

Effect of Distance Physical Training to YYIRL1 and YYIRL2 Test Performance Top Class Soccer Referees and Assistant Referees

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Citation: Kızılet Tuba. et.al (2024), Effect of Distance Physical Training to YYIRL1 and YYIRL2 Test Performance Top Class Soccer Referees and Assistant Referees, *Educational Administration: Theory And Practice*, 30(5), 1364-1370 Doi: 10.53555/kuey.v30i5.3094

ARTICLE INFO

ABSTRACT

Background and Study Aim: Nowadays game's tempo is increase with developing of professional soccer player's physical abilities (mean running of referees(R) 9-11 km; assistant referees (AR) 6-8 km and their physical and physiological sufficiencies is important for adapting game's tempo. Our hypothesis, using the recorded results of the evaluation of physical responses to distance physical training programme in practice, interpretation and practice in orientation of different age range, geographic distances, and different occupations, part-time or full -time working as a professional, it is possible for the development of the competencies of the referees performance.

Material and Methods. The study of group (R and AR; respectively age;36,5±4,1;37,1±2,1) trained programs 3 times a week during 3 months and performed Yo-Yo Intermitent Recovery Test Level 1 (YYIRL1) and Yo-Yo Intermittent Endurance test-Level 2 Modify Ariet test (YYIEL2) respectively. Heart rate was recorded every 1 second records. Data are presented as mean and SD. The differences within the groups themselves pre-post test comparisons in Wilcoxon Signed Ranks Test ($p < 0,05$).

Results. According to the scope of work of the R's YYIRL1 and AR's YYIEL2 results, distance running (respectively $p = .170$ and $.1000$) and physiological parameters (HRload, HRmax, HRmean and After 1 minute recovery) did not show significant difference (respectively; $p = .390$, $.326$, $.606$ and $.704$ and $p = .315$, $.802$, $.619$ and $.030$).

Conclusions: Using appropriate educational technologies in practice, different age range, geographic distances and different occupations, part-time or full-time working as a professional, the development of competencies in the performance of the referees is possible.

Key Words: Soccer Referee and Assistant Referee, Distance Physical Training Program, Heart Rate

Introduction

Nowadays, with the increase in the physical characteristics of professional football players participating in the competition under the supervision of coaches, the tempo of the game has accelerated, and the increase in the tempo of the game in football has made the physical and characteristic competencies of the referees very important. It is reported that the total running distance of the senior referee and assistant referee during the match, respectively; about 10 km. and 8 km (1). For this reason, the physical and physiological competencies of referees are important in keeping up with the tempo^[1,2]. Ayrıca physical qualities, specifically those linked to strength and speed, moderated the behavior of the referees and could be decisive in general preparation, as has been shown in previous studies^[3]. In addition, the previous findings also have a relationship with physical performance during sports competition^[4].

According to these data; Elit referees have to apply the rules and make decisions under physical and psychological load. However, unlike football players, refereeing is not professional. Additionally, they cannot train regularly because they work at different geographical distances and in different professions. In this context, the Distance Physical Education Program (DPEP), which has a flexible structure to help them overcome these obstacles, can be considered as a new model^[5]. Thus, thanks to the flexible structure of DPEP, it offers the opportunity to share recording results such as the individual's heart rate, load intensity zones, and workload, which are very important parameters of training, with their coaches.

In this context, the aim of our study is to evaluate the effect of DPEP on the physical and physiological competencies of referees. Our hypothesis in the study; It is possible to improve the performance competencies of referees who work part-time or full-time in different age ranges, geographical distances and in different professions by recording the physiological responses in training using appropriate training technologies, evaluating the results, interpreting them and directing the training.

Materials And Methods

Research Group

The study of group (R and AR; respectively age; $36,5 \pm 4,1$; $37,1 \pm 2,1$) trained programs 3 times a week during 3 months and performed Yo-Yo Intermittent Recovery Test Level 1 (YYIRL1) and Yo-Yo Intermittent Endurance Test-Level 2 Modify Ariet test (YYIEL2) respectively.

Gathering and Analysis of Samples

Yo-Yo Yo-Yo Intermittent Recovery Test Level 1 procedure: All participants should line up along the starting line. The athletes start with a foot behind the starting line, and begin running when instructed by the audio recording. The athlete turns when signaled by the recorded audio beep at the line 20 meters away, and returns to the starting point. For the endurance test, the athletes continue running in time with the audio signals with no rest period. For the intermittent tests, they walk or jog to the next line and back to come to a complete stop at the starting line again, before starting off with indicated. During the test: For the intermittent tests, there is an active recovery period of 5 or 10 seconds between every 40 meters run, during which the subject must walk or jog to the next line and return to the starting point. Participants should come to a complete stop before starting the next 40m run - rolling start is to be avoided. At regular intervals, the running speed will increase, as indicated on the recording. The participants must continue for as long as they can. Some of the athletes will choose to stop when they have reached their physical limit^[6].

Yo-Yo Intermittent Endurance test-Level 2 Modify Ariet test (YYIEL2): The endurance test is a 20m shuttle test like the beep test (no rest periods), and the intermittent test versions have rest periods of 5 seconds (intermittent endurance test) or 10 seconds (intermittent recovery test) between each 40m shuttle. All participants should line up along the starting line. The athletes start with a foot behind the middle line (cone B), and begin running when instructed by the audio recording. The athlete turns when signaled by the recorded audio beep (at cone C), and returns to the starting point. The athlete must not start running early, must run the complete distance, and reach each line before or in time with the recording. During the test: There is an active recovery period of 10 seconds between every 40 meters run, during which the subject must walk or jog to the next line (cone A) and return to the starting point. At regular intervals, the running speed will increase. The starting speed for the Level 2 Intermittent Recovery Test is 13.0km/hr, and increases to 15km/hr, 16km/hr, then increasing by 0.5 km/hr thereafter. The participants must continue for as long as they can. Some of the athletes will choose to stop when they have reached their physical limit^[6].

Heart rate analysis: Measurements were made with a polar heart rate monitor. The Polar watch was found attached to the wrist during the test. At the same time, there is a chest strap connected to the watch via bluetooth. At the midpoint of this band is a sensor that measures the heartbeat. This sensor is located at the level of the heart. During the test, the heart rate can be seen on the Polar watch display. This is usually shown as a specific metric in terms of BPM (beats per minute). The sensor transmits the data to the watch instantly. At the end of the test, the data was sent to the e-mail address via watch and made ready for analysis. The obtained data were examined and recorded on the computer.

Training programme: The weekly plan includes high-intensity interval, speed and agility training, speed continuity training and core strength training.

Analysis of Data

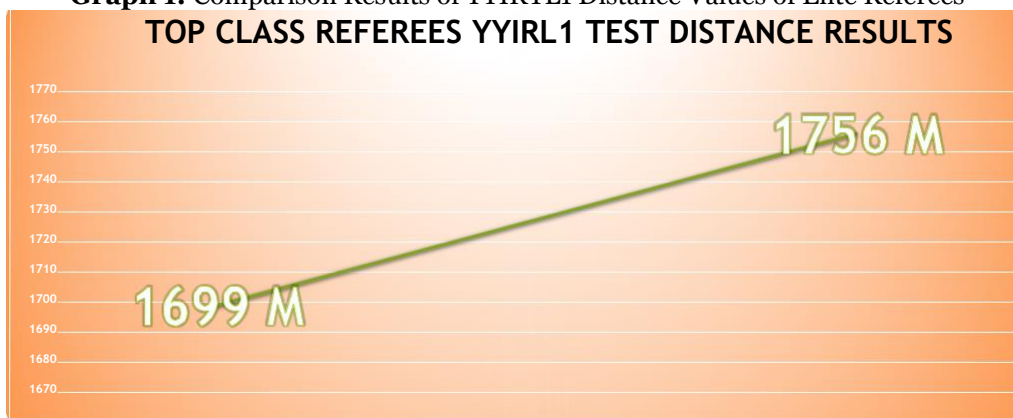
Data are presented as mean and SD. The differences within the groups themselves pre-posttest comparisons in Wilcoxon Signed Ranks Test ($p < 0,05$).

Results

Table 1. Descriptive Statistics Results of Age and Anthropometric Characteristics of Elite Referees and Assistant Referees

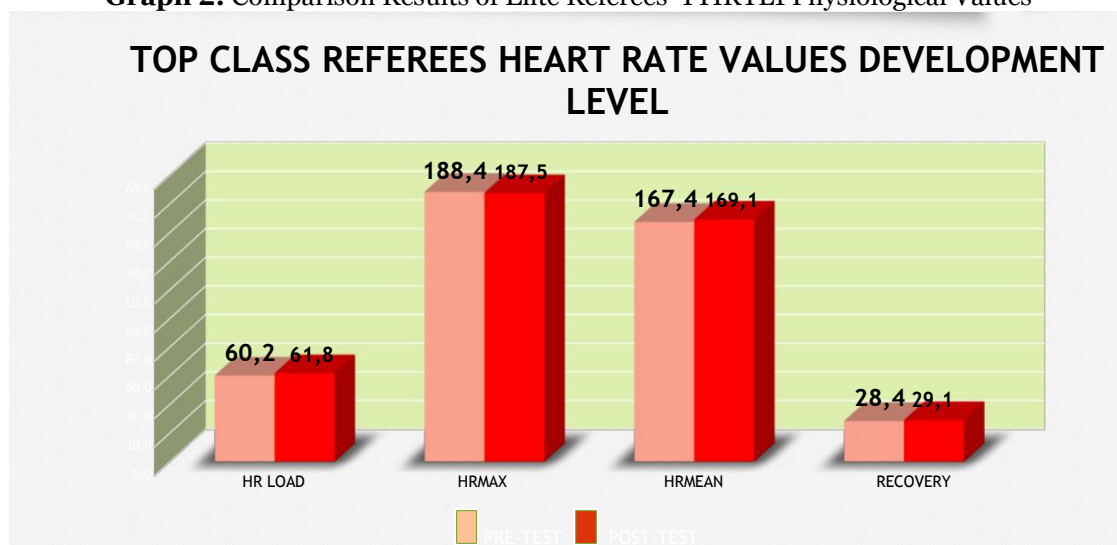
	Age	Height(cm)	Weight(kg)	Fat (%)
Top Class Referees	36,5±4,1	1,82±0,40	77,7±6,75	12,8±2,4
Top Class Assistant Referees	37,1±2,1	1,79±0,49	74,6±5,85	13,2±3,1

Graph 1: Comparison Results of YYIRTL1 Distance Values of Elite Referees



According to the study results, the pre- and post-test results of the elite referees are; YYIRTL1 distance 1699±209.9 m. and 1756±.179.9 m. was found as. According to the study results, no statistically significant difference was obtained ($p < 0.05$, $r = .170$)

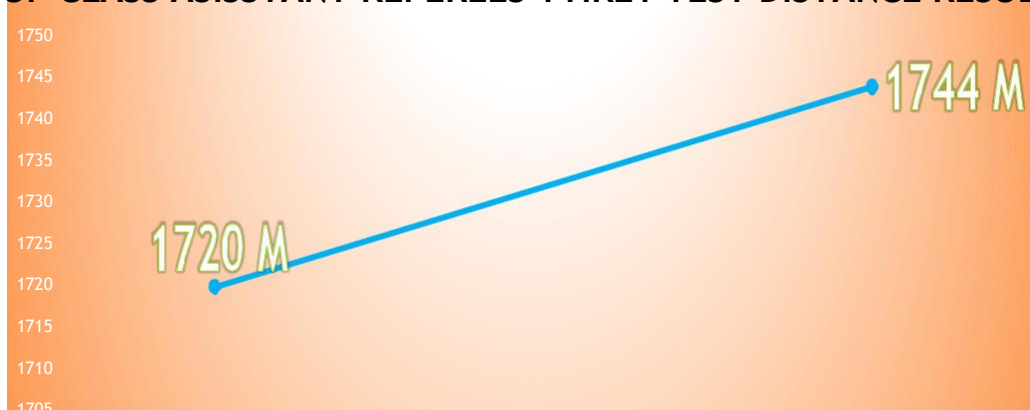
Graph 2: Comparison Results of Elite Referees' YYIRTL1 Physiological Values



: $p < 0,05$

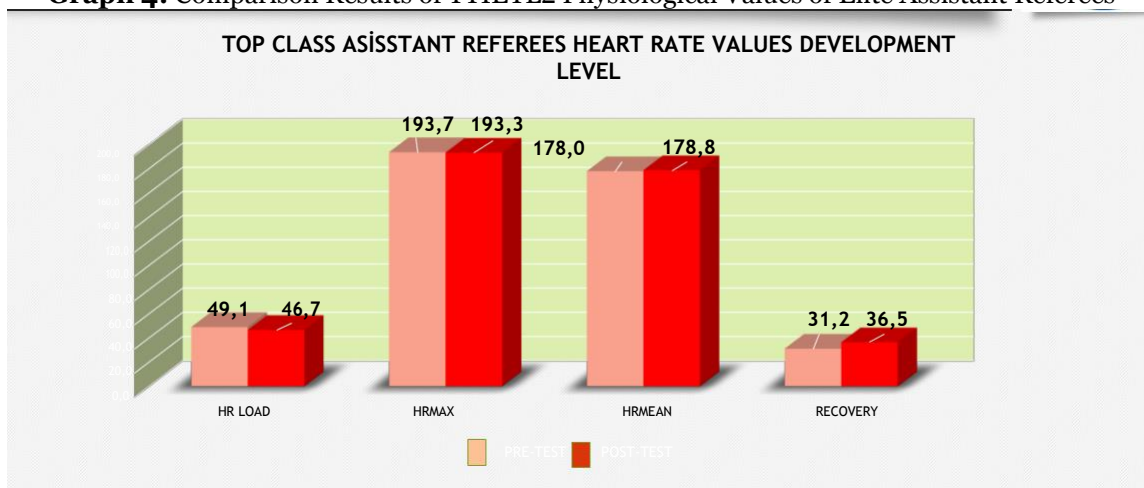
HRload pre- and post-test 60.2 ± 10.3 and 61.1 ± 11.6; HRmax 187.5 ± 10.7 beats/min and 172.7± 10.4 beats/min; HRmean was found to be 172.1 ± 22.7 beats/min and 169.1± 9.7 beats/min, and rest was 28.4± 13 beats/min and 29.1± 10.7 beats/min. According to the study results, no statistically significant difference was obtained ($p > 0.05$, $p = .390$, $.326$, $.606$ and $.704$).

Graph 3: Comparison Results of YYIETL2 Distance Values of Elite Assistant Referees
TOP CLASS ASISSTANT REFEREES YYIRL1 TEST DISTANCE RESULTS



According to the study results, the pre- and post-test results of the elite assistant referees are; YYIETL2 distance 1744 ± 285.9 m. and 1744 ± 209.4 m. was found as. According to the study results, no statistically significant difference was obtained ($p > 0.05$, $r = .1000$).

Graph 4: Comparison Results of YYIETL2 Physiological Values of Elite Assistant Referees



: $p < 0,05$

HRload pre- and post-test 49.1 ± 8.8 and 46.7 ± 9.8 ; HRmax 193.7 ± 10.2 beats/min and 193.3 ± 9.9 beats/min; HRmean was found to be 178 ± 10.3 beats/min and 178.8 ± 10.5 beats/min, and rest was 31.2 ± 8.7 beats/min and 36.5 ± 13 beats/min. According to the study results, no statistically significant difference was obtained ($p > 0.05$; $p = .315, .802, .619$ and $.030$).

Discussion

Soccer refereeing implies the necessity to perform high intensity and short actions and a greater cardiovascular capacity to be better positioned throughout the match-play^[7]. They must have good aerobic resistance and speed, since they cover distances between 9 and 13 km per match, occupying high-speed sprints between 4 and 8% of their actions^[8]. Interestingly more than 70 high-intensity accelerations ($> 1.5 \text{ m}\cdot\text{s}^{-2}$) interspersed with less 20 s of recovery were reported in continental cup matches⁴ and around the 60% of total accelerations were at high intensity ($> 1.5 \text{ m}\cdot\text{s}^{-2}$)^[7]. Soccer refereeing was considered as an intermittent high-intensity activity with elite field referees (FRs) exercising at 85-90% of the individual maximal heart-rate (HRmax)^[9]. Research into activity profiles and physiological demands of professional soccer referees during competitive matches showed that soccer refereeing is a challenging exercise^[10]. In the light of these studies showing the importance of the effect of athletic performance on referees, in the presented study, the effect of distance training applications on the physical and physiological competencies of referees was evaluated.

Elite Referees;

The Yo-Yo test has been shown to be related to match activities during elite-level soccer Competitions^[11,12]. It could be speculated that a well-designed training program aimed at developing the ability to change direction at high intensity speeds could be helpful for referees at all levels.

In a similar study, the top level referees, Yo-Yo test mean performances were stated as $1,874 \pm 143$ m.^[13]. Similarly, in similar studies applied to referees, the distance they ran according to YYIRTL1 test results was 1420 ± 90 m for Danish referees^[14], 1720 ± 276 m for Belgian referees^[15], and 1503 ± 399 m for Italian referees^[13]. According to the results of the presented study, the pre-test and post-test results of the elite referees after 2 months of training are; YYIRTL1 distance 1699 ± 209.9 m. and 1756 ± 179.9 m. was found as. No statistically significant difference was obtained ($p < 0.05$, $r = .170$). The study results are similar to the literature. Heart rate values are a successful method in evaluating football matches and training^[16,17]. The heart rate method is a tool used by referees to decide the intensity of endurance training. In other studies the average heart rate has been expressed in percentage of peak heart rate reached during the game, as it has been shown that referees reach 95–100% of their maximal heart rate during high-level games^[11,18]. When doing so, the average heart rate for the international referees in the present study was also very similar to values reported for national league games^[19,20], those referees the maximal heart rates were lower than reported in the study by Krusturp and Bangsbo, 2001 (179 vs. 190 beats min⁻¹). In another study, heart rate data after the YYIRTL1 test applied to Italian soccer referees was shown as 182 ± 6 beats / min.^[13]. Several studies on referees' heart rates during a match have been conducted. Which have measured averages of 162–165 beats/min^[21], 163 ± 2 beats/min^[22], 161 ± 9 beats/min^[23], and 163 ± 5 beats/min (in English Premier League referees; A study conducted on British referees showed no correlation between mean heart rate and average distance in the match. In a similar study conducted by Morris [2015] HRmax values were shown as 189 ± 8.61 beats / min and HRmean as 160.32 ± 10.42 beats / min according to the YYIRTL1 test results. In the presented study, HRload pre- and post-test were 60.2 ± 10.3 and 61.1 ± 11.6 ; HRmax 187.5 ± 10.7 beats/min and 172.7 ± 10.4 beats/min; HRmean was found to be 172.1 ± 22.7 beats/min and 169.1 ± 9.7 beats/min, and rest was 28.4 ± 13 beats/min and 29.1 ± 10.7 beats/min. The study results are similar to the literature.

Top Class Asisstant Referees;

This limits any generalization given that their physiological demands are different with respect to the AR (i.e., less total distance and high intensity running, less decisional challenges, more demand for physical factors vs cognitive factors of agility)^[24,25]. Therefore, more research is needed on those tests that measure fitness levels according to the physical demands of the ARs. The total distance covered was 6.76 ± 0.83 (5.20–8.21) km for assistant referees^[22]. The physical demands of assistant referees have been examined^[24,26]. Assistant refereeing in association football is characterised by brief intense bouts of forward and sideways running interspersed with long low-activity period. The assistant referees' performance of repeated sprints was correlated to the amount of HIR in a game. They performed 40% more sideways running and had lower heart rates compared to observations for national league games. It has also been shown that assistant referees fatigue later and have less deterioration in their sprint performance^[25]. A study on the subject showed ARIET performance (n ¼ 41) were 1288 ± 296 m. Similarly, in a study conducted on Italian assistant referees, the results were 1431 ± 193 m and 1460 ± 152 m for A and B series referees, respectively^[27]. According to the results of the presented study, the pre- and post-test results of the elite assistant referees are respectively; YYIETL2 distance 1744 ± 285.9 m. and 1744 ± 209.4 m. was found as. No statistically significant difference was obtained ($p > 0.05$, $r = .1000$). HRload pre- and post-test of the presented study was 49.1 ± 8.8 and 46.7 ± 9.8 ; HRmax 193.7 ± 10.2 beats/min and 193.3 ± 9.9 beats/min; HRmean was found to be 178 ± 10.3 beats/min and 178.8 ± 10.5 beats/min, and rest was 31.2 ± 8.7 beats/min and 36.5 ± 13 beats/min. No statistically significant difference was obtained ($p > 0.05$; $p = .315, .802, .619$ and $.030$).

Conclusions

As a result of the training, although there is a statistical significance in the values of assistant referees, there is a numerical increase, which means a result, using appropriate educational technologies in practice, different age range, geographic distances and different occupations, part-time or full-time working as a professional, the development of competencies in the performance of the referees is possible.

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