



COMPREHENSIVE ASSESSMENT OF THE PREPAREDNESS OF HIGHLY QUALIFIED FIELD HOCKEY PLAYERS AT THE STAGE OF DIRECT PREPARATION FOR THE MAIN COMPETITIONS

Viktor Kostiukevych^{1ABCE}, Nataliia Lazarenko^{1ACDE}, Vadym Adamchuk^{1BCDE},
Natalia Shchepotina^{1BCDE}, Tetiana Vozniuk^{1BCDE}, Oksana Shynkaruk^{2BCDE},
Inna Asauliuk^{1BCDE}, Stanislav Konnov^{1BCDE} and Serhii Voitenko^{1BCDE}

¹Vinnitsia Mykhailo Kotsiubynskyi State Pedagogical University

²National University of Ukraine on Physical Education and Sport

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Corresponding Author: Viktor Kostiukevych, E-mail: kostykevich.vik@gmail.com

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Abstract

The purpose of the study was to experimentally substantiate the methodological approach to the development of a comprehensive assessment of the preparedness of highly qualified field hockey players at the stage of direct preparation for the main competitions.

Materials and methods. Highly qualified players, members of the national field hockey team of Ukraine (n=21) participated in the study. The average age of the players was ($\bar{x} \pm S$) 24.9 ± 5.76 years, their sports qualification was masters of sports of Ukraine. The study was conducted over the first and second competitive periods of the two-cycle planning of the training process of highly qualified field hockey players of the 2020-2021 sports season. During the first competitive period, a methodical approach to comprehensive assessment of the preparedness of highly qualified field hockey players was developed. Within the second competition period, which included the stage of direct preparation for the main competitions indicators of a comprehensive assessment of readiness of the players were determined. In order to develop a comprehensive assessment of fitness, tests and criteria were used to assess the level of physical, functional fitness, physical fitness in relation to technique and competitive activity of hockey players.

Results. A methodical approach has been developed for the comprehensive assessment of the preparedness of highly qualified field hockey players according to the following algorithm: determination of criteria for the manifestation of physical and functional preparedness, physical preparedness in relation to technique, competitive activity; development of a 10-point rating scale; establishment of a comprehensive assessment of players' readiness during the stage of direct preparation for the main competitions.

Conclusions. The structure of the stage of direct preparation for the main competitions consisted of a basic and a special preparatory mesocycles. The volume of direct motor activity was 38 hours, in particular, the ratio of means: general preparatory exercises – 55.4%, special preparatory exercises – 19.5%, lead exercises – 10.9%, competitive exercises – 15.2%; ratio of training loads: aerobic – 56.5%, aerobic-anaerobic – 32.7%, anaerobic-lactate – 7.6%, anaerobic-glycolytic – 3.2%. A statistically probable positive change ($p < 0.01$) in the indicators of the comprehensive assessment of players' preparedness during the stage of direct preparation for the main competitions was established.

Keywords: highly qualified field hockey players, stage of direct preparation for the main competitions, comprehensive assessment of the preparedness, ten-point scale.

Introduction

The trends in the development of sports of higher achievements at the current stage are characterized by the

rational application of training influences on the level of preparedness of athletes depending on the stage of the training macrocycle (Bondarchuk, 2005; Bompà, Buzzichelli, 2018; Platonov, 2020). One of the most important structural formations of the training process of athletes in the annual training cycle is the stage of direct preparation for the main competitions (Platonov, 2018; Kostiukevich, Konnov, 2022;

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Adamchuk et al., 2023). The problem of training athletes at this stage lies both in the structure and content of the training process, and the diagnosis of their level of preparation (Shamardin, 2012; Tyshchenko et al., 2019; Russell et al., 2022). That is, at the stage of direct preparation for the main competitions, it is necessary to optimally use the means of training work and loads of various orientations in order to bring athletes to a high level of readiness to participate in competitions. The analysis of such readiness should be carried out on the basis of a comprehensive assessment that reflects the manifestation of physical, functional, technical-tactical and competitive preparedness of athletes (Mitova, 2020; Oliinyk et al., 2021; Bezmylov et al., 2022).

The problem of comprehensive evaluation of the preparedness of athletes in team game sports has been the subject of scientific research by many specialists. In particular, in the work of Tyshchenko et al. (2019) proposed a system for monitoring the effectiveness of training and competitive activities of highly qualified handball teams. A comprehensive assessment of indicators of physical, functional and competitive fitness of qualified volleyball players as a criterion for the effectiveness of building a training process is presented in the work of Kostiukevych et al. (2019). In the studies of Tyshchenko et al. (2018) and Doroshenko et al. (2020) substantiated the factor structure of physical and functional fitness of basketball players, as well as the competitive activity of highly qualified basketball players as a comprehensive assessment of technical and tactical skills. Mitova (2020) proposed the technology of implementing a system of complex control in team game sports in the process of long-term training. With the help of a comprehensive assessment of indicators of physical, functional, competitive readiness of qualified football players in the study of Shchepotina et al. (2021) the effectiveness of training process management based on programming has been experimentally justified.

As for field hockey, the study of Perepelytsia et al. (2019, 2021) was aimed at determining the indicators of tactical preparedness of field hockey players as well as improving tactical preparation within the annual training cycle. Indicators of physical and functional fitness of highly qualified field hockey players as criteria for adaptation to training loads were considered in the work of Kostiukevych, Shchepotina, Shynkaruk et al. (2020). Konnov (2021) characterized the indicators of the integral assessment of the technical and tactical activity of a highly qualified team in field hockey. Kostiukevych et al. (2021) examined the factor structure of special abilities of highly qualified athletes in field hockey which included morpho-functional indicators, indicators of physical, technical-tactical and competitive readiness of players.

Therefore, the analysis of literary sources allows us to state that the problem of comprehensive assessment of athletes' preparedness at the stage of direct preparation for competitions is relevant. At the same time, for such an Olympic sport as field hockey, a separate study on the specified problem is needed, the results of which are highlighted in this article.

The hypothesis of the study: it was assumed that the determination of the indicators of the complex preparedness of highly qualified field hockey players will allow to optimize the managerial influences on the determination and

maintenance of the second phase of the sports uniform at the stage of direct preparation for the main competitions of the sports season.

The purpose of the study was to experimentally substantiate the methodological approach to the development of a comprehensive assessment of the preparedness of highly qualified field hockey players at the stage of direct preparation for the main competitions.

Materials and methods

Participants

Highly qualified players, members of the national field hockey team of Ukraine (n=21) participated in the study. The average age of the players was ($\bar{x} \pm S$) 24.9 ± 5.76 years, their sports qualification was masters of sports of Ukraine. The study was approved by the ethics committee of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, and all procedures were in accordance with the Declaration of Helsinki. Informative consent to participate in the experiment was obtained from the study participants.

Study organization

The study was conducted over the first and second competitive periods of the two-cycle planning of the training process of highly qualified field hockey players of the 2020-2021 sports season. During the first competitive period, a methodical approach to comprehensive assessment of the preparedness of highly qualified field hockey players was developed. Within the second competition period, which included the stage of direct preparation for the main competitions (the European Field Hockey Championship "Championship II", which took place from 14 August to 21 August 2021 in Gniezno, Poland), indicators of a comprehensive assessment of readiness of the players were determined. In order to develop a comprehensive assessment of fitness, tests and criteria were used to assess the level of physical, functional fitness, physical fitness in relation to technique and competitive activity of hockey players (Table 1).

In the process of pedagogical observation, we timed the training work (recording the nature and duration of the exercises) with the simultaneous registration of the heart rate (HR) using a Polar RS800CX heart rate monitor. The analysis of the initial data made it possible to determine the volume and ratio of means (general training, special training, underwater, competitive), loads of various orientations (aerobic, mixed aerobic-anaerobic, anaerobic lactate, anaerobic glycolytic orientation).

Pedagogical testing was used to determine physical and functional fitness, physical fitness in relation to technology. To assess the starting speed, a 30 m run from a high start was used. Speed and strength abilities were determined by standing long jump. Cooper's test (continuous running for 12 minutes) was used to determine the general endurance of hockey players. To assess the speed endurance of hockey players, the 180 m shuttle run test is informative.

Based on the results of the shuttle run of 180 m, the integral adaptation index (IAI) was determined, which characterized the level of adaptation of the hockey players'

Table 1. Tests and criteria for comprehensive assessment of preparedness of the highly qualified field hockey players

Areas of preparedness		Tests and criteria					
Physical preparedness	Running 30 m from a high start, s	Long jump from a place, m	Shuttle run 180 m, s	Cooper's test, m			
Functional preparedness	MOCabs, l×min ⁻¹	MOCrel, ml×min ⁻¹ ×kg ⁻¹	IAI, relative units	ORI, relative units			
Physical preparedness interconnected with technique	Running 14.6 m with kicking the ball, s	Driving the ball – going around the posts – hitting the goal, s	Driving-passing the ball into the goal, s	Throwing the ball with a stick at a distance	A series of shots on goal, s		
Preparedness for competition	IC	MC	AC	EC	ECMA	CC	IE

Notes: MOCabs – absolute indicator of maximum oxygen consumption; MOCrel – relative indicator of maximum oxygen consumption; IAI – integral adaptation index; ORI – operational recovery index; IC – intensity coefficient; MC – mobility coefficient; AC – aggressiveness coefficient; EC – efficiency coefficient; ECMA – efficiency coefficient of martial arts; CC – creativity coefficient; IE – integral evaluation

body to anaerobic glycolytic loads. The lower the IAI indicator, the better the training of the hockey player:

$$IAI = t(f_1 + f_2 + f_3), (1)$$

where: t is the time of the 180 m shuttle run test;

f_1, f_2, f_3 – heart rate for 10 seconds at the end of the first, second and third minutes of recovery.

The operative recovery index (ORI) was determined by the formula (Kostiukevych, Shchepotina, Shynkaruk et al, 2020):

$$ORI = 100 - \frac{fr \cdot 100}{f_{sr}}, (2)$$

where: fr is heart rate at the end of the first minute of recovery in 10 s (from 50 to 60 s);

f_{sr} is heart rate immediately after the shuttle run 180 m test (in 10 s).

Absolute and relative indicators of maximum oxygen consumption (MOC_{abs} and MOC_{rel}) were determined on the basis of the run-based variant of the PWC₁₇₀ test (PWC_{170(V)}).

The level of physical fitness in relation to the technique of highly qualified hockey players was determined using the following tests:

1. Running 14.63 m with kicking the ball in order to assess starting speed in relation to special agility. Performance conditions: a hockey player from a high start at maximum speed runs a distance of 14.63 m and knocks out the ball, which is on the contact platform, with a blow of the stick. The result is evaluated by the duration of the entire exercise: from the start of the run to hitting the ball with the stick. The best result from two attempts is evaluated. Pause between attempts makes up 2-3 minutes.

2. Driving the ball – going around the posts – hitting the goal – evaluation of speed technique (Fig. 1). Performance conditions: the hockey player starts dribbling the ball, which is located at a distance of 45.7 m from the goal line, leads it to the post, which is located 21 m from the start, using at least 5 touches with the stick, then circles 5 posts that are behind 2 m from each other in a straight line, enter the kick circle (no more than 2 m beyond the circle line) and kick at the goal. The result is evaluated by the duration of the entire exercise – from the start of dribbling until the ball touches the back wall of the goal. The best result from two attempts was evaluated. Pause between attempts makes up 2-3 minutes.

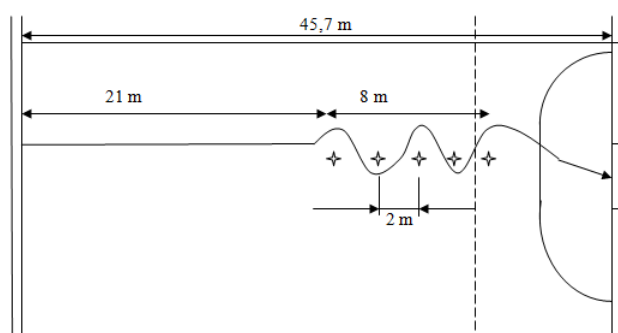
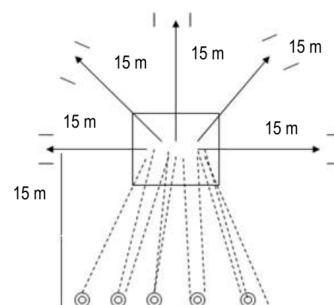


Fig. 1. Scheme of performance of the test “Dribbling the ball – going around the posts – hitting the goal”

3. Dribbling the ball – passing the ball to the goal (performed in the form of a shuttle run – 5 times) – in order to evaluate speed technique in relation to special endurance (Fig. 2). Performance conditions: 5 balls are placed on the starting line, a square (2×2 m) is drawn 15 m from the starting line, 5 goals are placed parallel to the left, right, and front sides of the square, as well as diagonally opposite its left and right corners at a distance of 15 m, each with a width of 1 m. The hockey player starts dribbling the ball using at least 3-x touches with the stick, enters it into the square, performs a targeted pass into the goal, which is located on the left, returns to the start, performs similar actions with the next ball, executes a pass to the gate, which is located opposite the left square, and so on. The result is evaluated by the duration of the entire exercise – from the start of dribbling the first ball until the hockey player crosses the starting line after the fifth pass of the ball.

Fig. 2. Scheme of execution of the “Dribbling – passing the ball into the goal” test



4. Throwing a ball with a stick at a distance – to assess technical preparation and special strength. Performance conditions: a hockey player throws the ball with a stick in a corridor 10 m wide. The result is evaluated by the best of three attempts.

5. A series of shots at the goal: in order to assess special speed-power endurance (Fig. 3). Performance conditions: 31 balls are placed in a straight line at a distance of 11 m from the goal (the distance between the balls is 20 cm). The central ball is in the center of the goal, and there are 15 more balls to the left and right of it. The hockey player starts the exercise from the left side and hits the balls with maximum force at the goal, which is protected by the goalkeeper. The result is evaluated by the duration of the entire exercise: from the beginning of the kick to the first ball and touching the goalkeeper or crossing the goal line of the 31st ball.

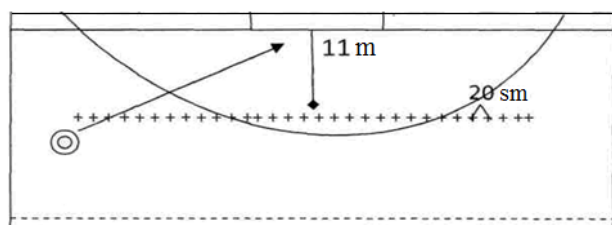


Fig. 3. Scheme of performance of the test – a series of shots at the goal

Control of competitive activity was carried out on the basis of assessment of technical and tactical activity (TTA) of players, taking into account coordination complexity. There were developed 6 specific indicators of competitive activity (coefficients of intensity, mobility, aggressiveness, efficiency, single combat efficiency, creativity) and integral assessment, which were described in detail in previous studies (Kostiukevych et al., 2018; Shchepotina et al., 2021).

1. The intensity coefficient (IC):

$$IC = \frac{\sum_{i=1}^n TTA}{t}, \quad (6)$$

where: $\sum_{i=1}^n TTA$ – total amount of technical and tactical actions of player in a match;

t – pure time played by a player in the match.

2. The mobility coefficient (MC):

$$MC = \frac{\sum_{i=1}^n TTA(2nd\ MCC + 3rd\ MCC)}{t} \times 2, \quad (7)$$

where: $\sum_{i=1}^n TTA(2nd\ MCC + 3rd\ MCC)$ – total amount of technical and tactical actions of player in the match in the second and third modes of coordination complexity;

2 – indicator of coordination complexity.

3. The aggressiveness coefficient (AC):

$$AC = \frac{\sum_{i=1}^n TTA(3rd\ MCC)}{t} \times 3, \quad (8)$$

where: $\sum_{i=1}^n TTA(3rd\ MCC)$ – total amount of technical and tactical actions of player in the match in the third mode of coordination complexity;

3 – indicator of coordination complexity.

4. The efficiency coefficient (EC):

$$EC = \frac{\sum_{i=1}^n preciseTTA}{\sum_{i=1}^n allTTA}, \quad (9)$$

where: $\sum_{i=1}^n preciseTTA$ – total amount of precise technical and tactical actions of player in the match;

$\sum_{i=1}^n allTTA$ – total amount of all technical and tactical actions of player in the match.

5. The single combat efficiency coefficient (SCEC):

$$SCEC = \frac{\sum_{i=1}^n preciseTTA(stops, holds, tacklings, dummies, performed in 3rd\ MCC)}{\sum_{i=1}^n allTTA(stops, holds, tacklings, dummies, performed in 3rd\ MCC)}, \quad (10)$$

where: $\sum_{i=1}^n preciseTTA(stops, holds, tacklings, dummies, performed in 3rd\ MCC)$ – total amount of precise technical and tactical actions of player in the match in the third mode of coordination complexity;

$\sum_{i=1}^n allTTA(stops, holds, tacklings, dummies, performed in 3rd\ MCC)$ – total amount of all technical and tactical actions of player in the match in the third mode of coordination complexity/

6. The creativity coefficient (CC):

$$CC = \frac{\sum_{i=1}^n preciseTTA(DP \times 1 + SP \times 2 + GP \times 5 + GK \times 5 + G \times 10)}{t}, \quad (11)$$

where: DP – developing passes; SP – sharpening passes; GP – goal passes; GK – goal kicks; G – goals.

7. The integral assessment (IA):

$$IA = IC + MC + AC + EC + SCEC + CC \quad (12).$$

Statistical analysis

In the mathematical processing of the research results, descriptive statistics were used, which involved the determination of the arithmetic mean ($\bar{x}$) and the mean square deviation (S). The statistical significance of the difference between indicators was determined using the Student's t-test for paired two samples, which was calculated as the ratio of the arithmetic mean of differences ($\bar{x}_d$) to the standard error of the arithmetic mean of differences (S_d). The hypothesis of a normal distribution of the research results was pre-tested according to the Shapiro-Wilk test (W). During statistical processing, the level of significance $p = 0.05$, $p = 0.01$ was accepted. Mathematical processing of the research results was carried out using the "Data Analysis" package of the MS Office Excel computer program, as well as using the Statistica 10.0 program (Albert et al., 2017; Byshevets et al., 2019; Kostiukevych, Lazarenko, Vozniuk et al., 2020).

Results

Experimental substantiation of the expediency of using training influences at the stage of direct preparation for the main competitions was carried out on the basis of a comprehensive assessment of the players' preparedness. In our study, the outlined stage consisted of basic and special preparatory mesocycles (Fig. 4).

Training influences on the preparedness of athletes were carried out through the use of loads of different orientations. The total amount of training loads at the stage of direct preparation for the main competitions amounted to 2260 minutes (~ 38 hours), of which 1274 minutes (56.5%) were aerobic loads, 736 minutes (32.7%) were mixed (aerobic-anaerobic) loads, 172 min (7.6%) anaerobic-lactate loads and 72 min (3.2%) anaerobic-glycolytic loads.

A comprehensive assessment of the preparedness of highly qualified field hockey players at the stage of direct

Stage of direct preparation for the main competitions						
Mesocycles	Basic			Special preparation		
Microcycles	4-day tightening	4-day shock	3-day recovery	4-day shock	3-day recovery	4-day introductory microcycle

Fig. 4. The structure of the stage of direct training of highly qualified field hockey players for the main competitions of the sports season

preparation for the main competitions was determined on the basis of a 10-point scale, which was developed on the basis of the algorithm:

The 1st step is to determine the main characteristics of the sample (arithmetic mean, mean square deviation) for each criterion of physical, functional fitness, physical fitness in relation to technique, integral assessment of competitive activity.

The 2nd step – based on the “3S rule”, according to which the interval from $\bar{x}+3S$ to $\bar{x}-3S$ contains 99.73% of all values

of the studied quantity (Byshevets et al., 2019), the interscore interval (ISI) was determined:

$$ISI = \frac{(\bar{x}+3S) - (\bar{x}-3S)}{9} (13)$$

The 3rd step is the definition of a 10-point scale of complex preparedness of highly qualified field hockey players: the value of the 1st point corresponded to the indicator – 3S; nine times the ISI value was added (or subtracted) to (from) this value (Table 2).

A comparative analysis of indicators of physical, functional fitness, physical fitness in relation to technique and competitive activity of highly qualified field hockey players before and at the end of the stage of direct preparation for the main competitions (Table 3) allows us to state that the training effects at this stage were effective. In particular, there were statistically significant changes in the indicators of the complex assessment of physical (8.0 %; $p<0.01$), functional (6.7%; $p<0.01$) preparedness, physical preparedness in relation to technology (1, 6%; $p<0.01$). Also, the statistical probability of increasing the indicators of the comprehensive assessment of players was observed by the value of the integrated assessment of competitive activity (6.1 %; $p<0.01$).

Table 2. Ten-point scale for evaluating the values of indicators of special abilities of highly qualified field hockey players (field players)

Indicator	Points									
	1	2	3	4	5	6	7	8	9	10
1 30 m run from a high start, s	4.59	4.51	4.43	4.35	4.27	4.19	4.11	4.03	3.95	3.87
2 Long jump from a place, m	1.98	2.11	2.24	2.37	2.50	2.63	2.76	2.89	3.02	3.15
3 180 m shuttle run, s	40.63	39.98	39.33	38.68	38.03	37.38	36.73	36.08	35.43	34.78
4 Cooper's test, m	2905.7	2904.5	3023.3	3082.1	3140.9	3199.7	3258.5	3317.3	3376.1	3434.9
5 MOCabs, l·min ⁻¹	3.30	3.45	3.60	3.75	3.90	4.05	4.20	4.35	4.50	4.65
6 MOCrel, ml·min ⁻¹ ·kg ⁻¹	40.91	43.73	46.55	49.37	52.19	55.01	57.83	60.65	63.47	66.29
7 IAI, relative units	2502.2	2579.1	2656.0	2732.2	2808.4	2884.6	2960.8	3037.0	3113.2	3189.4
8 ORI, relative units	16.03	17.09	18.15	19.21	20.27	21.33	22.39	23.45	24.51	25.57
9 Running 14.63 m with the kicking of the ball, s	2.95	2.90	2.85	2.80	2.75	2.70	2.65	2.60	2.55	2.50
10 Dribbling-going around the posts- hitting the goal, s	9.30	8.09	7.88	7.67	7.46	7.25	7.04	6.83	6.62	6.41
11 Dribbling - passing the ball into the goal, s	41.66	40.89	40.12	39.35	38.58	37.81	37.04	36.38	35.01	34.84
12 Hitting a ball with a stick at a distance, m	28.58	30.88	33.18	35.48	37.78	40.08	42.38	44.68	46.98	49.28
13 A series of shots on goal, s	32.78	31.81	30.84	29.87	28.90	27.93	26.96	25.99	25.02	24.05
14 Intensity coefficient, points	0.27	0.42	0.57	0.72	0.87	1.02	1.17	1.32	1.47	1.62
15 Mobility coefficient, points	0.59	0.86	1.13	1.40	1.67	1.94	2.21	2.48	2.75	3.02
16 Aggressiveness coefficient, points	0.19	0.44	0.69	1.13	1.57	2.01	2.26	2.51	2.76	3.01
17 Efficiency coefficient, points	0.51	0.56	0.61	0.66	0.71	0.76	0.81	0.86	0.91	0.96
18 Efficiency coefficient of single combats, points	0.15	0.24	0.33	0.42	0.51	0.60	0.69	0.78	0.87	0.96
19 Creativity coefficient, points	0.90	0.18	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.90
20 Integral assessment, points	2.18	2.94	3.70	4.46	5.22	5.98	6.74	7.50	8.26	9.02
21 Comprehensive evaluation, points	49.0	63.11	77.2	91.3	105.4	119.5	133.6	147.7	161.8	175.9

Notes: MOCabs – absolute indicator of maximum oxygen consumption; MOCrel – relative indicator of maximum oxygen consumption; IAI – integral adaptation index; ORI – operational recovery index

Table 3. Indicators of a comprehensive assessment of the preparedness of highly qualified field hockey players (n=21) during the stage of direct preparation for the main competitions

Types of preparedness	Comprehensive evaluation, points								
	SDP		Changes ($\Delta \bar{x}$)		Statistical indicators				
	Initial average values ($\bar{x}_1$)	Final average values ($\bar{x}_2$)	In points	%	d	σ	Sd	tp	p
Physical preparedness	24.0	26.1	2.1	8.0	2.4	2.37	0.51	4.71	<0.01
Functional preparedness	22.3	23.9	1.6	6.7	2.4	1.34	0.29	8.27	<0.01
Physical fitness in relation to technology	31.2	31.7	0.5	1.6	1.1	2.21	0.26	4.23	<0.01
Integrated assessment of competitive activity	35.1	37.4	2.3	6.1	0.7	0.71	0.16	4.38	<0.01

Notes: SDP – the stage of direct preparation for the main competitions; d – the arithmetic mean of the differences; σ – mean square deviation of the differences; Sd – standard error of the arithmetic mean of the differences; tp – estimated value of Student's t-test; p – level of significance

The indicators of the comprehensive assessment reflect the general level of preparedness of athletes and can serve as indicative models for the readiness of athletes for the main competitions of the sports season (Fig. 5).

Statistically probable changes that occurred in indicators of physical, functional fitness, physical fitness in relation to technique and competitive activity allow us to draw a conclusion about the rational construction of the training process of highly qualified hockey players at the stage of direct preparation for the main competitions.

Discussion

The training process of athletes at the stage of direct preparation for the main competitions of the sports season is determined by the training exercises on the basis of which the second phase (maintenance phase) of the sports uniform is formed. Sports form is the state of an athlete characterized by the best readiness for competitive activity. Sports form represents the harmonious development of all aspects of an athlete's preparedness (Bondarchuk, 2005; Bompá, Buzzichelli, 2018; Platonov, 2020). Based on this, in order to determine the state of sportsmen's sports form, a comprehensive assessment of their preparedness is necessary. In our study, a comprehensive assessment of the preparedness of highly qualified field hockey players at the stage of direct preparation for the main competitions was carried out on the basis of the following algorithm:

- determined tests for assessing the readiness of athletes, which to the greatest extent characterize the peculiarities of sports activity in field hockey;
- an integrated assessment of competitive activity in this sport was developed;
- a 10-point scale of comprehensive assessment of preparedness and competitive activity of highly qualified field hockey players was developed;
- a comparative analysis of the comprehensive preparedness of the players during the stage of direct preparation for the main competitions was carried out.

Our study is a continuation of solving the problem of comprehensive assessment in team game sports (Tyshchenko

et al., 2018; Doroshenko et al., 2020; Mitova, 2020, etc.). The proposed methodological approach of comprehensive assessment of the preparedness of highly qualified field hockey players significantly complements the results of previous studies in the context of the development and use of unified measurement units – points, which significantly simplifies the comparison of the obtained results, the comparison of different aspects of the athletes' preparedness. In our study, it was assumed, on the one hand, to develop a methodical approach to determine the comprehensive preparedness of highly qualified field hockey players, and on the other hand, to establish model indicators that reflected the level of their sports form. Thus, the presented models of preparedness can be used as a guide in the process of annual training and sports selection at the stages of multi-year improvement of field hockey players.

The integral assessment of competitive activity substantiated in previous studies (Kostiukevych et al., 2021; Shchepotina et al., 2021) was also reflected in field hockey. This emphasizes the important practical significance of the presented results, since the integral assessment acts as an objective and informative criterion of the competitive activity of hockey players, taking into account the quantitative and qualitative side of technical-tactical activity, the coordination complexity of technical-tactical actions, their tactical significance, the role of players, etc. Thus, the presented results complement the existing body of research on the assessment of competitive performance in team game sports (White, MacFarlane, 2015; Solovey et al., 2020; Oliynyk et al., 2021).

The knowledge accumulated regarding the structure of the stage of direct preparation for the main competitions of the season gained further development (Platonov, 2018). In addition, indicators of volumes and ratios of training equipment, loads of different orientations of highly qualified field hockey players represent a contribution to the existing scientific work on the content of the stage of direct preparation for competitions in team sports (Kostiukevych et al., 2019; Tyshchenko et al., 2019; Shchepotina et al., 2021).

The use of the results of this study will allow to optimize managerial influences in the training process of highly

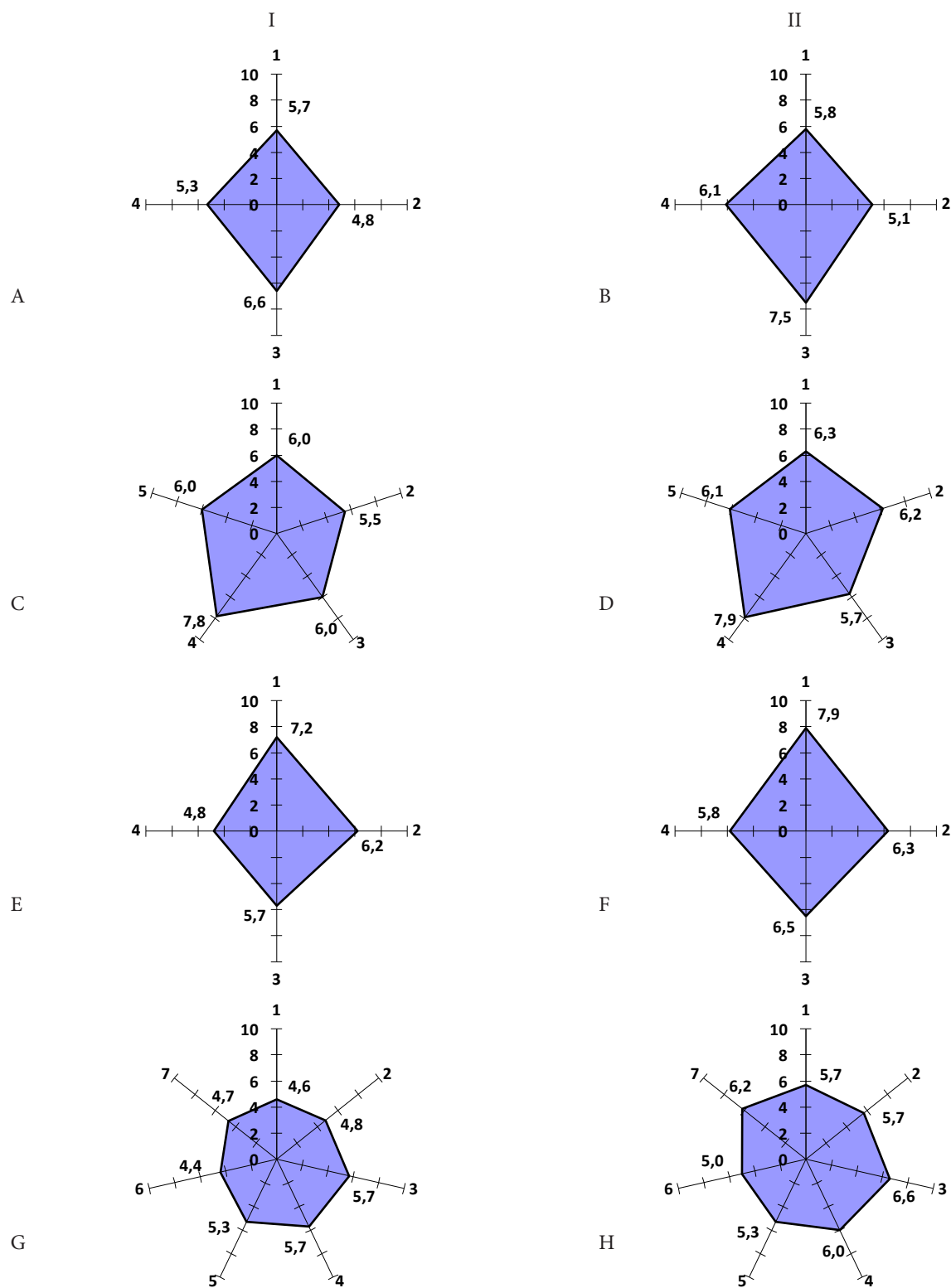


Fig. 5. Graphical models of a complex assessment of the preparedness of highly qualified field hockey players (n = 21) at the beginning (I) and at the end (II) of the stage of direct preparation for the main competitions: A, B – physical fitness: 1 – running 30 m from a high start; 2 – long jump from a standing position; 3 – shuttle run 180 m; 4 – Cooper's test; C, D – physical fitness in relation to technique: 1 – running 14.63 m with hitting the ball; 2 – dribbling the ball – going around the posts – hitting the goal; 3 – dribbling the ball – passing the ball into the goal; 4 – throwing the ball with a stick at a distance; 5 – a series of shots at the goal; E, F – functional readiness: 1 – absolute indicator of maximum oxygen consumption; 2 – relative indicator of maximum oxygen consumption; 3 – integral adaptation index; 4 – operational recovery index; G, H – competitive activity: 1 – intensity factor; 2 – mobility coefficient; 3 – coefficient of aggressiveness; 4 – efficiency ratio; 5 – efficiency coefficient of martial arts; 6 – creativity coefficient; 7 – integral assessment

qualified athletes, first of all, at the stage of direct preparation for the main competitions, where the main tasks of the sports season are solved.

Conclusions

A comprehensive assessment of athletes' preparedness reflects the optimal state of their readiness for effective participation in competitive activities, primarily for participation in major competitions. The scientific and methodical approach to the development of a complex assessment of the preparedness of highly qualified field hockey players involved an algorithm: definition of criteria for assessing the manifestation of various aspects of players' preparedness; development of a 10-point scale of values for each of the criteria (determination of the arithmetic mean ($\bar{x}$), mean square deviation (S), interscore interval according to the "3S rule"); assessment of test results; establishing model indicators of athletes' readiness for the main competitions of the sports season.

A statistically probable increase in the preparedness of highly qualified field hockey players during the stage of direct preparation for the main competitions was established at the significance level of $p < 0.01$ according to the indicators of physical (8.0%), functional (6.7%), physical preparedness in relationships connection with technology (1.6%), integrated assessment of competitive activity (6.1%). On the basis of these data, we can state the optimal construction of the players' training process at this stage.

The perspective of further research will be determined by determining the dynamics of a comprehensive assessment of the preparedness of highly qualified field hockey players during the annual macrocycle.

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Conflict of interests

The authors state that there is no conflict of interests.

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КОМПЛЕКСНА ОЦІНКА ПІДГОТОВЛЕНOSTІ ВИСОКОКВАЛІФІКОВАНИХ ХОКЕЇСТІВ НА ТРАВІ НА ЕТАПІ БЕЗПОСЕРЕДНЬОЇ ПІДГОТОВКИ ДО ГОЛОВНИХ ЗМАГАНЬ

Віктор Костюкевич^{1ABCDE}, Наталія Лазаренко^{1ACDE}, Вадим Адамчук^{1BCDE},
Наталія Щепотіна^{1BCDE}, Тетяна Вознюк^{1BCDE}, Оксана Шинкарук^{2BCDE},
Інна Асаулюк^{1BCDE}, Станіслав Коннов^{1BCDE}, Сергій Войтенко^{1BCDE}

¹Вінницький державний педагогічний університет імені Михайла Коцюбинського

²Національний університет фізичного виховання і спорту України

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 10 с., 3 табл., 5 рис., 26 джерел.

Мета дослідження – експериментально обґрунтувати методичний підхід щодо розробки комплексної оцінки підготовленості висококваліфікованих хокеїстів на траві на етапі безпосередньої підготовки до головних змагань.

Матеріал та методи. У дослідженні взяли участь висококваліфіковані гравці члени національної збірної команди України з хокею на траві (n=21). Середній вік гравців становив ($\pm$ S) 24,9 $\pm$ 5,76 років, спортивна кваліфікація – майстри спорту України. Дослідження проводилося упродовж першого та другого змагальних періодів двохциклового планування тренувального процесу висококваліфікованих хокеїстів на траві спортивного сезону 2020-2021 років. Упродовж першого

змагального періоду був розроблений методичний підхід до комплексної оцінки підготовленості висококваліфікованих хокеїстів на траві. В межах другого змагального періоду, до якого входив етап безпосередньої підготовки до головних змагань, було визначено показники комплексної оцінки підготовленості гравців. Для розробки комплексної оцінки підготовленості було використано тести та критерії для оцінки рівня фізичної, функціональної підготовленості, фізичної підготовленості у взаємозв'язку з технікою та змагальної діяльності хокеїстів.

Результати. Розроблено методичний підхід щодо комплексної оцінки підготовленості спортсменів високої кваліфікації в хокеї на траві за таким алгоритмом: визначення критеріїв прояву фізичної, функціональної підготовленості, фізичної підготовленості у взаємозв'язку з технікою, змагальної діяльності; розробка 10-бальної шкали оцінок; встановлення комплексної оцінки підготовленості гравців упродовж етапу безпосередньої підготовки до головних змагань.

Висновки. Структуру етапу безпосередньої підготовки до головних змагань склали базовий і спеціально-підготовчий мезоцикли. Обсяг безпосередньої рухової діяльності становив 38 год, зокрема, співвідношення засобів: загально-підготовчих вправ – 55,4 %, спеціально-підготовчих вправ – 19,5 %, підвідних вправ – 10,9 %, змагальних вправ – 15,2 %; співвідношення тренувальних навантажень: аеробних – 56,5 %, аеробно-анаеробних – 32,7 %, анаеробно-алактатних – 7,6 %, анаеробно-гліколітичних – 3,2 %. Встановлено статистично-вірогідну позитивну зміну ($p < 0,01$) показників комплексної оцінки підготовленості гравців упродовж етапу безпосередньої підготовки до головних змагань.

Ключові слова: висококваліфіковані хокеїсти на траві, етап безпосередньої підготовки до головних змагань, комплексна оцінка підготовленості, 10-бальна шкала.

Information about the authors:

Kostiukevych, Viktor: kostykevich.vik@gmail.com; <https://orcid.org/0000-0002-6215-764X>; Department of Theory and Methodology of Sports, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

Lazarenko, Nataliia: lazarenkoni@gmail.com; <https://orcid.org/0000-0002-3556-8849>; Department of Primary Education, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine

Adamchuk, Vadym: vadim-adamchuk@ukr.net; <https://orcid.org/0000-0002-5009-7221>; Department of Theory and Methodology of Sports, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

Shchepotina, Natalia: shchepa@mbx.vn.ua; <https://orcid.org/0000-0002-9507-3944>; Department of Theory and Methodology of Physical Education, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

Vozniuk, Tetiana: TV_Vinnitsa@ukr.net; <https://orcid.org/0000-0002-5951-7333>; Department of Theory and Methodology of Sports, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine

Shynkaruk, Oksana: shi-oksana@ukr.net; <https://orcid.org/0000-0002-1164-9054>; Department of Innovative and Information Technologies in Physical Education and Sport, National University of Ukraine on Physical Education and Sport, Fizkultury St, 1, Kyiv, 03680, Ukraine.

Asauliuk, Inna: innaasauliuk@gmail.com; <https://orcid.org/0000-0001-8119-2726>; Department of Theory and Methodology of Physical Education, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

Konnov, Stanislav: konnovstas12345@gmail.com; <https://orcid.org/0000-0002-2166-1735>; Department of Theory and Methodology of Sports, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

Voitenko, Serhii: voytenkosm@ukr.net; <https://orcid.org/0000-0003-0025-1064>; Department of Theory and Methodology of Sports, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ostrozkogo St, 32, Vinnytsia, 21001, Ukraine.

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