HYPEROXY AS A FORM OF ANAEROBIC WORKLOAD REDUCTION ON THE ELITE BASKETBALL PLAYERS

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Abstract
In our research we were monitoring reaction of the body of basketball players on the inhalation of oxygen concentrate of 99.5 %. We were testing sportsmen on treadmill and on specific basketball test – Jugo test. Our research showed that after inhalation of oxygen players had lower lactate level (after third time). We didn't find significant evidence that inhalation had positive effect on basketball players shooting. Result of our research is that inhalation of 99, 5% oxygen has positive effect during anaerobic loading in sport.

Key words: *oxygen, lactate, loading, basketball players*

Introduction

One of the most decisive factors defining actual playing capability of an athlete is connected to the altenate change in aerobic and anaerobic load. Majority of authors (Welch 1977, 1982, 1987; Gosselin et al. 2004; Prefaut, C. & Varray, A. 2004; Kocić 2005; Suchý et al. 2008) investigated the influence of hypoxy on human body as well as the impact of the functional abilities on the accomplishments of the elite basketball players.

Within the area of our project VEGA 1/4500/07 (Adaptedness to load in a yearly training cycle in different sports) the influence of 99.5% concentrated oxygen on bodies of two top league basketball players in Slovakia was researched.

Normally, oxygen concentration is 21% of air which is five times lower concentration of oxygen in the gaseous Oxyfit product inhaled by basketball players. Most crucial point in sport is to answer the question if it is possible to find the way to neutralize acute hypoxy caused by intensive workload. Similar to this is a question of disabling the production of lactic acid in muscles during strain. When the body enters the zone of anaerobic work lactate is accumulated and the inner balance of the body is disturbed. When lactic acid dissociates it forms lactate and hydrogen ions - which leads to an increase in acidity and causes inner changes in the body (Soumar, Soulek & Kučera, 2006).

Bunc et al. (1984) defined the 'anaerobic' or lactate threshold as based on the point at which blood lactate abruptly accumulates and is a breaking point of the curve of lactate dependence in relation to the workload. Bielik et al. (2006) consider 'anaerobic' or lactate threshold (ANP) as one of the most important variable to be used as a prediction for performance achievements in endurance sports.

Methods

Subject sample
This research comprised a sample of two basketball players (male and female) of the top quality league in Slovakia. Characteristics of the monitored athletes (Z.B. – female, aged: 22, body height: 176 cm, club: INPEK UKF Nitra and B.K. – male, aged: 26, body height: 176 cm, club: ŠKP Banská Bystrica).

Sample of measuring instruments
Researched athletes were tested on the comparative identical workload in standard conditions and then (after four days) an inhalation of 99.5% oxygen was applied. Testing was administered first in normal conditions and afterwards in hyperoxic environment whereby an athlete was given ten inhalations of 99.5% concentration of oxygen prior and after each workload. Basketball players participating in this research were subjected to the running tests in laboratory conditions in the interval of four days. Z.B. managed three tracks totalling 400 m reaching the speed of 16, 18 and 18,5 km.walk^{-1}. B.K. also managed three tracks totalling 400 m by 400 m, reaching the speed of 20 km. walk $^{-1}$ whereby the first track was run on a flat surface, the second track was run with the 2% steep and the third with the 4% steep. Both subjects were monitored for the lactate values upon the finishing of each track, upon finishing the first two tracks immediately after each track and after three minutes break. After the third track lactates were measured in the end after five minutes break and after 12 minutes break.

Upon the completion of the running test both subjects underwent subspecial basketball test – Jugo test (shooting from different positions for five minutes) whereby apart from the special basketball test the values of lactates were monitored in the end of the test and after the three minutes break.

Both tests were administered simultaneously after four days whereby both times subjects underwent two Jugo tests with the five minutes break.

Results and discussion

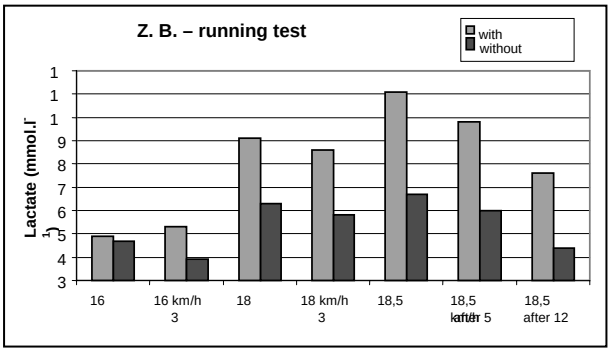

Chart 1 Values of lactate Ž.B. after running on the treadmill test

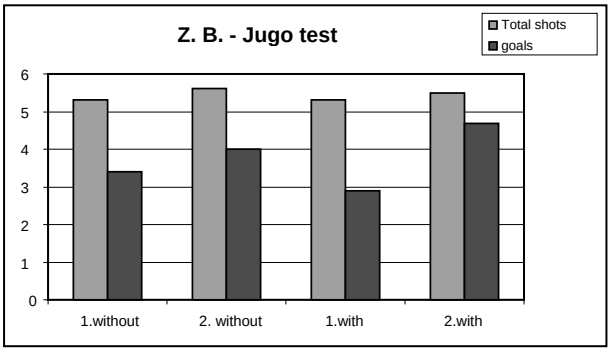

Chart 2 Effectiveness of Z.B.'s shooting in Jugo test

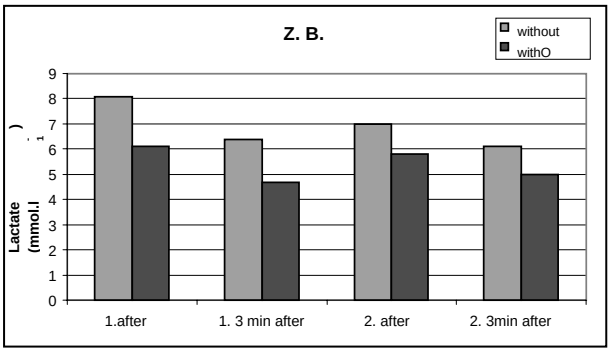

Chart 3 Comparison of lactate values at Z.B. after Jugo test

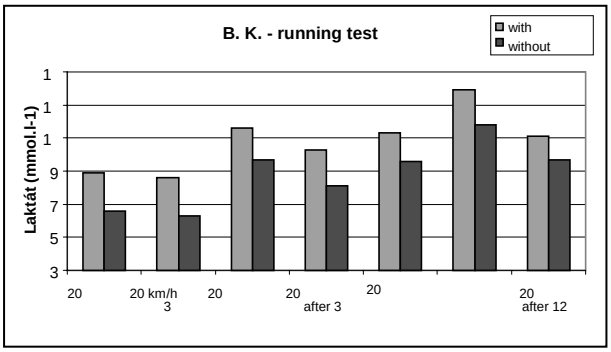

Chart 4 Values of lactate B.K. after running on the treadmill test

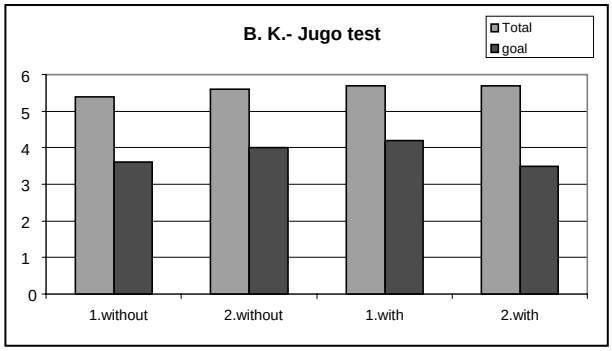

Chart 5 Effectiveness of B.K.'s shooting in Jugo test

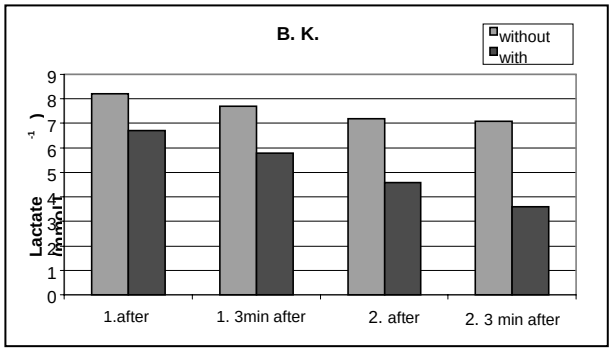

Chart 6 Comparison of lactate values at B.K. after Jugo test

The first tested basketball player Z.B. managed three 400 m tracks. As seen in Fig.1 within lower intensity efforts there did not occur bigger concentration of the lactate upon the finishing of the efforts and after the inhalation of the concentrated oxygen lactate value dropped for just 0,2 mmol.l^{-1}, which is neglectable in the sports practice. After the second run track causing higher intensity effort a difference in the lactate concentration showed significant values. Figure 1 shows that in the end of the second track at the speed of 18 km.walk^{-1} the lactate value was 9,1 mmol.l^{-1}, and after the inhalation of the concentrated oxygen lactate value ranged from 6,3 mmol.l^{-1}. Similar difference was obvious in lactate value after three minutes break.

The biggest difference occurred in the third run track performed with the highest intensity when the concentration of lactate reached 11,1 mmol.l^{-1} and then dropped to 6,7 mmol.l^{-1}. In sports practice this means a significant drop of concentration. There was a similar concentration of lactate after five, i.e.12 minutes break. In special basketball Jugo test there were no essential statistical differences. As seen in Fig.2 Z.B. had during the test without concentrated oxygen 53, i.e. 56 trials with 34, i.e. 40 successful shots. In the test with the inhalation of concentrated oxygen there were 53, i.e. 55 shoots and 29, i.e. 47 successful shots. Naturally 47 successful shots out of 55 is an excellent score but it cannot be related just to the inhalation of concentrated oxygen for the shooting precision is determined by many other factors.

Bearing in mind obtained results of physiological parameters higher values were shown in the concentration of the lactate after test taking. As seen in Fig. 3 in this special basketball test lactate value ranged in 8,1 mmol.l^{-1}, and after the inhalation of the concentrated oxygen it reached lactate value of 6,1 mmol.l^{-1}. In the second test the shift was from 7 mmol.l^{-1} to 5, 8 mmol.l^{-1}. As seen in Fig. 3 after rest there was a drop in the lactate concentration caused by physiological abilities of the female athlete which means the inhalation of the oxygen in rest did not accelerate lactate neutralization. The other tested basketball player B.K. ran also three tracks of 400 m, all with the 20 km.walk^{-1} speed whereby the first track was run on a flat surface, the second on 2% steep and the third on a 4% steep track. As seen in Fig. 4 showing his example the lactate concentration after running at 20 km.walk^{-1} without the change in steepness suddenly changes values with and without the inhalation of the concentrated oxygen, namely it drops for the third. Within the steepness of 2%, i.e. 4% lactate change was from 11,6 mmol.l^{-1} to 9,7 mmol.l^{-1}, i.e. 11,3 mmol.l^{-1} to 9,6 mmol.l^{-1} when tested with and without the inhalation of the concentrated oxygen. When analyzing obtained results of the specific basketball Jugo test there were no statistically significant differences. As seen in Fig. 5 in test without inhalation of the concentrated oxygen there were 54 in the first 56 attempts in the second case with the precision of 36, i.e. 40 successful shots. In the test with inhalation of concentrated oxygen in both cases a subject has attempted in five minutes 57, realized 42 in the first and 35 shots in the second case. It turned out that for this research more significance was attributed to physiological data on the lactate values after the exhorted effort. As seen in Fig. 6 in special basketball Jugo test concentration value of B.K. after the first test was 8,2 mmol.l^{-1}, and after the oxygen inhalation 6,7 mmol.l^{-1}. Upon the second test this advance increased from 7,7 mmol.l^{-1} to 5,8 mmol.l^{-1}. Fig.6 shows that after rest drop in lactate concentration was caused by physiological abilities of the athlete meaning the inhalation of the oxygen in rest did not accelerate lactate neutralization.

Conclusion

This research proves that inhalation of 99.5% concentrated oxygen can in some types of sports delay the production of lactate acid and its further transformation into lactates. Suppression of the appearance of anaerobic metabolism is possible in our opinion in constant effort in five minutes duration. It is our conclusion that positive effect of hyperoxy on the body in longer time intervals drops depending on the length of period of exerted effort simply because the body cannot be long saturated by oxygen. The influence of the inhalation of the concentrated oxygen on long lasting workload will be a topic for further research. On the basis of the obtained results it can be said that in anaerobic workload regardless of running (cyclic) or situational basketball (acyclic) workload in inhalation of concentrated oxygen in the bodies of the tested subjects lower values of lactate acid were produced therefore lower values of lactate were obtained. This statement is confirmed by (Cormery et al., 2008; Delextrat & Cohen 2008; Suchý et al., 2008; Malićević 2007; Vamvakoudis et al., 2007; *Vasiliauskas* et al., 2006; Sallet et al., 2005; Apostolidis et al., 2004) researches according to which concentrated oxygen has positive effect on short lasting regeneration processes and help revitalizing of anaerobic i.e. ability of speed strength of the moderate lasting.

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HIPEROKSIJA KAO OBLIK REDUKCIJE UTJECAJA ANAEROBNOG OPTEREĆENJA NA ORGANIZAM ELITNIH KOŠARKAŠA

Sažetak

U ovom istraživanju praćene su tjelesne reakcije košarkaša na inhalaciju kisika koncentracije 99.5 %. Sportaši su testirani na pokretnom sagu kao i uz pomoć specifičnog košarkaškog – Jugo testa. Istraživanje je pokazalo da nakon inhalacije kisika košarkaši imaju nisku razinu laktata u krvi (nakon trećeg puta). Nije pronađen značajan dokaz da inhalacija ima pozitivan utjecaj na šutiranje u košarci. Zaključak je, dakle, da inhalacija 99.5 % kisika ima pozitivne utjecaje tijekom anaerobnog opterećenja u sportu.

Ključne riječi: *kisik, laktati, opterećenje, košarkaši*

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