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Effect of jogging and core training after supramaximal exercise on recovery

Tulin ATAN [1,*], Menderes KABADAYI [1], Murat ELIOZ [1], Burak Talip CILHOROZ [1], Pelin AKYOL [1]

[1] *School of Physical Education and Sports, Ondokuz Mayıs University, Samsun, Turkey.*
[*] *Corresponding author: T. Atan, e-mail: takman@omu.edu.tr*

Abstract

The aim of this study is to compare the effect of jogging and core training after supramaximal exercise on recovery. 30 male basketball players (age; 23,57±1,32 years) playing in the regional basketball league participated the study. Subjects were required to visit the laboratory on 2 occasions, each separated by 3 days for recovery by 2 different methods. Subjects performed jogging or core training after Wingate Supramaximal Exercise (WSE) for recovery. The order of the 2 different recovery methods (jogging and core training) was selected randomly to prevent an order effect. Resting Heart Rate (HR) and blood lactic acid (LA) values of subjects were measured and then they performed WSE. Following the test, LA measurements were repeated in the 1st min, 5th min and 10th min of recovery. HR was measured right after the test and at the every 1 minute of 10 minutes recovery. LA values were not found significantly different between two recovery methods ($p>0.05$). It was determined that all HR values except resting, right after, 4th, 7th and 9th min of recovery with core training was significantly lower than the same minutes of recovery with jogging ($p<0.05$ and $p<0.01$). It was determined that the effect of jogging and core training on recovery LA level, carried out after supramaximal exercise were not different but they were different on recovery HR. It was determined that core training lowered HR faster.

Keywords: Core training, jogging, recovery.

Supramaksimal egzersiz sonrası yapılan jogging ve core antrenmanın toparlanmaya Etkisi

Özet

Bu çalışmanın amacı, supramaksimal egzersiz sonrası yapılan jogging ve core antrenmanın toparlanmaya etkisinin karşılaştırmaktır. Çalışmaya bölgesel basketbol liginde oynayan 30 erkek sporcu (yaş; 23,57 ± 1,32 yıl) katılmıştır. Bu çalışma Ondokuz Mayıs Üniversitesi Tıp Fakültesinin etik kurulu kararına uygun olarak yapılmıştır. Denekler 2 kez 3 gün arayla Wingate supramaksimal egzersizi (WSE) yapmışlardır. 1.ölçümde test sonrası deneklerin 15'i jogging 15'i core antrenmanı yapmışlar; 2.ölçümde 1.ölçümde jogging yapanlar core antrenmanı, 1.ölçümde core antrenmanı yapanlar jogging yaparak toparlanmışlardır. Sporcuların öncelikle dinlenik Kalp Atım Hızı (KAH) ve kan laktik asit (LA) değerleri ölçülmüş daha sonra WSE testine tabii tutulmuşlardır. Testten hemen sonra, toparlanmanın 1.dk, 5.dk ve 10.dk'ında LA ölçümleri tekrarlanmıştır. KAH ölçümleri ise testten hemen sonra ve 10dk'lık toparlanmanın her 1 dk'sında kaydedilmiştir. Araştırmada elde edilen verilerin aritmetik ortalama ve standart sapmaları hesaplanıp iki deneme arasında fark olup olmadığına bakmak amacıyla paired t testi kullanılmıştır. Jogging ve core antrenman ile yapılan toparlanmalarda LA değerleri karşılaştırıldığında, iki toparlanma LA değerleri arasında istatistiksel olarak anlamlı bir fark bulunamamıştır ($p>0,05$). Core antrenmanla yapılan toparlanmanın 1.dk, 2.dk, 3.dk, 5.dk, 6.dk, 8.dk ve 10.dk KAH değerleri, jogging ile yapılan toparlanmanın aynı dakikalarına göre istatistiksel olarak anlamlı derecede daha düşük bulunmuştur ($p<0.05$ ve $p<0.01$). Dinlenik, test biter bitmez, 4.dk, 7.dk ve 9.dk ölçülen KAH değerleri karşılaştırıldığında, iki toparlanma yöntemi arasında istatistiksel olarak anlamlı bir fark bulunmamıştır ($p>0,05$). Sonuç olarak supramaksimal egzersiz sonrası yapılan jogging ve core antrenmanının toparlanma laktik asit düzeyi üzerindeki etkisinin farklı olmadığı ancak toparlanma KAH üzerindeki etkisinin farklı olduğu görülmüştür. Core antrenmanın KAH'nı daha hızlı düşürdüğü tespit edilmiştir.

Anahtar Kelimeler: Core antrenman, jogging, toparlanma.

INTRODUCTION

Core strength exercise is a method which is frequently used in training many body muscles balancing spine and hip. With this core training, the control and the balance of the body is improved, and the strength of many small and large muscles are increased (1). Core exercises are a program applied to improve the sportsmen's strength competence and so to enhance their competence of standing up against a resistance.

Core muscle system is composed of lumbo-pelvic-hip connections. Core exercise basically involves small joint movements and this improves the combination of lumbo-pelvic-hip (10). Although there are studies that reveal core training fails to enhance the performance (13,14), it has been suggested that it helps to relieve the backache and is useful for the development of body muscles in other studies (4,5,9).

Lactate is well known to accumulate above the anaerobic threshold, so its elimination is very important for the next performance and lactate clearance is important in heavy exercises. Accumulating hydrogen ions and acidosis forming as a result of this prevents oxidative phosphorilation (7). Therefore, cells cannot get the energy needed for metabolic processes and tiredness appears. This exercise covering small joint movements is known to have an impact on lactate clearance (10). Recovery is vital for the next race performance of the athlete. The lactate which accumulates during exercise is firstly removed by muscles. The better the athlete's body organism removes the metabolic wastes after training, the better his performance is. The results of the studies related to active and passive resting have shown that lactate elimination speed is faster in active resting than it is in passive one.

After exercise, active resting can be done by the help of various methods and one of them is thought to be core exercise (10). Core training which is done after exercise and is a new method is clearly known to have an effect on recovery. The aim of this study was to search the effect of two different type of exercise, which is jogging and core training, after supramaximal exercise on recovery.

MATERIALS & METHOD

30 male athletes playing in regional basketball league have participated in the study (age; 23.57 ± 1,32 years). The protocol of the study is confirmed by the ethics committee of the University of Ondokuz Mayıs.

Experimental Protocol

Wingate supramaximal exercise (WSE) test applied to the subjects twice with an interval of 3 days. After WSE test subjects were recovered either with jogging or core training. The order of the 2 recovery conditions (jogging or core training) was selected randomly to prevent an order effect.

Before the WSE test, resting lactate level of the athletes was measured, then athletes performed WSE test. Immediately after the test, lactate measurement was repeated. After that, subjects started to do either core training or jogging for 5 minutes. 5 minutes after the test finished, another lactate measurement was done again. Just after this measurement, either core training or jogging has been done again for up to 10 minutes. After 10 minute blood lactate measurement was repeated. After Wingate test again, Heart Rate (HR) was recorded every one-minute interval during the 10 minute-recovery period.

Wingate Supramaximal Exercise Test:

Before the test begins, participants have been told how the test will be applied and what results it will give. For this test, Monark cycle ergometer (Moderl 894E) and a computer system connected to the bike have been used. Before the tests, saddle and handlebar adjustments have been done for each athlete. 75 gr/kg load has been estimated as the external resistance during the test for each athletes. 5-minute warm-up protocol which involves two unloaded 5 second sprints at a pedaling rate of 60-70rpm at the end of the third and fifth minutes of the warm-up period. After a 5-minute rest Wingate test was started. Athletes cycled for 30 seconds at the highest speed against the resistance determined before.

Lactate Measurement:

Lactate concentration was measured with a lactatemeter of Lactate Scout brand in terms of mmol/L. Blood sample was taken from the earlobe by obeying the sterilization rules. Earlobe was pierced with a Softclix brand device with a needle on the tip. Blood sample taken was dropped on the lactate test strip. 15 seconds after this strip is placed in the Scout device, lactate concentration in the blood was determined.

Recovery Techniques:

I- Jogging:

Subjects did jogging after the WSE test for 10 minutes in a distance of 40 meters. Heart Rate after every each minute was recorded.

II- Core training:

Before the exercises, participants were informed of how many actions there are, what the position of the posture should be during those actions, how many phases each exercise consists of and duration of the exercises. 4 different core exercises were done for 10 minutes. Each core exercise was finished in one minute. When the 4 pieces of core exercise finished subjects returned to the first core exercise and they respectively did the other core exercises until 10-minute recovery. The core exercises which were done were sorted below:

Exercise 1:

Beginning is in the position of a bank and the exercise consists of 4 phases-actions that are composed of 2-second concentric contraction (hip lateral flection), 2-second isometric contraction, 2-second eccentric contraction (hip medial rotation) and 2-second rest in the beginning position. Repetition number is 8, 4 of which are right leg exercises and the other 4 of which are left leg exercises. The duration of each exercise done with each leg is 30 seconds.

Exercise 2:

Beginning is in the long sitting position and the exercise consists of 4 phases-actions that are composed of 2-second concentric (hip flection), 2-second isometric, 2-second eccentric (hip extension) and 2-second rest in the beginning position. It is practiced in a way containing 8 repetitions in one minute.

Exercise 3:

Beginning is in the lateral facade position and the exercise is made up of 4 phases-actions that are composed of 2-second concentric contraction (hip adduction), 2-second isometric, 2-second eccentric and 2-second rest in the beginning position. Repetition number is 8, 4 of which are on the right arm and the other 4 of which are on the left arm. The duration of each exercise done on each arm is 30 seconds.

Exercise 4:

Beginning is in the face down lying position and the shoulders are in horizontal adduction. The exercise is made up of 4 phases-actions that are composed of 2-second concentric (hyperextension), 2-second isometric, 2-second eccentric and 2-second rest in the beginning position. Each type of core exercise was finished in one minute.

Heart rate:

With the device of Polar watch RS800, the values were taken in terms of beat/minute. Heart Beat Rate was recorded in the wireless heart rate monitor on the arm with a transmitter belt on the chest.

Height of the subjects:

The subjects' heights were measured with a one cm interval scale (SECA electronics scale).

Body weight measurements:

The subjects' weights were measured with bare foot and in shorts by the help of weighing scale (SECA electronics scale).

Statistical Analysis

Paired t test was used to analyse whether there is a difference between the two trials. Values were expressed as Means and Standard Deviation. The level of significance was set at 0.05.

RESULTS

Table 1 shows the power output values of WSE test that applied to the athletes before the two recovery methods. Peak power, average power and minimum power values were not found to be significantly different between core and jogging conditions ($p>0.05$).

Table 2 shows the LA values during the two recovery methods. LA values were not found to be significantly different between core and jogging ($p>0.05$).

Table 1. Mean values of anaerobic power outputs.

Anaerobic Power (W)	Recovery Method	Mean	Standard Deviation	p
Peak Power	Core	934,34	151,95	0,24
	Jog	918,69	147,08	9
Average	Core	589,21	92,63	0,20
Power	Jog	573,30	88,92	0
Minimum	Core	203,02	72,41	0,15
Power	Jog	219,85	80,73	8

Table 2. Blood lactic acid levels measured at two different recovery methods.

LA (mmol/L)	Recovery Method	Mean	Standard Deviation	p
Resting	Core	2,08	0,48	0,75
	Jog	2,11	0,37	1
Immediately	Core	5,57	1,39	0,44
after WSE	Jog	5,33	0,73	3
5.min	Core	8,64	1,72	0,07
	Jog	8,10	1,32	5
10.min	Core	7,30	1,77	0,11
	Jog	6,82	1,34	5

Table 3. Heart rate levels measured at two different recovery methods.

HR (beat/min)	Recovery Method	Mean	Standard Deviation	p
Resting	Core	71,41	5,32	0,857
	Jog	70,35	5,56	
Immediately	Core	178,48	8,10	0,648
after WSE	Jog	177,91	12,50	
1.min	Core	135,76	13,62	0,046*
	Jog	145,23	13,98	
2. min	Core	127,92	13,56	0,006**
	Jog	141,07	14,61	
3. min	Core	127,23	10,69	0,033*
	Jog	136,00	13,32	
4. min	Core	126,84	13,80	0,121
	Jog	133,53	13,32	
5. min	Core	119,92	12,46	0,035*
	Jog	130,30	13,81	
6. min	Core	118,23	13,52	0,027*
	Jog	127,38	12,86	
7. min	Core	119,84	9,45	0,060
	Jog	127,38	11,76	
8. min	Core	118,07	12,95	0,025*
	Jog	127,30	12,45	
9. min	Core	117,07	13,64	0,116
	Jog	124,92	12,43	
10. min	Core	115,61	10,21	0,046*
	Jog	122,92	10,27	

**p<0.01 and *p<0.05

DISCUSSION

In this study, the effect of jogging and core training after supramaximal exercise on recovery was searched. No statistically meaningful difference could be found among the power values measured after Wingate test applied three days apart (p>0.05). This finding revealed that the loads exerted to the subjects before both recovery methods were the same (table 1).

When the LA values of recovery through jogging and core training in this study were compared, no statistically meaningful difference was found between the two recovery LA values (p>0.05; table 2). Although muscle fiber number changes from person to person, many studies showed that core muscle system has the type I and type IIa genotype, and these fibres have roles in posture standing (6,8,11). Since these fibril types have a high oxidative capacity, they are more advantageous than the other types of fibrils in lactate clearance (12). Although additional studies are needed, the reason why core training has as much lactate clearance as jogging can be that type I and type IIa fibres composing core muscle system have a high oxidative capacity.

In a study in which the impact of recovery methods done after heavy activities on lactate clearance is searched, resting with core training has been seen to decrease lactate concentration 24 percent more than passive resting (10). Again in another study, 10-minute low level bike effort after a heavy activity was found to reduce the amount of arterial lactate by 13.33 percent compared to passive resting (2). In another research, when jogging with intervals and continuous jogging done after a heavy exercise were compared with passive resting, jogging with intervals was found to reduce lactate concentration by 14.93 percent while continuous jogging reduced by 34.19 percent (3).

In this study, the HR values of recovery via core training in the 1st, 2nd, 3rd, 5th, 6th, 8th and 10th minutes were found to be lower than those of recovery through jogging ($p<0.01$ and $p<0.05$). When the HR values measured at resting, immediately after WSE, 4th, 7th and 9th minutes following the test were compared, no statistically meaningful difference between both recovery methods could be found ($p>0.05$; table 3).

When the exercise was completed, HR started to fall down rapidly in both recovery methods in this study. However, once recovery was done with core training, HR was observed to decrease dramatically. It has been discovered that jogging and core training after supramaximal exercise has no meaningful impact on recovery LA level, but they reduce HR in a meaningful level.

HR and sensory nerves coming from mechanoreceptors, chemoreceptors and baroreceptors reach to ventrolateral medulla and by combining with stimuli from motor cortex cause adrenal medulla to release adrenalin and noradrenalin. These hormones enable sympathetic nerve activation and as a result of this, sinoatrial nodule is stimulated and HR increases. So the

cytological phase of the heart also increases (15). However, these physiological feedbacks can be at a lower rate in core training. The reason why HR of core training decreased faster than that of jogging can be that core training does not provide as much physiological feedback as jogging does.

In conclusion, it was found out that as well as core training's improvement of postural stability, it makes lactate clearance easy as much as jogging which is regarded as the most updated kinotherapeutic practice. At the same time, core training compared to jogging, more rapidly reduces the HR that is another measure in recovery. Conditioners, trainers and athletes can use core training as a technique of recovery in addition to a way of improving posture stability. It has been thought that an effective rest done on a mat and which athletes can adapt easily like core training can help them to get physically ready for the next training or the game, instead of an effective rest based on running effort like jogging which is one of the kinotherapeutic activities that should be done after training on hot summer days.

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