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The effect of eight-week workout specific to basketball on some physical and physiological parameters

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Abstract

This study has been carried out to research the effect of eight-week basketball workout on some physical and physiological parameters. The research has been applied to the athletes of Uşak Sports Inc. taking place in Beko Basketball League. The sportsmen average age 26,00±3,16 years, average height 196,62±9,91 cm, average weight 196,62±9,91 cm and body-mass index was 24,33±1,68 kg/m², have participated. Anaerobic power test (before and after the workout in preparation stage), aerobic power, lactate test (shortly after the practice and 3 minutes later) the strength of hand grip, the strength of back-leg, flexibility test and some pulmonary function tests have been carried out. A non-parametric test, 'wilcoxon signed ranks test' has been used to evaluate the data. Significant variations between anaerobic power, aerobic power, flexibility, FVC, FEV1 values and lactate level three minutes after the training, the values of back-leg strength ($p < 0,05$) have been established from the result of the measurement. On the other hand, it has been determined that there is no statistically significant variation between lactate after the workout, the strength of right and left grip and FEV1/FVC values. ($p > 0,05$). As a result, it was seen that the eight-week workout specific to basketball held during the preparation stage improved some physical and physiological properties of sportsmen. It was found out that their lactate tolerance was increased. Therefore, their recovery time shortened and readiness level increased.

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1. Introduction

Basketball is one the most popular indoor games. It is played widely in the world. Nowadays; it has become more brisk by the changes of some rules. In the last 30 years, it can be seen that basketball players has changed physically and physiologically and comparing to 1970's and 1980's, current players are more improved in terms of physical and biomotor skills (Foran& Pound 2007). Adaption of improving technology and technological tools to testing and evaluation methods in sport science have given opportunity to study the activities that cause physical stress during basketball competitions and response of players to this stress. Thus, they have knowledge about the physical and physiological needs of players during the competitions and reviewed the basics of the game. The biggest reason of this development is that the coach use training methods specific to basketball through the increase in the level of his knowledge (Sevim, 2010).

In studies, anthropometric and physiological profile of the successful players have been evaluated. In the evaluation of elite-level basketball players, the parameters such as experience, body composition, strength, aerobic and anaerobic power balance have been primarily evaluated among the other factors (Hoofman, 2003; Scheller& Rask, 1993).

The aim of this study is to investigate the effect of 8 weeks basketball training on the physical and physiological parameters

2. Method

Uşak Sports Inc. sportsmen age average $26,00\pm 3,16$ (years), height average $196,62\pm 9,91$ (cm), weight average $196,62\pm 9,91$ (cm) and body-mass index $24,33\pm 1,68$ (kg/m^2), taking part in Beko Basketball League, have participated in this study. The measurements have been held in the preparation stage and the essential information about test has been given to the all players before test runs.

2.1. Applied tests

2.1.1. Assessing the height and body weight

The height and body weight of research staff were measured with barefoot and wearing shorts. Secastadiometer with 0,01 accuracy rating was used in the measurements.

2.1.2. Measuring the strength of grip hand, back and leg

TAKEI GRIP- D hand grip dynamometer with a measuring range from 0 to 100 kg was used. The dynamometer was set according to the hand measurement of research staff. In the measurement, the research staff placed the arms at the side, standing and without touching the body to the dynamometer and gripped the dynamometer as hard as possible in one quick movement. Grip tests were performed twice on the right hand and then twice on left hand with dynamometer. The best score was determined in kg. In the measurement of back-leg, dynamometers were adjusted so that the participants were squatted over the dynamometer with knees and they could hold without bending their elbows. The best of two measurements was determined as kg.

2.1.3. Flexibility

Sit and reach test was carried out by using flexibility table. It was assessed twice in a seated position without bending knees. The best distance was recorded in cm.

2.1.4. Aerobic power

It was measured with 20 metres shuttle running test. In basketball court, the required distance was limited by using a steel tape 20 metres long. Upon hearing pre-recorded audiocassette tape, the male basketball players started

to run both start-finish line. MaxVO₂ levels in assessment table were estimated in (ml/kg/dk.) based on the recorded repetition number.

2.1.5. Vertical Jump / Anaerobic Power

The measurement was held by using Newtest 3000 electronic jump tester. The assessment was done, when the subject's feet were open in shoulder width, body was flexed to 90 degrees from knees, bend to front, the arms were at side. The assessment was performed three times. The best score was recorded in cm. Anaerobic power value (kg-m/sn.) was assessed by applying Lewis formula to the jump distance.

- ✓ $P = (\sqrt{4.9 \text{ (Weight)}}) \sqrt{D \text{ (m)}}$
- ✓ $P = \text{Power}$
- ✓ $D = \text{Vertical jump Distance (m.)}$

2.1.6. The measuring the blood lactate level

The blood lactate level has been measured with Lactate Scout blood lactate analyser. Before starting to the test, the measurement has been carried out to understand the lactate level at rest. Then, lactate measurement has been held just after 20 metres shuttle running test and 3 minutes after the test. Such measurement has been performed by obtaining blood samples from tip of either middle or ring finger. Firstly the tip of fingers is disinfected and then by means of lancet, drop of blood is developed (the first blood drop was wiped off and the second is used in the test). Lactate level is assessed with strip. Before the measurements, calibration of lactate analyzer has been supplied with control drop.

2.1.7. Pulmonary function test run

Spirometric analyses have been performed with Chestgraph HI-105 spirometer to the research group. All athletes have kept in seated position during all process. It has been managed during the test that sportsmen don't cough, test doesn't finish early. The sportsmen put the mouthpiece in their mouth, lightly bite the mouthpiece and close lips around it. They are firstly asked for breathing normally for three times. Then the sportsmen are expected to take a deep breath in their maximum level and after waiting a few seconds to breathe out as fast as they can. Test is technically acceptable. It has been performed at least three times. The highest FVC and FEV₁ values have been selected among three different obtained curves.

2.2. Statistical Analysis

In the evaluation of obtained data, Wilcoxon Signed Ranks Test has been used. It is a non-parametric test. Confidence interval has been selected as %95 and the values equal and below $p < 0,05$ have been accepted as meaningful actuarially.

3. Results

Table 1. Demographic Characteristics of the Participant Athletes

Variables	N	M±S.D.
Age (year)	12	26,00±3,16
Height (cm.)	12	196,62±9,91
Weight (kg.)	12	94,33±14,18
Body mass index (kg/m ²)	12	24,33±1,68

M; Mean, *S.D.*; Standart Deviation

Table 2. Comparison of Basketball Players' Values Before and After Eight-Week Workout

Variables	Group	N	M±S.D.	Z	P
Anaerobic Power (kgm/sec)	Pre-Test	12	163,25±22,85	-2,707	0,007**
	Post-Test	12	169,08±20,54		
Aerobic Power (ml/kg/min)	Pre-Test	12	48,14±3,82	-2,824	0,005**
	Post-Test	12	52,69±3,92		
Lactate Levels After Workout (mmol/L)	Pre-Test	12	15,41±5,65	-1,647	0,099
	Post-Test	12	11,57±4,88		
Lactate Levels Three Minutes After the Workout (mmol/L)	Pre-Test	12	11,33±4,18	-2,197	0,028*
	Post-Test	12	7,83±2,54		
Strength of Left Hand Grip (kg)	Pre-Test	12	53,98±8,27	-0,628	0,530
	Post-Test	12	52,50±9,04		
Strength of Right Hand Grip (kg)	Pre-Test	12	55,25±8,69	-1,490	0,136
	Post-Test	12	57,15±10,53		
Strength of Back-Leg (kg)	Pre-Test	12	185,50±35,13	-2,197	0,028*
	Post-Test	12	199,71±30,52		
Sit- Reach (Flexibility) (cm)	Pre-Test	12	24,08±7,57	-2,842	0,004**
	Post-Test	12	27,83±8,62		
FVC (L./sec.)	Pre-Test	12	5,00±0,92	-2,981	0,003**
	Post-Test	12	5,86±1,07		
FEV₁ (L./sec.)	Pre-Test	12	3,98±0,72	-2,981	0,003**
	Post-Test	12	4,68±0,87		
FEV₁/FVC (L./sec.)	Pre-Test	12	80,03±7,45	-0,980	0,327
	Post-Test	12	81,22±9,17		

* $p < 0,05$, ** $p < 0,01$, M; Mean, S.D.; Standart Deviation

4. Discussion

According to the findings of research, the average age of the participant players has been identified as 26,00±3,16 (year). According to Acarbay et al., (1996) the average age for players in the 1st league basketball team 21,37±1,90 years. According to Kuter and Ozturk, (1992) the average age of elite Turkish male basketball players has been reported as 23±5 years. In these studies, the data obtained about the age has been found higher than earlier researches. It is thought that Beko Basketball League is a league at the highest level and it requires experience in addition to technical and tactical skills.

The average body weight has been identified as 94,33±14,18 (kg) and also, the average body height identified as 196,62±9,91 (cm.). Pamuk et al., (2008) have identified the average height for 2nd League and Regional League players as 195,10±0,08 cm and their average body weight as 91,75±12,99 kg. Coleman et al., (1972) have reported the average height of American basketball players as 191.10 cm. In another study, the average height and weight of the Hungarian basketball players have been identified respectively as 192,10 cm and 84,80 kg (Csanády, Forster, & Högye, 1986). According to Bale and Scholes, (1986) the average height of British basketball league players is 191,00±10,10 cm. In a study, the average height of Turkish basketball players has been identified as 196,30 ± 5,80 cm and average body weight as 91,00±6,80 kg (Kuter&Ozturk, 1992). In this study, it is found that there is a correlation between the values of height and weight of Beko Basketball League players and the earlier ones.

According to Table.2, Significant variations between aerobic power, anaerobic power, lactate levels three minutes after the training, the values of back-leg strength, flexibility, FVC, FEV₁ values have been seen ($p < 0,05$) which is based on the 8 week basketball workout process in preparation period. On the other hand, it has been determined that there is no statistically significant variation between lactate after the workout, the strength of right and left grip and FEV₁/FVC values. ($p > 0,05$).

In this study, average MaxVO₂ for players has been identified as 48,14±3,82 before preparation stage while such average has been 52,69±3,92 after training. In the study during competition period Pamuk et al., (2008) has found that the average MaxVO₂ for players in 2nd League is 50.80±11.57 ml/kg/min., while the average MaxVO₂ for Regional League players is 46.65±3.97 ml/kg/min. Laplaud et al., (2004) have identified that the average maximal

oxygen uptake for professional basketball players is 44.10 ml/kg/min. Gocentas et al., (2005) have reported that average value of maximal oxygen uptake for international professional basketball players is 48.90 ml/kg/min. Such obtained data are in line with the data in our research.

During preparation stage, the average grip power of players is 55,25±8,69 kg for right hand and 53,98±8,27 kg for left hand. In the end of workout; it has been found that it is 57,15±10,53 kg for right hand and 52,50±9,04 kg for left hand (Table 2). Considering these values, there is no significant difference in right and left hand grip power ($p>0.05$). The characteristic of applied training programme may have affected the performance parameters.

It has been found that before preparation stage, the average anaerobic power is 163,25±22,85 kgm/sec. After training, it has become 169,08±20,54 kgm/sec. Upon examining the resources, medium level anaerobic power value of players between 20 and 30 year old has been identified as 140-175 kgm/sec. and high level ones has also been identified as 176-210 kgm/sec. (Erol, 1992). Latin et al., (1994) has made a research to determine the average vertical jump value of male basketball players in NCAA 1st league. They have acquired the average vertical jump height as 71.40 cm. It has been stated that the vertical jump power for such players is 170,28kgm/sec on average. In the research by Pamuk et al., (2008) it has been found that the value of anaerobic power for basketball players in 2nd league is 170,33±22,59 kgm/sec. while such value for players in regional league is 156,78±17,27 kgm/sec. It has been determined that the anaerobic for basketball players in 2nd league is significantly higher than the ones in regional league. In the light of these findings, it can be stated in our study that the players in Beko Basketball League achieve higher anaerobic power but they are lower according to the values of American League.

In our study, It has been established that lactate level before preparation stage is 15,41±5,65. It is seen that these values has reduced to 11,57±4,88 by means of 8 week-workouts.

As a result, it is determined that some physical and physiological skills of players have been developed thanks to 8 week basketball specific workout. Thus, it has been concluded that the recovery time has been shortened and pre-contest readiness level has been improved by increasing lactate tolerance.

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