



COMPARISON OF THE PERFORMANCE VALUES OF THE U-16 DEVELOPMENT LEAGUE FOOTBALL PLAYERS IN THE COMPETITION PERIOD

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Abstract:

This study aims to compare the performance values of U-16 development league football players. The research was carried out according to the experimental research model. A total of 25 football players of a super league football team (age: 16, height: 170,36±7,31cm, weight: 56,89±8,88kg), all competing in the U-16 elite development league, participated voluntarily. The players wear Polar watches on the grass football field; Yo-Yo Intermittent Recovery Level 1 test was applied and aerobic endurance levels, maximal heart rate, and heart rate recovery times were measured. Tests and measurements were applied 1 week before the start of the league. After the first test, the competition period general training program was applied for 9 weeks, 4 days a week, and after that, the same tests and measurements were carried out again. After a 9-week competition training program, there were statistically significant differences in aerobic endurance levels and heart rate recovery times at the 1st minute ($p<0.01$), no statistically significant differences were found in maximal heart rate and heart rate recovery times at the 2nd minute ($p>0.01$). In conclusion, it can be said that the 9-week training program applied during the competition period is effective on the aerobic endurance level and heart rate recovery time in the 1st minute.

Keywords: development league, aerobic endurance, maximum heart rate, recovery, heart rate recovery

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1. Introduction

Development leagues constitute the basic structure of our country's football. In football, the development leagues are the infrastructure of all teams from the amateur league to the super league. When we look at the success of Turkish teams, football players, and the national team in European and world tournaments, we see how far we are behind compared to other countries. So, to make the world talk about Turkish football and football players in the future, we think that the group that needs to be studied the most in terms of psychological, sociological, and performance science, is the development leagues. Football is a sport that includes aerobic and anaerobic energy systems (Açıkada, et al., 1999). The players' ability to benefit from these energy systems at the highest level is ensured by the development of physical and motoric performance (Taşkın, et al., 2015). In all sports branches, both the player and the coach need to use the correct data and the correct training program by applying scientific methods for performance enhancement (Kızılet, et al., 2010). Recovery also comes forth in branches where sudden performance changes occur during the match, such as football. The short recovery time contributes to the athlete's performance at the highest level for longer. One of the most important factors affecting this is the heart rate. Heart rate variability (HRV) may differ according to age and gender. It is also known that the athlete shows variability in situations such as hungry, full, standing, etc. Studies show that regular exercise increases HRV. Parasympathetic and sympathetic nerves affect heart rate. While parasympathetic has a decelerating effect, sympathetic increases the heart rate (Ateş, 2014; Berntson et al., 1997; Shaffer and Ginsberg, 2017) Heart rate analysis during exercise and recovery informs us of cardiac autonomic recovery (Javorka et al., 2002). Heart rate parallels this autonomic recovery, that is, heart rate also shows a great decrease (Imai et al., 1994). After exercise, a gradual slowdown in metabolic activities and a decrease in heart rate begin (Peçanha et al., 2016). Conditions such as training, age, gender, nutrition, genetic structure, etc. are the most important factors affecting the heart rate. Due to these factors, the number of heartbeats differs according to the individuals (Tamer, 2000). By monitoring the heart rate, the fatigue levels of the athletes can be controlled and unwanted injuries can be prevented. Also, with the development of the energy system desired, the performance capacity will be increased (Açıkada, 1990).

This study aims to compare the performance values of U-16 development league football players.

2. Materials and Methods

The research was carried out according to the experimental research model. Also, the ethical committee report stating that the experimental research conducted is in accordance with the "Declaration of Helsinki on Ethical Principles in Medical Research on Humans" was approved by the Manisa Celal Bayar University Faculty of Medicine Health Sciences Ethics Committee. The participants were informed about the applications

and tests to be carried out before the study. An informed consent form was obtained from the participants.

A total of 25 football players of a super league football team (age: 16, height: $170,36 \pm 7,31$ cm, weight: $56,89 \pm 8,88$ kg), all competing in the U-16 elite development league, participated voluntarily. The players wore Polar watches and on the grass football field, Yo-Yo Intermittent Recovery Level 1 test was applied. Aerobic endurance levels, maximal heart rate, and heart rate recovery times were measured. Tests and measurements were applied 1 week before the start of the league. After the first test, the competition period general training program was applied for 9 weeks, 4 days a week, and after 9 weeks the same tests and measurements were carried out again.

Anthropometric measurements were taken before the Yo-Yo test. Height was measured in 'cm' and barefoot with the heels adjacent to each other (Holtain brand stadiometer with an accuracy of ± 1 mm). Bodyweight was measured in 'kg' when they were barefoot with only shorts and t-shirts and in anatomical posture position. The bodyweight precision of the subjects was ± 0.1 kg (Tefal brand electronic scale).

Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1) is an endurance test consisting of repetitive runs that start with a running speed of 10 km/h between the start, turn, and finish lines in a 2×20 m area and gradually increase the running speed according to the signal sound coming from the signal device. After every 40 m run, there is an active recovery area of 10 seconds consisting of 2×5 m (Stolen et al., 2005). The test consisted of 1 lap at 10 km/h, 1 lap at 11 km/h, 1 lap each at 12-13 km/h, 3 laps at 13.5 km/h, 4 laps at 14 km/h, 8 laps at 14.5 km/h and 8 laps with 0.5 km/h increments up to 19.5 km/h. The test is terminated if the person reaches the point of exhaustion or if he misses two consecutive signals (Krustrup et al., 2003). Tests and measurements were applied 1 week before the start of the league to determine the endurance levels, maximum heart rate (HRmax) values, and heart rate recovery times of the football players. The players participated in the test in groups of 5 under the supervision of 3 football coaches. After the first test, general competition training was applied 4 days a week for 9 weeks, and after 9 weeks the same tests and measurements were carried out again. The % HRmax values of the subjects were determined by the Yo-Yo Intermittent Recovery Test, and the HR was monitored with a polar watch (RS800CX). At the end of the tests, the highest HR values reached by the subjects were taken into account. The heart rate recovery rate of the players was also measured with the polar watch. A tape was used to measure the areas. As the Yo-Yo IR1 signal transmitter, which is used to determine the distance traveled by the players, HR values, and heart rate recovery; The Yo-Yo IR1 signal program was used with 1 HP brand laptop computer. For the players to hear the incoming signals clearly, 3 loudspeakers were used. An example of the training program is given in Table 1.

Table 1: Weekly Training Program Example

Days	Program
Monday	Rest
Tuesday	Warm up (15min), Aerobic Endurance (30min), Narrow field game (30min), Cooldown (10min)
Wednesday	Warm up (15min), Quick strength training (30min), Game without goal 2x15min, Cooldown (10min)
Thursday	Isınma 15dk, 2x30dk Çift kale maç, soğuma 10dk
Friday	Warm up (15min), Sprint training 10x5m, Free kick exercises (20min), Cooldown (10min)
Saturday	Rest
Sunday	Match

The analysis of the data was carried out with the SPSS 25 package program. Frequency and percentage analyzes were used for the descriptive statistics of the research. The paired sample t-test was performed to determine whether Yo-Yo and heart rate tests differed between the measurements. The significance level in the study was determined as $p < 0,01$.

3. Results

Weight and height measurements were given in Table 2.

Table 2: Descriptive Statistics

	n	Minimum	Maximum	Mean	Std. Deviation
Weight	25	39	75	56,89	8,876
Height	25	153	183	170,36	7,308

As a result of the analysis, it was determined that there was a significant difference in favor of the post-test between the YOYO pre-test average scores (Mean=1516,80, SD=478,84) and the post-test average scores (Mean=1832,02, SD=432,20) ($t = -3,496$, $p < 0,01$). It was determined that there was no significant difference between the HRmax pre-test mean scores (Mean=197,88, SD=10,66) and the post-test mean scores (Mean=192,48, SD=9,30). There was a significant difference in favor of the post test between the 1st minute pulse pre-test mean scores (Mean=165,80, SD=14,74) and the post-test mean scores (Mean=153,28, SD=18,06) (Mean.=165,80, SD=14,74) ($t = 2,783$, $p < 0,01$). It was determined that there was no significant difference between the second minute pulse pre-test mean scores (Mean=140,76, SD=13,36) and post-test mean scores (Mean=134,16, SD=13,18) (Table 3).

Table 3: Yo-Yo IR1 and Heart Rate Results

		n	Mean	Std. Dev.	t	df	p
YOYO	Pre-test	25	1516,80	478,84	-3,496	24	,002*
	Post-test	25	1832,02	432,20			
HRmax	Pre-test	25	197,88	10,66	2,046	24	,052
	Post-test	25	192,48	9,30			
1st min. HR	Pre-test	25	165,80	14,74	2,783	24	,009*
	Post-test	25	153,28	18,06			
2nd min. HR	Pre-test	25	140,76	13,36	1,639	24	,114
	Post-test	25	134,16	13,18			

HRmax: Maximum heart rate, 1st min. HR:

4. Discussion

In this research, the performance values of U-16 development league football players were compared. The effect of the training programs applied to the football players on the aerobic endurance, heart rate, and heart rate recovery rate was examined and the performance of the football players was compared. In this context, when the relevant literature is examined, it is seen that researchers use different training methods to study the endurance levels, heart rates, and heart rate recovery rates of football players.

Javorka et al. (2002) aimed to determine the relationship between the decrease in HR and HRV after exercise. Measurements were taken during different exercises performed by 17 volunteer men (20.3±0.2 years). As a result of the study, no significant relationship was observed between HR and HRV in the first minute of the recovery process which is different from the present study. Albinet et al. (2010) in a study they conducted on 24 sedentary women and men (65-78 years old); examined the effect of a 12-week physical exercise program on some parameters of HRV. Similar to the present study they found the 12-week aerobic exercises can increase HRV parameters in sedentary individuals. Ostojic et al. (2011) applied maximal exercises to 32 healthy young football players aged 20-22 years. They examined the recovery levels of football players in 1 minute. As a result of this study, it was revealed that football players with high aerobic capacity responded positively in the short-term recovery period after maximal exercises. In a study by Rostgaard et al. (2008), after a 5-week training period, they found an increase of 31% in the Yo-Yo-IR1 running distance of elite football players, 17% increase after 7 weeks of narrow field games, and 22% increase after speed endurance training. Kurtay et al. (2020) revealed that there was a 34% increase in aerobic capacity of 18 elite U-14 league football players as a result of 12-week physical performance training, while there was no significant difference in HR values. Krstrup et al. (2005), the average maximal heart rate during the match of elite female football players were obtained as 167 beats/min. According to the playing positions, the average maximum heart rate of female football players was 194 beats/min for goalkeepers, 183 beats/min for defenders, 181 beats/min for midfielders, and 184 beats/min for forwards.

5. Conclusions

In conclusion, a 9-week training program applied during the competition period is effective on aerobic endurance level and HR recovery time in the 1st minute.

Conflicts of Interest Statement

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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