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MODEL INDICATORS OF INTEGRAL ASSESSMENT OF TECHNICAL AND TACTICAL ACTIVITY OF FEMALE FIELD HOCKEY PLAYERS

Viktor Kostiukevych,
doctor of sciences in physical education and sports, professor,
Vinnytsia State Pedagogical University named after Mykhailo Kotsyubynskyi,
st. Ostrozhkogo, 32, Vinnytsia, 21001, Ukraine;
orcid.org/0000-0002-9716-134X;
email: kostykevich.vik@gmail.com

Andrzej Soroka,
dr hab, profesor uczelni,
Uniwersytet w Siedlcach, Instytut
Nauk o zdrwiu, Wyclzsot Nauk Meduczuuch i Nauk o Zdrowiu, ul. Bolesława Prusa, 14, 08-110 Siedlce, Polska;
orcid.org/0000-0002-7673-6116;
email: andrzej.soroka@uws.edu.pl

Abstract Relevance. Control and analysis of competitive activity of athletes is an important component of effective management of their training. The article examines the scientific and methodological approach to the assessment of competitive activity of highly qualified female field hockey players.

The purpose of the study is to determine the model values of the integrated assessment of the technical and tactical activity of highly qualified female field hockey players of different game roles on the basis of an integrated approach.

Material and methods of the study. The study analyzed the competitive activity of highly qualified female field hockey players in different game roles. For several years, the competitive activity of the leading female hockey players of the European national teams was studied. The following methods were used in the study: theoretical analysis of literary sources; pedagogical observations; analysis of video materials of competitive activity; methods of mathematical statistics.

Results of the study. The model values of specific indicators as structural components of the integral assessment of technical and tactical activity of highly qualified female field hockey players of different game roles were determined. In particular, for the fullback the integral assessment of technical and tactical activity is 6.32 ± 0.68 points; for the central defender – 5.93 ± 0.99 points; for the winger – 6.64 ± 0.44 points; for the inside – 6.82 ± 0.90 points; for the striker – 6.45 ± 1.31 points.

Conclusions. The model values of the integral assessment of technical and tactical activity of highly qualified female field hockey players of different game roles can serve as a guide for building models of competitive activity of athletes of different qualifications.

Keywords: field hockey, leading national teams, integrated approach, quantitative and qualitative indicators of competitive activity, tactical moves, modes of coordination complexity.

МОДЕЛЬНІ ПОКАЗНИКИ ІНТЕГРАЛЬНОЇ ОЦІНКИ ТЕХНІКО-ТАКТИЧНОЇ ДІЯЛЬНОСТІ ХОКЕЇСТОК НА ТРАВІ

Kostiukevych Viktor,
доктор наук з фізичного виховання і спорту, професор,
Вінницький державний педагогічний університет імені Михайла Коцюбинського, вул. Острозького, 32, м. Вінниця, 21001, Україна;
orcid.org/0000-0002-9716-134X;
email: kostykevich.vik@gmail.com

Soroka Andrzej,
dr hab, profesor uczelni,
Uniwersytet w Siedlcach, Instytut Nauk o zdrwiu, Wyclzsot Nauk Meduczuuch i Nauk o Zdrowiu, ul. Bolesława Prusa, 14, 08-110 Siedlce, Polska;
orcid.org/0000-0002-7673-6116;
email: andrzej.soroka@uws.edu.pl

Анотація. Актуальність. Контроль та аналіз змагальної діяльності спортсменів є важливою складовою ефективного управління їх підготовкою. У статті розглядаються науково-методичний підхід щодо оцінки змагальної діяльності висококваліфікованих хокеїсток на траві.

Мета дослідження – на основі комплексного підходу визначити модельні значення інтегральної оцінки техніко-тактичної діяльності висококваліфікованих хокеїсток на траві різних ігрових амплуа.

Матеріал та методи дослідження. У дослідженні аналізувалася змагальна діяльність висококваліфікованих хокеїсток на траві різних ігрових амплуа. Упродовж декількох років досліджувалася змагальна діяльність висококваліфікованих хокеїсток національної збірної команди України та висококваліфікованих хокеїсток провідних збірних команд Європи. У дослідженні використовувались такі методи: теоретичний аналіз літературних джерел; педагогічні спостереження; аналіз відеоматеріалів змагальної діяльності; методи математичної статистики.

Результати дослідження. Визначено модельні значення специфічних показників як структурних компонентів інтегральної оцінки техніко-тактичної діяльності висококваліфікованих хокеїсток на траві різних ігрових амплуа. Зокрема, для крайнього захисника інтегральна оцінка техніко-тактичної діяльності складає 6,32 ± 0,68 балів; для центрального захисника – 5,93 ± 0,99 балів; для крайнього півзахисника – 6,64 ± 0,44 балів; для інсайда – 6,82 ± 0,90 балів; для нападника – 6,45 ± 1,31 балів.

Висновки. Модельні значення інтегральної оцінки техніко-тактичної діяльності висококваліфікованих хокеїсток на траві різних ігрових амплуа можуть слугувати орієнтиром для побудови моделей змагальної діяльності спортсменок різної кваліфікації.

Ключові слова: хокей на траві, провідні збірні команди, комплексний підхід, кількісні та якісні показники змагальної діяльності, тактичні ходи, режими координаційної складності.

Problem statement. Control and analysis of the competitive activity of athletes is necessary for the effective management of their training (Bazylevych, 2011; Platonov, 2021). This problem is the most difficult in team sports. First of all, this is due to the multi-vector nature of competitive activity in these sports (Bezmylov, & Shynkaruk, 2013; Doroshenko, 2013; Mitova, & Shynkaruk, 2022). Thus, an effective scientific and methodological approach to control and analysis of competitive activity of athletes of team sports is necessary, which should reflect the complex level of competitive activity of athletes (Kostiukevych, 2008; Shchepotina, 2018; Doroshenko, et. all., 2019; Vozniuk, Halaidiuk, & Svirshchuk, 2020; Konnov, 2024).

Analysis of the latest studies and publications. The control and analysis of the competitive activity of highly skilled athletes of team sports was the subject of scientific research of both domestic (Lysenchuk, 2003; Kostiukevych, 2010; Shamardin, 2013) and foreign scientists (Michels, 2006; Wein, 2004; Visentini, 2008).

In particular, dissertations and monographic studies by H. A. Lysenchuk (2003), V. M. Shamardin (2013), and V. M. Kostiukevych (2020) are devoted to this problem. The authors have defined theoretical and methodological approaches to both the general bases of management of training of highly skilled athletes of team sports and methodological approaches to control and analysis of their competitive activity.

Separate studies of scientists concerned a complex assessment of special technical and tactical preparedness of highly skilled athletes of team sports (Lysenchuk, & Tyshchenko, 2019) and determination of model values of their collective interactions during the match (Kostiukevych, 2019).

The analysis of literature sources confirmed the prediction that the problem of controlling and analyzing the competitive activity of highly qualified female field hockey players is not exhaustive and requires further research. It is considered relevant to determine the indicators of the integrated assessment of the technical and tactical activity of highly qualified female field hockey players of different game roles.

The purpose of the study is to determine the model values of the integral assessment of technical and tactical activity of highly qualified female field hockey players of different game roles on the basis of an integrated approach.

Material and methods of the study. The competitive activity of highly qualified female field hockey players of different game roles of the leading hockey teams of Europe has been analyzed in the study for several years.

The following methods were used in the study: theoretical analysis of literary sources; pedagogical observation; analysis of video materials of competitive activity; methods of mathematical statistics.

On the basis of theoretical analysis of literary sources, the working hypothesis of the study was formed and its purpose was determined.

The pedagogical observation was used for the purpose of development of the integral assessment of technical and tactical activity of qualified and highly qualified female field hockey players.

Statistical processing of the results of the study was carried out on the basis of descriptive statistics. The following statistical characteristics were determined: arithmetic mean ($\bar{x}$), average squared deviation (**S**), coefficient of variation (V). MS Exsel software was used.

Results of the study. An integral assessment is an objective indicator of the level of technical and tactical performance of both an individual player and the entire team. It takes into account the following indicators:

- number of technical and tactical actions (TTA) performed in the match;
- ratio of performed TTA during the game;
- performance of TTA in different game conditions;
- number and direction of tactical moves (ball passes);
- player (team) mobility in the match;
- player's participation in martial arts (aggressiveness in the game);
- effectiveness of individual game techniques;
- effectiveness of the execution of game techniques, taking into account the coordination complexity;
- level of creativity shown by the player (team) in the match;
- effectiveness of the player's participation in martial arts, etc.

The integral assessment is formed on the basis of six specific coefficients that take into account both quantitative and qualitative aspects of competitive activity: intensity coefficient (IC), mobility coefficient (MC), aggressiveness coefficient (AC), efficiency coefficient (EC), martial arts efficiency coefficient (MAEC), creativity coefficient (CC).

The methodology of determination of the integral assessment of technical and tactical activity of athletes in field hockey is set forth by V. M. Kostiukevych (2008).

Table 1 shows the model specific indicators of TTA of field players of elite teams and the national team of Ukraine. For elite national teams, the integral score varies from 5.93±0.99 points for the central defender to 7.24±0.94 points for the holding midfielder, which generally reflects the contribution of players in these roles to the team's integral score. Among the other players, the highest IA scores are also observed for the fullback (6.32±0.68 points) and the striker (6.45±1.31 points), while the winger (6.64±0.44 points) and the inside (6.82±0.90 points) have high values, in addition to the holding midfielder.

Considering individual specific indicators, the highest intensity coefficient is observed for the central defender (1.48±0.31 points) and the holding midfielder (1.46±0.13 points), and the lowest – for the striker (1.11±0.19 points). The mobility coefficient ranges from 1.85±0.28 points (fullback) to 2.68±0.27 points (holding midfielder).

Table 1

Model specific indicators of female field hockey players of elite national teams and the national team of Ukraine ($\overline{x} \pm S$)

Game role	Specific indicators of IA TTA, points.						
	Intensity coefficient	Mobility coefficient	Aggressiveness coefficient	Efficiency coefficient	Martial arts efficiency coefficient	Creativity coefficient	Integral assessment
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Fullback							
(n*=13) (n**=17)	1.21±0.18 0.84±0.14	1.85±0.28 1.51±0.28	1.50±0.81 0.69±0.22	0,81±0,04 0,76±0,14	0.56±0.13 0.58±0.07	0.39±0.17 0.24±0.06	6.32±0.68 4.62±0.59
Central defender							
(n*=15) (n**=18)	1.48±0.31 1.00±0.16	1.89±0.42 1.68±0.34	0.67±0.27 0.84±0.18	0.85±0.04 0.79±0.07	0.64±0.11 0.61±0.08	0.40±0.09 0.31±0.06	5.93±0.99 5.23±0.67
Winger							
(n*=12) (n**=16)	1.28±0.19 0.88±0.20	2.35±0.32 1.70±0.39	1.27±0.08 0.94±0.22	0.78±0.06 0.77±0.08	0.63±0.08 0.59±0.10	0.35±0.10 0.30±0.12	6.64±0.44 5.18±1.0
Holding midfielder							
(n*=12) (n**=13)	1.46±0.13 1.22±0.26	2.68±0.27 2.24±0.52	1.34±0.34 1.52±0.41	0.79±0.06 0.78±0.07	0.62±0.07 0.71±0.08	0.35±0.08 0.33±0.11	7.24±0.94 6.80±1.01
Central defender – inside							
1.27±0.14 0.89±0.15	1.27±0.14 0.89±0.15	2.33±0.38 1.69±0.25	1.49±0.46 1.24±0.33	0,.78±0.05 0.74±0.10	0.65±0.08 0.63±0.09	0.36±0.09 0.21±0.08	6.82±0.90 5.40±0.84
Striker							
(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)	(n*=15) (n**=15)

Notes: %; * – elite national teams, ** – national team of Ukraine; IA TTA – integrated assessment of technical and tactical activities.

As expected, the highest aggressiveness indicators are for the striker (1.53±0.47 points), and the lowest for the central defender (0.67±0.27 points). The highest values of the coefficient of efficiency in the game are demonstrated by the central defender (0.85±0.04 points) and the fullback (0.81±0.04 points), and the lowest - by the inside (0.78±0.05 points) and the striker (0.75±0.05 points). The martial arts efficiency coefficient is characterized by the highest values for the central defender (0.64±0.11 points) and the lowest for the fullback (0.56±0.13 points). Indicators of the creativity coefficient vary from 0.31±0.11 points for the striker to 0.40±0.09 points for the central defender.

In general, for almost all specific indicators of technical and tactical actions (TTA) of female hockey players of different game roles of elite national teams the highest values are observed in the holding midfielder (Fig. 1). At the same time, for each game role certain values of specific indicators are characteristic, which make up the integral assessment of TTA. As can be seen from Fig. 1, the highest values are observed:

- for the fullback – by the indicators of MC and AC;
- for the central defender – by the indicators of MC and IC;
- for the winger – by the indicators of MC, IC and AC;
- for the holding midfielder – by the indicators of MC, IC and AC;
- for the central midfielder (inside) – by the indicators of MC and CC;
- for the striker – by the indicators of MC and AC.

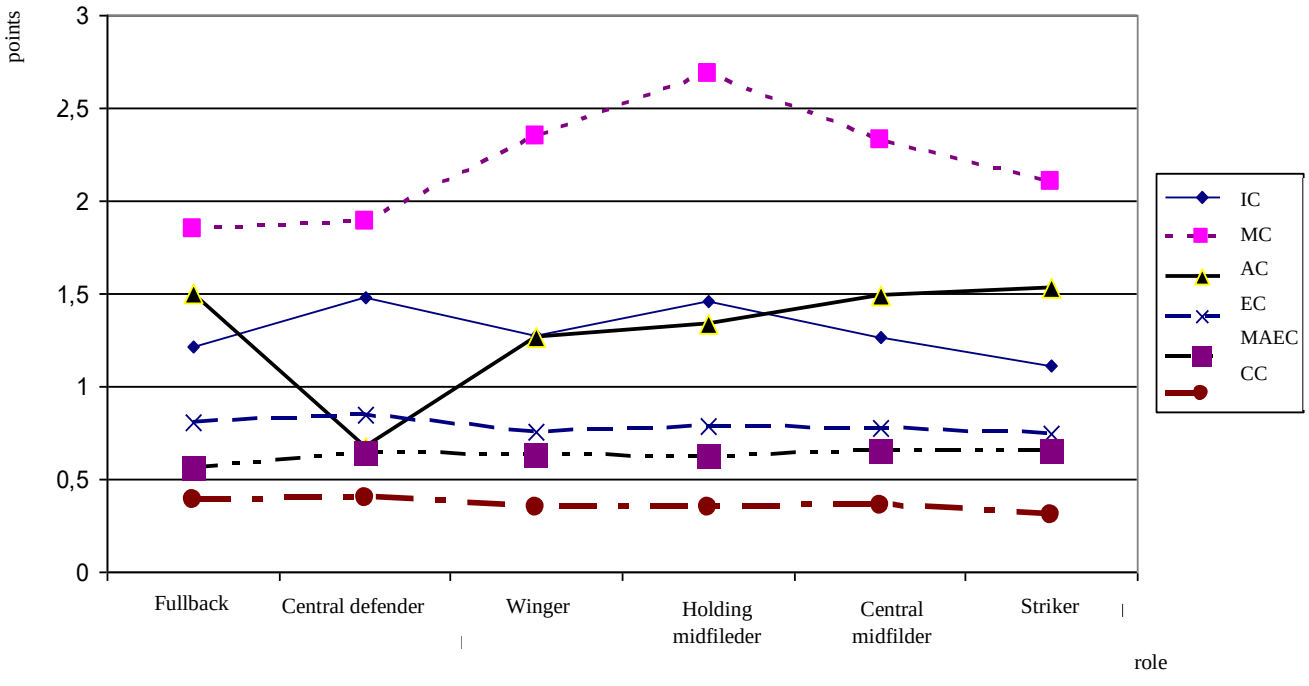

Fig. 1. Specific indicators of TTA of hockey players of different game roles of elite national teams.

Conventional designations: IC – intensity coefficient; MC – mobility coefficient; AC – aggressiveness coefficient; EC – efficiency coefficient; MAEC – martial arts efficiency coefficient; CC – creativity coefficient

Regarding the qualitative indicators of the integral assessment of TTA, the highest values for all game roles are characteristic of the efficiency coefficient, the lowest – for the creativity coefficient.

The analysis of specific indicators of TTA of female hockey players of different roles of the national team of Ukraine (Table 1) shows that the highest value of the integral assessment (IA) is observed for the holding midfielder – 6,80±1,0 points, the least – for the fullback – 4,62±0,59 points. As for some specific indicators of TTA, the values of IC range from 0.84±0.14 points for the fullback to 1.22±0.26 points for the holding midfielder; the values of MC – from 1.51±0.28 points for the fullback to 2.24±0.52 points for the holding midfielder; the values of AC – from 0.69±0.22 points for the fullback to 1.52±0.41 points for the holding midfielder. Comparison of these values shows that the smallest contribution to the team integral assessment is made by the fullback, and the largest – by the holding midfielder. If the value of the holding midfielder's IA approximately corresponds to the model indicators of elite national teams ($p > 0.05$), the indicators of the fullback of the national team of Ukraine are significantly lower than those of elite national teams ($p < 0.05$). This indicates that this playing position in the national team of Ukraine needs to be strengthened both in the individual skills of the players and in the tactical construction of the team's game.

Comparing Figs. 1 and 2, we can see that in both elite national teams and the national team of Ukraine, the most extensive work is performed by the holding midfielder. This is due to tactical functions that include both offensive and defensive responsibilities. The coach should put players with a high level of individual skill, physical and functional fitness in this position. Players of other roles of the national team of Ukraine are significantly inferior in some specific indicators of TTA to players of elite teams ($p < 0.05$). The difference in separate indicators is as follows:

1) intensity coefficient – fullback (-0.37; 30.6 %), central defender (-0.48; 32.4 %), winger (-0.40; 31.3 %), holding midfielder (-0.24; 16.4 %), central midfielder (-0.38; 29.9 %), striker (-0.25; 22.5 %);

2) mobility coefficient – fullback (-0.34; 18.3 %), central defender (-0.21; 11.1 %), winger (-0.63; 27.0 %), holding midfielder (-0.44; 16.4 %), central midfielder (-0.64; 27.5 %), striker (-0.38; 18.1 %);

3) aggressiveness coefficient – fullback (-0.81; 54.0 %), central defender (+0.17; 20.2 %), fullback (-0.33; 25.9 %), holding midfielder (+0.18; 11.8 %), central midfielder (-0.25; 16.8%), striker (-0.29; 18.9 %);

4) efficiency coefficient – fullback (-0.05; 6.2 %), central defender (-0.06; 7.1%), winger (+0.01; 1.2 %), holding midfielder (-0.01; 1.2 %), central midfielder (-0.04; 5.1 %), striker (-0.01; 1.2 %);

5) martial arts efficiency coefficient – fullback (-0.02; 3.4 %), central defender (-0.03; 4.7 %), fullback (-0.04; 6.3 %), holding midfielder (+0.09; 12.6 %), central midfielder (-0.02; 3.4 %), striker (-0.01; 1.2 %);

6) creativity coefficient – fullback (-0.15; 38.5 %), central defender (-0.09; 22.5 %), fullback (-0.05; 14.3 %), holding midfielder (-0.02; 5.7 %), central midfielder (-0.15; 41.6 %), striker (-0.08; 25.8 %).

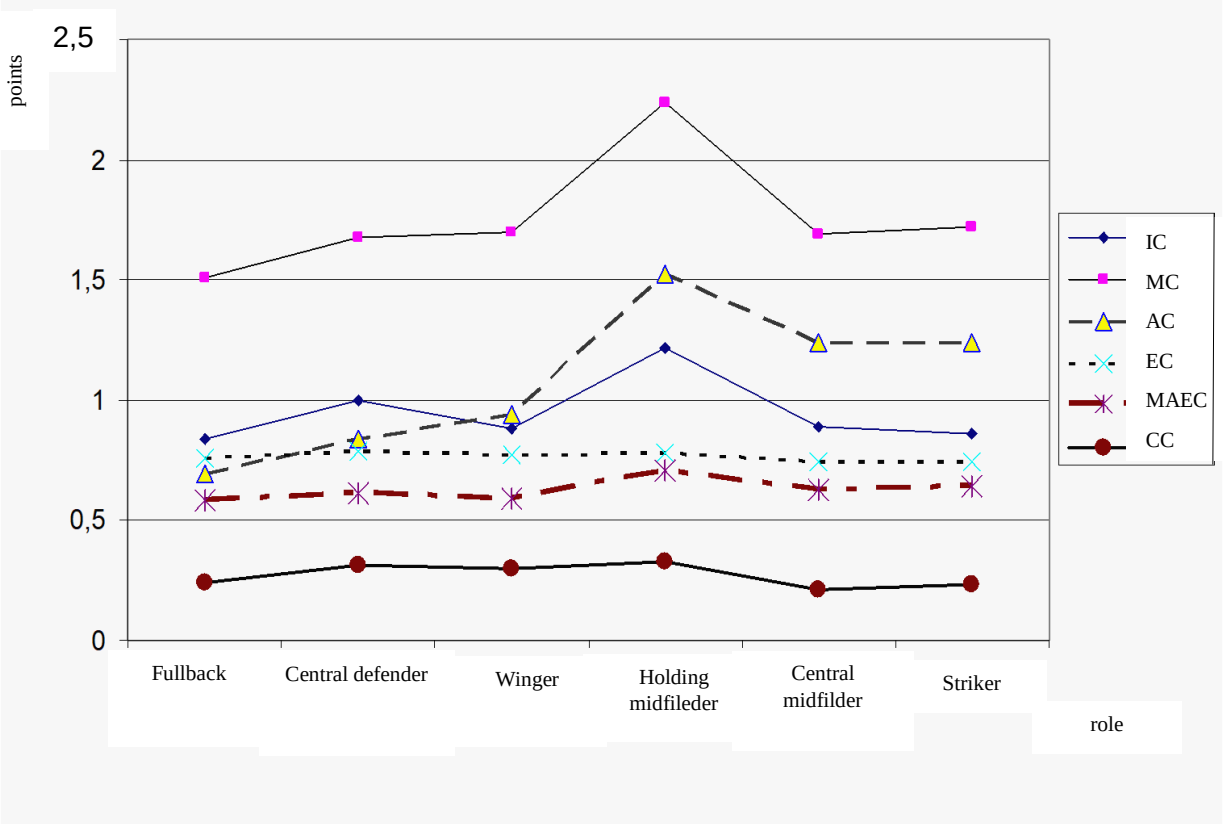

Fig. 2. Specific indicators of TTA of female hockey players of different game roles of the national team of Ukraine

Abbreviations: IC – intensity coefficient; MC – mobility coefficient; AC – aggressiveness coefficient; EC – efficiency coefficient; MAEC – martial arts efficiency coefficient; CC – creativity coefficient

Also, there is a significant difference ($p<0.05$) between the values of the integral assessment of female hockey players of different game roles of elite national teams and the national team of Ukraine (Fig. 3). First of all, it is necessary to equalize the values of the IA of the fullback, winger and striker.

The given values of both separate specific indicators and the integral assessment (IA) in general for the game roles of elite national teams and the national team of Ukraine allow to improve the system of training of high-class players in our country more purposefully. In this context, the indicators of the IA of the game roles of elite national teams can be considered as promising model characteristics of the technical and tactical activity of female hockey players of different game roles of the national team of Ukraine.

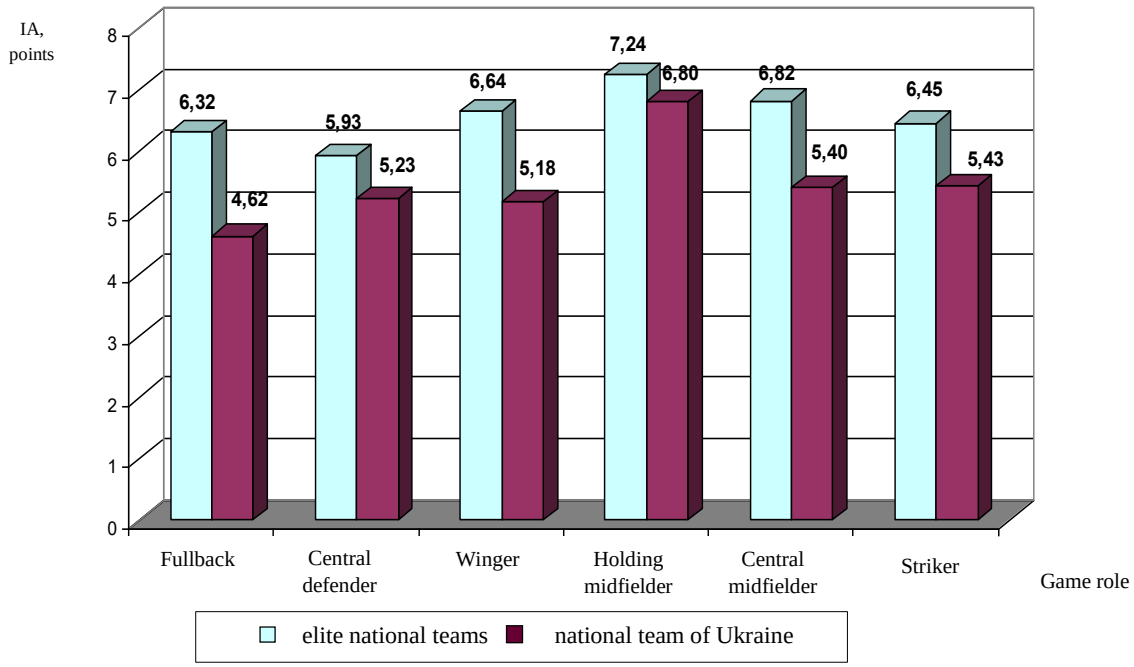

Fig. 3. Indicators of integral assessment of TTA of female hockey players of different game roles of elite national teams and the national team of Ukraine.

Discussion. As already noted, the control of the competitive activity of athletes in team sports is one of the most difficult. This complexity is due to the following components:

- a sufficiently large number of players participating in the game;
- a large volume of specific movements of actions with and without the ball;
- a wide variety of tactical actions;
- different coordination complexity of technical and tactical actions;
- constant change of active and passive phases in the game, etc. (Shchepotina, 2018; Mitova, & Shynkaruk, 2022; Doroshanko, et. al., 2019; Kostiukevych, 2019; Kostiukevych, Shchepotina, & Vozniuk, 2020).

All these and other components of competitive activity require an integrated approach to the control and analysis of competitive activity of athletes of team sports, including female field hockey players.

The analysis of literary sources and the experience of practical work of the authors of the article allowed to pass to the conclusion that such an integrated approach to control and analysis of the competitive activity of highly qualified female field hockey players is an integral assessment of technical and tactical activity (Kostiukevych, 2008; 2010; Vozniuk, Halaidiuk, & Svirshchuk, 2020; Konnov, 2024).

The integral assessment of technical and tactical activity of highly qualified female field hockey players reflects the following components:

1. Registration of technical and tactical activities should be carried out taking into account their coordination complexity and game orientation.

2. The methodology for analyzing the technical and tactical activities of players should take into account the direction and significance of technical and tactical moves (passes, drives, circles, etc.).

3. The number of indicators of technical and tactical activity must be analyzed together with their qualitative characteristics.

4. A differential approach is necessary for the definition of the integral estimation of technical and tactical activity of female field hockey players of different game roles.

5. The integral assessment of TTA objectively should reflect the skill of a female field hockey player revealed in a game, and be the main for drawing up models of competitive activity.

6. The model values of IA TTA of highly qualified female field hockey players of different game roles defined in this study will become a basis for the increase of efficiency of management of the training and competitive process of club and national hockey teams.

Conclusions. 1. Control and analysis of competitive activity in field hockey is an important component of managerial influences in the process of training and competitive activity of players.

2. One of the effective methodical approaches of control and analysis of competitive activity of female field hockey players is an integral assessment of their technical and tactical activity which reflects the complex character of participation of players in a match. The integral assessment consists of six specific coefficients: quantitative - intensity coefficient (IC), mobility coefficient (MC), aggressiveness coefficient (AC), qualitative - efficiency coefficient (EC), martial arts efficiency coefficient (MAEC), creativity coefficient (CC).

It is established that the model values of the integrated assessment of technical and tactical activity of highly qualified female field hockey players range from 4.90±0.84 points for the fullback to 7.24±0.94 points for the holdung midfielder.

It has been determined that each game role is characterized by model values for individual specific coefficients of the integrated assessment of technical and tactical activity.

The prospect of further study will be determined by determining the model indicators of the integral assessment of technical and tactical activity of players of different roles in club teams of different levels.

The authors declare no conflict of interest.

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