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SHORT COMMUNICATION

EFFECT OF PLASMA CREATINE KINASE (CK) ACTIVITY ON THE RESULTS OF SPECIAL PHYSICAL ABILITY TESTS IN ELITE CLASSICAL STYLE WRESTLERS

W. Starosta[1], E. Hübner-Woźniak[2]

[1]Dept. of Kinesiology, Institute of Sport, Warsaw, Poland; [2]Dept. of Biochemistry, Academy of Physical Education, Warsaw, Poland

Abstract. The aim of this paper was gaining the knowledge if the creatine kinase activity (CK) in plasma, which is the index of muscle fibres injuries, has some influence on the motor ability tests results. Studies were conducted during a training camp. Eight elite wrestlers took part in the study and they performed a set of 7 efficiency tests during 2 days. The CK activities were marked in mornings – before tests. The lack of statistically significant correlations between test results, expressed by both – the absolute values an by points " T " scale, and the CK activity in plasma was stated. However, it seems that the efficiency tests, especially those engaging upper limbs and the trunk muscles, should not be conducted during large training loads employment because the tests results might be dependent on the level of disturbances of the muscle fibres homeostasis elicited by performed earlier physical effort.

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Key words: Creatine kinase - Special (motor) physical ability tests – Elite classical style wrestlers

Introduction

The physical effort may be the agent causing changes in the membrane permeability or even mechanical injuries of muscle fibres what leads as a consequence to the efflux of intracellular protein to the blood. The creatine kinase is one of those proteins. It is an enzyme located mainly in skeletal muscles. The activity of the above enzyme increases in plasma after the effort performance in a degree dependent on the scale of muscle cells damage and it is regarded as a sensitive and specific index of muscle fibres injury [5]. The time, intensity and the

Reprint request to: Prof. Włodzimierz Starosta, Dept. of Kinesiology, Institute of Sport, 2/16 Trylogii 2/16; 01-982 Warsaw 45, Poland; E-mail: wlodzimierz.starosta@insp.waw.pl

kind of performed muscle contractions are factors influencing the post effort increase of the CK activity in plasma. There was stated that the most evident post effort changes are elicited by the eccentric contractions which may cause the mechanical injuries of muscle fibres [7].

The sport success is difficult to accomplish and it demands special practice system containing the systematic control over the athletes training. Wrestling belongs to the group of sports demanding many motor abilities, both kinds – physical and co-ordination ones. The level of the above abilities was the issue of a long term researches conducted over the Polish National Wrestling Team [3,9-12]. The level of motor abilities of wrestlers of the specific weight categories in various training periods, its changes during a few years training observation and its connection with obtained sports results was examined basing on the general and special physical tests set [9-12]. The short version of the set, containing 6–7 efficiency tests was compiled after many modifications. The results gained by wrestlers were correlated with an anthropometric and physiological indices however, the influence of the functional state of muscles on test results was not evaluated yet.

The aim of this work was to establish if the creatine kinase activity (CK) in plasma, reflecting the muscle fibres damage range, has the influence on results of the special motoric ability tests performed by elite wrestlers.

Materials and Methods

Eight wrestlers of the classical style took part in the research. Their characteristics were: age 22.2±1.6 years; body mass 76.0±9.6 kg; body height 174.7±7.1 cm; training practice 9.3±2.9 years. All of the subjects accepted the research conditions alike the Board of Ethics by Institute of Sport which ratified the research protocol. All of the athletes had the national champion sport class. The examinations were performed during the training camp.

Athletes had 2 following days to accomplish the set of 7 motor abilities tests. Six of them containing a maximal vertical jump [8], a turnover race, a parallel bars pull up, bending and straightening of propped arms (before noon), 20 m run and a maximal load chest throw (in the afternoon) were performed on the first day. The second day was left for the 1500 m run (before noon). Results reached in the respective tests (time, number of repetitions, work performed) were evaluated using the 100-points “T” scale [9].

The blood for the creatine kinase activity determination was taken from the earlobe each morning, (CK; EC 2.7.3.2) before test. The enzyme activity was

determined in the centrifuged plasma spectrophotometrically at 340 nm, using the commercial kit (Analco, Poland) and expressed in $U \cdot l^{-1}$.

The statistical analysis was conducted using the t-Student test for dependent variables and by calculation of the simple correlation coefficients values according to Pearson. The level of $p<0.05$ was accepted as the statistically significant.

Discussion

The motor abilities tests results, evaluated in the "T"scale, were individually differentiated (Table 1). The average point valuation has exceeded the number of 50 points in every test. The highest number of points (73.6) was reached during the bars pull up and the lowest (51.3) during the 20 m run.

Table 1
The tests results expressed in a points "T" scale and the creatine kinase activity in plasma (n=8)

Motor abilities test	Points in the "T" scale	
	x±SD	Range
1. Maximal vertical jump	59.2±8.2	43.5–73.0
2. Turnover race	54.8±5.4	46.0–60.0
3. Bars pull up	73.6±10.4	54.0–85.5
4. Bending and straightening of propped arms	67.8±8.4	60.5–78.5
5. 20m run	51.3±6.6	41.5–59.0
6. Maximal load chest throw	56.3±7.1	46.0–67.5
7. 1500m run	52.4±3.5	46.5–57.5
CK activity in plasma		
1^{st} day, morning	723±359*	254–1134
2^{nd} day, morning	520±270	245–907

*Significantly higher in comparison to 2^{nd} day of examinations ($p<0.01$)

Every morning of tests the CK activity in plasma was exceeding the upper limit of the physiological level (to 80 $U \cdot l^{-1}$). High activities of this enzyme in plasma were the effect of training and physical loads used during the day preceding tests. Some significant, individual differences of the CK activity in plasma are the effect of various response of skeletal muscle on physical loads. It is the confirmation of results gained by Schwane *et al.* [7], who have shown that some examined subjects

have displayed especially high CK activity in plasma (so called high-response) after the eccentric effort. The wrestlers training encompasses exercises demanding the eccentric work what causes often the of the CK activity in plasma [4]. Hence the reason of high post exercise increase individually differentiated activities of the CK in plasma in the 1st day of examinations were training loads applied the day before. Four of examined subjects were characterized by particularly high CK activity: from 967 to 1134 $U \cdot l^{-1}$ (high-response) and the reaction of other athletes was slight (the CK activity from 254 to 519 $U \cdot l^{-1}$). The motor ability tests performed in the 1st day were not the strong effort impulse for examined athletes. It was confirmed by the significantly lower (about 30%) activity of the CK in plasma noticed on the second day morning. The CK activity decrease was similar in all subjects and independent on absolute activities of CK in plasma. It was pointed by the correlation between this enzyme activities on the 1st and 2nd day of studies ($r=0.98$; $p<0.05$). Decreased the CK activity in plasma despite of the performance of 6 motor ability tests proves the adaptation of the organism to the heavy physical effort. There was stated that the training diminishes the range of the post exercise CK activity changes in plasma what points out the growth of the muscle fibres tolerance on the effort impulse [1,6].

Table 2
Values of correlation coefficients between motor ability tests (in the absolute values and in points scale) and the CK activity in plasma

	r value	
Motor ability test	Result	Points
1. Maximal vertical jump (cm)	0.56	0.56
2. Turnover race (time)	-0.38	0.39
3. Bars pull up (work*)	-0.15	-0.01
4. Bending and straightening of propped arms (work*)	-0.46	-0.51
5. 20 m run (time)	-0.05	0.05
6. Maximal load chest throw (kg)	-0.21	-0.23
Sum of points from the 1st day	-	-0.08
7. 1500 m run (time)	-0.29	0.28

*The number of repetitions multiplied by the athlete's body mass

Values of coefficients of the correlation between motor ability tests (results - expressed in points scale) and the CK activity in plasma are presented in Table 2.

They show the lack of statistically significant relationships and run from r=-0.51 to r=0.56. The relationship between the sum of points gained by athletes during the 1st day and the CK activity was also not significant. Positive correlation coefficient values were connected with tests in which legs muscles were involved (the maximal vertical jump, a turnover race, 20 and 1500 m runs). However, where tests results were expressed in absolute values (time reached in running tests) the correlation coefficients were negative. Hence, we can assume that the functional state of muscles may influence the running speed. Only in a case of the maximal vertical jump the correlation coefficient value was stable, independently on correlated data. The highest negative correlation was observed as considering the bending and straightening of propped arms, in both measured qualities alike: points (r=-0.46) and performed work (r=-0.51). It is presumed that the performance of the above exercise might be dependent on the functional injury of muscle fibres caused by previous training. Negative correlations between results expressed both in points and absolute values and the CK activity in plasma were stated also in other tests involving the work of upper limbs and trunk. It may suggest that the upper body muscles were more seriously damaged as a consequence of previous training. It cannot be excluded that the lack of statistically significant relationships between results of motor ability tests and the CK activity in plasma flows from the fact that intra-muscle enzymes efflux to blood does not have to be accompanied by the lowering of mechanical muscles work indices [2].

Gained results point at the lack of statistically significant relationship between the functional state of muscles and the motor ability tests results. It may be elicited by too small examined group. It seems that motor ability tests (especially those engaging upper limbs and trunk muscles) should not be performed during the large training loads employment. Results reached in such a period may be dependent on the degree of muscles fibres homeostasis disturbances caused by performed earlier physical effort. Nevertheless, this subject requires further researches.

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