

USING DISTANCE PHYSICAL EDUCATION IN ELITE CLASS SOCCER REFEREE TRAINING: A CASE STUDY

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ABSTRACT

The objective of this study is to present a model in the framework of Distance Education (DE), which suggests that a Distance Physical Education Program (DPEP) could be applied to those who are at various ages, in various geographical locations, and are working in various professions as part-time or full-time professionals. The use of DE in physical education with the support of education technologies and specialist systems provides significant opportunities. Through its flexible structure, DPEP partly or completely eliminates the restrictions encountered in traditional physical education programs, such as high costs, differences in age, geographical location and profession, and it provides solutions that are specific to an individual. The scope of this study comprises all of the referees who are employed in the Turkish Super League (34 top-class and high classification referees and 78 top-class and high classification assistant referees). The program was applied for two years (2 x 46 weeks in 2008-2009 and 2009-2010). In order to collect data, physical measurements were made at the beginning of the application, at the end of the first year and at the end of the second year of the application to assess referees' capabilities of endurance, speed, agility and recovery ability. The results were loaded into a database. Based on the test results, referees were submitted to individual and physical education programs via weekly e-mails. The outputs recorded by the referees during the application period with the support of specialist systems were submitted to the trainer every week. These were then entered into the training diary in the software on the computer, and were later subjected to assessment. At the end of the assessment process, referees were provided with feedback and the physical education continued without interruption. For the analysis and evaluation of the data, statistical techniques, such as descriptive statistics, one-way repeated measures and post hoc comparisons, were used. When the analysis results were evaluated, it was found that the endurance capabilities of referees and assistant referees significantly improved, which is a fact that can directly affect their professional proficiencies. The results of this study reveal that it is possible to conduct remote physical education in the scope of DE, by taking into account the individual differences and by including the support of suitable technology.

Keywords: Distance education, distance physical education, referees, education technologies, physical development.

INTRODUCTION

Depending on the constant increase in the physical level in football, the Continued Professional Development (CPD) of referees is getting more and more important for referees' careers. The CPD serves as a cornerstone in the education policies in many countries (Armour & Yelling 2004). It is said that in order to help improve the professional development of trainees, solutions that will remove the time strain in learning environments should be found instead of a trainer-based approach (Beijaard, Verloop, Wubbels & Feiman-Nemser, 2000).

The internet, in today's culture, is increasingly and commonly used by everyone regardless of the age (Kennedy, 2005; Looney, 2008). In line with this increased use, the Internet is being benefited from in many various professional areas. A study on the teachers of physical education emphasizes that the physical education process should keep its strategic structure and should still be informal (Armour & Yelling 2007). The changing needs of CPD would be constantly met and the restrictions between the trainer and trainees would be reduced or removed (Armour & Yelling 2004 a).

Thorburn (2006) provides an insight on professionalism that knowledge, autonomy and responsibility are key and interrelated characteristics for the development of distance education in physical education. The key factors of professionalism offer remarkable advantages regarding the use of the internet in distance physical education. One of the studies on the subject explains that a constantly updated professional structure which includes the demands of sporting is desired in the programs of the continued physical development rather than a traditional curriculum program (Amour & Yelling 2004 b). Another study by Thorburn (2006) makes a rationale of this research study as a theoretical framework by stressing the role of professionalism in distance physical education.

Today, the physical proficiency of soccer players, with professional and face-to-face training under the observation of a trainer within a soccer club environment, has reached a high level and has yielded a much faster tempo in games. Referees' ability to keep pace with this increased game tempo and to apply the rules is closely

related to their physical proficiencies. One study reports that referees cover around 9-11 km during an elite soccer match, and assistant referees cover around 6-8 km. (Castagna, Abt & D'ottavio, 2007). Furthermore, they are required to make a decision at least 3 or 4 times every minute (D'Ottavio & Castagna, 2001). The data suggest top-class referees have to apply the rules and make decisions under a high level of physical and psychological pressure, which is why referees should maintain a constant and a high level of physical development. However, the professions of referees do not keep to a professional structure. They work in various geographical locations and in various professions. Therefore, a need exists for a new way to remove the obstacles encountered during the physical education of referees.

Recently, DE has been commonly used in education to offer various opportunities for training to almost anyone. Aksal A. (2010) and Gazi A. (2010) pointed out that distance education applications and pedagogy foster professional development and personal development in higher education practices for both learners and tutors. DE is a flexible application, however, it might cause a loss of motivation due to the lack of face-to-face contact (Aksal A., 2009; Dabaj, F. Altinay & Z. Altinay, 2003; Gazi A., 2009;). In spite of this partial defect, trainees will believe in DE if the appropriate equipment and the training environment are maintained (Ilter, Aksu & Yılmaz, 2005). DE also has a structure which, when supported by education technologies and specialist systems, can ease communication with the target group, allowing for productive use of resources in line with the predetermined purposes. Today, multimedia computer technology is taken advantage of in enhancing the interaction between trainer and trainees, provided that it submits feedback to trainees in DE (McIsaac & Blocher, 1998).

Any education application that is structured on environments where trainers and trainees are separated in terms of time and location is named Distance Education (Ulug & Kaya, 1997). DE eliminates differences across cities, countries, ages and levels of income as well as the differences amongst professions (Miller & King, 2003). It meets the needs of the trainees regardless of these restrictions (Verduin & Clark, 1994). It allows for opportunities to provide education services in any place, such as a house, office, business center or a classroom environment (Roberts, 1996). The developments in education technology particularly on the Internet have significantly facilitated unlimited and easy access to information and have also eased the applications of DE, because the Internet has provided a cheaper and a faster means of communication (Gurbuz, 2001; Aydin & Tirkes, 2010). The inclusion of new technologies in DE has widened the learning environment (Chang & Lee, 2010). With these advantages, DE is being used in many various fields along with various education technologies and specialist systems.

Despite these advantages, some studies suggest that distance physical education may have practical problems due to the need for observation and assessment in physical education (Yaman, 2009). Through the specialist systems used in education systems, it is possible to document, evaluate and interpret the physiologic reaction of a trainee during physical education. The essential power of a specialist system is the use of an algorithm along with the methods toward a particular result, and the knowledge it contains (Onder, 2003). Specialist systems are defined as computer software that function as the basis for information and inference and are created to perform difficult tasks undertaken by people who are specialized in a particular subject. The use of such a system will significantly reduce the high costs that result from employing specialized people. Specialists make assessments based upon the data in their own field and inferences from the results. Similarly, specialist systems also make inferences based on the database, created in the form of software, and they reach conclusions. In this way, these devices that store the physiologic outputs of individuals during physical education are specialist systems.

The quality of these programs is based on the conformity of the program content with expectations (Daffuaa, Turki & Hawsawi, 2003). The specialist systems create opportunities for sharing, between the trainer and the trainee, of the data that are considered as important parameters of physical education, such as the number of heartbeats, loading intensity zone, energy consumption and covered distance. Additionally, it enables personal evaluation, thus allowing trainers to assess results and guide physical educations. In this framework, through the advantageous and flexible structure of the distance DE, it is believed that Distance Physical Education Program (DPEP) could be transferred into the system.

The research on online teaching and learning confirms that course design based on a constructivist framework is critical to the success of online practices (Gold, 2001; Ausburn, 2004; Salter, Richards & Carey, 2004; Wiesenbergl & Stacey, 2005; Gazi A., 2009). DPEP, too, is based on a theoretical structure like all new constructivist-based models.

In the planning stage, four features were considered in applying the DPEP:

- Defining the physical levels which referees should achieve
- Constant re-structure of the physical features based on the application results of the physical features
- Selection and usage of a suitable learning environment during the transfer of applications and fulfillment of the demands
- Supervising the efficacy of the tools used
- Putting the suitable measurement methods into application in order to evaluate the training situation of referees

The internal and external requirements of DPEP were determined by considering these features (Table 1)

Table 1: Internal and external requirements of distance physical education program

Internal requirements		External requirements
Needs analysis Evaluation criteria Physical needs Group needs Individual needs	Distance Physical Education Program	Number of provinces Number of referees Number of Physical Education Programs Duration of Physical Education Program Number of times data were examined

The current situation was determined in this theoretical framework. Meeting the individual demands by taking the trainee’s demands into account in light of the results was determined as the fundamental target.

The objective of this study is to prove that Distance Physical Education could be implemented for the individuals of various ages, professions and locations, with the support of suitable education technologies.

The hypothesis of the study is that Distance Physical Education could be implemented for the individuals who are at various ages, in various locations and are working as part-time or full-time professionals in various professions by means of recording and evaluating the physiological reactions, which must be observed during physical education, by means of suitable education technologies and by constantly guiding the trainings based on the emerging demands.

IMPORTANCE OF THE STUDY

It has been suggested that it would be difficult to implement distance physical education, emphasizing the need for observation and assessment during the implementation of physical education (Yaman, 2009). However, it is not always possible to do physical trainings in group environments, due to the restrictions in learning environment in some locations and in some situations. Because referees work in various professions, they can reserve only their after work hours for trainings. Since they are in various separate locations, it becomes impossible for them to perform face-to-face group trainings, which also makes distance physical education a must.

Also, it should be noted that the employment of expert trainers in 31 provinces would create a considerably higher cost for the organization. Implementing the distance physical education would clearly provide a good option for solving the aforementioned problems. This study could serve as an exemplary application model in order to reveal that the physical hurdles in applying the distance physical education could be overcome through DE.

When the previously mentioned individual differences of referees are taken into account, it becomes clear that person-specific applications matter. The new trends in education have gone towards the application of education regardless of location, time and age (Sıgri, 2010). It is suggested that an individual level assessment has to be made when each new change was implemented (Hall, 1995). In training sciences, physical education which is customized and is applied based on the personal features are considered to be one of the fundamental factors of success (Sharkey & Gaskill, 2006). In this regard, this study is remarkable in achieving the application of the principle of individualization by evaluating each individual separately.

Also, the study is considered to contribute to the literature as there is not a sufficient number of studies on distance physical education.

METHOD

Problem Statement

- a. We have tried to answer the following questions in this study.
- b. Can individuals who work in different professions, either part-time or full-time, undertake common physical training?
- c. Can individuals in different geographical locations do similar physical training together?
- d. Can the physiologic loads be remotely checked in physical applications?
- e. Can special training programs be remotely checked for those who will do similar physiologic loading?
- f. Does it provide any advantage compared to group training?
- g. Would it be possible to store physical outputs and ensure sustainability of the program?

Procedures

The subject of this study is the application of physical education programs in the scope of DE that were prepared by a trainer based on the test data in the beginning. Our application is based on the constructivist training model recommended by the research of Isman et al. (2005). In that model, the first step is determined as an input, the second step as process, the third step as output and the fourth one as the feedback. In the framework of this model, the physical measurements were made in order to determine the physical needs and requests of referees in the first place, and then an assessment on individual needs was made. The first step in the process of assessing the needs was selecting suitable tools and determining the problem. Then, a training time schedule was prepared in line with the determined purposes. These were submitted to the referees via e-mails within the scope of the selected communication technologies. In the second step, a pre-evaluation was made toward the determined targets and within the framework of needs analysis related to the strong and weak aspects of the program. The trainings on individual endurance, which were submitted over the Internet within the scope of DE, were performed by the referees in line with the heartbeat breaks, which were stated in the training program with the support of specialist systems. The third step included the referees' applying the training program, recording these applications by means of specialist systems, and submitting outputs to the trainer via the Internet. The trainer created a database of the results. The outputs stored in the database were automatically processed by the software. The graphics, as well as the tables, were assessed and interpreted by the trainer. The incoming data were evaluated by the trainer in terms of various parameters, such as length of time for forcing in the submitted program and physiologic recovery ability during the rest. If these data were satisfactory, we continued with the program or some alterations were made on the programs. The fourth step included assessment of strong and weak aspects of the application results and feedbacks to referees every week. With this, the continuity of the program was maintained.

Participants

The study group consisted of a total of 112 referees (aged 28 - 43). These included 8 FIFA referees, 26 high classification referees, 8 FIFA assistant referees, and 70 assistant referees, who were located in 31 different cities and who worked in the Super Football League in the 2008-2009 and 2009-2010 league seasons. In our application where we included all high classification referees and assistant referees in Turkey, we studied on all participants and there was no sample selection. The subjects who faced errors during the application of the test and were not able to participate in any of the three test sessions were considered as missing cases and were not included in the statistical evaluation.

Instrument

Selection of technology in education is a process that includes the stages of planning, designing, producing, implementing and evaluating technological products in line with the purposes. For the selection of technology related to our application, we have made many multidimensional evaluations, and in particular, in terms of efficacy and economy. The technological structure of the program was completed by using specialist systems. As a result, we decided to use communication and specialist systems via e-mail in the Internet environment (Fig.1).



Figure 1. Specialist Systems used in Physical Education applications.

Opportunities and restrictions

The study was limited to high classification referees and assistant referees who worked in the Turkish Super League for 2008-2009 and 2009–2010 football seasons. The data of the physical education were collected by means of technology and the application continued. These programs were restricted to 1.5 hours per day on average, 4.5 hours per week and 138 trainings in a year (46 weeks), which totaled 276 trainings in 2 years. The total was 414 hours of physical training, which referees were free to carry out any time and anywhere they liked, on any three days a week. These programs were applied between June 20th and May 20th each year.

Another restriction to the study was that the search for previous studies in literature on distance physical education has yielded in few studies.

Data collection

In the scope of DPEP, at the early stages of the application, the referees and assistant referees were administered pre-tests as follows: for evaluating endurance, the Yo Yo Intermittent Recover Level 1 (YYIRL1) (Krustrup et al., 2003; Castagno, Impellizzeri, Chamari, Carlomagno & Rampinini, 2006); for evaluating speed features, 20-30 m Sprint Test (Psotta, Blaus, Cochrane & Martin, 2005); for evaluating agility and coordination, the T’ test (Hoffman, Tenenbaum, Mareshi & Kraemer, 1996); and for measuring recovery abilities, the Repeated Sprint Ability Test (RSAT) (Gabbett, 2009). Then, the obtained results were loaded into the database. In light of the test results, a physical education program, which was developed based on the principle of individualization, was prepared by the trainer and was submitted by weekly e-mails to the individual to be educated. The physiological outputs of this training program during the application (number of heartbeats, loading intensity zone, energy consumption, covered distance) were transferred by means of radio frequency (attached on the chest of the user) into the clock that had the data collection and processing software. The data in the specialized system clocks, which were used as the source of physiologic output, were then transferred by the users into their own computers via infrared technology, and then the data were compressed into a single file and submitted to the trainer by weekly e-mails. The incoming data were placed under the records of the relevant person in the training diary calendar within the software operating on the trainer’s computer (Fig. 2).

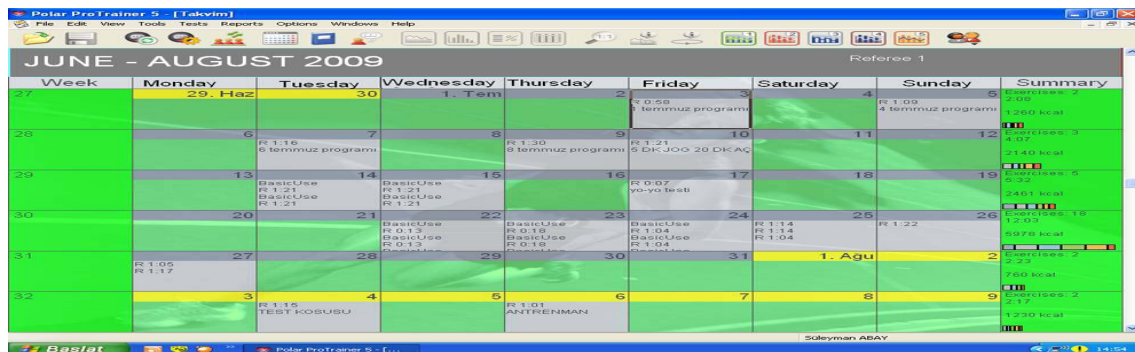


Figure 2. The Calendar of the Training Diary.

The analysis of the graphics and tables attached to the database were automatically processed. The program continued, and referees were provided feedback every week (Fig. 3). This stage covered a program of 2 x 46 weeks.

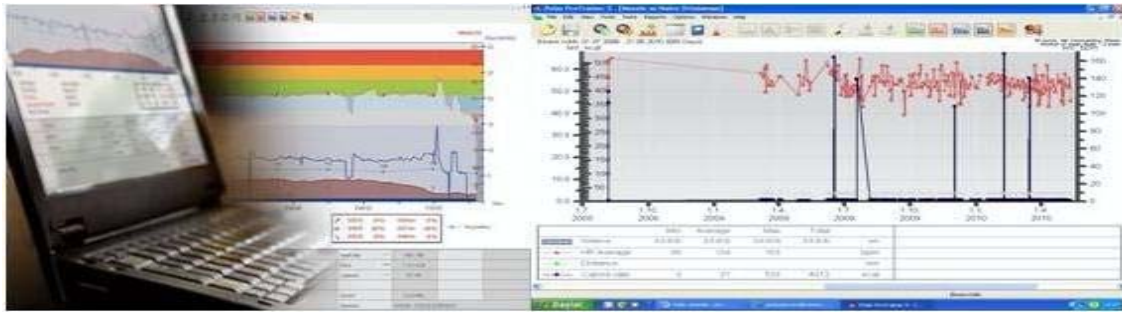


Figure 3. The graphics and tables of the outputs attached to the database, which are automatically processed.

At the end of the first and the second years of the education process, in order to evaluate DPEP results, all high classification referees and assistant referees were re-administered the same tests, and the results were loaded into the database of the relevant person.

The Analysis of the Data

Descriptive statistics (means, standard deviation and percentile) were utilized for dependent variables. A one-way analysis of variance with repeated measures was used for variables. For multi-comparisons, post hoc comparisons were performed with a Benferroni adjustment of the alpha level (0.05). The data acquired from the evaluation tools were analyzed using SPSS 14.00 for Windows statistics program.

RESULTS

At the beginning of DPEP, all referees and assistant referees were assessed in terms of their physical and physiologic capabilities, such as endurance, speed, recovery abilities and agility. The relevant findings are given below.

Results of Yearly Changes in Physical Features of High Classification Referees:

Table 2: Yearly Performance Results of High Classification Referees (Mean±SD).

	n	Start values	End of the first year	End of the second year	F	p
		Mean±SD	Mean±SD	Mean±SD		
20 m Sprt.(s)	27	3.20 ± 0.22	3.16±0.18	3.20 ± 0.15	0.67	0.54
30 m Sprt.(s)	27	4.59 ± 0.32	4.44±0.26	4.50 ± 0.21	4.05	0.23
30 m AA.(s)	28	1.43 ± 0.18	1.53±0.17	1.48 ± 0.13	4.95	0.01
T' Test (s)	26	10.61 ± 0.57	10.53±0.73	10.42 ± 0.76	0.71	0.49
RSMT (s)	32	7.52 ± 0.37	7.05±0.44	6.86 ± 0.45	36.4	0.00
RSBT (s)	32	7.28 ± 0.37	6.74±0.43	6.60 ± 0.41	44.5	0.00
YYIRL1 (m)	30	1248 ± 283.1	1437±281.2	1710 ± 329	48.4	0.00

AA= Acceleration, RSMT=Repeated Sprint Mean time, RSBT=Repeated Sprint Best Time, YYIRL1= Yo-Yo Intermittent Recover Level 1

The detailed results of application regarding high classification referees were provided in Table 2. In the course of time, the YYIRL1 distance mean values of referees increased in a statistically significant way ($p < 0.05$). When compared to the beginning, progress was seen as follows: 19.4% ($p < 0.05$) at the end of the first year and 41.4% ($p < 0.05$) at the end of the second year (Fig. 4).

Although the capabilities of referees in 20 m and 30 m sprints are not statistically significant, they improved (when compared to the early stages) as follows: at the end of first year (-0.5% and -2.6% respectively) and at the end of the second year (-0.2%, and -1.9% respectively) (Fig. 5).

There is statistically significant difference in the feature of acceleration by years ($p < 0.05$). Compared to the beginning, this significant difference seemed like an improvement in the first year ($p < 0.05$) while it seemed a recession in the second year ($p > 0.05$) (Fig. 5).

Although the agility and coordination capabilities of high classification referees are not statistically significant, they were slightly improved at the end of the first and second years.

According to the results of RSAT tests that were conducted to determine the best times and speed mean values, the mean time values for high classification referees has improved from (-6%) ($p<0.05$) at the end of first year to (-8.6%) ($p<0.05$) at the end of second year compared to the beginning. The best sprint speed of referees improved (-7.2%, and -9.1%) ($p<0.05$) at the end of first and second years, respectively, compared to the beginning (Fig. 6).

Results of Yearly Changes in Physical Features of High Classification Assistant Referees:

Table 3: Yearly Performance Results of High Classification Assistant Referees. (Mean \pm SD)

		Start values	End of the first year	End of the second year		
	n	Mean \pm SD	Mean \pm SD	Mean \pm SD	F	p
20 m Sprt.(s)	53	3.22 \pm 0.15	3.26 \pm 0.14	3.27 \pm 0.12	2.3	0.10
30 m Sprt.(s)	53	4.58 \pm 0.23	4.55 \pm 0.18	4.59 \pm 0.19	0.75	0.47
30 m AA (s)	52	1.44 \pm 0.14	1.44 \pm 0.12	1.43 \pm 0.12	0.16	0.85
T' Test (s)	52	10.26 \pm 0.51	10.84 \pm 0.56	10.66 \pm 0.47	41.4	0.00
RSMT (s)	54	7.57 \pm 0.28	6.92 \pm 0.39	6.74 \pm 0.40	186	0.00
RSBT (s)	53	7.32 \pm 0.28	6.65 \pm 0.44	6.50 \pm 0.42	129.9	0.00
YYIRL1(m)	54	1210 \pm 291	1354 \pm 241.8	1532 \pm 367.3	34	0.00

AA= Acceleration, RSMT=Repeated Sprint Mean time, RSBT=Repeated Sprint Best Time, YYIRL1= Yo-Yo Intermittent Recover Level 1

The detailed results of application regarding high classification assistant referees were provided in Table 3. In the course of time, the YYIRL1 distance mean values of referees increased in a statistically significant way ($p<0.05$). When compared to the beginning, the progress was made as follows: 15% ($p<0.05$) at the end of the first year, and 28.8% ($p<0.05$) at the end of the second year (Fig. 4).

Although, when compared to the beginning, 20 m sprint values were not statistically significant at the end of the first and second years, there was some recession (1.5%, and 1.9 % respectively). As for 30 m sprint feature, while there was slight improvement at the end of first year (-0.1%), there was some recession at the end of second year (0.8%). As for the feature of acceleration, there was some recession at the end of the first and second years compared to the beginning (Fig. 5).

When compared to the beginning, the capabilities of agility recessed at the end of the first and the second years in a statistically significant way, respectively being (5.7%, 4.1%) ($p<0.05$) (Fig. 5).

According to the RSAT tests results, there was improvement (-8%) ($p<0.05$) at the end of the first year, and (-10.9%) ($p<0.05$) at the end of the second year. The best asymmetrical sprint speed of assistant referees improved at the end of the first and second years (-9%, and -11.2%) ($p<0.05$) respectively) compared to the beginning (Fig. 6).

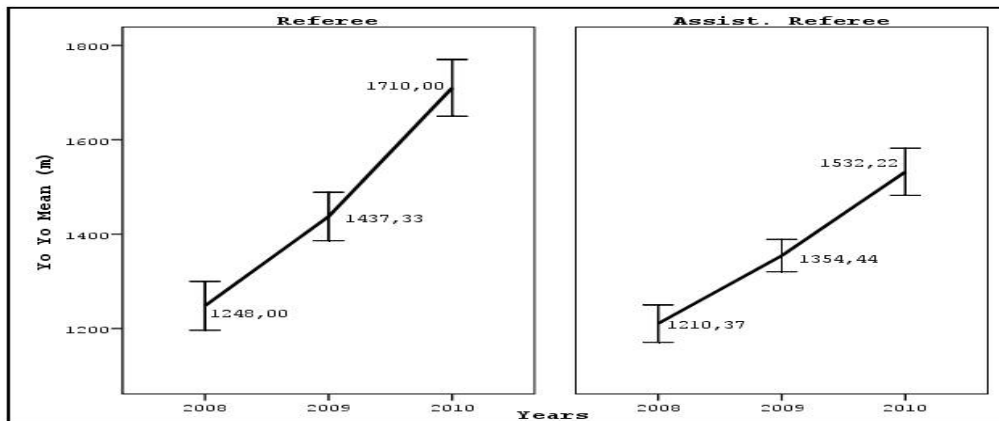


Figure 4. Diagram of changes in performance of endurance capability of high class referees and assistant referees.

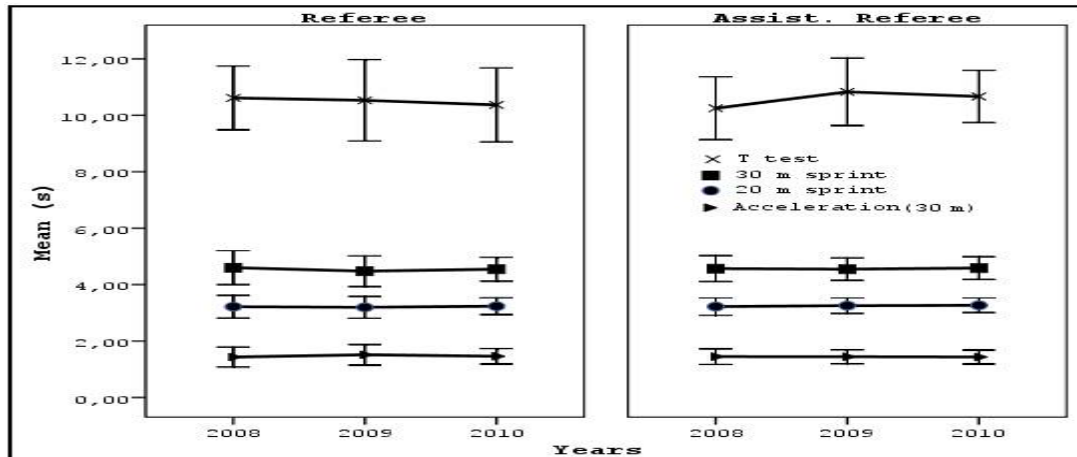


Figure 5. Diagram of changes in sprint and agility performances of high class referees and assistant referees.

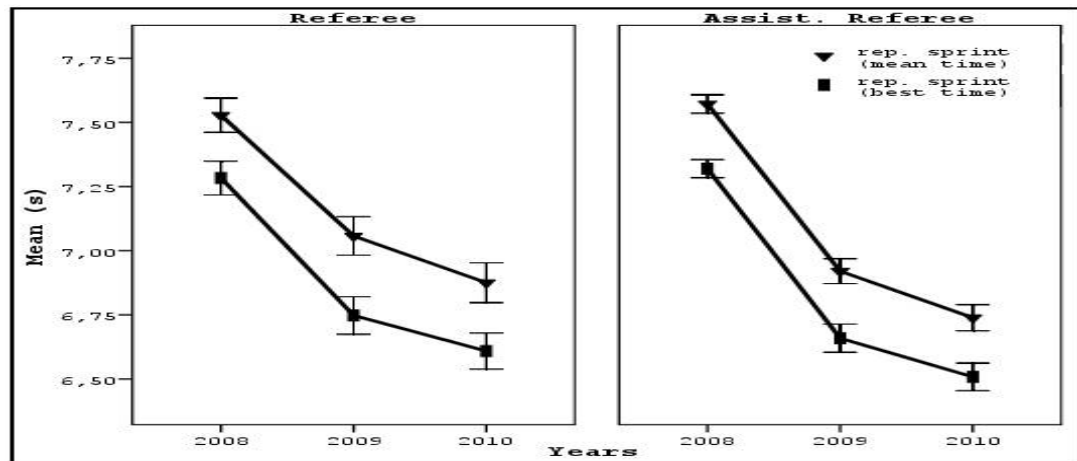


Figure 6. Diagram of changes in capability of recovery abilities of high class referees and assistant referees.

CONCLUSION AND DISCUSSION

Distance education is commonly used to obtain educational outputs at the end of the education process based on a theoretical basis. It is successfully used in Turkey and other countries with the student-centered approach (Gultekin, 2006). It has been discussed to some extent that DE, which is commonly used in the theoretical field, could also be used in physical education, too. Only a limited number of studies have been found through searches of the existing literature. In one of these studies, it is explained that distance education is hard to carry out (Yaman, 2009). Traditional face-to-face trainings in physical education do certainly have important advantages; however, sometimes, factors such as separate geographical locations, occupational restrictions and age differences do not allow for face-to-face physical education. Our hypothesis in this study is that distance physical education for those who are at various ages, in various geographical locations, in various professions, and working as part-time or full time professionals could be possible, in the scope of suitable education technologies, by means of evaluating, assessing the results and guiding the trainings after documenting the physiological reactions that need to be observed in the trainings.

The key achievement factor of the program has focused on the solution of the problems. The existing problem is that referees are working in various professions as part-time or full-time professionals. DE offers opportunity for trainees to do education in almost any place, such as the home, office, business center or classroom environment (Roberts, 1996). The opportunities offered by the flexible structure of DE were evaluated, and based on the individual feedback from tests, person-specific physical education programs were submitted to referees, and they were able to do it at any time and in any place they desired during the day.

The second target of the DPEP application is to find a solution to the issue of holding common and similar physical trainings for those who are in various geographical locations. In other words, it is not possible for

referees who are working in 31 various cities to do trainings altogether. Furthermore, holding common physical education programs for referees throughout the country under the observation of a sufficient number of trainers through traditional physical training programs, costs too much for the organization. Using DPEP would significantly reduce this high cost arising from the employment of expert individuals (Gultekin, 2006). By means of the education technology in the framework of DPEP and through using specialist systems, the cost was considerably reduced.

Another key factor of the program is the capability to remotely control the physiologic load on the organism in the physical applications done in the framework of DPEP. This problem was solved by means of specialist systems. Thus, it became possible to evaluate when and what type of a need a referee would have, and new guiding became possible based on the physical development. Another advantage of the program is the ability to remotely manage the person-specific training programs, prepared specially by considering the age differences of individuals who will do similar physiologic forcing on the body. The weekly training program data about the physical features targeted for improvement here were recorded by referees by means of specialist systems and were submitted to the trainer. The analysis of these feedbacks was made, and DPEP were suitably re-guided, and, the referees had constant feedback.

Another feature of DPEP is that it increases the interest in the program. When a person-specific action is voluntarily made by that particular person, the application becomes more attractive (Houston, 2008; Leinonen & Bluemink, 2008). So, the programs, which were prepared in line with the physical demands of referees in their daily lives or during the competitions, would increase their interest and willingness. The fact that the program has a flexible and person-specific structure that also considers the age differences serves as an advantage over group trainings. The physical outputs documented and submitted by referees every week to the trainer after each physical education were stored by means of education technologies, and then a database was created. So, remotely saving, sorting, processing and transferring the application data into the application area, were constant.

One of the most important elements in education system is evaluation (Demirci, 2010). Two evaluation methods in particular (individual and group) are more common and predominantly used (Paris & Paris, 2001; Shepard, 2000). The individual method was used for this study. Using this method in the field of physical education has significantly contributed to the feasibility of the program. So, individual performances of referees were constantly checked for conformity to the program and the referees were guided when necessary.

In order to evaluate the aforementioned issues, the features to be developed in the beginning of DPEP were measured with suitable tests. Individual measurements were repeated at the end of the first and second years to assess the gains of the program. When the results were examined, significant improvements in features that directly affect the professional proficiencies of the referees and assistant referees were found. The YYIRL1 test performance that was applied at the beginning of the program to evaluate the endurance capability of referees of high classification was determined at 1216 m. This distance, when compared with the literature, was found to be too low. The previous studies reported this distance to be 1345 m for elite referees and 1720 for top-class referees (Krustup & Bansbo, 2001; Weston, Helsen & MacMahon, 2004). In our application, it was measured that the referees had covered 1437 m at the end of the first year and that this distance had increased 19.46 % ($p < 0.05$) compared to the beginning, while they had covered 1710 m at the end of the second year with an increase 41.49% ($p < 0.05$) compared to the beginning. These results match those in the literature. Similarly, at the end of the second year, when compared with the start, somewhat significant progress had been made in the features of asymmetrical repeated average and best times (-8.6%, and -9.1% respectively) ($p < 0.05$), such as wide angle during the observation of the game, repeated preparations for actions and changes in direction, which are considered important for referees. Statistically significant progress had been seen in the evaluation of agility and symmetrical speed ($p < 0.05$). The fact that these improvements were seen in two years time, serves as an important proof that DPEP really worked successfully. When one considers the fact that a football game lasts for 90 minutes, the improvement that was gained in referees' features of continual, constant and repeated endurance is a key factor in terms of the professional proficiency of the referees.

Similarly, the assistant referees improved their YYIRL1 running distances. It was determined that the assistant referees had covered 1354 m at the end of the first year and that this distance had increased 15.09% ($p < 0.05$) compared to the beginning, while they had covered 1532 m with an increase 28.8% ($p < 0.05$) at the end of the second year, when compared to the start period.

There is a slight progress, though not statistically significant, in 20 m and 30 m sprint and acceleration values at the end of the first and second years, when compared to the start. However, this progress is important considering the fact that speed is a bio-motor feature that is hard to improve.

In the case of referees, mean time values of asymmetrical speed were measured as (-2%) ($p < 0.05$) at the end of the first year, compared to the beginning, and (-10.9%) ($p < 0.05$) at the end of the second year, according to the results of RSAT tests that evaluate another dimension of endurance. There is progress in the best asymmetrical sprint speed of assistant referees at the end of first and second years compared to the beginning (-9%, and -11.2% respectively) ($p < 0.05$). Similarly, the capabilities of agility improved in a statistically significant way at the end of the first and the second years (respectively, 5.7%, 4.1%) ($p < 0.05$).

During the performance evaluation for both groups of referees, it was found that the features related to endurance improved remarkably; however, there was only a slight improvement, even with some recession, in the features of speed and agility. It is thought that this situation has to do with the specialist systems in DPEP.

Like any program, this application has strong and weak sides, too. Through the use of specialist systems, constant and remote monitoring, evaluation and feedback about heartbeats became possible, which resulted in significant improvement in the feature of endurance. However, the expected results of improvement in the feature of agility were not achieved due to the difficulty in controlling it through heartbeat values. However, it should be noted that the improvement of the features of speed and agility should normally take years. So, it could be recommended that the device for measuring the speed of running should be added into the education technologies to increase the efficiency of DPEP.

It is considered that DPEP, which is presented in the study as a new application, could be accepted as a model in this field. DPEP could partly or wholly eliminate the restrictions in the applications of traditional or group-based physical education. When applied within the scope of education technologies and based on the principle of person-specific customization, DE could be benefited from in many applications of physical education. The study is remarkable in that it demonstrates DFEP could be applied commonly in many sporting branches even when sportsmen are outside the club environment. It would also serve as a sample model during which sportsmen could continue with the program prepared in the framework of DE, especially outside competition periods. Also, distance physical education could be applied to the sedentary individuals in the framework of DFEP. Thus, it would be possible to enlarge the coverage of DFEP and to make it more widespread.

As a conclusion, the results of the evaluation about the targets mentioned in the study indicate that the use of DE in physical education would produce positive results when used in the field of distance physical education supported by suitable education and measurement technologies. So, a wide range of individuals will be able to take advantage of the opportunity of physical education with much less cost and time.

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