Paisii Hilendarski University of Plovdiv

FACULTY OF PEDAGOGY

**Department of Theory and Methodology
of Physical Education and Sports**

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OPTIMISATION OF PSYCHO-PHYSICAL TRAINING OF THE FOOTBALL REFEREE

ABSTRACT

on a dissertation for the award of the educational and scientific degree **Doctor**

Field of higher education 1. Pedagogical sciences
Professional area 1.3. Pedagogy of training in ...
Doctoral program "Theory and methodology of physical education and sports training"

Scientific Supervisor:

Professor Veselin Zheliazkov Margaritov, Doctor of Pedagogical Sciences

Reviewers:

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The dissertation study was discussed and proposed for official defense by the extended departmental council of the department of Theory and Methodology of Physical Education and Sports at the Pedagogical Faculty of Paisii Hilendarski University of Plovdiv on 18.11.2022.

The volume of the dissertation study is 144 pages, structured in an introduction, 4 chapters containing text, 45 tables, 97 figures and 12 diagrams. 7 appendices in a volume of 30 pages are attached to the dissertation. The bibliography consists of 235 literary sources, of which 133 are in Cyrillic and 102 are in Latin. The list of the author's publications includes 4 titles.

The defense of the dissertation work will be held on 28.02.2023 at 11.00 a.m. at Paisii Hilendarski University of Plovdiv, 24 Tsar Asen St., Conference Hall.

The defense materials are at the disposal of those interested in the library of the Faculty of Pedagogy at PU Paisii Hilendarski, on 236 Bulgaria blvrd, floor IV.

TOPICALITY OF THE PROBLEM

The magic of the football game has captivated the world since ancient times. It is not by accident that this sport is considered the most popular on a global scale. Football matches provoke extremely powerful positive emotions in the spectators in case of victory and negative ones in case of loss. We could argue that there is a pronounced social factor which is directly dependent on a referee's decision. Along with the development of the football game over the years, the following consistencies are observed in football players – the physical, tactical, sports and technical qualities are being progressively enhanced. Modern football is performed with exceptional dynamics, which obliges the referee to always be in the right position, with a good angle of vision in order to make the correct decision. Bearing this in mind, it can be stated that football places high demands on the training and performance of the football referees.

The accomplished referee is made over a long period of time, because a lot of the motor habits – speed of reaction, decision-making under pressure, split attention, concentration, correct positioning with a good viewing angle, reading the game, anticipation, etc. are gradually developed over time. A referee is considered to be fully developed and possessing all the subtleties of practice at the age of about 40. The referee team is an integral part of the football match. This is not an accidental fact, since the referee, as well as his/her colleagues who are responsible for officiating the football match, occupy two out of the seventeen rules of the football game – Rule 5 "The Refeee" and Rule 6 "The other members of the refereeing team". (IFAB. Laws of the Game 19/20, 2019). The decisions of the referee team are made based on the best judgment and in accordance with the spirit of the game. Football referees perform a multifaceted activity when making important decisions, in dynamic and complex situations under stress, which is why one of the fundamental personal qualities contributing to the adequate performance of the referees is their theoretcal, physical, mental and psychophysical training. It could be argued that referees are the sports eductors on the pitch. Other qualities, related to making the right decisions, are anticipation and reading the game, how the situation will develop, what comes next and where the referee's next possible prolem might occur. The management of all participants in the football match – the two teams on the field, the reserve players and the officials in the technical areas, obliges the referee to possess excellent leadership qualities, principles, self-control, determination and will. The trends of the Bulgarian Football Union, UEFA and FIFA for the development of football refereeing are clear and well-founded – young individuals who are ambitious and driven to work according to a set model in order to reach the summits of their careers. Refereeing in football is an extremely topical problem that often gives rise to major discussions in society and requires a well-founded methodology for the improvement and development of football refereeing. The aim of this scientific study is to help optimise the psychophysical training of the football referees in order to ensure better efficiency in their activities.

SUMMARY OF CONTENTS OF THE DISSERTATION STUDY

CHAPTER I

The theoretical analysis of the current study is distributed in five parts which contain research, analysis and summaries based on literary sources concerning the topic.

In the **first part**, a literature review was conducted regarding the history and origin of the football game. Historical sources reveal that the first game which involved kicking a ball in a square and sand-strewn court happened in China (third and second centuries BC), and the name of the game was *Tsu'Chu*. In 1894, at the invitation of the Minister of Education, Georgi Zhivkov, a group of Swiss sports teachers and athletes arrived in Bulgaria, including Georges de Regibus. He is considered the founder of the game of football in the country, which at that time was called *ritnitop*.

The **second part** lays out the history and stages of development of football refereeing. In 1891, the Football Association of England decided that the referee should be positioned inside the field and officiate the match with a whistle. The first referee section was founded in Sofia in 1920 under the name *Collective Referee Organisation Sofia*. Nowadays, football refereeing has developed to such an extent that in most of the countries in Europe – England, Italy, Germany, the Netherlands, Spain, Switzerland, Russia and others – it is a profession. This trend is evident not only in Europe, but also in some countries of other continents. Currently, there are a number of innovations related to modern technologies. Goal Line Technology is introduced, as well as a video monitoring system – Video Assistant Referee, which support the activity of the football referees.

The **third part** concerns the problem of the mental preparation of the football referee. We can point out that it has a fundamental role in their activity and is divided into *general mental training, specialised mental training and special mental training*.

In the **fourth part**, we discuss the physical fitness of the athletes, in particular – of the football referees. It is one of the fundamental trainings, belonging to the structure of psychophysical fitness. When officiating a football match, the referees overcome various difficulties requiring great effort. A higher load requires more capacity. This obliges judges to use appropriate training programs aimed at the complex development of their motor qualities, which will also shape their physical readiness.

In the **fifth part** we focus mainly on psychophysical preparation. Mental and physical training in sports must be conducted simultaneously as psychophysical training. The basic means which support the development of psychophysical preparedness in athletes are mental and physical exercises. Our leading theory of the unity of mental and physical activity is based on Fechner's law in his work *Elements of Psychophysics* from 1860. It is considered to be the basis of the works of a large number of domestic and foreign authors.

HYPOTHESIS, AIMS, TASKS, SUBJECT, OBJECT, METHODOLOGY AND ORGANISATION OF THE RESEARCH

II.1. HYPOTHESIS

By creating and testing models for the psychophysical training of the football referees, we assume that its structure will be optimised, and the degree of their complex training will also be increased.

II.2. AIMS AND OBJECTIVES

The aim of the present study is to optimise the psychophysical training of football referees in order to ensure better efficiency in their activities.

Tasks of the present study

1. To perform a retrospective and theoretical analysis of football refereeing, as well as to develop theoretical foundations of the physical, mental and psychophysical training of football referees.
2. To follow the dynamics of the physical, mental and psychophysical training of football referees.
3. To create and implement models for optimisation of the training of football referees.
4. To investigate the correlational dependences between the main physical, mental, psychophysical and tactical indicators.
5. To create a methodology for measuring some psychophysical indicators.
6. To study and draw conclusions, as well as recommendations for the theoretical and practical application.

II.3. SUBJECT AND OBJECT OF THE RESEARCH

The subject of the study is the optimisation of the training of football referees through the improvement of the three types of training – physical, mental and psychophysical.

The object of the research are ninety-two football referees aged 18-30 in the rankings of the Third League, U 19 and Amateur football, divided into four groups. The groups, on the other hand, are two experimental and two control (Table 1). Each of the groups has a subgroup – Referees and Assistant Referees.

Table 1. *Total number of studied football referees, divided by position and groups – EG and CG*

Refereeing Group	Experimental Group (EG)	Control/ Checking Group (CG)	TOTAL
Referees	23	23	**46**
Assistant Referees	23	23	**46**
TOTAL	**46**	**46**	**92**

II.4. RESEARCH METHODOLOGY

To achieve the goal and solve the tasks, we used a complex of methodologies. When selecting the applied methods, we were guided by the analysed literary sources and works, as well as the specifics of the refereeing activity.

Description of Methods

1. Research, analysis and summarisation of literary sources

Written data on our topic were studied, analysed and summarised. A total of 235 literary sources were analysed for the hereby developed concept, which ensure optimisation of the psychophysical training of football referees, of which *Bulgarian – 133*; *Foreign – 102* and *Web sites – 16.*

2. Survey

In the course of the dissertation project two sociological surveys were conducted. The first was in conversational form with specialists from Bulgaria (20 people) and abroad (20 people) operating in the field of football refereeing. This study was conducted online. Based on the analysis of the discussion, fifteen questions were prepared, which were later formulated and included in a survey.

In September 2021, the second study was conducted – a survey of all referees (46 participants) and assistant referees (46 participants) from the control and experimental groups. In March 2022, all participants were interviewed again. By means of this method, the referees' individual views on the emphases they place in the course of their complex training were investigated.

3. Methods of measuring and evaluating the physical development

We used an anthropometric method to measure weight and BMI (body mass index).

4. Pedagogical monitoring

During the period February 2021 – February 2022 we organised and conducted a pedagogical observation. It allowed us to test our research hypothesis, namely, to establish the positive influence of the models we developed resulting in optimisation of the psychophysical training of the football referees.

5. Pedagogical testing for physical capacity

After a detailed study and analysis of the scientific and methodological literature, we chose some tests for physical capacity. At the tests selection, we complied with the basic requirements for the specifics of the referees' activities. In the process of carrying out the testing, the level of motor qualities (speed, strength, endurance, flexibility and agility) was tracked and studied, which is expressed in the physical capacity and preparedness of the referees. The tests applied in the dissertation are detailed in Table 2.

Table 2. Pedagogical testing for physical fitness – types of tests

Test No.	Test Type	Measure	Precision of Measure
1.	Explosive Strength Test	metres	0,01
2.	Joints Flexibility Test	centimetres	0,5
3.	FIFA Fitness Test	seconds/no. of segments	0,01/1,0
4.	Single-Double-Single Test	seconds/no. of segments	0,01/1,0

Table 2. Pedagogical testing for physical fitness – types of tests

FIFA Fitness Test

The FIFA Fitness Test is a physical test which is used as the main tool for determining the physical fitness of referees from FIFA, UEFA, as well as the Referee Commission of the Bulgarian Football Union. It assesses speed, endurance of all referees, as well as agility, particularly of the assistants.

Test Description

FIFA Fitness Test No. 1 of the referees consists of 6 sprint runs of 40 m, in 90 sec. walking to return to starting position (Figure 1). It is required that each run does not exceed the specified time limit (Table 3).

Figure 1. FIFA Fitness Test No. 1 – 40 m sprints of Referees

For assistant referees, the FIFA Fitness Test No. 1 consists of two tests. First, the FIFA Fitness Test No.1.1 – CODA is performed (Fig. 2), followed by a 120 seconds rest, then it is proceeded to FIFA Fitness Test No.1.2 – running 5 sprints x 30 m (Fig. 3). Table 3 shows the time limits for the above tests.
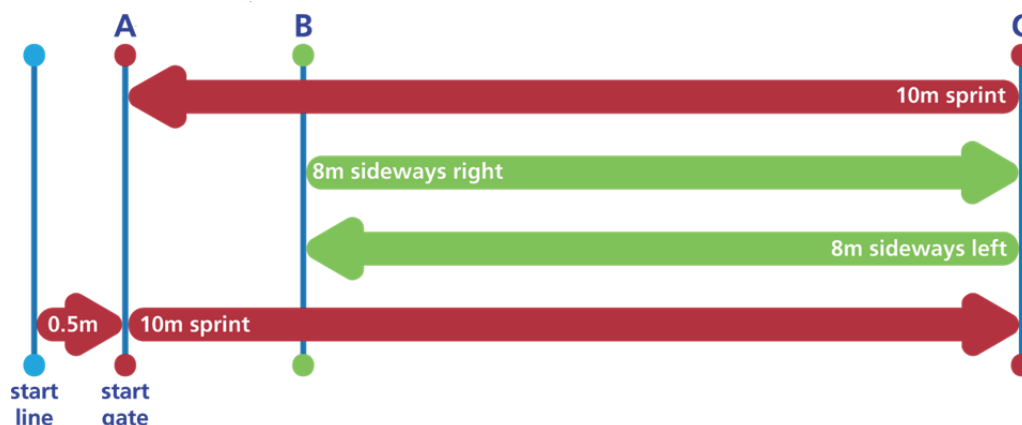

Figure 2. FIFA Fitness Test No.1.1 – CODA of Assistant Referees

Figure 3. FIFA Fitness Test No.1.2 – 30m sprints of Assistant Referees

Table 3. Time limits FIFA Fitness Test No.1 for Referees, FIFA Fitness Test No.1.1 and FIFA Fitness Test No.1.2 for Assistant Referees according to the UEFA and FIFA scale

No.	Refereeing Group	Metres	Repetitions	Time	Rest
1.	Referees	40	6	6.1 s	60 s
2.	Assistant Referees	30	5	4.7 s	60 s
3.	Assistant Referees	CODA	1	10 s	120 s

FIFA Fitness Test No.2 is a 75m smooth run followed by a 25m walk. 10 laps or a total of 40 runs (Figure 4) are performed. The times are as follows – both the referees and the assistant referees run 75m in 15 seconds. The first group – walking 25m in 20 seconds, and the second – in 22 seconds. (Table 4).

Table 4. Time limits for running and resting in FIFA Fitness Test No.2 according to the UEFA and FIFA scale

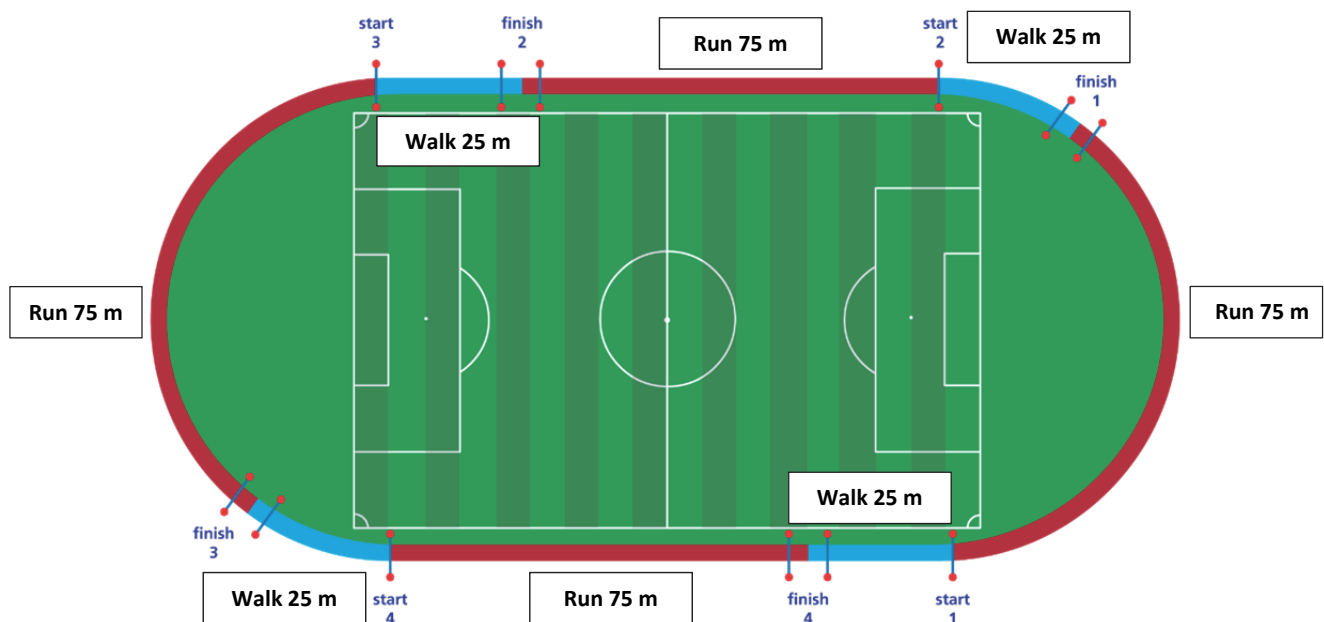| No.	Refereeing Group	Metres	Repetitions	Time running	Rest – walking
1.	Referees	75	40	15 s	20 s – 25 m
2.	Assistant Referees	75	40	15 s	22 s – 25 m

Figure 4. FIFA Fitness Test No. 2 Referees and Assistant Referees

Mode of Performance

The normative is carried out after a thorough warm-up.

In the FIFA Fitness Test No.1, the referees are divided into groups of 6-10 people, in a pre-determined order by the fitness instructors, wearing a vest with a number used to identify the participants. It is extremely important to follow the pre-set order. After a signal, a high start 1.5m from the starting line is performed. After finishing, the referees have 90 seconds to walk to the starting position. If one of the runs is not covered, a warning is given and after the sixth sprint a chance is given for correction. The test is considered failed at two uncovered sprints.

During the FIFA Fitness Test No.1 the assistant referees are divided into groups of 6-10 people. Again, the order is set in advance, marked vests are used to identify the participants, and the order of performance is followed. FIFA Fitness Test No.1.1 CODA (Fig. 2) is performed first – a sprint along the straight line from point A to point C (10 metres). From point C to point B (8 metres) – siderun with leading left shoulder. From point B to point C (8 m), siderun with leading right shoulder. When point C is reached, a 10-meter sprint is performed in a straight line to point A, where the finish line is set.

A 120 sec. rest follows and a continuation with FIFA Fitness Test No.1.2 (the 5 30m sprints) is performed. The execution is identical to that of the referees.

Time measurement in the sprints (30 m and 40 m) is carried out by means of three photocells – at the start, at the 10th meter, as well as at the finish (40th meter). The first and last photocells are mandatory, while the one at the 10th meter is recommended, in order to further analyse the motor quality of explosive force.

In the FIFA Fitness Test No.2 (Fig. 4), the referees and assistants are again divided into groups of up to 6 people while continuing to wear a vest with the number assigned at the beginning. Running pace is determined by sound signals pre-recorded on audio files standardised by FIFA and UEFA for the different categories of referees. A sound system is necessary for this purpose. At the beginning of each new lap, a signal is sounded in the order of the starting lap. At each starting position there is an instructor with a flag, who holds it up and does not allow a start until the signal to do so is produced. In this way the earlier start can be controlled. At the finish, all referees must have entered a square (3 x 3 m), which is located at the 75th meter. This is followed by a 25 m walk for a certain time (according to the ranking list). To cover the physical fitness test, a total of forty sections of 75 m must be run. Provided that there is a participant who fails to finish in time, he is warned and after the last section, an additional section is run. In case of repeated incorrect finishing, the test is considered failed.

Assessment

The evaluation of the performance of the first part of the test is performed by means of the table of time limits presented below (Table 5), and the second part of the physical standard for endurance – passed / failed.

Table 5. *Evaluation of the speed of football referees according to the UEFA and FIFA scale*

Referees		Assistant Referees
< 5,6	**Excellent**	< 4,3
5,6 – 5,7	**V. Good**	4,3 – 4,4
5,8 – 5,9	**Good**	4,5 – 4,5
> 6,0	**Needs improvement**	> 4,7

Necessary supplies and equipment

Athletics track, electronic measurement system, audio system, cones (to indicate start and finish), start control flags, numbered vests, pre-printed forms for recording results.

6. Pedagogical testing including various types of mental tests

In the current dissertation project, the mental preparation, which is fundamental to the activity of football referees, is investigated. It includes several types of readiness – general, permanent, specialised and situational. In order to obtain correct overall information from the subjects, several psychological tests are applied (Table 6), providing information on the interrelationships between emotional, volitional and cognitive personality factors.

Table 6. *Pedagogical testing – mental tests*

No. Test	Test Type	Measure	Precision of Measure
1.	Self-esteem, Activity and Mood Test (SAM Test)	grade	1.0
2.	Situational Mental Preparedness Test (SMP Test)	grade	1.0
3.	Concentration Test	number/sec	1.0
4.	Time Perception Test	seconds	0.1

SAM Test (Self-esteem, Activity and Mood Test)

The test aims at the examination of the emotional state – self-esteem, activity and mood of the football referees, as it plays an important role in their activity. The test consists of 30 pairs, or 10 pairs of opposites for each emotional state – self-esteem, activity and mood. Each person tested evaluates their performance in the test, giving marks from 1 to 9, depending on their personal perception. The ratings of each quality (state) are summed, the number is divided (10), then the emotional state of the subject is determined (from 1 to 9 points).

7. Pedagogical testing for professional competences

In the course of the current scientific and pedagogical research, we implemented a *Combined Video Test,* allowing for the monitoring of the preparedness of the football referees (incl. assistants) in their theoretical knowledge on *Laws of the Game*, as well as their practical decision-making in a video situation.

8. Pedagogical testing for psychophysical capacity

The test puts on a serious trial the psychophysical fitness of the football referees. By means of this normative, we trace the interrelationship between mental preparation –

decision-making in complex situations, as well as physical fitness with an emphasis on the stability of the physical quality of endurance.

Test description

The process starts with a signal, followed by another sound signal on the 15th second, during which 75 m must be run, where the direction of movement is shifted. At the 30th second, the final signal is given, during which the participants must have run a total distance of 150 m. Immediately after finishing, the referees head to a monitor on which a game situation is displayed as they must make an adequate decision. After watching replays from differently positioned cameras, they approach an instructor, to whom they give the correct answer, who, in turn, writes it down on a pre-prepared form with the name of each participant. From the moment of the finish, a total time of 45 seconds is counted to review the situation, make a decision and rest, then start again. 20 repetitions are performed (Fig. 5). The test can be performed by one, two or more participants.
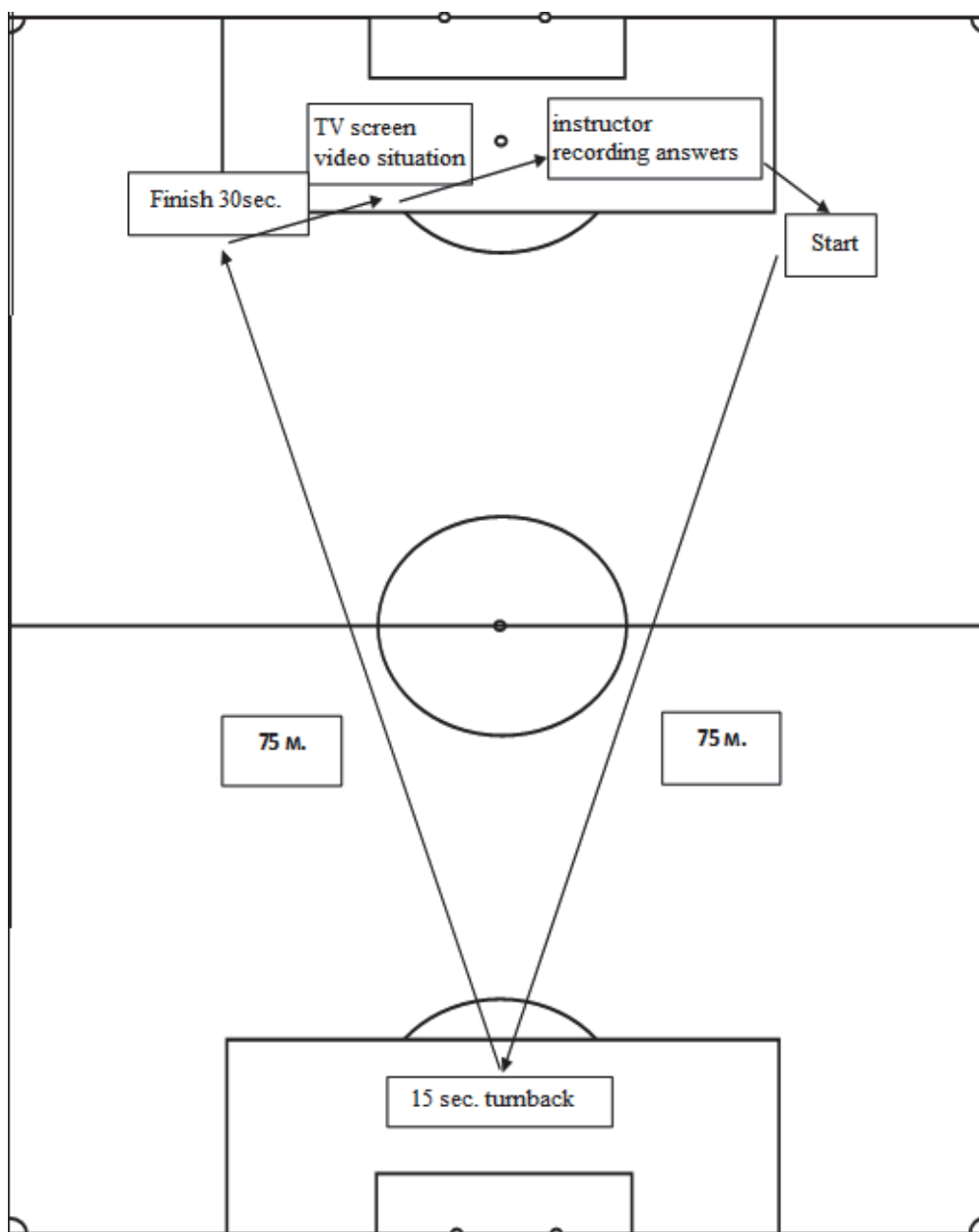

Figure 5. Psychophysical Test Referees and Assistant Referees

Assessment

The assessment of test performance is complex. Professional competence is taken into account, producing a correct answer to video situations, as well as the ability to overcome all twenty runs – the assessment has pass and fail options.

Necessary supplies and equipment

Football pitch (natural or artificial grass), electronic measurement system, audio system, cones (to indicate the start and finish line, as well as additional distance markers), TV or projector with a screen to project the video situations, pre-prepared forms for recording answers (paper), pens, numbered vests.

9. Pedagogical experiment

The program developed by us bears the following concept – to justify and verify the effect of the models we have prepared for mental, physical and psychophysical preparation. It is important to note that each group has a subgroup of **Referees** and **Assistant Referees**. The experimental work was performed in two consecutive stages – first and second stage in the period 02.2021 – 02.2022.

In the first study, we took the test results of all participants and analysed them. For the purpose of the research, we planned, prepared and organised a group training plan, which was adapted to the different periods in the activity of the referees – preparatory, competitive and transitional. The models we developed and applied to the experimental groups have a logically aligned macro and micro structure. We ensured targeted as well as systematic exertion in the course of the selected workouts through variable methods and tools. Each of the participants in the experimental group attended more than 80% of the group training sessions.

In the control group, we did not apply training models, the referees planned and organised their complex training by themselves without attending organised group activities.

10. Mathematical-statistical processing of the results

The analysis of the obtained experimental data is performed by applying statistical methods. These are processed, analysed and summarised below in Chapter III.

1.1. Variational analysis

Mathematical-statistical data processing was performed with the Microsoft Excel 2019 and the SPSS22 statistical package. The statistical methods used are:

a) arithmetic mean value:

$$\bar{x} = \frac{\sum x}{n}$$

b) standard deviation:

$$S = \frac{\sum (x_l - \bar{x})^2}{n - l}$$

c) coefficient of variation (V%)

$$V = \frac{S}{\overline{x}} \cdot 100$$

– confidence limit of the mean for a normally distributed sample of

$$95\% \ (a = 0{,}05), \ \mu = \overline{x} \pm \frac{ts}{\sqrt{n}}$$

– absolute growth $d = \overline{x}_2 - \overline{x}_1$, and relative growth

$$d\% = \frac{\overline{x}_2 - \overline{x}_1}{\overline{x}_1} \cdot 100$$

1.2. Hypothesis testing

For this purpose, Student's criterion for dependent samples was applied with a guarantee probability of $P = 0{,}95$ (95%)

$$t_{emp} = \frac{\left|\overline{d}\right|}{\sqrt{\dfrac{\sum d^2 - n\left(\overline{d}\right)^2}{n^2 - n}}}$$

1.3. Correlation analysis

The Pearson coefficient (r) is calculated using the formula:

$$r = \frac{P}{S_x \cdot S_y}, \text{ where}$$

$$P = \frac{\sum XY}{n-1} - \frac{\sum X \sum Y}{n(n-1)}$$

II.5. RESEARCH ORGANISATION

The scientific-pedagogical research was planned in detail, organised and conducted in three stages. We planned the experimental study to take place in the period 2020-2022.

The first stage took place from May 2020 to 2021. This time interval was dedicated to the study of Bulgarian and foreign literary sources related to the topic of the dissertation work. Seminars for football referees organized by the BFU, FIFA and UEFA were attended. A discussion with specialists was held, as well as the content and structure of the various types of training in the activity of football referees were analysed from the point of view of theory and practice. Through the data gathered, we determined a concept through which we prepared a sample plan-program for testing their psychophysical preparation.

Second stage – from February 2021 to March 2022, we administered an experimental study where we applied mental, physical and psychophysical tests, as well as recording the results obtained. Training models were created applying variable methods and means to optimise the psychophysical training of the subjects.

Third stage (2022) – we processed and studiedthe results of the research. We prepared conclusions and recommendations. The research paper was refined and finally completed.

CHAPTER III

RESULTS AND ANALYSIS OF THE RESULTS OBTAINED

III.1. RESULTS AND ANALYSIS OF THE SURVEY ON FOOTBALL REFEREES

To clarify the problem, we conducted a survey in two stages of the research, including 15 questions. It allowed us to study and analyse the opinion of the researched persons regarding certain qualities and perceptions about the training of football referees. The opinions of 92 respondents were taken into account.

In this regard, we asked: "**Do you include psychophysical exercises in your training program**?".

a. Yes, I include;
b. No, I don't include;
c. I do not know any psychophysical exercises, so I do not include such.

During the first survey to the question "*Do you include psychophysical exercises in your training program*?" the responses from the surveyed persons lacked firmness. For "*Yes, I include*" the obtained results are as follows – EG R 39%, for EG AR 39%, and for the control groups respectively – 35% CG R and 48% CG AR. For the respondents who indicated "*No, I do not include*", the analysis of the results shows that the obtained values are 43% of EG R and 48% EG AR, and for the two control groups – 47% for CG R and 39% for CG AR. The percentage of referees who are not familiar with any psychophysical exercises and give this reason for not including them in their training program is low – EG R and CG R 18%, and for EG AR and CG AR 13%.

The results obtained from the second study in both experimental groups show a significant change. An extremely large percentage of respondents at EG R (96%) and EG AR (96%) share that they include psychophysical exercises in their training program. We believe that these results are a consequence of the methods and tools we applied at both EGs in the course of the pedagogical experiment.

In the two control groups, no significant deviations were observed in the indicated responses in the second study.
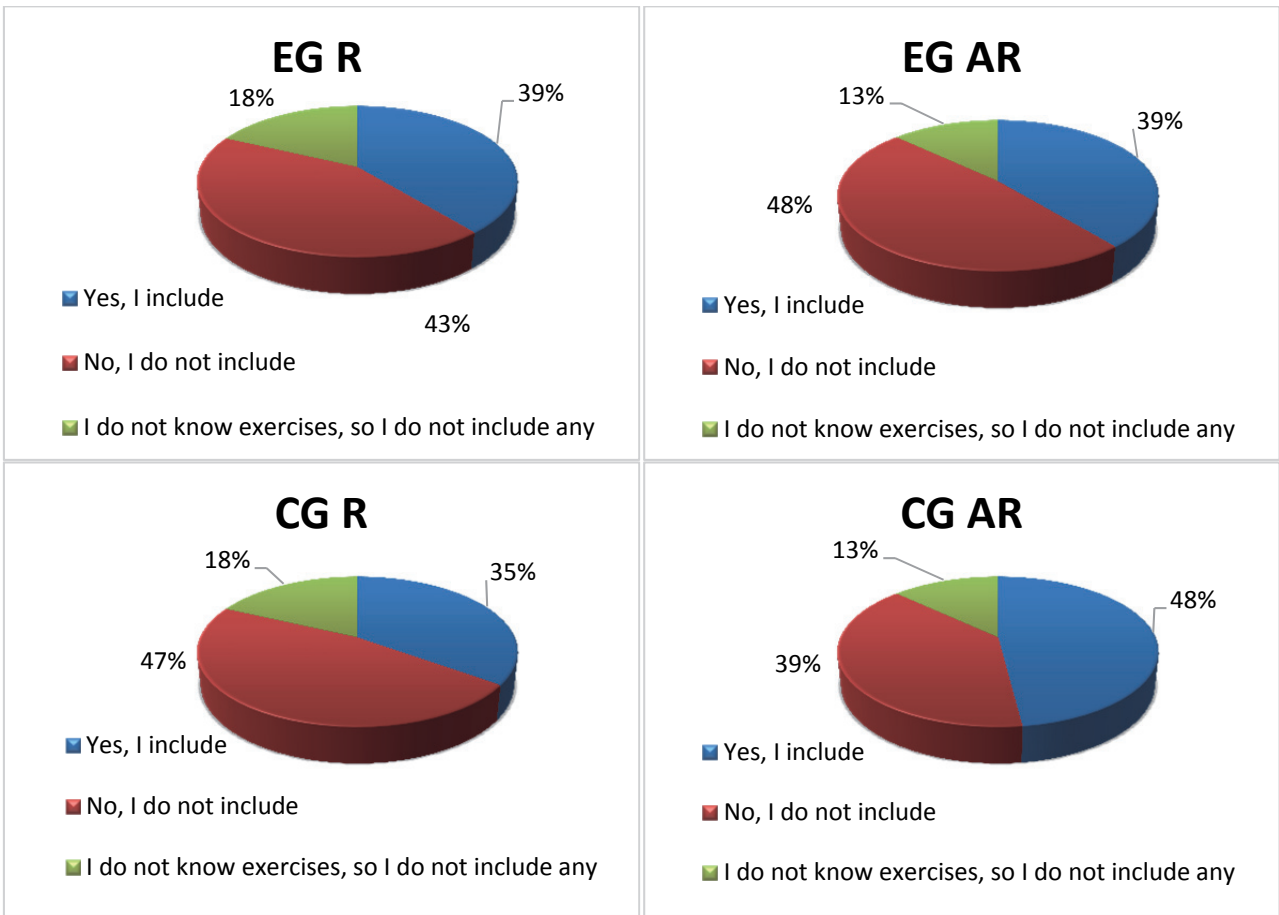
Figure 1*. Do you include psychophysical exercises in your training program? – I survey*
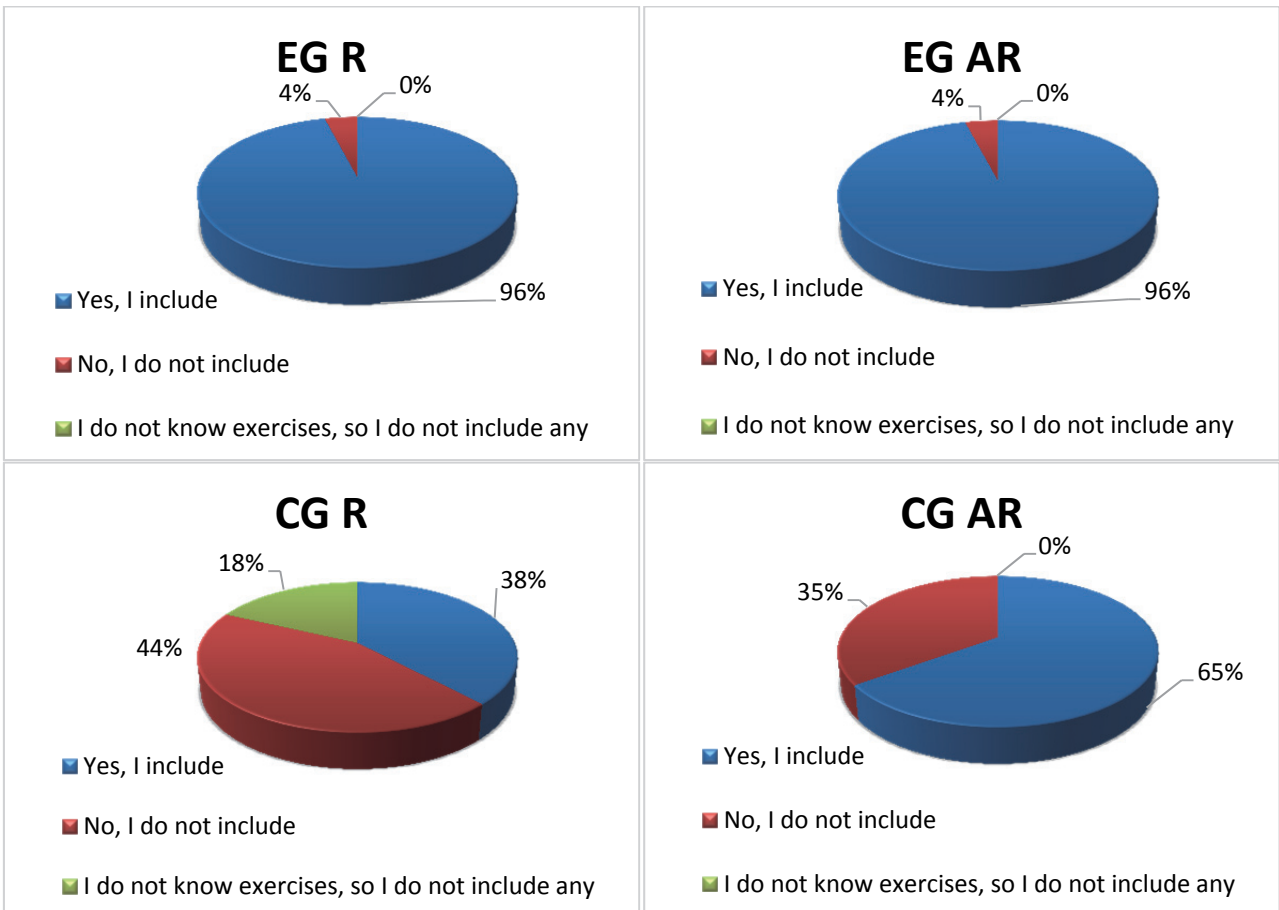

Figure 2*. Do you include psychophysical exercises in your training program? – II survey*

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Based on the analyses of the survey conducted during the first and second research, it was established that the attitude and understanding of the examined subjects from the two experimental groups changed significantly in a positive direction. This is accounted for by the modification in the indicated adequate answers in the second study. We believe that EG R and EG AR specified the different types of training, as well as their understanding of a more professional attitude towards the training process. We attribute all this to the models, discussions and literature provided by us to optimise the structure of their psychophysical training.

III.2. RESULTS AND ANALYSIS INDICATORS FOR DETERMINING THE PHYSICAL DEVELOPMENT OF FOOTBALL REFEREES

The physical development of the referees is tracked by analysing the results of the body mass index. The change in the average body mass index between the first and second examination of the two experimental and control groups is presented graphically (Fig. 3) and tabularly (Table 7). In EG R, comparing the results of the first and second research, we register a positive change from 12.67% to 11.71%. At EG AR, a positive difference between the two experiments is again noticeable (from 13.31% to 11.91%). We can point out that the values for both EGs from "very good" in the first study are transformed to "excellent" in the second study. CG R's results show negligible deterioration.

In conclusion of the obtained results, we can indicate the significance of the applied model for physical training, the diet, but we should highlight that another main factor, in our opinion, are the regularly applied strategies for flexibility and strength, during the experiment for motor qualities, which inevitably contribute to better results of EG R and EG AR in the second test.

Table 7. *Body Mass Index (BMI) in %*

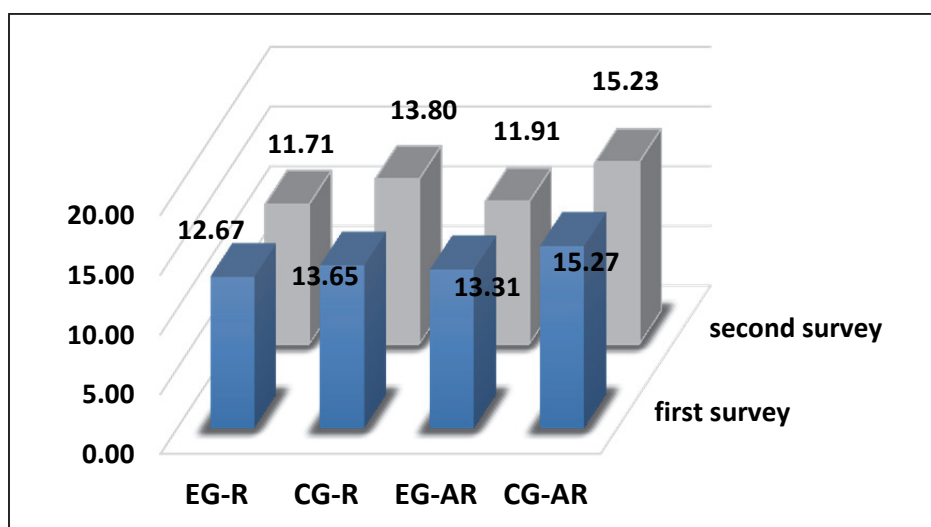| Survey Groups	First Research			Second Research			Confidence *P* (%)
	$\bar{x}$	*s*	*V* (%)	$\bar{x}$	*s*	*V* (%)	
EG R	12.67	2.66	21.01	11.71	2.41	20.54	99%
EG AR	13.31	2.39	17.97	11.91	1.95	16.41	99%
CG R	13.65	2.44	17.91	13.80	2.81	20.35	< 95%
CG AR	15.27	3.18	20.84	15.23	3.21	21.11	< 95%

Figure 3. *Changes in results at measuring Body Mass Index (BMI) in %*

III.3. RESULTS AND ANALYSIS OF THE RESULTS OF THE RESEARCH ON PHYSICAL FITNESS IN FOOTBALL REFEREES

FIFA Fitness Test

We monitored the effectiveness of the physical training models applied by us through this complex physical test, testing the motor qualities of speed (*FIFA Fitness Test 1*), endurance (*FIFA Fitness Test 2*) and agility (*CODA Test for assistant referees*).

1.1. FIFA Fitness Test 1

The results of the EG and CG for the referees and assistant referees from FIFA Fitness Test 1 are graphically presented (Fig. 4). Since this test has different parameters for the referees (6 x 40 m) and assistant referees (5 x 30 m), the values of EG and CG referees, as well as EG and CG assistant referees in the first and second study is analysed, without making a comparison between referees and assistant referees. The change in mean values between the studied groups in the two periods is indicated. The results show that the average time of the referees of the experimental group decreased from 5.50 to 5.42 seconds, the assistant referees of the same group also saw a decrease from 4.36 seconds to 4.23 seconds. In the control group, there was a slight increase in mean time from 5.614 seconds to 5.615 seconds for referees and an increase for assistant referees from 4.58 seconds to 4.60 seconds.

These results are also confirmed statistically by the related samples test in Table 8. The data provide an argument for the statistical significance of the results obtained from a comparison of values between related groups i.e. there is an improvement in the performance of the referees and assistant referees from both EGs in the FIFA Fitness Test 1, expressed by a reduction in seconds. Confidence coefficient for both EGs is P > 99%. In the control groups there is no statistically significant result (*P* < 95%).

These data clearly confirm the conclusions that the applied model for the physical training of the referees during the different periods of the sports year had a positive effect. In particular, this is the adapted training for speed, in which sprint runs of different distances are performed, from different starting positions. All these means visibly increase the results of the experimental group, both of the main and assistant referees. The small percentage in the coefficient of variation (V%) gives us grounds to claim that the results achieved are uniform. In both CGs, the differences between I and II survey are insignificant.

Table 8. *FIFA Fitness Test 1 (seconds)*

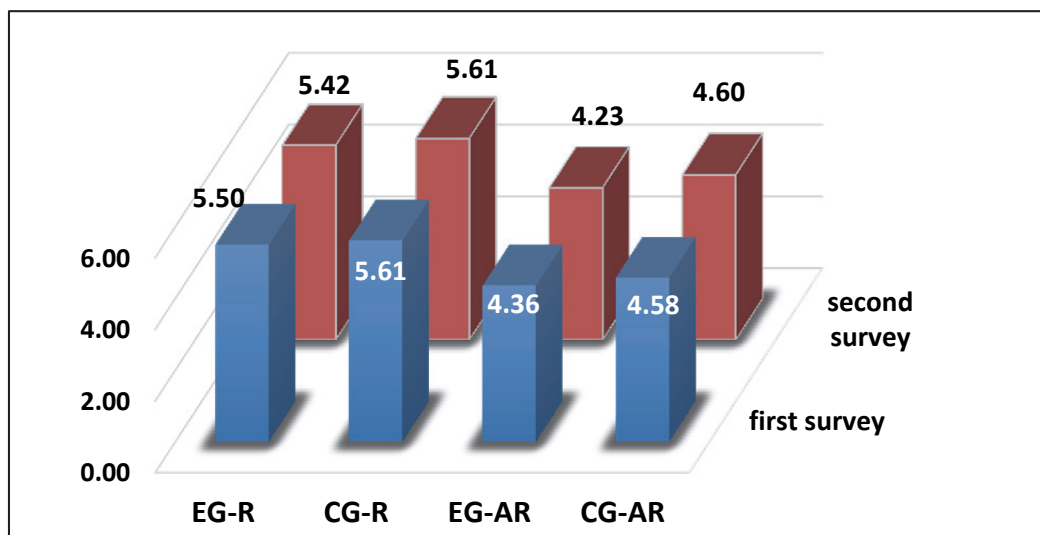| Survey	First Research			Second Research			Confidence *P* (%)
Groups	$\overline{x}$	s	*V* (%)	$\overline{x}$	s	*V* (%)	
EG R	5.50	0.19	3.50	5.42	0.15	2.73	99%
EG AR	4.36	0.19	4.37	4.23	0.14	3.25	99%
CG R	5.614	0.18	3.25	5.615	0.20	3.60	< 95%
CG AR	4.58	0.13	2.76	4.60	0.12	2.69	< 95%

Figure 4. *Changes in FIFA Fitness Test 1 scores (seconds)*

1.2. FIFA Fitness Test 2

The shifts in the results of the referees and assistant referees from EG and CG during the first and second study are presented graphically (Fig. 5). Nineteen of the referees of EG passed the physical test and four failed during the first survey. After applying the models to improve physical fitness in a second study of the same group conducted in 2022, all participants successfully managed to run the forty segments of the physical test. A similar change is observed in the EG of the assistant referees. These results are statistically confirmed by the related groups test (Table 9). The data provide an argument for the statistical significance of the obtained results from a comparison of values between related groups i.e. there is a statistically significant improvement in the performance of the referees and assistant referees in the FIFA Fitness Test 2, expressed by an increase in laps towards achieving full coverage of the normative. The confidence coefficient for the referees from EG is greater than 96%, while for the EG assistant referees it is greater than 97%. In the control groups, there is no statistically significant result, as the confidence coefficient is less than 95%. Looking at the results of the I and II survey in the two control groups, no such change is observed.

From the presented values, we can conclude that the better results in the experimental groups are mainly due to the applied model for physical training, as a result of which we have significantly improved the motor quality endurance. Hereby we can point out that the sample training we prepared for the preparation of FIFA Fitness Test 2 also positively influenced the performance of the participants from both EGs.

Table 9. *FIFA Fitness Test 2 (number of segments)*

Survey	First Research			Second Research			Confidence *P* (%)
Groups	$\overline{x}$	s	V (%)	$\overline{x}$	s	V (%)	
EG R	38..5	3.21	8.30	40.00	0.00	0.00	96%
EG AR	37.61	4.44	11.80	40.00	0.00	0.00	97%
CG R	37.00	5.27	14.23	36.652	5.89	16.07	< 95%
CG AR	37.48	4.39	11.71	37.96	3.94	10.37	< 95%
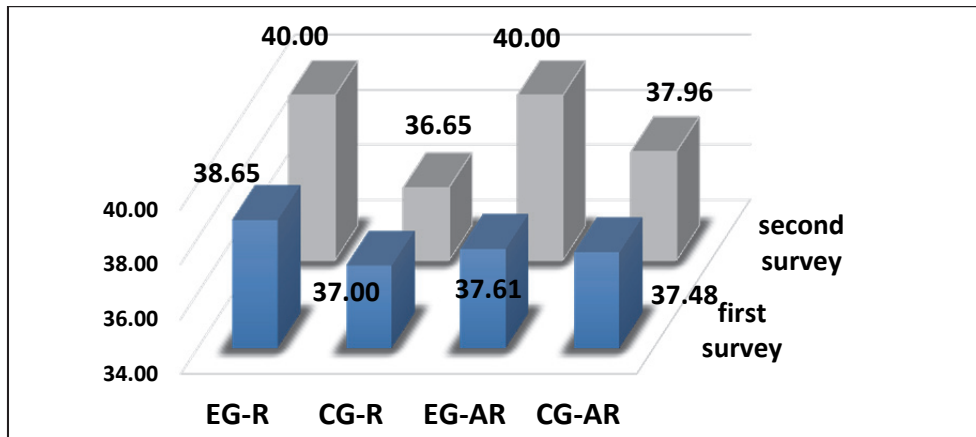
Figure 5. *Changes in FIFA Fitness Test 2 scores (number of segments)*

1.3. CODA Test (Assistant Referees only)

The results of the EG and CG assistant referees from the CODA test are presented graphically (Fig. 6). A change in mean values between the study groups for survey I and II was reported. The results indicate that the average time for assistant referees in the experimental group decrease from 9.12 seconds to 8.90 seconds. Assistant referees in the control group see a minimal drop in average time from 9.34 seconds to 9.29 seconds, with the change, despite the similar direction, being much smaller as an average score. The obtained values can be confirmed statistically (Table 10). There is an improvement in the performance of the EG assistant referees in the CODA Test, as expressed by a reduction in time measured in seconds (0.22). No statistically significant result is observed in the control group, despite the slight improvement in their performance in surveys I and II.

Based on the earlier analyses for the performance of the two researched groups of assistant referees, we can claim that those from EG, where an experimental model for physical training was implemented, show a significant improvement in motor-coordination abilities in the II study. We cannot claim the same for the assistant referees from the CG, where no profiled methodology was applied.

Table 10. *CODA Test (seconds)*

Survey	First Research			Second Research			Confidence P (%)
Groups	$\overline{x}$	s	V (%)	$\overline{x}$	s	V (%)	
EG AR	9.12	0.31	3.43	8.90	0.25	2.77	97%
CG AR	9.34	0.36	3.85	9.29	0.36	3.90	< 95%

Figure 6. *Changes in CODA Test scores (seconds)*

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III.4. RESULTS AND ANALYSIS OF THE RESULTS OF THE RESEARCH ON THE MENTAL QUALITIES OF FOOTBALL REFEREES

Self-Esteem, Activity and Mood Test (SAM Test)

By means of this mental test, conveying information on the mental qualities of self-esteem, activity and mood, we can examine the general capacity of football referees participating in the experiment – two experimental and two control groups, consisting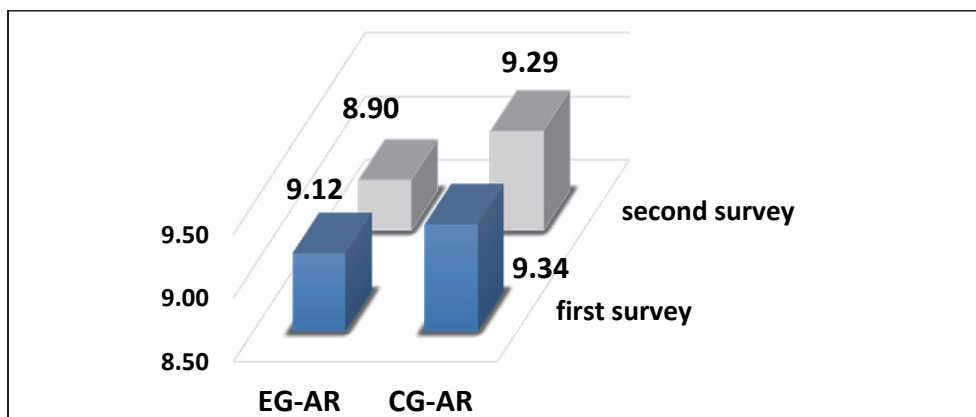 of referees and assistant referees. The results by group (self-esteem, activity and mood) for the referees and assistant referees for the two studied groups – experimental and control during the first and second surveys (Fig. 7 and Fig. 8) are visualised and presented below. For the referees of the experimental group in the first study, the values in points for self-esteem were 6.8, for activity 6.9 points, and for mood 7 points. During the second survey for the same group, the results improved significantly – for self-esteem 7.7 points, for activity 8 points and for mood 7.9 points. No significant changes were observed in the CG of the referees between the first and second survey. The results of the assistant referees of the experimental group are as follows: first survey (self-esteem 6.7 points; activity 6.8 points, mood: 6.9 points), second survey (self-esteem 7.6 points; activity 7.8 points, mood 7.8 points). For the assistant referees in the control group, there was no similar trend towards improvement in results between the two surveys.

In addition to the average values of the first and second survey of the referees and assistant referees from the experimental and control groups for the three types of psychophysical condition groups, the confidence values P (%) and the statistical significance of the obtained results are presented (Table 11). From a comparison of values between related groups, expressed as above 99% for the experimental groups and below 95% for the controls.

We believe that we can evidence the significant alterations in the indicators of the two experimental groups via the methods and means we applied, expressed in models for mental, physical and psychophysical training.

Table 11. Measurement of SAM test (points)

Survey Groups	SAM Groups	First Research			Second Research			Confidence P (%)
		$\overline{x}$	s	V (%)	$\overline{x}$	s	V (%)	
EG-R	self-esteem	6.8	0.5	6.6	7.7	0.6	7.8	99%
	activity	6.9	0.5	6.9	8.0	0.5	6.2	99%
	mood	7.0	0.4	6.2	7.9	0.4	5.1	99%
EG-AR	self-esteem	6.7	0.6	9.0	7.6	0.5	6.6	99%
	activity	6.8	0.6	8.1	7.8	0.7	8.3	99%
	mood	6.9	0.5	7.2	7.8	0.6	7.7	99%
CG-R	self-esteem	6.7	0.4	6.0	6.8	0.6	8.8	< 95%
	activity	6.9	0.5	6.5	7.0	0.6	7.9	< 95%
	mood	6.8	0.6	8.8	6.8	0.5	7.4	< 95%
CG-AR	self-esteem	6.6	0.5	7.6	6.6	0.6	9.1	< 95%
	activity	6.7	0.4	6.2	6.9	0.6	8.0	< 95%
	mood	6.9	0.4	6.2	6.8	0.4	5.9	< 95%
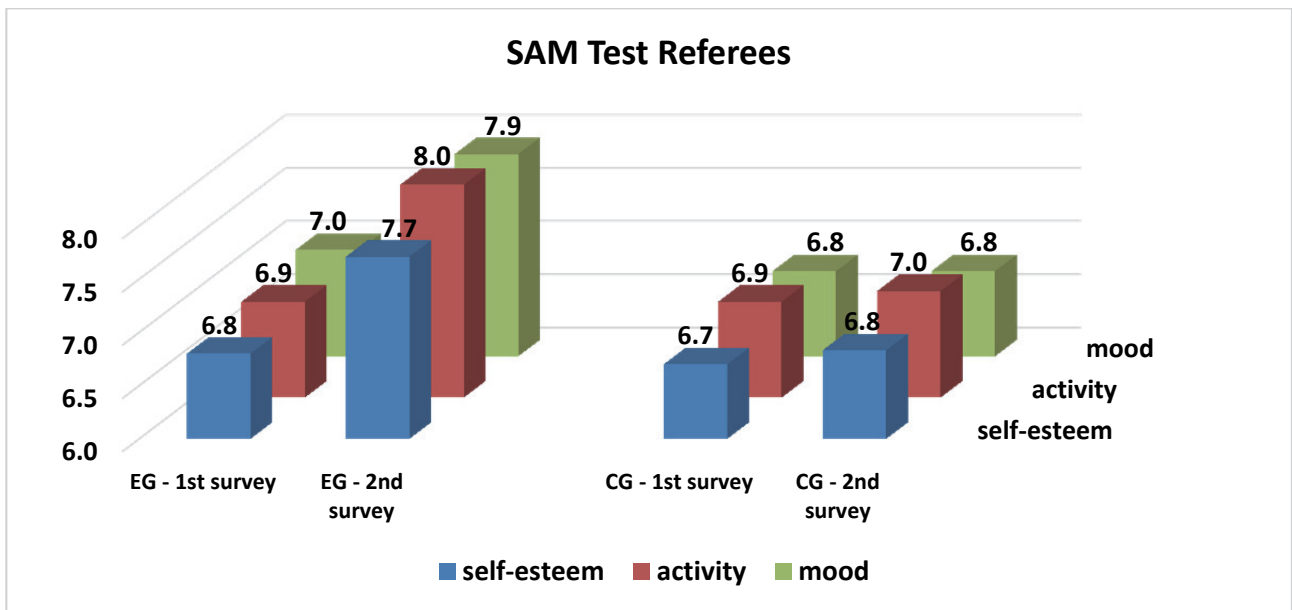
Figure 7. *Changes in results when measuring Self-esteem,*
Activity and Mood (number of points) for the referees
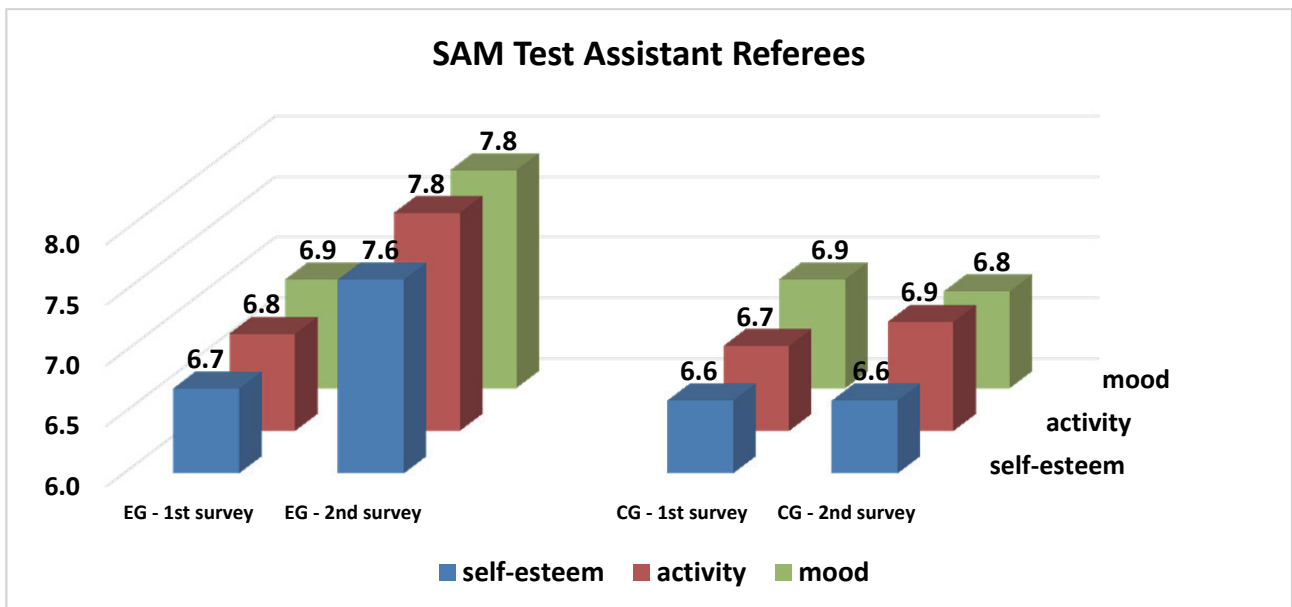
Figure 8. *Changes in results when measuring Self-esteem,*
Activity and Mood (number of points) for the assistant referees

III.5. RESULTS AND ANALYSIS OF RESULTS OF COMBINED VIDEO TEST

The test provides information about the competences of football referees. It contains ten double questions. The first part of each question gives us information about the knowledge of the Rules of the Game, and the second part tests the knowledge of the rules through game situations presented with video clips. Through this test, we extract information about the theoretical training of the referees, namely the ability to make adequate decisions in a calm environment, without physical strain. The results of the Combined video test are presented below (Table 12). The changes occurring in the experimental group are pointing towards decrease of the errors or preserving the existing result for both the referees and the assistant referees.

Due to the methodology implemented in the course of the pedagogical experiment, in the II survey there was a significant upgrade in the EG of the referees. There were no participants with two mistakes on the combined video test. A similar shift was observed in the experimental group of assistant referees. In the first studied period, two results with four and two with three errors were reported, similar values were not observed in the second survey. No significant differences were found in CG between the first and the second surveys. For the referees, in the first and second tests, results from 0 to 4 errors are observed, while for the assistant referees there is even a tendency for the results to deteriorate with the presence of 5 errors in the second test, a fact that was not observed in the first test. It is likely that these results are a consequence of very heterogeneous responses.

The test of significance of differences indicates that the results of the experimental group are statistically significant i.e. there is an improvement in the performance of the referees and assistant referees in the Combined Video Test, expressed by a reduction in the number of errors. The confidence coefficient for the EG of the referees as well as the assistant referees is greater than 99% (P > 99%). There was no statistically significant result in the control groups (P < 95%).

Table 12. Combined Video Test (number of errors)

Survey	First Research			Second Research			Confidence *P* (%)
Groups	$\overline{x}$	*s*	*V* (%)	$\overline{x}$	*s*	*V* (%)	
EG R	0.57	0.72	128.76	0.13	0.34	264.00	99%
EG AR	0.91	1.34	147.36	0.26	0.44	172.11	99%
CG R	1.39	1.23	88.66	1.39	1.34	96.28	< 95%
CG AR	1.00	1.38	138.17	1.35	1.30	96.50	99%

III.6. RESULTS AND ANALYSIS OF THE RESULTS OF THE RESEARCH ON PSYCHOPHYSICAL CAPACITY IN FOOTBALL REFEREES

The psychophysical capacity of each athlete is considered fundamental and decisive for achieving high sports results. This test puts to a serious trial the psychophysical preparation of the referees by getting as close as possible to the real situation during a football match, namely dynamic movement on the pitch and making adequate decisions in situations which arise.

The change in the number of errors in the two studies for the experimental and control groups is presented. In the EG, the average number of errors in the first survey is 3.30 for the referees and 3.83 for the assistant referees, respectively. In the second round, we notice a significant drop in the values of the referees – 2.04 number of errors and 2.43 for the assistant referees. In the control group, the values in the first study are 3.74 errors for the referees and 4.13 for the assistant referees. In the second survey, the values are 3.87 errors for the referees and 4.09 for the assistant referees, respectively.

The confidence coefficient P (%) and the statistical significance of the obtained results are expressed in the following values – over 99% for the experimental groups and below 95% for the control groups (Table 13). We believe that the higher coefficients of variation V (%) in the experimental group are a consequence of the more heterogeneous results.

The conclusion we can draw from the conducted research is that during the first testing, all participants from EG and CG during the execution of the test, started making

more mistakes on the video situations at the end of the test with the accumulation of physical fatigue. The same can be explained by the strong correlation between mental and physical training, expressed uniformly in the structure of psychophysical preparation. Based on the analyses from the first survey, in the course of the pedagogical project we applied different models for physical, mental and psychophysical training in order to optimise them. We believe that they had a positive effect on the referees from both EGs, who showed a significant upgrade in the results in the second study. Based on the obtained values, we can claim that our model for psychophysical training, including variable methods and tools (six different psychophysical exercises) is worthwhile.

Table 13. Psychophysical Capacity Test (number of errors)

Survey	First Research			Second Research			Confidence *P* (%)
Groups	$\bar{x}$	*s*	*V* (%)	$\bar{x}$	*s*	*V* (%)	
EG R	3.30	1.66	50.34	2.04	1.40	68.38	99%
EG AR	3.83	2.01	52.66	2.43	1.44	59.16	99%
CG R	3.74	1.86	49.85	3.87	2.10	54.15	< 95%
CG AR	4.13	2.18	52.79	4.09	1.90	46.61	< 95%

Established on the studies and research on the issues of theoretical preparation for football referees, as well as the conducted survey, we can claim that the participants from the two experimental groups showed a positive change in the second study. We believe that from the results obtained and the in-depth analyses developed earlier of the physical, mental and psychophysical performance tests we applied, as well as the tracking of physical development (weight and BMI), we can claim that the models we applied led to better efficiency in the activity of football referees, as a result of which their psychophysical training is optimised. We cannot draw the same conclusion for their colleagues from the two control groups.

III.7. CORRELATION ANALYSIS DETERMINING CORRELATION DEPENDENCIES BETWEEN INDICATORS OF PHYSICAL QUALITIES OF EG AT THE END OF THE PERIOD

With the purpose to establish the relationships between the physical, mental and psychophysical indicators, a correlation analysis was performed using the statistical package IBM SPSS 26, which allowed us to trace and analyse statistically significant correlations. The application of correlation analysis concentrates on tracking the two experimental groups in which stable structural changes are observed as a result of our effectively implemented models.

Table 14 lays out the correlations between the results of the experimental group of referees.

Table 14. *Correlation matrix for EG of the referees*

		Combined Video Test	FIFA Test 1	FIFA Test 2	SDS Test 1	SDS Test 2	Time Perception Test	SMP Test	SAM Test
Combined Video Test	Pearson Correlation	1	,498**	–,444*	,480**	–,430*	,260	–,248	–,265
	Sig. (2-tailed)		,001	,030	,005	,040	,282	,306	,273
FIFA Test 1	Pearson Correlation	,498**	1	–,623**	,810**	–,563**	,271	–,432*	–,428*
	Sig. (2-tailed)	,001		,000	,000	,000	,161	,040	,041
FIFA Test 2	Pearson Correlation	–,444*	–,623**	1	–,579**	,811**	–,434*	,399	,240
	Sig. (2-tailed)	,030	,000		,000	,000	,039	,089	,308
SDS Test 1	Pearson Correlation	,480**	,810**	–,579**	1	-,533**	,405	–,440*	–,439*
	Sig. (2-tailed)	,005	,000	,000		,000	,085	,032	,032
SDS Test 2	Pearson Correlation	–,430*	–,563**	,811**	–,533**	1	–,428*	,333	,358
	Sig. (2-tailed)	,040	,000	,000	,000		,041	,163	,132
Time Perception Test	Pearson Correlation	,260	,271	–,434*	,405	–,428*	1	–,512**	–,523**
	Sig. (2-tailed)	,282	,161	,039	,085	,041		,000	,000
SMP Test	Pearson Correlation	–,248	–,432*	,399	–,440*	,333	–,512**	1	,719**
	Sig. (2-tailed)	,306	,040	,089	,032	,163	,000		,000
SAM Test	Pearson Correlation	–,265	–,428*	,240	–,439*	,358	–,523**	,719**	1
	Sig. (2-tailed)	,273	,041	,308	,032	,132	,000	,000	

In the offered matrix (Table 14), the following statistically significant relationships were established (correlation dependence with a significance level of less than 0.05):

Strongly positive correlation

R (FIFA Test 1 and SDS Test 1) = 0,810
R (FIFA Test 2 and SDS Test 2) = 0,811
R (SMP Test and SAM Test) = 0,719

Significant negative correlations

R (FIFA Test 1 and FIFA Test 2) = –0.623
R (FIFA Test 1 and SDS Test 2) = –0.563
R (SDS Test 1 and FIFA Test 2) = –0.579
R (SDS Test 1 and SDS Test 2) = –0.533
R (Time Perception Test and SMP Test) = –0.512
R (Time Perception Test and SAM Test) = –0.523

Moderately positive correlations

R (Combined Video Test and FIFA Test 1) = 0.498
R (Combined Video Test and SDS Test 1) = 0.480

Moderately negative correlations

R (Combined Video Test and FIFA Test 2) = –0.444
R (Combined Video Test and SDS Test 2) = –0.430
R (Time Perception Test and FIFA Test 2) = –0.434
R (Time Perception Test and SDS Test 2) = –0.428
R (SMP Test and FIFA Test 1) = –0.432
R (SAM Test and FIFA Test 1) = –0.428
R (SMP Test and SDS Test 1) = –0.440
R (SAM Test and SDS Test 1) = –0.439

Figure 9 graphically visualises the correlation dependence detailed in the table above (Table 14).
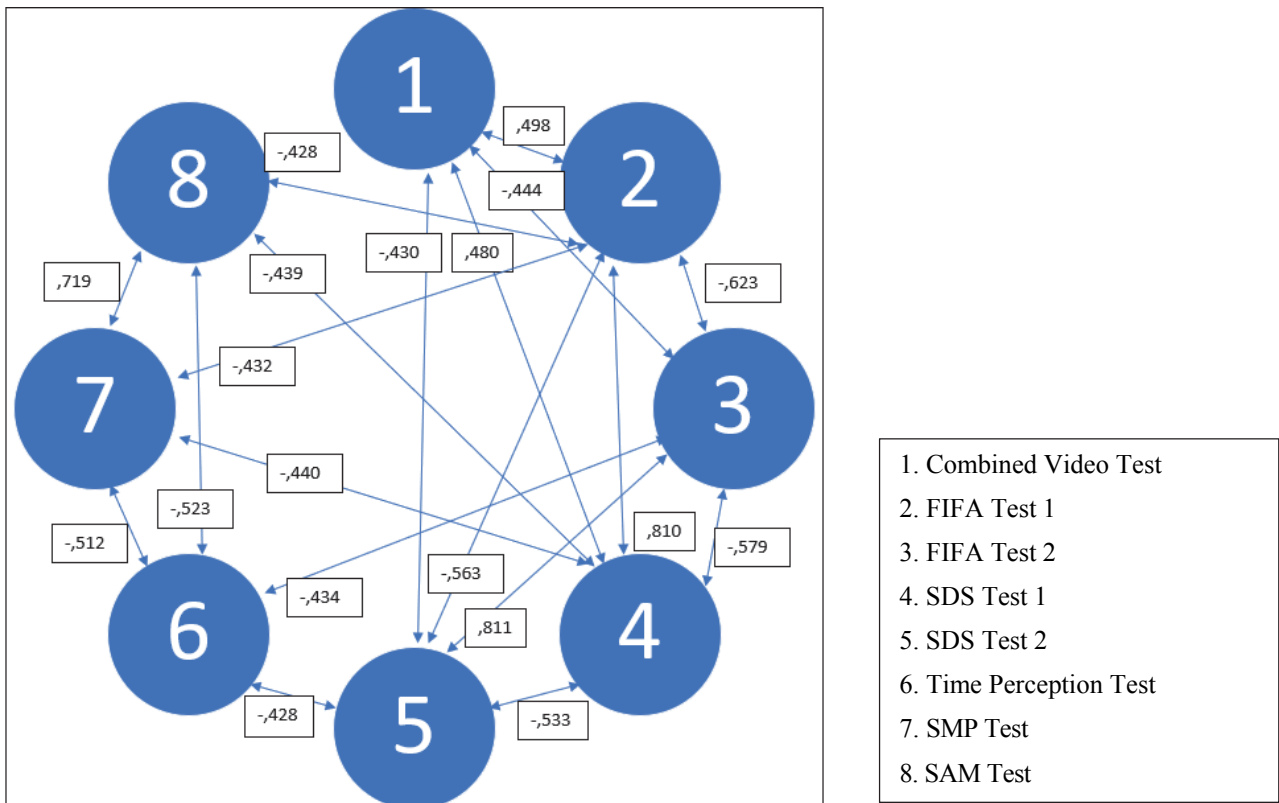
Figure 9. Correlation dependences for R from EG

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A clear statistically significant relationship can be established between the combined video test and the remaining physical tests from the displayed results (Table 14 and Fig. 9): FIFA 1 (0.498), FIFA 2 (–0.444), SDS Test 1 (0.480) and SDS Test 2 (–0.430). In some of them, the relationship is positive due to the same direction of shift in values, for example, the reduction of errors is related to a decrease in sprint seconds, in others it is negative due to inverse dependencies, for example, an increase in laps achieved. There is a clear correlation between the physical tests, with a strong positive correlation in the sprint tests (FIFA Test 1 and SDS Test 1 – 0.810), as well as in normative tests (FIFA Test 2 and SDS Test 2 0.811), but it is negative between them (FIFA Test 1 and FIFA Test 2 – 0.623), (FIFA Test 1 and SDS Test 2 –0.563), (SDS Test 1 and FIFA Test 2 –0.579), (SDS Test 1 and SDS Test 2 –0.533).

The following relationship exists between the physical tests and the rest of the psychophysical tests: between the normative tests and the time perception test (FIFA Test 2 and Time Perception Test -.434), (SDS Test 2 and Time Perception Test– .428). There is a correlation between sprint tests and SMP, SAM Tests: (FIFA Test 1 – SMP –0.432), (FIFA Test 1 – SAM –0.428), (SDS Test 1 – SMP –0.440), (SDS Test 1 – SAM –0.439).

Between the psychophysical tests there is a dependency between the three tests: (Time Perception Test and SMP Test –0.512), (Time Perception Test and SAM Test –0.523), (SMP Test and SAM Test 0.719).

Table 15 shows the correlations between the results of the experimental group of assistant referees.

In the presented matrix (Table 15) the following statistically significant relationships were established (correlation dependence with a significance level of less than 0.05):

Strongly positive correlation

R (FIFA Test 1 and SDS Test 1) = 0.801
R (FIFA Test 2 and SDS Test 2) = 0.820
R (SMP Test and CAH Test) = 0.699

Significant negative correlations

R (FIFA Test 1 and FIFA Test 2) = –0.650
R (FIFA Test 1 and SDS Test 2) = –0.577
R (SDS Test 1 and FIFA Test 2) = –0.600
R (SDS Test 1 and SDS Test 2) = –0.544
R (Time Perception Test and SMP Test) = –0.502
R (Time Perception Test and SAM Test) = –0.506

Moderately positive correlations

R (Combined Video Test and FIFA Test 1) = 0.496
R (Combined Video Test and SDS Test 1) = 0.476

Moderately negative correlations

R (Combined Video Test and FIFA Test 2) = –0.431
R (Combined Video Test and SDS Test 2) = –0.445
R (Time Perception Test and FIFA Test 2) = –0.433
R (Time Perception Test and SDS Test 2) = –0.430

R (SMP Test and FIFA Test 1) = –0.431
R (SAM Test and FIFA Test 1) = –0.429
R (SMP Test and SDS Test 1) = –0.412
R (SAM Test and SDS Test 1) = –0.415

Figure 10 graphically visualises the correlation dependence detailed in Table 15.

Table 15. *Correlation matrix for EG of assistant referees*

		Combined Video Test	FIFA Test 1	FIFA Test 2	SDS Test 1	SDS Test 2	Time Perception Test	SMP Test	SAM Test
Combined Video Test	Pearson Correlation	1	,496**	–,431*	,476**	–,445*	,277	–,035	–,075
	Sig. (2-tailed)		,001	,040	,006	,030	,251	,886	,759
FIFA Test 1	Pearson Correlation	,496**	1	–,650**	,801**	–,577**	,300	–,431*	–,429*
	Sig. (2-tailed)	,001		,000	,000	,000	,212	,040	,041
FIFA Test 2	Pearson Correlation	–,431*	–,650**	1	–,600**	,820**	–,433*	,154	,213
	Sig. (2-tailed)	,040	,000		,000	,000	,039	,299	,381
SDS Test 1	Pearson Correlation	,476**	,801**	–,600**	1	–,544**	,401	–,412*	–,415*
	Sig. (2-tailed)	,006	,000	,000		,000	,086	,049	,049
SDS Test 2	Pearson Correlation	–,445*	–,577**	,820**	–,544**	1	–,430*	,299	,359
	Sig. (2-tailed)	,030	,000	,000	,000		,040	,165	,132
Time Percetion Test	Pearson Correlation	,277	,300	–,433*	,401	–,430*	1	–,502**	–,506**
	Sig. (2-tailed)	,251	,212	,039	,086	,040		,000	,000
SMP Test	Pearson Correlation	–,035	–,431*	,154	–,412*	,299	–,502**	1	,699**
	Sig. (2-tailed)	,886	,040	,299	,049	,165	,000		,000
SAM Test	Pearson Correlation	–,075	–,429*	,213	–,437*	,359	–,506**	,699**	1
	Sig. (2-tailed)	,759	,041	,381	,033	,132	,000	,000	
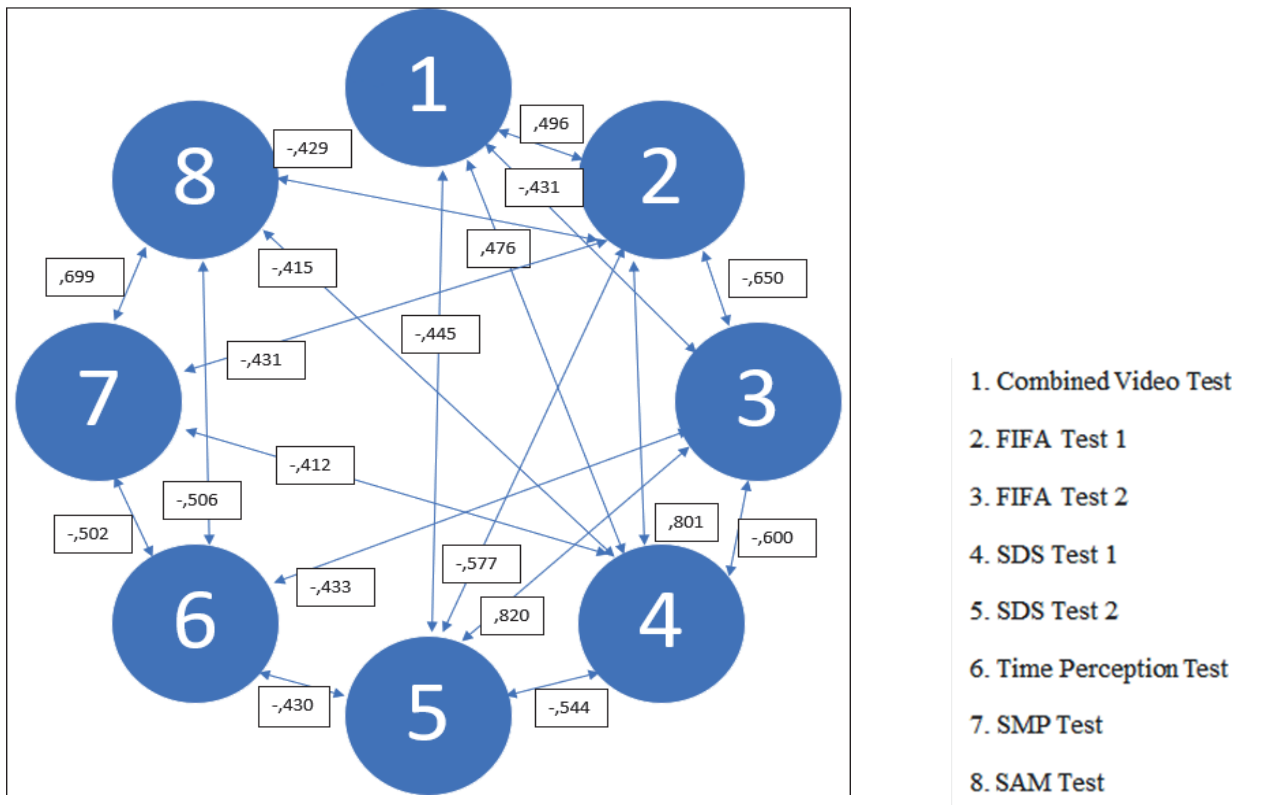
Figure 10. Correlation dependences for AC from EG

From the presented results for AR EG (Table 15 and Fig. 10) we could claim that there is a clear statistically significant relationship between the combined video test and the rest of the physical tests: FIFA 1 (0.469), FIFA 2 (–0.432), SDS Test1 (0.476) and SDS Test 2 (–0.445). For some of them, the relationship is positive due to the same direction of change in values, and for others it is negative, as the reason was already explained above. There is a clear correlation between the physical tests, with a strong positive correlation in the sprint tests (FIFA Test 1 and SDS Test 1 – 0.801), as well as in norm tests (FIFA Test 2 and SDS Test 2 0.820), but is also negative between them (FIFA Test 1 and FIFA Test 2 –0.650), (FIFA Test 1 and SDS Test 2 – 0.577), (SDS Test 1 and FIFA Test 2 –0.600), (SDS Test 1 and SDS Test 2 –0.544). The following relationship exists between the physical tests and the rest of the psychophysical tests: between the normative tests and the time perception test (FIFA Test 2 and Time Perception Test -.433), (SDS Test 2 and Time Perception Test–0.430). There is a correlation between sprint tests and SMP, SAM Tests (FIFATest 1– SMP –0.431), (FIFA Test 1 – SAM –0.429), (SDS Test 1 – SMP –0.412), (SDS Test 1 – SAM –0.415). Between the psychophysical tests there is a dependency between the three tests: (Time Perception Test and SMP Test –0.502), (Time Perception Test and SMP Test –0.506), (SMP Test and SAM Test 0.699).

The conclusions that can be drawn from the obtained correlation, statistically significant coefficients are the following:

First, there is quite understandably a high correlation between the sprint tests and the FIFA Test 1 and SDS Test 1, as both tests measure speed of motor reaction, covering a certain distance in the shortest possible time, performing frequently repeated cyclic movements. A high correlation is also present in the tests for the special endurance of football referees – FIFA Test 2 and SDS Test 2. Due to the use of a similar evaluation methodology, a high correlation is also present in the SMP and SAM tests, as they measure the mental readiness of athletes in a similar way.

Second, there are significant dependencies between tests within the specific 'type' of activity measurement – between the physical, mental and psychophysical tests.

Third, there are moderate correlations between the tests of the different types of dimensions i.e. there is a relationship between the change in physical, mental and psychophysical readiness scores.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The study and analysis we have performed give us grounds to draw the following conclusions for optimisation of the psychophysical training of football referees:

1. When developing the theoretical analysis and summarising the literature sources, it was found that there is no unified theory for optimising the psychophysical training of football referees.

2. When analysing the results of the survey, more significant differences were observed in the subjects of the experimental groups. Their cognitive, emotional and volitional readiness change, based on the psychophysical model applied by us.

3. It was established that the mental training of the examined football referees from the experimental group marked a more significant growth compared to those from the control group. This applies mostly to the following indicators – concentration of attention, stability of attention, cognitive-volitional activity and others.

4. When examining and analysing the physical training, the most significant changes were observed in the two experimental groups. Their motor-coordination capabilities are significantly improved, as a result of which their physical capacity is improved. In the control groups, no significant changes were observed according to the indicators we studied.

5. When investigating the level of mental and physical training, strong correlations were found between the mental and physical indicators we studied.

6. The models for mental, physical and psychophysical training implemented by us had a positive impact on optimising the structure of psychophysical training among football referees from the experimental groups.

RECOMMENDATIONS

Based on the research conducted and the conclusions drawn, the following basic recommendations for theory and practice can be made:

1. To develop and implement models for psychophysical training according to gender and age for football referees, according to their professional qualification – referees in the rankings of amateur, professional football, as well as international referees.

2. The preparation models should be planned in detail and adapted to the different periods of the sports and competition year.

3. To prepare and adapt models for mental training at different levels of the football referee hierarchy – ideomotor training, psychophysical relaxation, concentration of attention, regulation of muscle tension and regulation of breathing.

4. To develop and validate tests for the assessment of mental training.

5. The dependencies established in the present work could be included in future strategies to improve the psychophysical training of football referees.

CONTRIBUTIONS

Based on the theoretical-practical research and the conclusions presented in the current dissertation work, the following more important contributions can be highlighted:

1. An ongoing and significant problem related to the process of development, improvement and specialisation in the training of football referees and assistant referees was investigated.

2. Rational training models for physical, mental and psychophysical training in the annual cycle in terms of content and structure were created and experimented.

3. Our applied models and methodology for psychophysical training of football referees are a foundation for new research and development of more training models.

4. An appropriate test battery with high informativeness and complex assessment was used in the three spheres for referees training. Objective results as well as statistical analysis have proven the effectiveness of the applied models.

5. Enhanced knowledge of psychophysical training of football referees is of particular value for an innovative approach to the preparation and training of referees, adequate for the modern football.

SCIENTIFIC PUBLICATIONS ON THE DISSERTATION TOPIC

1. **Kabakov, G.** (2020) „Модерни тенденции в изграждането на футболния съдия" [*Modern Trends in the Formation of the Football Referee*]. Contemporary Problems of Physical Education and Sports №7, pp. 57-64. Paisii Hilendarski University Publishing House, Plovdiv. ISSN 2367-8216

2. **Kabakov, G.** (2020) „Психическа подготовка на футболния съдия". [*Mental Preparation of the Football Referee*]. Contemporary Problems of Physical Education and Sports № 7, pp. 65-72. Paisii Hilendarski University Publishing House, Plovdiv. ISSN 2367-8216

3. **Kabakov, G.** (2020). „Физическа подготовка и тестове при футболни съдии". [*Physical Preparation and Testing of the Football Referees*]. Contemporary Problems of Physical Education and Sports №7, pp. 73-79. Paisii Hilendarski University Publishing House, Plovdiv. ISSN 2367-8216

4. **Kabakov, G.**, Margaritov, M. (2021). „Изисквания към дейността на Видео асистент съдията (ВАР/VAR)". [*Requirements to the Activity of VAR*]. Contemporary Problems of Physical Education and Sports № 8, pp. 14 – 22, Paisii Hilendarski University Publishing House, Plovdiv. ISBN 2367-8216

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