredness period. For the reason, Beta-Alanin has a comprehensive application as a nutritional supplementation for recovering thethe performance of athletes during the workout in high intense practices. The increase of Carnosin through its buffer capacity and its ability for recovering the sensitivity of Myofibril Ca2+ can reduce the tiredness. Some studies have shown that Beta-Alanin supplementation can recover the capacity of the high intense practice retarding the muscular-neurotic tiredness and ventilation threshold increasing the VO2max period by obtaining the body net mass during the practice. In a study with the endurance practice, the degree of the tiredness recovery and body mass are increased potentially. Since the reported studies have reported the Carnosin levels in the contraction of the muscles and intense activities of the muscular aerobic system, it is supposed that the Beta-Alanin can assist to the aerobic performance [5]. The recent studies have shown that the application of the Beta-Alanin in a short term (for two weeks) can lead to increase the Carnosin concentration in muscles [1]. Usually in most cases the effect of the Bata-Alanin consumption on the accumulation metabolite has been evaluated as a buffer in this case. There are still some intrigues regarding to the daily consumption of Beta-Alanin to recover the physiological performance and sport issues. In the other hand, there are some controversial results in relation to the degree of the daily consumption ofBeta-Alanin to increase the Carnosin and its short term effect on the recovery cycle after a maximal activity. For the reason, it is observed in the present study that the accumulation of H+ in the blood can increase the tiredness feeling having a direct role in the tiredness [4]. The physio-chemical buffersof the muscle that Carnosin is one of them can make a defensive line against any PH local changes [4]. Along this, buffering H+ as being produced during these maximal activities is very valuable for athletes increasing their performance potentially. The Beta-Alanin buffering role due to Imidazol with pKa 6.83 in its combination and also the degree of the high concentration in the human skeletal muscles can be found. This subject has been confirmed by observing the highest concentration of Carnosin in the muscular fibers [3] experiencing the highest accumulation of H+ levels during a physical work so that in the isolated muscles, the lack of Carnosin can make tiredness due to the acidosis but when Carnosin occurs in the environment, this does not take place. Beta-Alanin is a speed limiting subtract being necessary for increasing the Carnosin muscular levels. However, some studies have shown that the Beta-Alanin supplementation can increase the muscular Carnosin levels playing a key role in the Base-Acid tampon capacity [3,1]. For example, Harris et al [3] observed about 42% increase of muscular carnosin levels after supplementing 3.2g daily beta-alanin and 64% increase with 6.4g daily beta-alanin for 4 weeks [3]. Thus, as it shown in early studies, it is represented the differences and controversies regarding to the different consumption of these supplementations and their different doses in a certified period of time. But the present study is aimed at investigating the degree of the lactate cleanness in the recovery cycles. It also tries to investigate the degree of Beta-Alanin supplementations in this course because today athletes try to back to their early situation after a maximal activity and this causes them to reach to a energetic and happy sport temperament eliminating the process of the sport tiredness having the highest readiness towards the competitions potentially. For the reason, the present study aims at assessing the effect of the 14 days consumption of Beta-Alanin supplementation in different tests obtaining various results in this pavement. Although Beta-Alanin supplementation does not have any effect in activities less than 1 minute particularly for athletes having 1-4 minutes activity, the importance of achieving the present study is getting precious in this field.Athletes having this kind of activity may pay attention to use these supplementations instead of drugs and other medications and they can provide their own expectations from these supplementations and drugs potentially.

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METHOD AND MATERIALS

The present study is an experimental type of study regarding to its application. The statistical population of the study includes male athletes of Shahin-Dezh Town using ZARRIN DANEH Soccer Team. About 20 male athletes ranging from 20 to 30 years old with equal body mass have been applied in this study. This number is used from 28 total players of the related team.Also the whole people had 2 to 3 sessions practice and physical workout during the week. According to the completed questionnaire, it is specified that none of these athletes had cardiac background or any other chronic diseases. Also these athletes were asked to complete their own consent form in order to participate in the present study. This number of athletes was divided into two experimental and control (medication-based) groups including 10 experimental people and ten control ones. The dose 4.8g daily for two weeks has been also investigated strongly in this regard.

Research completion method:

Due to the purposes of the study and after the agreement and satisfaction of the subjects, the investigation of the infectious disease, disorder and allergy, lack of taking drug and supplementation, lack of smoking, personal health, lack of having any bloody ulcers and the consent were carried out and then the data regarding to the same process was also gathered in the study. Complete explanation is given to the whole subjects of the study verbally and written forms. The whole subjects are trained to prevent any intense physical activity before and after the sport test for 48h before achieving the test. They have to prevent any dietary and supplementations or any other medications for 48h. In addition,the lack of taking tobacco, alcohol and caffeine should be stopped for 48h and eating food should be also prevented for 8 or 4 hours before the test. Also,the practice programs and consuming foods should be gathered for one week and one day before the test.Age, height, weight, sport history of every subject, the degree of the practice per week has been registered in special lists of the whole subjects.Then, every subject is used to determine the degree of lactate and their non-aerobic power. In other words, the whole subjects were blood-sampled in order to measure their lactate in the recovery cycle and they were re-sampled again after 15min. then, these athletes were divided into two experimental and control groups with Beta-Alanin 4.8g dosage and latter group with the same dosage glucose. After taking these supplementations, they were again re-sampled to determine the recovery cycle.

Practice protocol (how to achieve Rest test):

The whole subjects were asked to achieve the Rest test after 5min war-up workout. These have been achieved in pre and post tests along with doing stretching movements. The mean, minimum and tiredness index were also applied in order to measure the climax of the aerobic power. The Rest test includes 6 rapid running in 35m distance with the highest intensity being achieved in 10s at each iteration of the running. The subjects have to warm-up themselves before 5min beginning of the test. All records are registered in a konometer in the start line and 35m of the finish line. For making better results of the Rest test,the subjects should achieve every iteration with the highest intensity. This measures their maximum power, minimum power, mean power and tiredness index based on the test instructions.

Mean power = total 6 iterations of the running / 6 Index = (maximum power – minimum power) / total time of 6 iterations of tiredness Blood-sampling and experimental analysis:

In order to gather the maximum degree of lactate after 6min in the blood, after 6min, the arm vein of the athletes were blood-sampled in sitting position.

Due to the main purpose of the present study measuring the degree of the blood lactate in the recovery cycle, the whole players were blood-sampled in a one shift. Then they were re-sampled after 15min to determine the degree of the lactate in the blood. After passing two weeks, the achievement of the test and the consumption of the supplementation by the subjects were completed in the Rest test including 6 rapid running in 35m distance and again the blood samples were gathered in two different shifts. The blood sampling was achieved in two shifts and every phase has been achieved in a two shifts. In every shift, the sampling 4ml blood in arm vein as sitting position without using Torno-Kit has been carried out potentially. After blood sampling, the blood sample of the Vials including ethylene Di Amino Tetra Estates (EDTA) blood clot was transferred into the laboratory by keeping the temperature conditions in order to separate the plasma.In order to determine the degree of the blood lactate, the enzymatic method of Lactate LS was also applied efficiently. The test was achieved by the help of the Automated Analysis method separating the plasma from the blood. This instrument is called Alpha-Max that has been used in the present study. The carried out method try to transfer the recent lactate of the sample into the oxygenic water due to the effect of the oxidize lactate enzyme. The oxygenic water is transferred into a purple material in neighborhood of the peroxidize and 4-anti perin and a one exclusive chromogen increasing the light absorb in wavelength 540-660 nanometer with the degree of the lactate. zitCal U is also applied in order to calibrate the instrument that it has been put in the quality control and evaluation unit of the instrument.

Statistical method:

The software SPSS is used to represent and explain the results of the study. According to the results of Smirnov-Kolmograph test for every group (Beta-Alanin and pseudo-medication) that they are not significant in pre and post tests. The results of Levin test showed the homogeneity of the variances and the convergence assumption of the regressions slope was also established in this regard. The covariance analysis test with one dependent variable (pre test) and a one covariance (post test) were also applied in order to testify the hypotheses first to sixth of the present study. The sig level was considered as equal to alpha 0.05 in the study.

Results of research:

The obtained results of the present study have been represented in table 1 showing the standard deviation of the subjects' features and table 2 shows the descriptive statistics regarding to the maximum power, mean power, minimum power and tiredness index in pre and post tests and table 3 indicatesthe descriptive statistics regarding to the lactate degrees after activity and 15min after activity in pre and post tests. Table 4 shows a comparison between the mean of every index and their measurements in pre and post tests.

Table 1: mean and standard deviation of subjects' personal features by group separation

	Age (year)	Height (cm)	Weight (kg)
Beta-alanin group	5.19±24.1	4.9±184.9	76.80±9.30
Pseudo-medication group	4.55±22.4	7.5±177.8	9.48±71.60

Table 2: descriptive statistics regarding to the degrees of max and min power, mean power and tiredness index in pre and post tests

	Beta-alanin group		Pseudo-medication group	
	Pre test	Post test	Pre test	Post test
Max power (watt)	108.04±644.66	157.58±698.78	177.99±664.36	137.47±633.96
Mean power (watt)	106.91±544.60	80.54±575.56	135.71±545.26	127.92±511.15
Min power (watt)	114.74±453.44	56.84±471.04	115.33±461.11	123.51±416.15
Tiredness index (watt / seconds)	5.90±2.56	6.98±4.08	6.22±2.80	3.31±6.47

Table 3: descriptive statistics regarding to the degrees of the lactate after activity and 15min activity in pre and post tests

	Beta-alanin group		Pseudo-medication group	
	Pre test	Post test	Pre test	Post test
Lactate after activity (mmol / L)	14.633±73.050	32.464±89.550	19.190±64.100	20.275±76.500
Lactate 15min after activity (mmol /L)	7.100±31.050	27.687±49.840	7.681±27.150	15.420±41.120

Table 4: comparison of the means min power, min power and tiredness index and blood lactate in pre and post tests of every group (Beta-Alanin and pseudo-medications)

Statistical indices of the measured variables		Pre test	Post test	Mean changes	Result
		M±SD	M±SD		
Beta-alanin group	Max power (watt)	108.04±644.66	157.58±698.78	172.598±54.12	insignificant
	Mean power (watt)	106.91±544.60	80.54±575.56	98.067±30.95	insignificant
	Min power (watt)	114.74±453.44	56.84±471.04	121.944±17.60	insignificant
	Tiredness index (watt / seconds)	5.90±2.56	4.08±6.98	1.080±5.149	insignificant
	Blood lactate (mmol/ dl)	14.633±73.050	32.464±89.550	32.373±16.500	insignificant
	Blood lactate in recovery cycle after rest activity	7.100±31.050	27.687±49.840	26.406±18.790	insignificant
Pseudo-medication group	Max power (watt)	177.99±664.36	137.47±633.96	133.122±-27.398	insignificant
	Mean power (watt)	135.71±545.26	127.92±511.15	121.748±-34.11	insignificant
	Min power (watt)	115.33±461.11	123.51±416.15	140.565±-44.96	insignificant
	Tiredness index (watt / seconds)	2.80±6.22	3.31±6.47	0.254±2.267	insignificant
	Blood lactate (mmol / dl)	19.190±64.100	20.275±76.500	21.883±12.400	insignificant
	Blood lactate in recovery cycle after rest activity	7.681±27.150	15.420±41.120	12.907±13.970	insignificant

According to the obtained results, it can be concluded that the degrees of the max power, mean power, min power and the tiredness index and blood lactate in the maximal activity and also the recovery cycle in the maximal activity is not significant after taking a supplement consumption although there have been observed some changes in the activity of the Rest test in both groups of Beta-Alanin and pseudo-medication groups but these changes are not significant statistically.

Discussion and conclusion:

The main purpose of the study was to investigate the effect of 14 days Beta-Alanin supplementation on the power of the non-aerobic, tiredness index and blood lactate in the recovery cycle and the maximal activity among the male athletes. According to the obtained results of the study, it can be concluded that the consumption of Beta-Alanin with 4.8g dose does not have an influence on the maximal activity and recovery cycle and muscular neurotic tiredness as well as the blood accumulation. Along this, the studies of Hoffman et al, sweeni et al, Jagim (2010), Hill et al [1] are compatible together and the studies of Bagoot et al (2010), Jordan et al (2010), Stawt et al (2008), draw et al (2007) Emerson et al [2] are not compatible together. Draw et al (2007) reported that after taking the supplementation, the concentration of Carnosin 47% in the horse-shaped muscles and 37% in the twin muscles increased efficiently. It also is the little rate or percent of the increase has been seen by Hill. Hill et al [1] investigated the effect of Carnosin concentration of the muscle and cycling power in ten weeks supplementation of BA potentially. The concentration of Carnosin regarding to skeletal muscle increased to 60% of the consumption during 4 weeks and it reached to 20% after passing 10 weeks while the carnosin concentration is increased in contractive fibers and both types of the membranes were equal together. Of course there have been some reasons for these differences and one of them is subjected to the investigation of the carnosin concentration by the use of two different methods and two muscle groups being measured differently. Another explanation is that the approach of the consumption dosage led by Draw et al (2007) can be investigated after daily dose 4.8 g/day during 4 weeks while Hill observed the mean 5.2 g/day in this case. Suzuki et al (2002) investigated the relationship between the carnosin concentration of the skeletal muscle and sport performance for 30s of the maximal cycling in 11 healthy males. The results showed that there is a relationship between carnosin concentration and output power of 5s. However, it can be concluded that the carnosinconcentrationis an essential factor in the intense sports performance. Probably due to the consumed dosage being used by Suzuki et al, it could be taken place but Hill investigated the effect of four weeks Beta-Alanin supplementation on the three cycling activity and did not observe any effect on the consumption of Beta-Alanin and its output power. Sweeni et al (2010) carried out the effect of 5 weeks taking Beta-Alanin on the sport activity performance and intense interval sport issues that has been achieved on 19 healthy males in two groups. They used to take 4g daily in the study and then in the next week it is reached to 6g a day. The results of the study indicated that 5 weeks supplementation of BA did not have any effect on the rapid running performance efficiently. In a study led by Jagim (2010), the investigation of the BA effects on the sport performance of the rapid running in two different intensities was carried out efficiently. The subjects were established in two intensities of 115% and 145% in Vo2 peak in pre and post tests and they were supposed to take Beta-Alanin supplementation during 5 weeks. After the supplementation consumption cycle, there was no observed any significant difference between groups for the tiredness time. The same observations were obtained for the lactate response. Hoffman et al (2008) investigated the 30 days effect of taking Beta-Alanin on the endurance sport performance and endocratine changes in 8 healthy males potentially.The endurance sport activity protocol includes 6 squash movements with 12 iterations by 70% RM intensity. The results showed that 4 weeks consumption of BA can increase the endurance of the muscles during the endurance activities among the most experienced athletes but it did not any effect on the response of endocratine towards the sport stimuli. The main aim of Stwat et al (2008) is to investigate the effects of 90 days consumption of Beta-Alanin on their work capacity and activity in the threshold of tiredness (PWcft) among males and females. In the cycle of the pre and post consumption of the related supplementation, the subjects carried out an interval test to determine the degree of PWcft. There is observed a considerable increase in PWcft (28.6%) due to the effect of the supplementation consumption for group BA. They also concluded that these results indicate that 90 days consumption of BA may cause to increase the physical activity capacity by delaying the threshold of the muscular-neurotic between old males and females. The carried out research has been achieved due to its consumption cycle delaying the tiredness threshold between the whole subjects because there is a positive strongly probability of the consumption cycle in this regard. Bagoot et al (2010) carried out the effect of the acidosis reduction by BA consumption during the cycling. People consumed for 4 weeks a pseudo medication or Beta-Alanin with 4.8 g/day. Before and after the supplementation consumption, these people run about 6min on a treadmill with 70% intensity Vo2 peak. After taking BA in compare to Placebo, the sport acidosis is roughly reduced. These results show that the supplementation BA can cause to increase of the Carnosin. In another study led by Jordan et al (2010) the investigation of BA supplementation on the accumulation of the blood lactate (OBLA) was achieved during running case. 17 active males took BA supplementation with 6g/day dosage and the use of Maltovextrin as a pseudo medication for 28 days in this participation. Group BA did show any significant or considerable changes regarding to OBLA from 19.2 ± 161.6 to 9.9 ± 173 but in group PL no any changes observed in this case. The body mass is increased in group BA but no changes seen in PL. hence, BA supplementation for 28 days can recover the performance by delaying OBLA in this case. Emerson et al (2009) carried out the investigation of a recovery cycle after a tournament regarding to the blood lactate and the recovery of the judo athletes performance. The results showed that a short term recovery is very suitable (for 15min) to reduce the blood lactate than the inactive recovery increasing the chance of judo athletes for winning

the match potentially. The degree of the lactate is not subjected to the muscles' bruise (Carlson et al, 1975). Adding lactate into the external part of the muscle can reduce the tethanic force but it depends on the intracellular osmosis increase causing water to get out of the muscle cell in this case. Therefore the lactate intracellular accumulation is not the main factor of making the muscular tiredness (Allen et al, 2008). For the reason, one of the most important factors causing not to have any effects of Beta-Alanin on the recovery cycle in the present study, the degree of people's tiredness reduction can be observed. Due to the obtained results of the present study and carried out studies in this relation, the results are compatible with the studies of Jagim et al, Hoffman, Hill, Sweeni et al because the results have shown that the consumption of Beta-Alanin cannot merely reduce the blood lactate eliminating the tiredness and other factors such as taking the supplementation in different dosages, time of consumption and practice protocol can be applied in this regard. Also other different sports with different intensities can be effective in the degree of this supplementation because obtained results of other studies have shown that there are some controversies in representing the related results. Therefore it can be concluded that the consumption of Beta-Alanin for 14 days did not have any effect on the elimination of lactate. Also the results have shown that there is no any influence found on the recovery cycle after a maximal activity. Hence, the consumption of 2 weeks beta-Alanin did not have any effective influence on the degree of blood lactate in the recovery cycle efficiently.

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