ISSN: 2146 - 9466
www.ijtase.net
International Journal of New Trends in Arts, Sports &Science Education – 2023, volume 12, issue 3

DETERMINING THE EXHAUSTION OF PROFESSIONAL SOCCER PLAYERS AFTER LONG AND HIGH-INTENSITY EFFORTS BY MEASURING THE FORCE AND BLOOD LACTATE

Metin DALIP
Prof. Dr., The University of Tetovo, Faculty of Physical Education and Health, 1200, Tetovo, North Macedonia
ORCID: https://orcid.org/0000-0002-7142-8931
metka_piksi@yahoo.com

Saadet Rana VAROL
Prof. Dr., Ege University. Sport Science Faculty, Turkey
ORCID: https://orcid.org/0000-0002-9196-984X
rana.varol@ege.edu.tr

Mustafa Ferit ACAR
Prof. Dr., Girne American University. Sport Science Faculty, North Cyprus
ORCID: https://orcid.org/0000-0002-3988-2990
mustafaferitacar@gau.edu.tr

Çetin İŞLEĞEN
Prof. Dr., Ege University School of Medicine, Sports Medicine Department, Izmir, Turkey
ORCID: https://orcid.org/0009-0001-9587-9147
cetin.islegen@ege.edu.tr

Oğuz KARAMIZRAK
Prof. Dr., Ege University, Sport Medicine Department, Turkey
ORCID: https://orcid.org/0000-0002-1860-6671
oguz.karamizrak@ege.edu.tr

Received: February 28, 2023 **Accepted:** June 15, 2023 **Published:** July 31, 2023

Suggested Citation:
Dalip, M., Varol, S. R., Acar, M. F., Işleğen, Ç., & Karamizrak, O. (2023). Determining the exhaustion of profesional soccer players after long and high-intensity efforts by measuring the force and blood lactate. *International Journal of New Trends in Arts, Sports & Science Education (IJTASE), 12*(3), 213-221.

Abstract

This study was done on 19 professional soccer players who are playing on the Football Team of Karşıyaka-Turkey`s II. Professional League. The average age is 21.5±4.27, the average body weight is 72.3±7.06 kg, and the average height is 179.6±5.11 cm. In the study; body fat ratio percentage (%) was 13.45±2.50, vertical jump 62.0±6.76(cm), anaerobic capacity according to Lewis nomogram 125.68±15.46 kg.m/sn, aerobic capacity (VO_{2max}) 55.10±4.09ml/kg/min, flexibility 16.34±5.23 (cm). The Wingate Anaerobic Power test (30 sec) was done three times and the rest interval was 2 minutes between each workout. At the blood lactate measurements, the blood samples were taken after each workout the lactate measurements were done at the 3rd and 5th minutes. 20-meter Shuttle Run Test was done to calculate the VO_{2max} indirectory. In conclusion to add of all this; we found a correlation between these parameters; fatigue index (%) with blood lactate mean values at the second measurement, anaerobic capacity with body weight and vertical jump mean values, fatigue index with minimum power/kg and peak power/kg mean values. And we found differences between the three peak power/kg and average power/kg. Minimum power/kg, fatigue index (%), and the four blood lactate mean values.

Keywords: Soccer, anaerobic power, wingate test, lactate.

INTRODUCTION

Along with the development of technology, the evaluation of athletes is provided by the analysis of human physiology in the micro plan. The analysis of energy systems play a major role in the determination of the performance of the athletes, and the planning and routing of training programs. Today the aerobic and anaerobic energy systems are particularly analyzed and are still being analyzed. The anaerobic strength values of professional soccer players are analyzed with computer supported

Wingate test and the calculation of fatigue index with blood lactic acid measurements is the subject of the research. With the results obtained from this research, we come out with a chart that explains how the alactacid and lactate capacity reacts to the anaerobic loading of soccer players' organisms. The blood lactate measurements can show how much the soccer player is loaded. The recovery of soccer players is determined by the measurement of the fatigue index between two efforts. According to which the loading dosage of the training is identified, and determined recovery timing between two loadings is the direction indicator of providing optimum loading of training in lactacid anaerobic developing training.

Equipment and Method

The research includes 19 players of the Football Team of Karşıyaka-Turkey`s II. Professional League. The average age is 21.5±4.27, the average body weight is 72.3±7.06 kg, average height is 179.6±5.11 cm.

One part of the research measurements is realized in the training facilities of the Çiğli district and the other part is realized in the Performance Laboratories of Physical Education and Sports Academy of Ege University. Flexibility, vertical jump, and Maximal Aerobic capacity (Progressive Shuttle Run) tests are performed in the training facilities of Karşıyaka Çiğli.

The first day of the research is realized in the natural environment of soccer, which is turf, and the second one is realized 5 days after the first one at Ege University Physical Education and Sports Academy Performance Laboratory.

VO_{2max} Test:

For the determination of VO_{2max} has applied the shuttle run test "Progressive Shuttle Run". The test is accomplished at the Karşıyaka Çiğli Facilities training field. The necessary means for the test are 20 m nonskid ground; a cone for specifying a 20 m running field; a tape player with sufficient loudness and "Progressive Shuttle Run" tape with set signals. The test was performed in 4 groups each group with 5 subjects (individuals) after the warming in 20 m nonskid ground (turf). Subjects of the testing are running until exhaustion by following the tempo of the tape recorder. After the level of abandonment and the shuttle number is registered, the maximum oxygen consumption per kilogram of the individual is expressed in VO_{2max} scale as lt/min.

Anaerobic Capacity Measurement:

For measurement of anaerobic capacity is used the Monarch Wingate Laboratory test is. Also the Wingate Test, it is used a Monarch Wingate Ergometer 824E model computer program working together with Monarch Bodyguard AB version 1.00 Monarch Wingate Ergometer tool. The subjects of testing were told about the measurement day and hour 10 days earlier and were also told in this period not to consume forbidden substances like doping, drugs, or alcohol, they had to respect the conditions. It was reported to the athletes to come in their usual sports clothes. The first Wingate Test was performed in 1974 at Israel Wingate Institute and the studies still continue.

Vertical Jump test:

For this purpose, it is used the Vertical Jump Meter T.K.K. 5106 JUMP-MD vertical jump device made in Japan. The device is connected to the subject's waist by measuring it 3 times and registering the best degree.

Flexibility Test:

For this purpose, it is used a flexibility table with a centimeter device attached to it. Before the test, the subject warms up and makes stretch-out exercises. Later the measurement is accomplished twice with the knees untwisted, the best within two is chosen.

Wingate Bicycle Test and Blood Lactate Measurements:

The Wingate Test is applicated before the validity and controls of the Wingate computer program and lactate analyzers are done. First, the test starts with general warming, and the Wingate test is

applicated 3 times for each subject according to the test protocol. 1.1/2 minutes later after the Wingate test is done blood is taken from the fingertip, and lactate acid values within 60 seconds are registered from the lactate analyzer.

In the second minute after the first Wingate test has ended, the subject starts with the second Wingate test. As in the first one in the 1.1/2 minute blood samples are taken and at the end of the 2. minute 2. test the subject starts with the 3. Wingate test. When the 3. Wingate test ends blood is taken in the 3rd and 5th minutes on the finish of the third test. So the values of blood lactate acid are determined in this way. In the measurements of blood, lactate acids are used the portable "Accusport" lactate analyzer with an accumulator of the "Boehringer Manheim" firm. Steryl lancets are used in taking blood samples. Also "BM-Lactate" strips are used in the measurement of lactic acid in the blood. In blood taking procedure alcohol and cotton are used (Barzdukas, Hollander, D'Acquisto, & Troup, 1991).

Body fat ratio:

The fat ratio percentage is calculated with the Yuhazs method. Triceps, Subscapula, Supraillac, and Abdomen areas are measured 3 times with the Skinfold Holtain Caliper device, and the average values are registered. Later together with this measurement and the Yuhazs method is calculated the body fat ratio percentage.

RESULTS

It calculated the height(cm); body weight (kg), body fat ratio percentage (%), peak power/kg, average power/kg, minimum power/kg, fatigue index percentage (%), anaerobic capacity (according to Lewis`s nomogram Kgm/sn), aerobic capacity (VO_{2max}), vertical jump (cm), flexibility (cm) and minimum values and arithmetic averages (x), ± standard deviations of 19 professional soccer players of the II. League.

According to which; it is found height 179,68±5.11(cm), body weight 72.31±7.06(kg), body fat ratio percentage (%) 13.45±2.50, vertical jump 62.06±.76(cm), anaerobic capacity according to Lewis nomogram 125.68±15.46 kg.m/sn, aerobic capacity (VO_{2max}) 55.10±4.09ml/kg/min, flexibility 16.34+-5.23 (cm).

Table 1. I Wingate Bicycle Test Peak, Average and Minimum Power/Kg results Values Minimum, Maximum and Standart Deviations.

II.League (n=19)	Min.	Max.	Mean ± Std.Dev.
Wing. 1 Peak Power/Kg	8.01	12.53	10.25±1.11
Wing. 1 Average Power/Kg	6.72	8.95	8.14±.66
Wing. 1 Minimum Power/Kg	4.57	6.76	6.08±.50
Wing. 1 fatigue Index(%)	28.20	52.70	40.06±7.29
Lactate 1 (mmol/L)	6.90	11.10	9.04±1.31
Fatigue Index 1 (%)	28.20	52.70	40.067±.29

Table 2. I Wingate Bicycle Test Peak, Average and Minimum Power/Kg results Values Minimum, Maximum and Standart Deviations.

II.League (n=19)	Min.	Max.	Mean ± Std.Dev.
Wing. 2 Peak Power/Kg	7.98	11.97	9.78±1.03
Wing. 2 Average Power/Kg	6.05	8.10	7.01±.58
Wing. 2 Minimum Power/Kg	3.54	5.71	4.73±.57
Lactate 2 (mmol/L)	9.20	20.20	12.66±3.41
Fatigue Index 2 (%)	40.20	70.40	51.07±6.85

Table 3. III. Wingate Bicycle Test Peak, Average and Minimum Power/Kg Values Minimum, Maximum and Standard Deviations.

II.League (n=19)	Min.	Max.	Mean ± Std.Dev.
Wing. 3 Peak Power/Kg	6.98	10.86	8.63±1.13
Wing. 3 Average Power/Kg	4.27	6.97	5.93±.64
Wing. 3 Minimum Power/Kg	.067	5.38	3.78±1.05
Lactate 3 minute (mmol/L)	9.60	20.60	13.93±3.00
Lactate 5 minute (mmol/L)	9.90	22.20	13.44±3.33
Fatigue Index 3 (%)	34.20	93.60	54.111±3.7

When the values of the II. league 19 soccer players are analyzed among them

Table 4. Correlation Between Lactate 1. Measurement and Wingate I. Measurement Peak, Average, Minimum Power/Kg, and Fatigue Index Percentage (%)

	Lactate 1. Measurement (mmol/L)		
II.League (n=19)	**r**	**P**	**Sig.**
Wing. 1 Peak Power/Kg	.029	.907	p>.05
Wing. 1 Minimum Power/Kg	.067	.784	p>.05
Wing. 1 Average Power/Kg	.255	.292	p>.05
Fatigue Index 2 (%)	.013	-.956	p>.05

There wasn`t found any statistically significant value (p>.05) among Lactate 1 measurement and Wing. 1. Peak Power/Kg. Wing 1 Average Power/Kg. Wing 1. Minimum Power/Kg. Fatigue Index Percentage (%).

Table 5. Correlation among Lactate 2 Measurement and Wingate II. Measurement Peak, Average, Minimum Power/Kg, and Fatigue Index (%).

	Lactate 2. Measurement (mmol/L)		
II.League (n=19)	**r**	**P**	**Sig.**
Wing. 2 Peak Power/Kg	.442	.058	p>.05
Wing. 2 Minimum Power/Kg	-.216	.374	p>.05
Wing. 2 Average Power/Kg	.327	.171	p>.05
Fatigue Index 2 (%)	.457	.049	p<.05*

There wasn`t found significant relation (p>.05) among Lactate 2. measurement and Wing. 2 Peak Power/Kg, minimum power/kg, and average power/kg. But there was found statistically significant relation on p<.05 positive level between Lactate 2. measurement and Fatigue Index (%).

Table 6. Lactate 3. Correlation among Measurement (3 minutes) and Wingate III. Measurement Peak, Average, Minimum Power/Kg, and Fatigue Index Percentage (%)

	Lactate 3. Measurement 3. minute-(mmol/L)		
II.League (n=19)	**r**	**P**	**Sig.**
Wing. 3 Peak Power/Kg	.285	.237	p>.05
Wing. 1 Minimum Power/Kg	.237	.328	p>.05
Wing. 1 Average Power/Kg	.174	.475	p>.05
Fatigue Index 1 (%)	-.234	.335	p<.05*

Lactate 3. There wasn`t found a significant relation between (3 minute) and Wing. 2 Peak Power/Kg. Minimum power/kg and average power/kg and fatigue index (%).

Table 7. Correlation among Lactate 4. Measurement (5 minutes) and Wingate III. Measurement Peak, Average, Minimum Power/Kg, and Fatigue Index Percentage (%)

	Lactate 4. Measurement 5. minute-(mmol/L)		
II.League (n=19)	**r**	**P**	**Sig.**
Wing. 3 Peak Power/Kg	.422	.072	p>.05
Wing. 2 Minimum Power/Kg	.233	.337	p>.05
Wing. 2 Average Power/Kg	.291	.227	p>.05
Fatigue Index 2 (%)	-.231	.340	p>.05

Lactate 4. There wasn`t found a significant relation between (5 minutes) measurement and Wing. 3 parameters.

Table 8. Relation of values between Anaerobic Capacity (according to Lewis Nomogram) and Wingate 1, 2, 3, Peak Power/Kg.

	Anaerobic capacity lewis program Kg.m/sn		
	r	**P**	**Sig.**
Wing. 3 Peak Power/Kg	-.135	.582	p>.05
Wing. 3 Peak Power/Kg	.093	.704	p>.05
Wing. 3 Peak Power/Kg	.070	.775	p>.05

According to Anaerobic Capacity-Lewis Nomogram (Kg.m/sn) and Wing. 1,2,3 measurements Peak Power/kg there wasn`t found statistically significant relation.

Table 9. Relation between Anaerobic Capacity (according to Lewis Nomogram) and Body Fat Ratio (%), Body Weight (Kg), and Vertical Jump (cm).

	Anaerobic capacity lewis program Kg.m/sn		
	r	**P**	**Sig.**
Body Fat Ratio (%)	.148	.582	p>.05
Body Weight (Kg)	.897*	.000*	p<.001*
Vertical Jump (cm)	.624*	.004*	p<.05*

There wasn`t found a significant relation between Anaerobic Capacity-according to Lewis Nomogram (Kg.m/sn) body fat ratio (%). There is found positive statistical relation on p<.001 level between body weight according to Anaerobic Capacity Lewis Nomogram.

Table 10. Relation between Fatigue Index Percentage (%) and Wing. 1 peak power/kg and Wing. 1 minimum power/kg.

	Fatigue Index. 1 Percentage (%)		
	r	**P**	**Sig.**
Wing. 1 Peak Power/Kg	.739*	.000*	p<.001*
Wing. 1 Minimum Power/Kg	-.474	.041*	p<.05*

Wing.1 There was found a high degree of positive relation on p<.001 level between Peak Power/Kg and Fatigue Index Percentage 1. (%). Wing. 1 there is found negative relation on p<.05 level between Minimum Power/Kg and Fatigue Index Percentage 1(%).

Table 11 Relation between Fatigue Index Percentage (%) and Wing. 2 peak power/kg and Wing. 2 minimum power/kg.

	Fatigue Index. 2 Percentage (%)		
	r	**P**	**Sig.**
Wing. 2 Peak Power/Kg	.622*	.004*	p<.05*
Wing. 2 Minimum Power/Kg	-.719*	.001*	p<.05*

Wing. 2 There was found a high degree of positive relation on p<.05 level between Peak Power/Kg and Fatigue Index Percentage 2 (%). There was found negative relation on p<.05 level between Lowest Power/Kg and Fatigue Index Percentage 2.

Table 12. Relation among Fatigue Index Percentage (%) and Wing. 3 peak power/kg and minimum power/kg.

	Fatigue Index. 3 Percentage (%)		
	r	**P**	**Sig.**
Wing. 3 Peak Power/Kg	.465*	.043	p<.05*
Wing. 3 Minimum Power/Kg	-.873*	.000*	p<.001*

Wing. 3 There was found positive relation on p<.05 level between Peak Power/Kg and Fatigue Index Percentage 3 (%). There was found negative relation on p<.01 level between Lowest Power/Kg and Fatigue Index Percentage (%).

Table 13. Relation of Values between Aerobic Capacity (Max.VO2) and Wingate 1,2,3 Average Power/Kg

	Aerobic Capacity Max.Vo 2		
	r	**P**	**Sig.**
Wing. 1 Average Power/Kg	-.050	.838	p>.05
Wing. 2 Average Power/Kg	.172	.481	p>.05
Wing. 3 Average Power/Kg	.262	.278	p>.05

After the values of Maximal Aerobic Capacity (ml/kg/minute) and Wingate 1,2,3 Average Power/Kg are examined it was found that there is negative relation on p<.05 level between Wing. 1 Average Power and Max.VO2 capacity. Wasn`t found significant relation on p<.05 level between Wing.2 Average Power.Kg and Max.VO2 capacity. There wasn`t found significant relation on p<.05 level between Wing. 3 Average Power/Kg and Max.VO2 capacity.

Table 14. Differences in values of Blood Lactic Acid (mmol/L) between themselves.

Blood Lactic Acid Values (mmol/L)		
	Mean	**Std.Dev.**
Lactate 1	9.04	1.31
Lactate 2	12.66	3.41
Lactate 3 (3min.)	13.92	3.00
Lactate 3 (5min.)	13.44	3.33
ANOVA		p<.001*

It looked at the differences of values of blood lactic acid X averages and SD standard deviations by applicating ANOVA statistic analysis, and as a result, it was found statistical difference on p<.01 level.

Table 16. Differences of values of Wingate 1,2,3, Peak Power/Kg between themselves

Peak Power/Kg		
	Mean	**Std.Dev.**
Wing. 1 Peak Power/Kg	10.25	1.11
Wing. 2 Peak Power/Kg	9.78	1.03
Wing. 3 Peak Power/Kg	8.63	3.33
ANOVA		p<.001*

After an ANOVA statistic analysis is being applicated to Wingate 1,2,3, Peak Power/Kg measurements, it was looked at their differences, and as an outcome, it was found significant statistical difference on p<.001 level.

Table 17. Wingate 1,2,3, Minimum Power/Kg value differences between themselves

Wing. Minimum Power/Kg		
	Mean	**Std.Dev.**
Wing. 1 Minimum Power/Kg	6.08	.50
Wing. 2 Minimum Power/Kg	4.73	.57
Wing. 3 Minimum Power/Kg	3.78	1.05
ANOVA		p<.001*

It looked at the differences between themselves by application of ANOVA statistic analysis for Wingate 1,2,3, Minimum Power/Kg measurements, as a result, it was found significant statistical difference on p<.001 level.

Table 18. Wingate 1,2,3, Average Power/Kg value differences between themselves

Wing. Average Power/Kg (Average/Kg)		
	Mean	**Std.Dev.**
Wing. 1 Average Power/Kg	6.08	.50
Wing. 2 Average Power/Kg	4.73	.57
Wing. 3 Average Power/Kg	3.78	1.05
ANOVA		p<.001*

It looked at the differences between themselves by application of ANOVA statistic analysis for Wingate 1,2,3, Average Power/Kg measurements, as a result, it was found significant statistical difference on p<.001 level.

DISCUSSION, CONCLUSION, and SUGGESTIONS

In the research made on the II. League upon 19 Professional soccer players' height values is found as X±SD 179.68±5.11cm. Another parameter is the body weight is Mean±Std.Dev. 72.31±7.06 kg. The body fat ratio percentage is a minimum % of 8.00, and a maximum % of 18.60. Mean±Std.Dev. is found as 13.4±2.5. Max VO2 minimum 45.80 (ml/kg/minute), maximum % 62.70 (ml/kg/minute) Mean±Std.Dev. 55.1±4.09 (ml/kg/minute). The vertical jump is found as Mean±Std.Dev. 62.0±6.76. The anaerobic capacity according to Lewis`s Nomogram is found as Mean±Std.Dev. 125.68±15.46 kg.m/sec. Flexibility is found as Mean±Std.Dev. 16.35±5.23cm. According to the research of Hollman and friends (Adams & Beam, 1994) on 17 soccer players of the German National team average heights are; Mean±Std.Dev. 178.64 4.65 cm, Body weights are Mean±Std.Dev. 75.17±4.53kg, Max.VO2 Mean±Std.Dev. 62.02±4.49 (ml/kg/minute).

Watson and friends (Acar, Varol, & Gücü, 1996) in England made a research on 12 amateur soccer players on their body fat ratio. It was found a norm of % 14.00. Raven and friends (Acar, Varol, & Gücü, 1996) made research in the USA on 18 professional soccer players oh their body fat rate, and it turned out as an average of 9.59%. Zelenka and friends (Acar, Varol, & Gücü, 1996) in Czechoslovakia measured the body fat ratio of II. league soccer players and they found an average of %14.3. Akgün and friends (Acar, Varol, & Gücü, 1996) in the measurements of the body fat ratio of 128 soccer players playing in Turkey`s league found an average of %9.75. Güvel and friends (Beneke, Hutler, & Leithauser, 2000) in their research on body fat ratio found it as 12.3±3.53 percent. Kayatekin and friends (Bulbulian, Jeong, & Murphy, 1996) in their research on athletes found the body fat ratio percentage as 10.42±41, and on students as 13.32±2.86. Caru and friends (Acar, Varol, & Gücü, 1996) in Italy on the research of 95 soccer players measured the anaerobic capacity and found an average of 1.617 kgm/kgs. In the works made on soccer players and athletics, the age of soccer players participating in the works is found as mean=23.1, height mean=179 cm and body weight mean=73.8 kg (Acar, Varol, & Gücü, 1996), amateur soccer players; age mean=23.2, height=179 cm, body weight mean=70.1 kg, athletes mean=20.1, height mean=172.2 cm and body weight mean=68.8 kg.

Studies made upon another parameter peak power on amateur soccer players, sprinter athletes, and professional soccer players obtained as follows:

Defense players	: 8.0125±.5375	(w/Kg)
Center Court (midfielder)	: 8.2437±.6500	(w/Kg)
Striker players	: 8.5662±.5646	(w/Kg)
Amateur soccer players	: 7.612±.689	(w/Kg)
Professional soccer players	: 8.274±.606	(w/Kg)
Sprints	: 8.84±.77	(w/Kg)

Gökbel and friends (Bar-Or, 1987) have found peak power as 8.2±1.4 (w/Kg). The average power value is found as 6.9±.8 (w/Kg). David and friends (Bangsbo, Gollnick, Graham, Juel, Kiens, Mizuno, & Saltin, 1990) in the research of the measurements in 1992-1993 found the values of peak power in 1992 as 8.44 (w/kg), and in 1993 as 8.51 (w/kg). In the research made it was found the fatigue index values as W1Y1 %40.06±7.29, W2YI %51.07±6.85, and W3 Yi %54.11±13.78. There wasn`t found a statistically significant relationship between the three values of peak power/kg and minimum power/kg. It established a direct proportion between peak power/kg values and an inverse proportion between minimum power/kg. Gökbel and friends (Bar-Or, 1987) found the fatigue index as %30.9±9.0.

David and friends (Bangsbo et all., 1990) in 1992 found the fatigue index as % and 30.9, and in 1993 as %35.4.

Bradley and friends (Astrand, Hultman, Juhlin-Dannfelt, & Reynolds, 1986) found the fatigue index as %26.1±5.6. There couldn't be found a statistically significant relation among blood lactic acid values and peak power/kg, average power/kg, and minimum/kg values. During the measurements, the highest lactic acid values were found at 20.20 mmol/L. There was found statistically significant relation between body weight in anaerobic acid capacity (according to Lewis nomogram) and vertical jump. If we look at the differences between lactic acid measurements and peak power, average power, and minimum power there wasn`t found statistically significant difference.

Bangsbo and friends (Adams & Beam, 1994) in the research they made on soccer players' blood lactic acid during the match found them rise up to 11.9 mmol/L. The differences between blood lactic acid values were found as statistically significant. There was found statistically significant difference between Wingate parameters and lactic acid measurements. Evinç and friends (Bangsbo, 1992) on the research made found the lactic acid values as 4.78±1.53 in soccer players, 2.36±0.81 in athletes, and 4.24±1.9 in the control group.

Conclusion

As it was specified before soccer is a team sport that has the conditions, technic, tactics, and individual skills, also depending on physiological, psychological, and sociological dimensions. So in this regard, sports sciences are constantly developing, researching the factors that form the performance, obtaining information, and besides tracing and controlling them, providing aim just to achieve more productive and optimal training with the developing technology.

For this reason along with the thought of our long-term high intense effort, by applying the Wingate bicycle test in laboratory conditions 3 times at 2-minute intervals about high-intensity efforts during soccer play, together with blood lactic acid measurements, by researching how the soccer player reacts on this kind of efforts, to determine the fatigue index by researching peak blood lactic levels, it was targeted to establish in which stage the organism performs the highest intense effort.

According to the results in the first two tests, the soccer players achieved the highest power peaks and the blood lactic acid values were at the highest degree in this level. The values in the third test are evidently falling and the effort indicated in the first two tests doesn`t show the same effort in the third test.

It is considered that this situation is due to the training of the soccer player.

Thus while preparing the test protocole it was observed that the soccer player couldn`t finish the fourth test. By researching the highly intense efforts of soccer players, and detecting the reaction of the organism to the efforts it was necessary to prepare a program that will develop this capacity, especially developing the lactate anaerobic.

Acknowledgments

I would like to thank Prof.Dr. Mustafa Ferit Acar, Prof.Dr. Oguz Karamizrak, Prof.Dr. Cetin Islegen and Prof.Dr. Rana Varol for helping in this study. Also, I like to thank Professor Sengul Ago for proofreading the manuscript.

Ethics and Conflict of Interest

During the data collection process, all ethical issues were considered. The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

REFERENCES

Acar, M. F., Varol, S. R., & Gücü, H. K. (1996). Profesyonel futbolcularda oyun mevkilerine göre wingate anaerobik güç testi ile sürat koşuları testlerinin karşılaştırılması [in Turkish]. I. Futbol Kongresi Bildirisi A.K.M., İzmir, 1996

Adams, G. M., & Beam, W. C. (1994). *Exercise physiology: Laboratory manual*: Brown & Benchmark Dubuque (p. 64–65–66–67–68–69–94–105).

Astrand, P. O., Hultman, E., Juhlin-Dannfelt, A., & Reynolds, G. (1986). Disposal of lactate during and after strenuous exercise in humans. *Journal of Applied Physiology*, *61*(1), 338-343.

Bangsbo, J. (1992). Is the O2 deficit an accurate quantitative measure of the anaerobic energy production during intense exercise?. *Journal of Applied Physiology*, *73*(3), 1207-1209.

Bangsbo, J., Gollnick, P. D., Graham, T. E., Juel, C., Kiens, B., Mizuno, M., & Saltin, B. (1990). Anaerobic energy production and O2 deficit‐debt relationship during exhaustive exercise in humans. *The Journal of physiology*, *422*(1), 539-559.

Bar-Or, O. (1987). The Wingate anaerobic test an update on methodology, reliability and validity. Sports medicine, 4, 381-394.

Barzdukas, A. P., Hollander, A. P., D'Acquisto, L. J., & Troup, J. P. (1991). Measurement and verification of the anaerobic capacity during swimming. *Medicine and Science in Sports and Exercise*, *23*(4), 91.

Beneke, R., Hutler, M. A. T. T. H. I. A. S., & Leithauser, R. M. (2000). Maximal lactate-steady-state independent of performance. *Medicine and science in sports and exercise*, *32*(6), 1135-1139.

Bulbulian, R. O. N. A. L. D., Jeong, J. W., & Murphy, M. A. R. T. H. A. (1996). Comparison of anaerobic components of the Wingate and Critical Power tests in males and females. *Medicine and science in sports and exercise*, *28*(10), 1336-1341.