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Integral assessment of football team tactics

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Abstract

The purpose of the research was to develop a methodology of control and determine the indicators of integral assessment of competitive performance by various tactical game models of highly qualified football club teams.

Material and methods. In the period of 2018-2023, 110 games of the leading European club teams and 46 games of the football team "Dynamo" (Kyiv) were analyzed with regard to the tactical models of the games "A", "B", "C", "D". Specific coefficients were determined in the phase of passing and possession of the ball, which constituted an integral assessment of competitive performance. The assessment of attacks and goalscoring situations, the realization of pressing, the effectiveness of players' interaction in the phase of picking up the ball, as well as the criteria of creativity and game combinations were taken into account.

Results. An integral assessment methodology of the competitive performance of football club teams has been developed, consisting of 10 specific coefficients: high pressing coefficient; high pressing efficiency factor, low pressing efficiency factor, coefficient of ball picking efficiency, ball interceptions efficiency coefficient, penetration attack efficiency coefficient, successful penetration attack efficiency coefficient, goalscoring situation coefficient, the creativity and the combinability coefficients. The first five coefficients characterize the team's play in the phase of picking up the ball, the other five – in the phase of ball control on the field. The determined indicators of the integral assessment of the competitive performance of the leading European club teams according to different tactical models of the game are as follows: model "A" - 5.95±0.32 points; model "B" - 5.35±0.29 points; model "C" - 5.57±0.47 points; model "D" - 5.14±0.33 points.

Conclusions. The integral assessment of competitive performance allows to provide effective control of interaction of players of a club football team in the phases of picking up and possession of the ball.

Keywords: highly qualified football club teams, control, integral assessment of competitive performance, models of game tactics.

Анотація

Інтегральна оцінка тактики гри футбольної команди. Костюкевич Віктор, Щепотіна Наталя, Адамчук Вадим, Абаласей Беатріче, Вознюк Тетяна, Богуславська Вікторія, Драчук Андрій, Межвинський Артем

Мета дослідження - розробити методику контролю та визначити показники інтегральної оцінки змагальної діяльності за різними тактичними моделями гри клубних футбольних команд високої кваліфікації.

Матеріал та методи. Упродовж 2018-2023 рр. було проаналізовано110 ігор провідних клубних команд Європи та 46 ігор футбольної команди «Динамо» (Київ) з урахуванням тактичних моделей гри «А», «В», «С», «Д». Визначалися специфічні коефіцієнти у фазі відбору та володіння м'ячем, що складали інтегральну оцінку змагальної діяльності. Враховували оцінку проникаючих атак та гольових ситуацій, реалізацію пресингу, ефективність взаємодії гравців у фазі відбору м'яча, а також критерії креативності та комбінаційності гри.

Результати. Розроблена методика визначення інтегральної оцінки змагальної діяльності клубних футбольних команд, що складається з 10-ти специфічних коефіцієнтів: коефіцієнту прояву високого пресингу; коефіцієнту ефективності високого пресингу; коефіцієнт ефективності низького пресингу; коефіцієнт відборів; коефіцієнт перехоплень; коефіцієнт ефективності проникаючих атак; коефіцієнт ефективності успішних проникаючих атак; коефіцієнт гольових ситуацій; коефіцієнт креативності; коефіцієнт комбінаційності. Перших п'ять коефіцієнтів характеризують гру команди у фазі відбору м'яча, інші п'ять - у фазі володіння м'ячем. Визначено показники інтегральної оцінки змагальної діяльності провідних клубних команд Європи за різними тактичними моделями гри: модель «А»- 5,95±0,32 бала; модель «В» - 5,35±0,29 бала; модель «С» - 5,57±0,47 бала; модель «Д» - 5,14±0,33 бала.

Висновки. Інтегральна оцінка змагальної діяльності дозволяє оперативно здійснити ефективний контроль взаємодії гравців клубної футбольної команди у фазах відбору та володіння м'ячем.

Ключові слова: клубні футбольні команди високої кваліфікації, контроль, інтегральна оцінка змагальної діяльності, моделі тактики гри.

Introduction

Management of competitive performance of the athletes should be based on effective control [1, 2, 3]. Control in the process of competitive performance is especially important for team game sports, including football [4, 5]. It allows to carry out effective management both during the tournament and directly in the process of competitive performance [6, 7, 8].

The problem of control in team game sports has been the subject of scientific research by many scientists [9, 10, 11]. In particular, in basketball, studies in this direction was conducted by N. Bermylov [12]. The author defined the assessment of indicators of competitive performance of highly skilled basketball players in various tournaments of the game season. M. Pernigoni et al [13] studied high-intensity external load taking into account different activity patterns, playing positions, playing actions with and without ball during official games in this kind of sport.

Control in the process of competitive performance of skilled and highly skilled volleyball players was studied by T. A. Yousif et al [14] and I. Oliinyk et al [15]. As for the football, the development of methods of control over the competitive performance of athletes was carried out by V. Kostiukevych et al [16], V. A. Principe et al [17], A. Pertsukhov and V. Shalenko [18].

However, the analysis of the existing studies in the field suggests that the problem of control of the competitive performance of football club teams is still relevant and requires further scientific research.

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Hypothesis of the research assumes that the control of the integral assessment of the competitive performance of highly qualified football club teams on the basis of different tactical models of the game will allow to determine the tendencies of the modifying the training process of football players and will create preconditions for the effective management of football players' training.

The purpose of the study was to develop a methodology of control and determine the indicators of integral assessment of competitive performance by various tactical game models of highly qualified football club teams.

Materials and methods

Participants. The study involved pedagogical monitoring and video filming of the competitive performance of the leading European football club teams (Barcelona Real Madrid, Atletico Madrid, Valencia, Inter Milan, Juventus, Ajax, Bayern Munich, Borussia Dortmund, Arsenal, Chelsea, Tottenham, Liverpool, Manchester City, Manchester United, etc.). The analysis covered matches of the Champions League, UEFA Europa League, Spanish, Italian, German, English, and Ukrainian championships. In total, 110 games of the leading European club teams and 46 games of the Dynamo Kyiv football team were analysed over the period from 2018 to 2023. It is worth noting that the competitive performance of Dynamo Kyiv was analysed only in matches of European club competitions and matches of the Ukrainian championship with Shakhtar Donetsk.

The study was approved by the Ethics Committee of the Mykhailo Kotsiubynskyi Vinnytsia State Pedagogical University and all procedures were in line with the Helsinki Declaration.

Research organization. The research process of the study included:

– identification of different tactical models of football club teams;

– development of a methodology for determining integral assessment of the competitive performance (IACP) of a football club team;

– analysis of the indicators of the IACP of football club teams.

Tactical models of the game. The tactics of the game of a football team is based on the following elements [20]: the system of the game; the method of the game; the ratio of positional attacks; the ratio of fast attacks; the ratio of holding, progressive and pressing passes; the ratio of high, middle and low pressing; the ratio of technical and tactical actions performed in different modes of coordination complexity (Table 1).

Some specific terms in Table 1 are important to clarify. A tactic in football is defined as the actions of team players in the phase of ball possession that are directly aimed at passing the ball in order to "score a goal" into the opponent's net. There are positional and fast attacks (Fig. 1).

Positional attacks are divided into attacks of the 1st, 2nd and 3rd tempo.

Positional attack of the 1st tempo is characterised as being carried out mainly with the use of progressive and pressing passes of the ball which leads to escalation of the game situation. Usually, such attacks consist of 4-6 tactical moves

Table 1. The main elements of tactical game models of highly qualified football teams [20]

Elements	tactical game models			
	model «A»	model «B»	model «C»	model «D»
Positional attacks, %:				
- of the first pace	34,3	29,2	20,2	25,1
- of the second pace	37,5	34,1	35,4	56,3
- of the third pace	28,2	36,7	44,4	18,6
Fast attacks, %:				
- short	35,2	45,1	44,1	38,2
- medium	35,4	24,1	26,8	17,8
- long	23,4	30,8	22,1	44,0
Pressing,%:				
- high	58,4	22,6	36,4	12,1
- medium	30,2	63,1	55,0	47,1
- low	11,4	14,3	8,6	40,8
Passes,%:				
- holding	22,6	26,5	32,1	22,5
- progressive	60,8	63,9	59,1	68,5
- pressing	16,6	9,6	8,1	9,0
Modes of coordination complexity (MCC),%:				
- first MCC	15,4	13,2	18,6	10,5
- second MCC	52,1	58,4	59,6	58,1
- third MCC	32,5	28,4	21,8	31,4
Technical and tactical activity structure,%:				
- passes	43,2	44,1	47,5	41,5
- pauses	22,7	26,6	26,9	24,6
- posession	6,0	4,9	5,7	4,5
- dribbling	6,8	6,3	5,9	7,1
- picking up	6,5	6,3	3,8	8,1
- interception	12,2	10,0	8,1	12,6
- goal kicks	2,6	1,8	2,1	8,6

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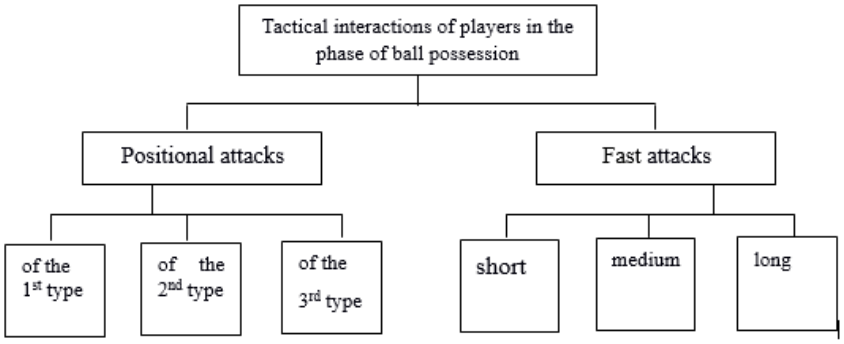

Figure 1. Classification of tactical interactions of football team players in the phase of ball possession [20]

that allows to quickly pass the ball to the opponent's net.

The positional attack of the 2nd tempo is defined by the fact that it has two phases. The first phase is a positional attack of the 1st tempo, and the second phase involves more players to proceed. Such attacks consist of 7-10 tactical moves.

Positional attack of the 3rd tempo, as a rule, consists of many tactical moves (10-20 or more) and is characterised by the gradual transfer of the ball to the opponent's net with the involvement of players from almost all lines - attack, midfield and defence.

The main goal of a fast attack is to move the ball into the opponent's net in the shortest possible time with optimal use of the playing field. In such attacks, longitudinal and diagonal passes with a quick dribble ("spurt with the ball") are mainly used in a logical combination.

Depending on the zone of the playing field, there are short (the attack starts in the 3rd zone), medium (the attack starts in the 2nd zone) and long (the attack starts in the 1st zone) fast attacks.

An important component of a football team's competitive performance is *pressing*. In football, pressing is the tactic of collective ball pick up, preventing the opposing team from starting an attack.

Depending on the areas of the football field it is necessary to distinguish between:

- high (long-range) pressing - when the team actively picks up the ball in the first zone of the opponent;
- medium pressing - when the team loses the ball, the players move to the second zone and start to pick up the opponent's ball in this zone;
- low (deep) pressing - active ball picking is carried out in their own half of the field.

The team's tactics in the phase of ball possession is mainly determined by the ratio of ball passes. Depending on the direction of the tactical moves — keeping the ball, developing the attack and escalating the team's attacking actions - a distinction should be made between ball passes, such as holding, developing and pressing. Another important component that characterises the tactical model of a team's game is the coordination complexity mode (CCM) of technical and tactical actions (TTA).

All TTAs carried out while standing in one's position or at a convenient speed are classified as CCM 1. TTDs performed while moving with limited space and time are classified as 2nd CCM. In the 3rd CCM type TTDs are performed under active opponent's interference.

The ratio of passes, stops, dribblings, pickings, interceptions and goal kicks characterises the structure of a football team's game.

Thus, each tactical model of a football team's game has its own specific characteristics.

Model "A" is an aggressive attacking tactical model with the predominant use of positional attacks of the first (34.3%) and second (37.5%) tempos, as well as high (58.4%) and medium (30.2%) pressing. This model is characterised by the predominant use of progressive (60.8%) and pressing (16.6%) passes of the ball. Model "A" is considered to be rather complicated in terms of coordination of TTD. In particular, 52.1% of TTDs are performed in the 2nd CCM and 32.5% of TTDs in the 3rd CCM.

Model "B" is the most balanced tactical model in terms of offensive and defensive actions. This model is characterised primarily by the use of medium (63.1%) pressing, progressive (63.9%) passes as well as the performance of TTD in the 2nd (58.4%) and 3rd (28.4%) CCM.

Model "C" most fully reflects playmaking tactics, i.e., the prevailing control of the ball through positional attacks of the second (35.4%) and third (44.4%) tempos. At the same time, this model is characterised by a fairly significant use of high (36.4%) pressing.

Model "D" is a counterattacking tactical model of a football team. In the phase of ball possession within this tactical model, teams mainly use positional attacks of the first (25.1%) and second (56.3%) tempos, as well as short (38.2%) and long (44.0%) fast attacks. In the phase of ball picking - medium (47.1%) and low (40.8%) pressing is mainly used (see Table 1).

Integral assessment of the competitive performance of a highly qualified football team

The integral assessment of the competitive performance of a football team is based on:

- on the assessment of penetrating attacks;
- assessment of goalscoring situations;
- realisation of pressing;
- efficiency of players' interaction in the phase of picking up the ball;
- criteria of creativity and combination of the game.

A penetrating attack should be understood as a game situation characterised by the position of the players of the opposing team as well as the location of the ball, which allows for an escalating tactical move to "score a goal" into the opponent's net.

Typically, every attack in football consists of four stages. The first stage is the possession of the ball and its steady control, the second is the development of the attack, the third is the escalation of the game situation, and the fourth is the final part of the team's attack.

The penetrating attack is a reflection of the third stage which can mainly take place in the following ways: from the right wing; from the left wing; from the right half-wing; from the left half-wing; an escalating tactical move from the third zone of

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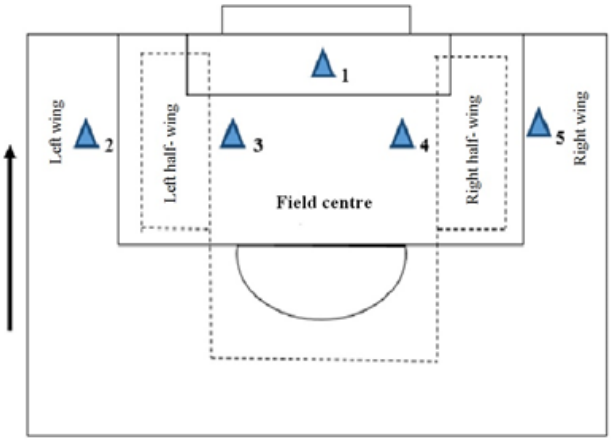

Figure 2. Variants of the third – escalating stage in football

Table 2. Protocol of football teams' competitive performance

The date _____ "A" team _____ "B" team

TTA in the phase of ball picking				zones	1	2	3	∑	1	2	3	∑
picking ups												
interceptions												
positional attacks				tempo	1 tempo	2 tempo	3 tempo		1 tempo	2 tempo	3 tempo	
Fast attacks					short	medium	long		short	medium	long	
Penetrating attacks	right wing											
	left wing											
	right half-wing											
	left half-wing											
	centre	behind one's back										
		combinations										
		individual										
Successful penetrating attacks	right wing		C									
			FK									
			→									
	left wing		C									
			FK									
			→									
	right half-wing		C									
			FK									
			→									
	left half-wing		C									
			FK									
			→									
	centre	behind one's back	C									
			FK									
			→									
		combinations	C									
			FK									
			→									
		Individual	C									
			FK									
			→									
Standard position	A corner	near goalpost										
		far goalpost										
		playing the ball										
Free kicks-	direct attack											
	playing the ball											

Notes: C – a corner; FK – a free kick; → – goal kicks

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the field (Fig. 2).

During the game a corresponding protocol is filled in for control of the competitive performance of the football team during the match (Table 2).

The rating scale for penetration attacks is presented in Table 3.

A *goalscoring situation* is a short-term fragment of the game characterised by favourable opportunities for the attacking team to score a goal. Such opportunities are determined by:

a) the position of the ball regarding the opposing team's net;

b) the position of the attacking team's players;

c) the location of the players of the team that is in the phase of ball picking.

It should be noted that the first and second levels of coordination complexity of the goalkeeper's game include TTAs that characterise the player's technique. The third level of coordination complexity is based on the goalkeeper's specific skills and abilities. The fourth level of coordination complexity includes all saves, including the goalkeeper's play in a 1-on-1 game with a player of the opposing team. The highest fifth level of coordination complexity is characterised by goalkeeper saves combined with a sense of his intuition (anticipation).

On the basis of the above mentioned, an integral assessment of competitive performance (IACP) of a highly qualified football club team has been developed. The IACP consists of 10 specific coefficients (5 coefficients reflect the team's play in the phase of ball picking, 5 -- in the phase of ball possession).

The numerical value of each coefficient must be less than 1.

Specific coefficients in the ball picking phase.

The integral assessment of the competitive performance of a football team (IACP) is determined by the following formula:

$$IACP = HPC + HPEF + LPEF + CBPE + BIEC + PAEC + SPAEC + GSS + CrC + CC \quad (1)$$

Coefficients in the ball pickup phase

1. High pressing coefficient (HPC)

$$HPC = \frac{\sum TTA(t+i)3^{rd}\,zone}{\sum TTA(t+i)1^{st} + 2^{nd}\,zones} \quad (2)$$

where $\sum TTA(t+i)3^{rd}\,zone$ is the number of technical and tactical actions (tackles and interceptions) performed in certain areas of the field – 1st, 2nd, 3rd areas of the field.

2. High pressing efficiency factor (HPEF)

$$HPEF = \frac{\sum TTA(t+i):s\ in\ 3^{rd}\,zone}{\sum TTA(t+i):t\ in\ 3^{rd}\,zone} \quad (3)$$

where *s* stands for *successful TTAs*; and *t* – for *total TTAs*.

3. Low pressing efficiency factor (LPEF)

$$HPEF = \frac{\sum TTA(t+i):s\ in\ 1^{st}\,zone}{\sum TTA(t+i):t\ in\ 1^{st}\,zone} \quad (4)$$

where $\sum TTA(t+i):s\ in\ 1^{st}\,zone$ is the number of successful tackles and interceptions of the ball;

$\sum TTA(t+i):t\ in\ 1^{st}\,zone$ is the total number of tackles and interceptions of the ball.

4. Coefficient of ball picking efficiency (CBPE)

$$CBPE = \frac{\sum TTA(t)s}{\sum TTA(t)t} \quad (5)$$

where $\sum TTA(t)s$ is the number of successful tackles during the game;

$\sum TTA(t)t$ is the total number of tackles during the game.

5. Ball interceptions efficiency coefficient during the game (BIEC)

$$BIEC = \frac{\sum TTA(i)s}{\sum TTA(i)t} \quad (6)$$

where $\sum TTA(i)s$ is the number of successful interceptions made during the game;

$\sum TTA(i)t$ is the total number of interceptions of the ball during the game.

Coefficients in the ball possession phase

1. Penetration attack effectiveness coefficient (PAEC)

$$PAEC = \frac{\sum PA(point\ s)}{\sum PA(point\ s) + 10} \quad (7)$$

where $\sum PA(point\ s)$ is the total amount of points when performing penetrating attacks (PA);

10-number value.

2. Successful penetration attack efficiency coefficient (SPAEC)

$$SPAEC = \frac{\sum SPA}{\sum (PA + SPA)} \quad (8)$$

where SPA means successful penetration attacks.

Table 3. Evaluation scale for managing and performing a football team's attacks

Score, points	The nature of penetration attacks
1	Penetrating attack - loss of the ball
2	Successful penetrating attack: free kick; corner kick, inaccurate goal kick
3	Successful penetrating attack: accurate goal kick - the goalkeeper plays in the 1st, 2nd and 3rd levels of coordination difficulty
4*	Penetrating attack: the loss of the ball by the team in a game position in which there was an opportunity to «score a goal»
5*	Successful penetration attack: an inaccurate shot on the net from outside the penalty area in a game position where, if the ball had been hit on target, it would have crossed the goal line
6*	Successful penetration attack: an inaccurate shot on the net within the penalty area in a game position where, if the ball had been hit accurately, it would have crossed the goal line
7*	A successful penetrating attack: an accurate shot on the net from outside the penalty area, but the goalkeeper makes a save of the 4th level of coordination complexity
8*	A successful penetrating attack: an accurate shot on the net within the penalty area, but the goalkeeper makes a save of the 4th level of coordination complexity
9*	Successful penetrating attack: an accurate shot on the net within the penalty area, but the goalkeeper makes a save of the 5th level of coordination complexity; an 11-metre free kick is awarded
10*	Successful penetrating attack: scoring a goal

Notes: 4-10 - goalscoring situations*

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3. Goalscoring situation coefficient (GSS)

$$GSS = \frac{\sum GSO,\ point\ s}{\sum (PA + SPA),\ point\ s} \quad (9)$$

where $\sum GSO$, is the sum of points for creating goalscoring opportunities during the game;

$\sum (PA + SPA)$ is the sum of points for penetrating attacks and successful penetrating attacks during the game.

4. Creativity coefficient (CrC)

$$CrC = \frac{\sum (PA + SPA)}{\sum (PosA + FA)} \quad (10)$$

where $\sum (PA + SPA)$ is the number of penetrating attacks (PA) and successful penetrating attacks (SPA) conducted by the team during the game;

$\sum (PosA + FA)$ is the number of positional attacks (PosA) and fast attacks (FA) carried out by the team during the game.

5. Combinability coefficient (CC)

$$CC = \frac{\sum BP}{600} \quad (11)$$

where $\sum BP$ is the number of ball passes during the first half of the game;

600 is a numerical value.

On the basis of the developed methodological approach the indicators of IACP for highly qualified club teams were determined. The results are as follows.

Statistical analysis. Statistical analysis of the research results was carried out on the basis of descriptive mathematical statistics. The indicators characterising the sample were determined as such: arithmetic mean ($\bar{x}$), standard deviation (S), and coefficient of variation (V). The reliability of the difference in indicators was determined using the parametric Student's t-test for independent samples. Preliminarily, the compliance with the normal distribution of data was checked using the Shapiro-Wilkie W-test. The mathematical processing of the results of the study was carried out using the Data Analysis package of the MS Office Excel computer program, as well as the Statistica program [20, 21].

Results

The indicators of the integrated assessment of the competitive performance of high-quality football club teams are presented in Table 4. As can be clearly observed in Table 4, the highest values of the IACP are observed in football club teams that build their game on the basis of the tactical model "A".

Each of the specific coefficients of the football team's IACP reflects the level of manifestation of the relevant components of the game. HPC and HPEF characterise the quantitative and qualitative indicators of the use of high pressing. The LPEF allows one to analyse the team's game in the 1st zone of the field, which indicates the effectiveness of the team's counteraction to the opponent's attacks.

CBPE and BIEC characterise the general team's interactions in the phase of ball picking. The effective execution of tackles and interceptions of the ball allows the team to carry out more attacking actions, which, to a certain extent, determines the sports result.

IACP specific coefficients characterise the game of a football team in the phase of ball possession. The PAEC reflects the quantitative indicators of the team's attacking actions, as each penetrating attack is evaluated in accordance with game situations (see Table 3).

The SPAEC reflects the ratio of successful penetrating attacks, which, in general, contributes to the creation of goalscoring situations (indicated by the GSS). To a certain extent, the CGS is an indicator that characterises the overall level of a football team.

The CrC allows to establish the ratio of penetrating at-

Table 4. Indicators of the integral assessment of the competitive performance of highly qualified football club teams

Coeficients	Tactical models												The average data		
	A			B			C			D					
	n	$\bar{x}$	S	n	$\bar{x}$	S	n	$\bar{x}$	S	n	$\bar{x}$	S	n	$\bar{x}$	S
HPC HPEF	29	0.34	0.08	28	0.22	0.07	34	0.27	0.07	19	0.17	0.05	110	0.26	0.06
	-	-	-	13	0.19	0.04	17	0.18	0.06	16	0.15	0.04	46	0.17	0.05
HPEF	29	0.65	0.09	28	0.55	0.06	34	0.63	0.09	19	0.53	0.08	110	0.59	0.08
	-	-	-	13	0.54	0.07	17	0.53	0.08	16	0.43	0.07	46	0.53	0.07
LPEF	29	0.72	0.08	28	0.72	0.06	34	0.73	0.08	19	0.70	0.02	110	0.72	0.06
	-	-	-	13	0.59	0.07	17	0.68	0.09	16	0.50	0.06	46	0.63	0.07
CBPE	29	0.49	0.12	28	0.42	0.05	34	0.45	0.08	19	0.43	0.10	110	0.45	0.09
	-	-	-	13	0.40	0.06	17	0.40	0.08	16	0.21	0.05	46	0.40	0.06
BIEC	29	0.79	0.06	28	0.77	0.05	34	0.78	0.06	19	0.75	0.07	110	0.77	0.06
	-	-	-	13	0.71	0.06	17	0.76	0.07	16	0.64	0.06	46	0.74	0.07
PAEC	29	0.88	0.03	28	0.82	0.03	34	0.83	0.03	19	0.79	0.07	110	0.83	0.04
	-	-	-	13	0.72	0.12	17	0.78	0.05	16	0.67	0.05	46	0.78	0.07
GSS	29	0.63	0.12	28	0.56	0.11	34	0.58	0.12	19	0.58	0.12	1140	0.59	0.08
	-	-	-	13	0.49	0.09	17	0.47	0.10	16	0.33	0.12	46	0.19	0.10
CrC	29	0.49	0.08	28	0.39	0.05	34	0.44	0.07	19	0.31	0.03	110	0.41	0.06
	-	-	-	13	0.36	0.08	17	0.44	0.11	16	0.31	0.04	46	0.37	0.08
CC	29	0.50	0.02	28	0.46	0.07	34	0.54	0.07	19	0.42	0.07	110	0.48	0.06
	-	-	-	13	0.44	0.04	17	0.49	0.06	16	0.40	0.04	46	0.47	0.05
IACP	29	5.95	0.32	28	5.38	0.29	34	5.57	0.47	19	5.14	0.33	110	5.51	0.35
	-	-	-	13	4.93	0.30	17	5.33	0.37	16	4.71	0.33	46	5.08	0.33

Notes: 1st row is the indicators of the leading football teams in Europe; 2nd row illustrates the indicators of the football team Dynamo (Kyiv)

tacks to all interactions of team players in the phase of ball possession. A high value of this coefficient indicates the level of the team's creativeness in actions.

CC is primarily determined by the quantitative values of ball passes, which generally characterises the level of interactions between team players in the phase of ball possession.

The analysis of Table 4 suggests that the highest IACP is observed in teams that develop the game in accordance with model "A" (5.95 points) and model "C" (5.57 points).

The presented values of special coefficients (see Table 4) of the IACP of the leading football club teams in Europe can be considered as model values for the control of the competitive performance of football club teams.

Analysing the results of the general average values of specific coefficients of the integral assessment of competitive performance (Table 5), one can notice a statistically significant difference between the values of the leading club teams in Europe and the team "Dynamo" (Kyiv). In particular, the greatest difference is registered by the values of HPC - 34.6% ($p<0.01$), LPEF - 12.5% ($p<0.01$), GSS - 16.9% ($p<0.01$).

A ten-point scale of specific coefficients (Table 6) of the competitive performance of highly qualified club football teams was developed on the basis of the identified indicators (see Table 4). The scale was designed with regard to the rule of three sigmas according to the algorithm presented below.

The first step is to determine the average value of a particular coefficient ($\bar{x}$).

The second step is to determine the standard deviation (S).

The third step is to determine the range (the difference between $\bar{x}$ + 3S and $\bar{x}$ - 3S).

The fourth step is to determine the point interval (PI):

$$P = \frac{(\bar{x}+3S)-(\bar{x}-3S)}{9} \quad (12)$$

The fifth step is to design a ten-point scale: 1 point is the $\bar{x}$ - 3S value, 2 points is the $\bar{x}$ - 3S value plus the value of the point interval, etc.

A ten-point scale allows to develop graphical models of the integral assessment of the competitive performance of football club teams (Fig. 3).

Discussion

The control of competitive performance is an extremely relevant issue in modern football. Management decisions are based on it both during a competitive tournament and a specific match [8, 16].

A systematic analysis of the literature allowed us to develop the hypothesis of the study. The components of the hypothesis were as follows: development of a methodology for determining the integral assessment of the competitive performance of football club teams; identification of the features of different tactical models of the game; elaboration of a ten-point scale for assessing specific coefficients of competitive performance.

The analysis of the above allows us to claim that the

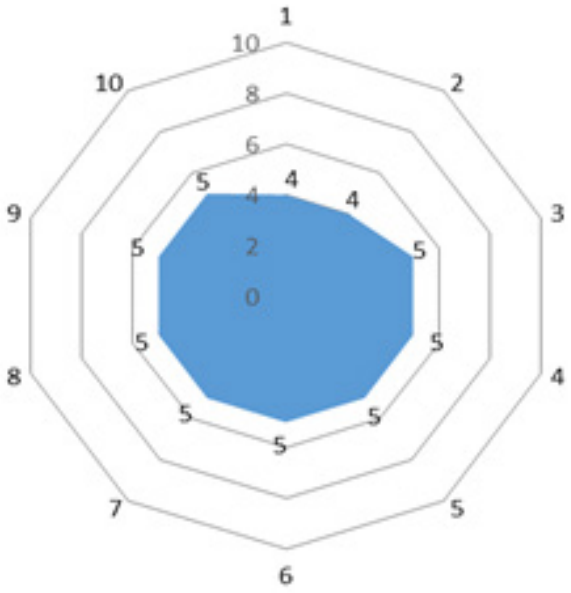
Table 5. Special coefficients of the integral assessment of the competitive performance of football club teams

Coefficients	Leading European football club teams, (n=110)		Dynamo (Kyiv) team (n=46)		$\Delta\bar{x}$ (%)	t	p
	$\bar{x}$	S	$\bar{x}$	S			
HPC	0,26	0,06	0,7	0,05	0,09 (34,6)	5,55	<0,05
HPEF	0,59	0,08	0,53	0,07	0,06 (10,2)	4,68	<0,01
LPEF	0,72	0,06	0,63	0,07	0,09 (12,5)	7,69	<0,01
CBPE	0,45	0,09	0,40	0,06	0,05 (11,1)	4,16	<0,01
BIEC	0,77	0,06	0,74	0,07	0,03 (3,9)	2,54	<0,05
PAEC	0,83	0,04	0,78	0,07	0,05 (6,0)	5,55	<0,05
SPAEC	0,50	0,09	0,47	0,09	0,03 (6,0)	1,91	>0,05
GSS	0,59	0,18	0,99	0,10	0,10 (16,9)	4,42	<0,01
CrC	0,41	0,06	0,37	0,08	0,04 (9,8)	4,30	<0,01
CC	0,48	0,06	0,47	0,05	0,01 (2,1)	1,11	>0,05
IACP	5,51	0,35	5,08	0,33	0,43(7,8)	6,89	<0,01

Table 6. A ten-point scale of specific indicators of the competitive performance of highly qualified football club teams

Specific indicators	Level of display of specific indicators of competitive performance, points									
	low		below medium		medium		above medium		high	
	1	2	3	4	5	6	7	8	9	10
HPC	0,10	0,15	0,21	0,26	0,31	0,37	0,42	0,47	0,52	0,58
HPEF	0,38	0,44	0,50	0,56	0,62	0,68	0,74	0,80	0,86	0,92
LPEF	0,48	0,53	0,59	0,64	0,69	0,75	0,79	0,85	0,90	0,96
CBPE	0,18	0,24	0,30	0,36	0,42	0,48	0,54	0,60	0,66	0,72
BIEC	0,59	0,63	0,67	0,71	0,75	0,79	0,83	0,87	0,91	0,95
PAEC	0,71	0,74	0,77	0,80	0,83	0,86	0,89	0,92	0,95	0,98
SPAEC	0,23	0,29	0,35	0,41	0,47	0,53	0,59	0,65	0,71	0,77
GSS	0,23	0,31	0,39	0,47	0,55	0,63	0,71	0,79	0,87	0,95
CrC	0,23	0,27	0,31	0,35	0,39	0,43	0,47	0,51	0,55	0,59
CC	0,30	0,34	0,38	0,42	0,46	0,50	0,54	0,58	0,62	0,66
IACP	4,46	4,69	4,92	5,15	5,38	5,61	5,84	6,07	6,30	6,53

a)



b)

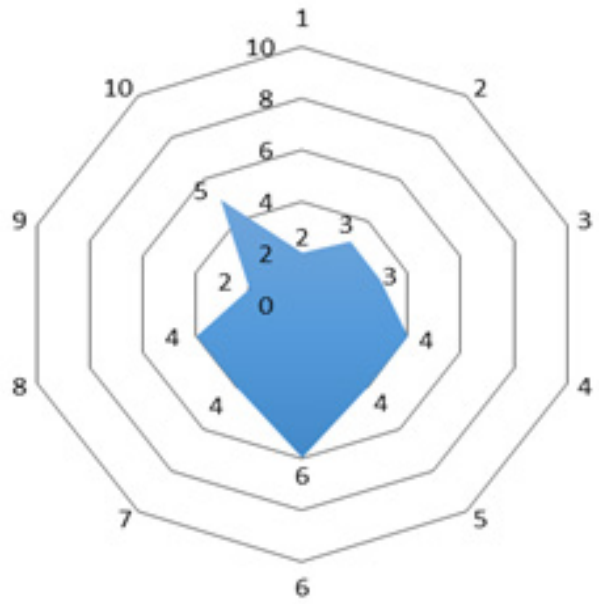


Figure 3. The model of competitive performance of the leading European football club teams (a) and the Dynamo (Kyiv) football team (b):

1 – HPC; 2 – HPEF ; 3 – LPEF; 4 – CBPE; 5 – BIEC; 6 – PAEC; 7– SPAEC; 8 – GSS; 9 – CrC; 10 – CC

research hypothesis has been sufficiently resolved.

The scientific novelty of the study is due to the following:

- a methodology for control of the competitive performance of a football team based on the integral assessment has been developed for the first time;
- the criteria of game tactical models - “A”, “B”, “C” and “D” were determined on the basis of which the game of a football team is being managed;
- a ten-point scale for assessing the specific coefficients of the competitive performance of a club football team has been developed. On the basis of this scale, the appropriate level of the team’s game is determined – low, below medium, medium, above medium, high.

The methodology of integral evaluation in team game sports, tested in previous studies [3, 19], which takes into account the quantitative and qualitative aspects of competitive performance, has found its practical application in correcting direct management decisions on the performance of a football team. Taking into account these activities, the tactics of the game is modified. It should be noted that the analysis of competitive performance is carried out simultaneously for two teams.

Moreover, the analysis of indicators of competitive performance over several matches enables a more targeted training process [4, 11]. This primarily concerns the establishing of different tactical systems of the game.

Obviously, the results of the study can be indicative model values for different football teams, for example, the team “Dynamo” (Kyiv), (see Table 4).

Therefore, the research to a certain extent solves the problem of operational control of the competitive performance of highly qualified football club teams. One of the methodological approaches to the implementation of control of the competitive performance of football teams is an integral assessment of competitive performance, the structure of which consists of 10 specific coefficients – high pressing coefficient (HPC), high pressing efficiency factor (HPEF), low pressing efficiency factor (LPEF), coefficient of ball picking efficiency (CBPE), ball interceptions efficiency coefficient during the game (BIEC), penetration attack efficiency coefficient (PAEC), successful penetration attack efficiency coefficient (SPAEC), goalscoring situation coefficient (GSS), creativity coefficient (CrC), and combinability coefficient (CC). Each of these coefficients reflects a certain aspect of the team’s play. In general, the IACP allows one to determine the level of a football team.

In general, the presented results significantly expand current scientific and methodological views on the control of competitive performance in team game sports [7, 9, 15]. Additionally, the study updates existing scientific findings on the indicators of competitive performance of skilled and highly skilled football players [5, 18]. In particular, unlike prior works in the field, which were aimed mainly at determining the performance indicators or quantitative component of the competitive performance of athletes, the suggested methodology takes into account the assessment of penetrating attacks and goal situations, the realisation of pressing, the efficiency of interaction between players in the phase of ball picking, as well as the criteria of creativity and combinatibility in the game. Thus, the paper is further exploration of the theoretical data on the problem of tactics in football [19], which found its practical application in the conducted analyses.

Conclusions

1. Effective management of competitive performance in team game sports, including football, requires targeted operational control. Operational control of the competitive performance of a highly qualified football club team can be carried out on the basis of an integral assessment.

2. The integral assessment of the competitive performance of a football team consists of 10 specific coefficients, including: high pressing coefficient, high pressing efficiency factor, low pressing efficiency factor, coefficient of ball picking efficiency and ball interceptions efficiency coefficient reflect the team’s game in the phase of ball picking. The characteristic of the team players’ interactions in the phase of ball possession is carried out on the basis of penetration attack efficiency coefficient, successful penetration attack efficiency coefficient, goalscoring situation coefficient, the creativity and the combinability

coefficients.

3. The value of the integral assessment of competitive performance for different tactical models of the game of the leading club football teams in Europe has been identified as follows: model "A" - 5.95±0.32 points; model "B" – 5.38±0.29 points; model "C"– 5.57±0.47 points, model "D"– 5.14±0.33 points.

These values can be considered as model benchmarks for other club football teams. The prospect of further research on this problem may be related to the definition of indicators of the integrated assessment of the competitive performance of club football teams of different qualifications.

Conflict of interests

The authors state that there is no conflict of interests.

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