

The Effects of Competition Performance in Elite Male Football Players on Selected Biochemical and Hematological Parameters

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Abstract

Aim: *The aim of this study was to examine the effects of competition performance in elite male football players on selected biochemical and hematological parameters.*

Materials and Methods: *Two-stage tests were applied, either of which was a pre-test applied in the rested state in the laboratory, while the other was in field conditions. The footballers' selected biochemical and hematological parameters were evaluated in the laboratory according to the pre-test post-test model. Mann Whitney U and Wilcoxon tests were used to compare variables A and B, which not provided parametric test assumptions. A statistically significant result was accepted that $P < 0.05$.*

Findings: *As a result of comparing pre-test averages and post-test averages of selected biochemical and hematological parameters of the groups, There was a statistically significant difference in LDH, DBK, HDL Cholesterol and WBC values in group A while there was a statistically significant difference in Glucose, DBK and WBC values in group B. There was no difference in other values.*

Conclusion: *According to these results, it is suggested that trainers and sports scientists follow a method considering the changes in biochemical and hematological parameters measured while preparing training programs.*

Keywords: *Biochemical and Hematological Parameters, Body Composition Competition Performance, Football.*

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Introduction

During physical activity, physical and physiological changes in almost all organs and systems in the human organism can occur. With the use of the right scientific methods, changes that occur in the organism can be detected and what needs to be done in this direction can be determined. Physiological adaptation to the different training conditions of the athletes can be achieved in the direction of the data determined on the basis of the researches (1, 2, 3).

Topics covering our circulatory system; biochemical and haematological parameters such as cardiac, vascular, and blood circulation athletes can adapt to exhaustion, physiological and physiological balance can play an important role (4,5).

Knowing the biochemical and hematological parameters of the athletes; assist the coaches and sports scientists in identifying energy needs and preparing training programs in this direction (6). This study will determine the extent of acute effects of blood and hormone levels before and after competition. Thus, when planning training towards coaches and sports scientists, it will ensure that the athletes need to integrate their physiological values as well as develop their physical aspects. This will help in the identification of cardiovascular diseases that are vital for sportsmen and for the prevention of possible injuries.

Material Methods

Preparations were made for the measurement of selected biochemical and hematological parameters in the Central Laboratory of the Dicle University Medical Faculty Hospital. The subjects were brought to the Central Laboratory of the Dicle University Medical Faculty Hospital on a day when there was no competition and training (rest day after the match) and they were taken from the basal subjects (28 athletes) required by the hospital nurses under the supervision of the responsible doctor. In order to determine the metabolic, biochemical and haematological values of the subjects in the competition environment, a competition was played between the teams of Diyarbekirspor with the conditions suitable for 90 minutes official competition. In this study, one of the subjects was pre-tested in the laboratory environment and two-stage tests were performed in the other field conditions (natural grass surface soccer field) as post-test.

Statistical analysis:

Mann Whitney U and Wilcoxon tests were used to compare the variables of groups A and B, which not provided parametric test assumptions. Dependent t test was used to compute intra- group pre- and post-test variables in comparing A and B sets that provided parametric test assumptions. Independent t test was used to calculate the inter-group pre- and post-test variables of the teams. Pearson Correlation analysis was used for the relationship between variables in each team. A statistically significant result was accepted if $P < 0.05$.

Results

Mean Values and Comparison Results of Physical Properties of Groups (Independent t test)

	GROUP A (n=14)($x \pm sd$)	GROUP B (n=14)($x \pm sd$)	t	p
Age (years)	25.43 \pm 3.41	24.93 \pm 3.91	.360	.721
Height (cm)	175.29 \pm 5.18	178.14 \pm 7.14	-1.211	.237
Body Weight (kg)	70.364 \pm 7.42	75.671 \pm 8.70	-1.736	.094
BMI (kg/m ²)	22.843 \pm 1.55	23.779 \pm 1.73	-1.501	.145
Fat free mass (kg)	59.136 \pm 4.60	61.979 \pm 5.72	-1.448	.159
Fat mass (kg)	8.5 \pm 4.83	10.8 \pm 6.01	-1.460	.156
Total body water (kg)	45.307 \pm 3.54	38.251 \pm 1.25	-1.006	.323

$P < 0.05$ was significant.

As a result of comparison of physical properties of groups with Independent t test, between groups; There was no statistically significant difference in terms of age, height, body weight, body mass, body fat weight, body fat ratio ($p > 0,05$).

A Team's Pre-Test Average Values and Final Test Average Values and Comparison Results

Variables	PRE-TEST (n=14) (x±sd)	FINAL TEST (n=14) (x±sd)	z	p
Glucose (mg/dl)	95,29+15,27	102,14+14,98	-2,229	0,026
LDH (u/l)	247,42+67,26	341+112,51	-2,606	0,009***
CK (u/l)	407+204,21	411,43+780,76	-1,287	0,198
IBC (ug/dl)	168,30+84+54	229+96,49	-3,233	0,001***
Triglycerides (mg/dl)	87,57+24,84	139+79,33	-0,063	0,950
Total cholesterol (mg/dl)	169+29,93	166+26,68	-1,633	0,103
HDL cholesterol (mg/dl)	43,35+8,93	46,63+10,15	-3,045	0,002**
LDL cholesterol (mg/dl)	107,27+26,65	92,16+30,71	-2,417	0,016
T4 (pmol/l)	11,27+9,46	17,16+1,58	-0,828	0,778
WBC (K/ul)	6,65+1,40	10,27+2,25	-3,296	0,001***
RBC (K/ul)	5,42+0,36	5,45+0,45	-1,107	0,132
HGB (g/dl)	15,98+0,92	16,02+0,77	-0,188	0,851
HCT (%)	47,07+2,37	47,43+2,49	-0,942	0,346
MCV (fL)	86,96+2,75	87,17+3,00	-2,229	0,026
MCH (pg)	39,78+1,29	29,76+1,38	-0,910	0,363
MCHC (g/dl)	34,26+0,86	33,79+1,38	-0,565	0,572
PLT (K/uk)	209,14+41,01	247+45,58	-0,417	0,016
Growth hormone (ng/ml)	1,58+1,62	7,20+6,88	-0,028	0,043

*p≤0,05; **p≤ ; 0,01 ;*** p≤ ; 0,001 Significant

As a result of comparing the pre-test averages of the A-team in our study with the Wilcoxon Test of the post-test averages, LDL, LDL, cholesterol, free T4, RBC, HGB, HCV, MCV, MCH, MCHC, PLT (p <0.05) were found statistically significant and there was no statistically significant difference between the two variables in GH values (p > 0,05).

B Team Pre-Test Average Values and Last Test Average Values and Comparison Results

Variables	PRE-TEST (n=14) (x±sd)	FINAL TEST (n=14) (x±sd)	z	p
Glucose (mg/dl)	95,29+17,11	119,43+20,51	-2,691	0,007**
LDH (u/I)	249+93,31	290,14+68,53	-1,922	0,005
CK (u/I)	341,43+199,49	265,43+45,62	-0,031	0,975
IBC (ug/dl)	184+33,46	221+67,05	-2,731	0,006**
Triglycerides (mg/dl)	88,29+36,12	139,43+81,98	-0,220	0,826
Total cholesterol (mg/dl)	154,86+18,37	156,29+18,30	-0,245	0,807
HDL cholesterol (mg/dl)	44,48+10,14	44,45+9,87	-0,534	0,594
LDL cholesterol (mg/dl)	91,68+12,02	82,85+22,45	-0,282	0,778
T4 (pmol/l)	14,02+9,00	16,30+2,96	-0,534	0,594
WBC (K/ul)	5,40+1,63	8,62+2,96	-2,830	0,005**
RBC (K/ul)	5,41+0,76	5,64+0,73	-2,263	0,024
HGB (g/dl)	15,52+1,36	15,04+0,97	-0,282	0,778
HCT (%)	44,03+2,45	45,60+1,65	-1,036	0,300
MCV (fL)	82,45+9,83	82,28+9,18	-0,973	0,331
MCH (pg)	27,29+4,18	27,4+4,02	-1,601	0,109
MCHC (g/dl)	32,97+1,97	33,12+1,47	-0,094	0,925
PLT (K/uk)	234,92+71,71	286,80+61,98	-2,480	0,013
Growth hormone (ng/ml)	1,04+1,65	6,06+9,68	-2,197	0,028

*p≤0,05; **p≤ ; 0,01 ;*** p≤ ; 0,001 Significant

As a result of comparing the pretest mean values of group B with the Wilcoxon Test of posttest mean values, LDL, CK, Triglyceride, Total Cholesterol, LDL Cholesterol, Free T4, RBC, HGB, HCT, MCV, MCH, MCHC (p <0.05) were found to be statistically significant , There was no statistically significant difference between two variables in PLT and GH values (p > 0,05).

A Team's Pre-Test Average Values and Pre-Test Average Values of Group B and Comparison Results - Final Test Average Values of Team A, and Final Test Average Values of Group B and Comparison Results

Variables	TEAM A pre-test (14) (x±sd)	TEAM B final-test N(14)(x±sd)	z	p	TEAM A final-test N(14)(x±sd)	TEAM B final-test N(14)(x±sd)	z	p
Glucose (mg/dl)	95,26+15,27	95,29++17,11	-0,759	0,448	102,14,+14,98	119,41+20,51	-0,023	0,982
LDH (u/I)	247,42+67,26	249+93,31	-0,046	0,963	341+112,51	290,14+68,53	-0,230	0,818
CK (u/I)	407+240,21	341,43+199,49	-0,276	0,783	411,43+180,76	265,43+45,62	-1,654	0,098
IBC (ug/dl) (ug/dl)	168,30+84,54	184+33,46	-0,391	0,969	229+96,49	221+67,05	-0,345	0,730
Triglycerides (mg/dl)	87,57+24,84	88,29+36,12	-0,184	0,854	139+79,33	139,43+81,98	-0,092	0,927
Total cholesterol (mg/dl)	169+29,93	154,86+18,37	-1,310	0,190	166+26,68	156,29+18,30	-0,667	0,505
HDL cholesterol (mg/dl)	43,35+8,93	44,48+10,14	-0,827	0,408	46,63+10,15	44,45+9,87	-0,643	0,520
LDL cholesterol (mg/dl)	107,27+26,65	91,68+12,02	-2,619	0,009**	92,16+30,71	82,85+22,45	-0,781	0,435
T4 (pmol/I)	11,27+9,46	14,02+9,00	-1,424	0,154	17,16+1,58	16,30+2,96	-0,712	0,476
WBC (K/ul)	6,65+1,40	5,40+1,63	-0,736	0,462	10,27+2,25	8,62+2,96	-1,359	0,174
RBC (K/ul)	5,42+0,36	5,41+0,76	-0,781	0,435	5,45+0,45	5,64+0,73	-0,437	0,662
HGB (g/dl)	15,98+0,92	15,52+1,36	-1,195	0,232	16,02+0,77	15,04+0,97	-0,965	0,334
HCT (%)	47,07+2,37	44,03+2,45	-1,192	0,073	47,43+2,49	45,60+1,65	-1,700	0,089
MCV (fL)	86,96+,275	82,45+9,83	-1,332	0,183	87,17+3,00	82,28+9,18	-1,195	0,232
MCH (pg)	39,78+1,29	27,29+4,18	-0,873	0,383	29,76+1,38	27,34+4,02	-1,080	0,280
MCHC (g/dl)	34,26+0,86	32,97+1,97	-0,115	0,909	33,79+0,90	33,12+1,48	-0,735	0,462
PLT (K/uk)	209,14+41,01	234,92+71,71	-1,057	0,291	247+45,58	286,80+61,98	-0,322	0,478
Growth hormone (ng/ml)	1,58+1,62	1,04+1,65	-0,116	0,908	7,20+6,88	6,06+9,68	-1,432	0,152

*p≤0.05;** p≤0.01;*** p≤0.001 Significant

As a result of our study, we compared the pre-test averages of the players of Team A with the pre-test averages of Team B players with the Mann-Whitney U Test; LDL cholesterol, HDL cholesterol, free T4, WBC, RBC, HCT, MCV, MCH, MCHC, There was no statistically significant difference between PLT and GH values (p> 0,05).

Discussion

The mean average of all players, 28 footballer (group A, group B) age of was 25.18 ± 3.66 years, height 176.7 ± 6.16 cm and body weight 73.01 ± 8.05 (table 4.1.1) . In the study of 22 professional footballers, younesian et al. Found that the average age was 21.7 ± 1.31 years, the average height was 175 ± 0.05 cm and the body weights were 67.03 ± 6.33 kg (7). In his study with 23 elite football players, Aslan found that the average age of the players was $21,56 \pm 2,78$ years, height average of $179,17 \pm 5,40$ cm and body weight value of $73,98 \pm 11,98$ kg (8). Alemdaroglu found that the average age of the players was 21.92 years, height 176.14 cm and body weight 72.28 kg (9). In his study with 15 professional footballers, Aslan found that the mean age was 25.67 ± 3.79 years, the mean height was 179.10 ± 5.43 cm and the mean body weight was 77.40 ± 7.55 (10). In the study on footballers, Taşkın found that the average age was 23.56 ± 3.34 years, the mean body weights were 73.64 ± 4.67 kg and the average height lengths were 179.00 ± 4.00 cm (11).

As a result of comparing pre-test averages of group A with Mann-Whitney U test of post-test averages; Lactad Dehydrogenase LDH, Iron Binding Capacity IBC, High Density Lipoprotein HDL Cholesterol and White Blood Cell WBC values were found to be statistically significant ($p < 0,05$). Other selected parameters of the groups were Glucose, Creatine Kinase CK, Triglyceride, Total Cholesterol , Low Density Lipoprotein LDL Cholesterol, Free T4, Red Blood Cell RBC, Hemoglobin HGB, Hematocrit HCT, Mean Erythrocyte Volume MCV, Mean Hemoglobin MCH, Erythrocyte Hemoglobin Concentration MCHC, Trbombocytes PLT and Growth Hormone GH values were statistically significant ($p > 0,05$). (Table 4.2.1).

As a result of comparing pre-test averages of group B and post-test averages with Mann-Whitney U test, which is another group, Glucose, Iron Binding Capacity IBC and White Blood Cell WBC values were found to be statistically significant ($p < 0,05$); Lactate Dehydrogenase LDH, High Density Lipoprotein HDL, Creatine Kinase CK, Triglyceride, Total Cholesterol, Low Density Lipoprotein LDL Cholesterol, Free T4, Red Blood Cell RBC, Hemoglobin HGB, Hematocrit HCT, Mean Erythrocyte MCV, Mean Hemoglobin MCH, Erythrocyte Hemoglobin Concentration There was no statistically significant difference between the variables in MCHC, Trbomocyte PLT and Growth Hormone GH values ($p > 0,05$). (Table 4.2.2).

Younesian et al. Found a statistically significant increase in WBC, RBC, HGB, HCT and PLT values in pre and post match pre and post test on 22 professional football players ($p < 0.001$), while MCV, MCH, MCHC values did not find a meaningful difference (7). Kappel et al. Found that a

significant increase in White Blood Cell WBC counts after exercise in acute training and post-exercise observations in sedentary individuals with a mean age of 25 (12). Bezci et al., 11 elite taekwondo, found that athletes had a significant increase in WBC levels in their research on athletes rated in the World, Europe and Turkey youth categories (13).

As a result of comparing the pre-test averages of Team A players with the pre-test averages of Team B players with the Mann-Whitney U Test; LDL, CK, IBC, Triglyceride Total Cholesterol, HDL Cholesterol, Free T4, WBC, RBC, HGB, HCT, and LDL cholesterol levels were found to be statistically significant ($p < 0.05$) There was no statistically significant difference between MCV, MCH, MCHC, PLT and GH values ($p > 0,05$). (Table 4.2.3).

Patlar, on his study of 40 athletes, found that some selected blood parameters of acute exercise were; WBC, HGB, RBC, HCT and PLT levels (in the direction of increase); MCV, MCH and MCHC found no significant difference (14). Lactate Degidrogenase LDL Cholesterol averages of Team A players; 107.27 ± 26.65 , while the average of the LDL values of the B team players was; $91,68 \pm 12,02$. Accordingly, when we look at the average pre-test values of the groups, it is understood that the average value of the LDH of the team B players is lower than that of the team A before the start of the competition.

Conclusions and Suggestions

1. The effects of competition performances on soccer players were observed on selected biochemical and hematological parameters. As the performance of the competition affected the biochemical and hematological parameters, these parameters also observed an effective role in determining the performance of the competition.
2. It is deduced that this result may have been due to the fact that the study groups were subjected to the same overload, rest and training programs as it was observed that there was very little difference in significance between pre-test mean values in selected biochemical and hematological parameters.
3. As in our study, the effects of acute exercise on biochemical and haematological parameters were found to be different from those of chronic exercises.

In line with the results of this study;

1. While coaches and sports scientists are preparing training programs, it is suggested that the athletes make biochemical and hematological test measurements and move accordingly considering their individual characteristics.
2. While efforts are being made to protect sportsmen from injuries, it is thought that biochemical and hematological findings may also be known to protect the athletes from possible risks and injuries.

References

1. Hazar Z, İbiş S. Influence on the performance parameters of the competition training in amateur soccer team. Selcuk University Physical Education and Sports Science Journal 2010, 239-43.
2. Günay M, Tamer K, Cicioğlu İ. Sports Physiology and Performance Measurement. Ankara: Gazi Kitabevi 2006.
3. Özaltaş HN. An Analysis of Short, Medium, Long Distance Running Performance and Apelin Relationship in Elite Male Athletes. Institute of Health Sciences, Department of Physical Education and Sport. Ph.D Thesis, Malatya: İnönü University 2015.
4. Bezci Ş. An Examination of Some Hematological and Biochemical Parameters Before and After Training in Elit Taekwondocular. Institute of Health Sciences, Department of Physical Education and Sports. Graduate Thesis, Konya: Selçuk University 2007.
5. Öztürk Ç. Effects of Pre-Acute Exercise Glycerol Revolution on Lactate and Aerobic Power with Some Biochemical Parameters in Athletes and Sedanter Individuals, Health Science Institute, Department of Physical Education and Sports. Master Thesis, Konya: Selçuk University 2009.
6. The Influence of Different Grouping Methods on 4x4 Small Area Playing Performance on Rooted Y. Young Footballers. Institute of Health Sciences, Department of Physical Education and Sports. Doctorate Thesis, Ankara: Ankara University 2011.
7. Younesian A, Mohammadion M, Rahnama N. Haemathology of professional soccer players before and after 90 min match. *CMBL* 2004, 9: 2.
8. Aslan CS. Comparison of Effects of Narrow Field Games and Interval Running Training Methods on Selected Physiological and Technical Capacities of Footballers. Institute of Health Sciences, Department of Physical Education and Sport. Doctorate Thesis, Ankara: Ankara University, 2012.
9. Alemdaroğlu U. Comparison of Field and Laboratory Tests Used in Determination of Aerobic Capacity. Health Sciences Institute, Physical Education and Sports High School, Master Thesis. Denizli: Pamukkale University, 2008.
10. Aslan CS, Karakollukçu M. Effects of pre-season preparatory work on selected physical and physiological characteristics of a super league team, *Sportmeter Physical Education and Sports Science Journal* 2010, 7: 51-6.
11. Taşkın H. Examination of some physical parameters and 30-meter sprint ability in professional soccer according to the positions. *Sportmeter* 2006, 4: 49-54.
12. Kappel M, Poulsen T, Galbo H, Pedersen BK. Effect of elevated noradrenaline concentration on the immune system in humans. *EJAP* 1998, 79: 93-8.
13. Bezci S, Kaya Y. Elit. The evaluation of some biochemical parameters before and after training in Taekwondocular. *Pamukkale Journal Of Sport Sciences* 2010, 1: 1-16
14. Chan DW, Booth RA, Diomondis EP. Tumor markers. In: Burtis CA, Ashwood ER, Bruns DE, eds. *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics*. 4th ed. Missouri: *Elsevier Saunders* 2006: 745-95.