

The Effect of Physical Performance Training on Yo-Yo Intermediate Level 1 Test Parameters in Young Soccer Players

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Abstract

This research was conducted to determine the effect of physical performance training on Yo Yo intermediate level 1 test parameters in young soccer players. The research was conducted according to the experimental research model. The research was conducted in the U-14 elite development league of a football team that competed in the super league, age:14, height: 160.11 ± 7.68 ; weight: 47.79 ± 5.55 , 18 players participated voluntarily. Yo-Yo intermediate level 1 test was applied to the football players on the grass football field and maximal heart rate was measured with a polar watch. Tests and measurements were performed two weeks before the start of the league, and the endurance and maximal heart rate of football players' values were determined. After the first test, 12 weeks of physical performance pieces of training were performed and the same tests and measurements were performed again. In order to determine the difference between pre and post-test measurements, Paired Sample t-test was performed in SPSS 21 programme. According to the findings obtained as a result of the analysis; it was found that there was a statistically significant difference between Yo-Yo intermediate level 1 test performed before the season and Yo-Yo intermediate level 1 test after the physical training program. ($p < .05$). As a result; It can be said that physical performance training performed 12 weeks had a positive effect on endurance performance and maximal heart rate in young players. It is recommended that the research is applied to components of other performance such as speed and force.

Keywords: Yo-Yo Intermittent Recovery Test, Durability, Maximal Heart Rate

Introduction

The physical needs of football, which appeal to a wide audience around the world, and the movements performed by the players in the game are among the topics that are of interest to today's sports scientists. The football is defined as having an intermittent structure with high-intensity movements ending in 3-5 seconds (bounce, turns, sliding interventions) (Castagna et al., 2006; Krstrup et al., 2003, 2006). Many studies have been conducted on the effect of physical performance training in football until today (Bendiksen et al., 2013; Ingebrigtsen et al., 2013; Laursen, 2010; Ramírez-Campillo et al., 2014). In some of these studies, the running distances were examined and it was found that adult professional players covered a distance of 9 to 12 km during a match (J. Bangsbo, 1994; J. Bangsbo et al., 1991; MOHR et al., 2003). In research on young elite players after determining the running distances of adult professional players during the match; the distance covered by young players during the match was determined as 10.3 km (Helgerud et al., 2001). The research on adult and young soccer players has shown that the distance covered by both groups is similar. The similar results of the researches conclude that the training requirements of young and adult players may be similar (Stratton et al., 2004). The performance tests are needed to be determined training requirements and to be performed an appropriate training at an appropriate intensity.

Testing players' performance is very important to contribute to the physical preparation of the players, to create an appropriate training program for them, to follow their progress and to load the players according to their performance status (Impellizzeri et al., 2006; E. Rampinini et al., 2007). In this context, there are many research methods to measure the physical characteristics of the athletes and the physical requirements of the branch. However, the field and the laboratory tests are two main methods in determining physical properties (Krstrup et al., 2003; Bozkus, 2014; Leger et al., 1982; Ramsbottom et al., 1988). However, as an alternative to laboratory tests in cases where the subject group is high; the application is designed to be simple, reliable and cheaper field tests (Sproule et al., 1993). In other ways, the field tests are more advantageous than laboratory tests in terms of measuring specific movements during the match. Because the field tests consist of certain movements, certain intensity and a certain environment (Balsom, 1994). As the field tests frequently used by researchers; the shuttle run test, hoff test, and yo-yo test are outstanding (Chamari, 2005; Hoff et al., 2002; Krstrup et al., 2006; Stølen et al., 2005). YIRT (Yo-Yo intermittent recovery test) field test is frequently used for games with an intermittent structure such as football in determining the aerobic endurance level of the players. The YIRT test measures the ability of players to repeat high-intensity runs and their ability to rest capacity between these runs (J. Bangsbo, 1994; Jens Bangsbo et al., 2008). The durability that is one of the physical parameters is described according to muscles or energy systems (aerobic, anaerobic). It is known that aerobic energy systems are usually used more intensively in football (Üner, 2017). The players exposed to high intensity during the match use %80 to %90 of the aerobic energy system. Therefore, higher efficiency can be obtained from the player, by increasing the aerobic capacity of a player (Jens Bangsbo et al., 2008). It is very important for children and young soccer players need to train for this purpose to increase aerobic capacity and adaptation to endurance studies. The fact that hemoglobin and red blood cells, which act as the transport of oxygen in childhood affect the maximal oxygen capacity as low. Besides, the slow growth of muscular growth leads to incomplete development of glycogen stores and thus causes an inability to obtain full efficiency from endurance training. However, regular endurance

training increases heart and lung capacity (%10 - %30 range) and improves endurance level. (Üner, 2017).

The aim of this research was conducted to determine the effect of physical performance training on Yo-Yo intermediate level 1 test parameters in young soccer players.

Method

Participants

The 18 football players of the U-14 elite development league (age: 14; height: 160.11 ± 7.68 ; weight: 47.79 ± 5.55) participated in the study voluntarily.

Research Design

Anthropometric Measurements

The measurements were taken before the Yo-Yo AT1 test. The length measurement was measured in centimeters adjacent to each other in the anatomical posture position of the bare feet and the heels. The lengths of the players were measured with a Holtain stadiometer with an accuracy of ± 1 mm. The body weights were measured in kilograms with bare feet and anatomical posture only in shorts and T-shirts. The sensitivity of the subjects' body weights was measured with the Tefal brand electronic bath scale which is ± 0.1 kilograms.

Yo-Yo Intermittent Recovery Test Level 1 (Yo-yo AT1) And Heart Rate (HR) Measurements

Yo-Yo Intermittent Recovery Test is a durability test consisting of repeated conditions starting at a running speed of 10 kmh between start, turn and end lines in an area of 2 x 20 m and increasing the running speed gradually according to the signal sound from the signal device. There is an active recovery area consisting of 2x5 m for 10 seconds after every 40 m running (19). The test is 1 lap at 10 kmh, 1 lap at 11 kmh, 1 lap at 12-13 kmh, 3 laps at 13.5 kmh, 4 laps at 14 kmh, 8 laps at 14.5 kmh and 0.5 kmh increments of up to 19.5 kmh. The test is terminated if the person misses two consecutive beeps or until the point of extinction (3). The tests and measurements were performed 2 weeks before the start of the league to determine the endurance and HRmax values of the players. The players participated in the test in groups of 6 members under the supervision of 5 football coaches. After the first test, 12 weeks of physical performance training was applied and the same tests and measurements were performed again. HR max values of the subjects were determined by Yo-Yo Intermittent Recovery Test and HR follow-up was performed with the polar clock (RS800CX). At the end of the tests, the highest HR values reached by the subjects were taken into consideration. The tape measure was used to measure the areas. The 21 funnels were used to determine the running path of the players. As a Yo-Yo AT1 signal transmitter to determine the distance and HR values of players; an HP laptop and a Yo-Yo AT1 signal program on youtube video channels were used over the Internet. The 3 loudspeakers were used to enable players to hear incoming signals clearly.

12 Weeks Physical Performance Training (Aerobic Training)

Soccer-specific training drills were applied to improve aerobic endurance 2 days week (Tuesday-Wednesday) after the preliminary Yo-Yo AT1 test and HR measurements. The following criteria were applied during the training protocol.

Load Time: 4 – 6 minutes

Number of sets: 3 – 6 sets

Total Load Time: 15 – 30 minutes

Severity: 50% - 70% heart rate reserve

Recovery: Aerobic training program, which is Productive Rest (1:2 of load time), was implemented. The most important point in this training program is to increase the loading times gradually (23). Therefore, loading times were increased by 1 minute at the end of every 2 weeks and loading time was increased by 6 minutes at the end of the 12th week.

Analysis of the data

The SPSS 21 package program was used in the analysis of the obtained data. Paired Sample t-test was used to analyze the data obtained before and after the implementation of the physical training program. Significance level was taken as $p < 0.05$.

Results

Table 1. Yo-Yo AT1 Test Results of U-14 Elite League Players

	\bar{X}	N	SS	t	df	p
Pre-test	1235,56	18	377,14	-5,795	17	,000*
Post- test	1658,89	18	546,06			

* $p < .001$

As a result of Paired Sample t-test which was performed to evaluate the Yo-Yo AT1 test results of U-14 elite league football players, there was a significant difference between pre-test ($\bar{X}=1235,56$, $SS=377,14$) and post-test ($\bar{X}=1658,89$, $SS=546.06$) of football players ($t_{17}=-5,795$, $p < ,001$). The difference was found to be in favor of the last test.

Table 2. HR Test Results of U-14 Elite League Players

	\bar{X}	N	SS	t	df	p
HR 1	200,11	18	11,67	,443	17	,663
HR 2	198,94	18	8,96			

$p > .001$

As a result of Paired Sample t-test which was performed to evaluate HR test results of football players, there was no significant difference between pre-test ($\bar{X}=200.11$, $SD=11.67$) and post-test ($\bar{X}=198.94$, $SD=8.96$) results ($t_{17} = ,443$, $p > ,001$).

Discussion and Conclusion

Football is a structurally versatile sport and success in this branch comes with top performance components (Stølen et al., 2005). The high-intensity athletic performance in football; contributes to the technical-tactical level and the elite performance, which are the most important factors in success (Mohr et al., 2008). Besides, football players' durability

levels should be at the upper levels, as traits like rust, speed, smash, sprint, etc. are frequently repeated in the competition and require recovery as soon as possible (Mohr et al., 2005). In this context, when the relevant literature is examined, it has been seen that the researchers have made studies to improve the endurance levels of football players by using different training methods (Şenel, 1991), has achieved an increase of 18% of aerobic capacity development of male high school students in the 14-16 age group by applying 8-weeks endurance training. The study of the Hong Kong elite footballers showed a significant increase in AT1 running distance after 8 weeks of muscular strength and high-intensity interval training. In this study, the 8 weeks training period was found to be 1808 m while the running distance before the test was determined to be 1510 m. (Wong et al., 2010). Rostgaard and his friends (2008); reported that a 5-week training period after the elite footballers AT1 running distance increased by 31% (Rostgaard et al., 2008), 7-week narrow field games after the study 17%, in speed after the continuation training by 22% (Hill-Haas et al., 2009). Krstrup (2003); found that his study on 10 elite players that the Yo-Yo intermittent recovery level 1 test performed when the season preparations started was worse than the test performances performed in other periods (Krstrup et al., 2003). In the pre-test and post-test results to determine the heart rate; he found that the heart rate was lower in the last test and showed improvement. Krstrup and his friends (2006), applied the Yo-Yo intermittent recovery level 1 test to 15 first league players at different periods of the season. They reported that the performances performed at the end of the preparation period and at the end of the season were better than those performed at the beginning of the preparation period according to the test results (Krstrup et al., 2006). In another study conducted on footballers, the average At¹ running distance of 1968 m for the first week of the competition period, 2117 m for the halftime period and 2132 m for the end of the season was reported (Ermanno Rampinini et al., 2007). Seyis and his friends; have determined that the AT1 running distances of professional male footballers are 1651 m in the preparation period and 1820 m in the competition period (Seyis et al., 2011). Can and his friends; reported an average running distance of 1539 m for the first week of the preparation period and 1889 m for the first week of the competition period and they stated that there was a statistically significant difference between the preparation period and the competition period (Can et al., 2013). When looking at the distance covered during the Yo-Yo At¹ test in football players, U13 (933 m), U14 (1000 m), U15 (1184 m), U16 (1538 m), U17 (1581 m), U18 (1800 m) and U19 (2128 m) playing in the infrastructure of a football team in the Croatian 1st league players have a significant difference between running distances (Markovic et al., 2011). In the study conducted by Cihan and his friends on Turkish football players, the average Yo-Yo AT1 running distance of 955 m for U15 players, 1328 m for U17 players and 1967 m for A2 players was obtained (Cihan et al., 2012). In the study on players playing in the U17 age group, it was found that the mean HR_{max} values in the AT1 test were 197.2 beats / min⁻¹ for the U17 Czech national team, 195.2 beats / min⁻¹ for the best team in the U17 league, and 194 beats / min⁻¹ for the worst team (Teplan et al., 2012). In the study conducted on professional and amateur football

players, the average HRmax values in the AT1 test were 188 beats / min-1 in professionals and 194 beats / min-1 in amateur players (Ermanno

Rampinini et al., 2010). In the study conducted in professional male football players who struggle in different game positions, the average HRmax values of the athletes in the AT1 test were 179.3 beats / min-1 for goalkeepers, 186.0 beats / min-1 for defenders, 185.0 beats / min-1 for midfielders and offensive players for 188.4 beats / min-1 (Cihan et al., 2012).

In our study, a significant difference was found between the pre-test and post-test results of the Yo-Yo AT1 of U-14 elite league football players in favor of the post-test ($p < .05$). When the results were examined, it was found that there was a 34% difference between the results of the pre-Yo-Yo AT1 test and the Yo-Yo AT1 test after 12 weeks of physical performance training. This result shows that 12-weeks physical performance training results in a 34% increase in the aerobic capacity of football players. Thus, the physical performance training program had a significant positive effect on the Yo-Yo intermittent recovery level 1 test parameters. In our study, there was not found a significant difference in the maximal heart rate of U-14 elite league players ($p > .05$). It is recommended that the study should be conducted in different age groups and with different training methods.

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