DETERMINATION OF THE STYLE OF PLAY OF YOUNG TENNIS PLAYERS TAKING INTO ACCOUNT INDIVIDUAL CHARACTERISTICS

ВИЗНАЧЕННЯ СТИЛЮ ГРИ ЮНИХ ТЕНІСИСТІВ З УРАХУВАННЯМ ІНДИВІДУАЛЬНИХ ОСОБЛИВОСТЕЙ

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Abstracts

Purpose is to determine the playing style of young tennis players, taking into account the psychophysiological, psychological and neurological indicators of athletes. Material and methods. The research group consisted of 24 tennis players aged 11–13 who train in the tennis section of the Polytechnic Sports Club of the National Technical University "Kharkiv Polytechnic Institute" at the stage of preliminary basic training of the 1st year of study. The tennis players underwent a survey of the tactical skills of tennis players using a specially developed questionnaire. The assessment of psychophysiological indicators of tennis players aged 11–13 was carried out using the "PsychoTest" software complex, which included tests to determine: simple visual-motor reaction, discrimination reaction, choice reaction, tapping test and short-term memory test. The Eysenck Personality Inventory (EPI) online personality questionnaire was used to diagnose the personality and temperament characteristics of athletes. It is easier for athletes to keep their balance if the quality of their balance function is high, which is one of the important informative stabilometric indicators. That is why the Romberg's test was used in the study, which was carried out using the Stabilan-01 software complex. Tennis players were asked to assess their balance with their eyes open and closed, standing on one leg with their arms raised. A factor analysis of indicators using the method of principal components and the Varimax rotation method with Kaiser normalization was carried out to determine the most significant indicators in the formation of the playing style, in parallel with this, the individual factor structure of each athlete was determined. Correlation analysis of test indicators and identified factors was carried out. Results**.** Factor analysis of the results of the survey of tactical skills of tennis players made it possible to divide the athletes into 4 groups depending on the style of play and to reveal the most significant indicators of the factor's severity. Correlation analysis made it possible to reveal relationships between psychophysiological, psychological and neurological indicators and playing styles of tennis players. Individual factor analysis made it possible to identify the most pronounced indicators that influence the choice of playing style of tennis players aged 11–13. Conclusions**.** The obtained results among tennis players aged 11–13 made it possible to reveal indicators that have the greatest contribution to the formation of playing styles. The basis for the formation of the playing style is a set of psychophysiological indicators and psychological properties of athletes. Identifying the relationships between the indicators allows you to orientate both the coach and the player to the identification of indicators of the tendency to choose one or another style of playing the game, which significantly affects the success of the game. Individual factor analysis of neurological and psychological indicators allows to identify predictor indicators of the way tennis players play and the formation of their successful strategy.

Key words: psychophysiological indicators, playing style, tactics, tennis players, factor analysis.

Мета – визначити стиль гри юних тенісистів з урахуванням психофізіологічних, психологічних та неврологічних показників спортсменів. Матеріал і методи**.** До складу досліджуваної групи вхо-

дили 24 тенісисти віком 11–13 років, які тренуються у секції тенісу спортивного клубу «Політехнік» Національного технічного університету «Харківський політехнічний інститут» на етапі попередньої базової підготовки 1 року навчання. Тенісисти проходили анкетування з тактичних навичок тенісистів за допомогою спеціально розробленої анкети. Оцінка психофізіологічних показників тенісистів 11–13 років проводилась з використанням програмного комплексу «ПсихоТест», яка включала тести на визначення простої зорово-моторної реакції, реакції розрізнення, реакції вибору, тепінг-тест та тест на короткочасну пам'ять. Для діагностики особистості та характеристик темпераменту спортсменів використовувався онлайн особистісний опитувальник Айзенка EPI (Eysenck Personality Inventory). Утримувати рівновагу спортсменам легше, якщо якість функції рівноваги у них висока, що є одним з важливих інформативних стабілометричних показників. Саме тому у дослідженні застосовувався тест «Проба Ромберга», який проводився за допомогою програмного комплексу «Стабілан-01». Тенісистам пропонувалось оцінити свою рівновагу з відкритими та закритими очима, стоячи на одній нозі з піднятими руками вгору. Проведено факторний аналіз показників методом головних компонент і методу обертання Varimax з нормалізацією Кайзера для визначення найбільш значущих показників у формуванні стилю гри, паралельно з цим визначалась індивідуальна факторна структура кожного спортсмена. Проведено кореляційний аналіз показників тестування та виявлених факторів. Результати. Факторний аналіз результатів опитування тактичних навичок тенісистів дозволив розділити спортсменів на 4 групи залежно від стилю гри та виявити найбільш значущі показники вираженості фактора. Кореляційний аналіз дозволив виявити взаємозв'язки між психофізіологічними, психологічними та неврологічними показниками та стилями гри тенісистів. Індивідуальний факторний аналіз дозволив виділити найбільш виражені показники, які впливають на вибір стилю гри тенісистів 11–13 років. Висновки. Отримані результати серед тенісистів 11–13 років дозволили виявити показники, які мають найбільший внесок у формування стилів гри. Фундаментом у формуванні стилю гри лежить комплекс психофізіологічних показників та психологічних властивостей спортсменів. Виявлення взаємозв'язків між показниками дозволяє зорієнтувати як тренера, так і гравця на виявлення індикаторів схильності до вибору одного чи іншого стилю ведення гри, що суттєво впливає на успішність ігрової діяльності. Індивідуальний факторний аналіз неврологічних та психологічних показників дозволяє виділити показники-предиктори способу ведення гри тенісистів та формування їх успішної стратегії.

Ключові слова: психофізіологічні показники, стиль гри, тактика, тенісисти, факторний аналіз.

Introduction. To succeed in a sport, it is necessary to possess exceptional tactical skills [1–4]. Tennis is a fast-paced sport where players often need to make quick and accurate tactical decisions of high efficiency and productivity [5–8]. Tennis players need to identify and use meaningful and kinematic information to predict their opponent's intentions under time constraints.

In modern tennis, it is extremely necessary for a player to receive predictive information about the position of the opponent on the court, the sequence of strokes, his intentions and goals. Scientists Borysova, Fonseca Morales, Martínez-Gallego, Filipcic, Leskosek, Crespo, Kozina, Sobko, etc. [8–20] suggest that the first thing is to obtain generalized, analyzed in advance and corrected information, which is the source of predicting the opponent's actions, and that in the background is the appearance of kinematic information from the opponent's actions, already around the contact of the racket with the ball, which is considered as a confirmation of previous settings. Thus, as the appropriate signals from the opponent are received, there is a decrease in the number of options for the appropriate response, and this leads to the emergence of only one variant with a high probability of success [22].

Many authors corroborate the information that highly skilled players are better at detecting non-verbal information from an opponent compared to less skilled players [21–25]. This leads to better anticipation of the situation and rational, more effective decision-making [25]. Professional tennis players have the ability to put pressure on opponents, to execute counter-punches that are likely to compromise the opponent's actions (for example, to make the opponent move more on the court, or to exploit the opponent's weakness).

In the practice of tennis coaches, the concept of "game intelligence" is considered a necessary key point for athletes' performances, it is often defined as the ability to "read the game" and act accordingly [1; 2; 4; 6]. Since tactical skills such as foresight, decision-making, positioning, game intelligence, game thinking, adaptability, variability must be well developed to meet the modern requirements of tennis, their formation

and monitoring is important for the development of the player already at the stage of preliminary basic training.

Nevertheless, in modern literature, the problems of tactical training of young tennis players are not sufficiently covered, there is no tool for assessing tactical skills and abilities, there is no algorithm for the formation of an individual style of play.

Based on the relevance of assessment and planning of tactical skills in tennis, **the purpose of this study** is to determine the style of play of young tennis players, taking into account the psychophysiological, psychological and neurological indicators of athletes.

Material and methods

Participants. The study involved 24 tennis players aged 11–13 years who train in the tennis section of the sports club "Polytechnic" of the National Technical University "Kharkiv Polytechnic Institute" at the stage of preliminary basic training of the 1st year of study. All study participants were informed of the purpose of the study and agreed to participate.

Procedure. The study was conducted from September 2023 to December 2023 on the basis of the Polytechnic Sports Complex of the National Technical University "Kharkiv Polytechnic Institute". At the first stage of the study, tennis players were questioned about the tactical skills of tennis players using a specially designed questionnaire. Participants filled out the questionnaire individually under the supervision of a trainer. All participants were interviewed for 3 weeks. At the second stage of the study, the athletes underwent psychophysiological testing for 2 weeks. The third stage was devoted to the statistical processing of the research results and the analysis of the data obtained.

Tennis players' tactical skills questionnaire. The developed questionnaire consists of 31 questions, the answers to which are possible on a 5-point scale, where "1" – almost never, very indirectly; "5" – almost always, very beautiful. The first 16 questions are aimed at determining the number and variations of tactical skills, questions 17–31 are aimed at analyzing the quality of the applied tactical skills and abilities.

Psychological, psychophysiological and neurological methods. The assessment of psychophysiological indicators of tennis players aged 11–13 was carried out using the software package "PsychoTest", which included tests to determine: simple visual-motor reaction, discrimination reaction, selection reaction, tapping test and short-term memory test. All these tests determine the sensitivity to psychophysiological stress, the speed of switching from one action to another, the speed abilities of the athlete, the speed of response to changing tactical situations, the accuracy of choosing the best course of action depending on the specific tactical situation or the actions of the opponent, the balance of nervous processes and the timeliness of response. To diagnose the personality and temperament characteristics of athletes, Eysenck's online personality questionnaire EPI (Eysenck Personality Inventory) was used, which consisted of 56 questions. The characteristics of the individual psychological composition and the characteristics of a person in terms of emotional stability, anxiety, level of self-esteem and possible vegetative disorders were determined. It is easier for athletes to maintain balance if the quality of their balance function is high, which is one of the important informative stabilometric indicators. That is why the study used the Romberg's test, which was carried out using the Stabilan-01 software package. Tennis players were asked to assess their balance with their eyes open and closed, standing on one leg with their arms raised. The maximum balance time was estimated.

Statistical Methods. The results of the research were processed using the IBM SPSS Statistics 23 statistical program. All samples were checked for the normality of the distribution according to the $\chi 2$ test and the Monte Carlo test, and all of them had a normal distribution ($p > 0.05$). The next step was to determine the descriptive statistics for each measured indicator (arithmetic mean x, standard deviation S, and standard error m). Based on the results of the survey of tennis players, a factor analysis was carried out using the principal component method and the Varimax rotation method with Kaiser normalization. At the same time, at the same time, the individual factor structure of the results of testing the tactical skills of each athlete was determined.

Results. The examination for the normality

of distribution of test indicators indicated that all test indicators conform to a normal distribution (with asymptotic significance according to the $\chi 2$ test > 0.05; significance according to the Monte Carlo test > 0.05). The distribution of indicators within the analyzed sample does not substantially deviate from a Gaussian normal distribution (Table 1).

In the study, a special questionnaire of tactical skills of tennis players (Tennis Players' Tactical Skills Questionnaire) was developed. The purpose of its implementation was to obtain

Table 1

$\chi 2$ test results of psychological, psychophysiological and neurological features for the normal distribution of a tennis players (n = 24)

Indicators		Latency time choice response 1 attempt (ms)	Latency time choice response 2 attempt (ms)	Latency time choice response 3 attempt (ms)	Time of the latent period of a simple visual-motor connection reaction (ms)	Errors in the test for determining the latency time of a simple visual-motor reaction (number)	Mean square deviation of the latency time of a simple visual-motor reaction (ms)	The time of the latent period of the selection reaction in the feedback mode (ms)
χ^2		1.71	3.71	0.00	4.286	0.00	0.00	0.00
df		41	41	41	41	41	41	41
Asymp. Sig.		0.2	0.90	0.009	0.09	0.99	0.99	0.99
Monte Carlo Sig.		0.48	0.90	0.999	0.525	0.99	0.99	0.99
95% Confidence Interval	Lower Bound	0.47	0.00	0.976	0.515	0.97	0.97	0.97
	Upper Bound	0.49	0.01	0.999	0.534	0.99	0.99	0.99

Continuation Table 1

Indicators		Errors in the test for determining the latency of the choice reaction in the feedback mode (number)	Mean squared deviation of individual values of the latent time of the choice reaction in the feedback mode (ms)	Minimum signal exposure time in feedback mode (ms)	Total test execution time in feedback mode (s)	Time to reach the minimum exposure of the signal in the feedback mode (s)	Romberg's test (c)	Eysenck Personality Inventory	Tapping test (ms)	The time of the latent period of the discrimination reaction (ms)	Errors in the test for determining the latent time of the discrimination reaction (number)	Mean square deviation of the latency of the discrimination reaction (ms)
Chi-Square		0.00	1.71	7.71	0.00	4.286	4.286	0.00	0.00	4.286	2.571	5.143
df		41	41	41	41	41	41	41	41	41	41	41
Asymp. Sig.		0.99	0.42	0.90	0.99	0.509	0.50	0.99	0.99	0.50	0.46	0.27
Monte Carlo Sig.		0.99	0.48	0.00	0.99	0.525	0.52	0.99	0.99	0.52	0.49	0.27
95% Confidence Interval	Lower Bound	0.97	0.47	0.00	0.97	0.515	0.51	0.97	0.97	0.51	0.48	0.27
	Upper Bound	0.99	0.49	0.01	0.99	0.534	0.53	0.99	0.99	0.53	0.50	0.28

self-reports from players about their tactical skills over a long period of time, regardless of their form, day or opponent. Table 2 presents the average test scores and their statistical values.

As you know, psychophysiological and neurological aspects affect the player's ability to effectively solve tactical problems and interact on the court [4; 5; 6; 7; 8; 9; 14; 19; 20; 25]. The results of the assessment of these indicators allow us to assert that tennis players aged 11–13 have a sufficient level of development of psychophysiological, psychological and neurological capabilities and this can serve as a foundation for the formation of an individual style of play (Table 3).

According to scientists [6; 7; 8; 14; 15; 16; 24; 25], the use of factor analysis is aimed at reducing variables, identifying hidden relationships between indicators and determining the main components that determine the structure of athletes' fitness. Thus, in our study, the data obtained from the results of the survey factor analysis allowed us to identify 4 components (Table 4).

According to the analysis, the first component with the highest severity coefficient included answers to questions No. 1 "I use the weak spot of my opponent" (r=0.813), question No. 2 "I quickly see where my opponent is serving to" (r=0.833), question No. 3 "When I am under pressure from my opponent, I make the right decisions" (r=0.886), question No. 5 "Before my opponent hits the ball, I move toward the right spot" (r=0.844), question 12 "Before my

Table 2

Average test scores of answers of Tactical Skills Questionnaire of tennis players (n = 24)

Question	N	$\bar{x}$	S	m
1. I use the weak spot of my opponent	24	3.62	1.24	0.25
2. I quickly see where my opponent is serving to	24	3.25	1.39	0.28
3. When I am under pressure from my opponent, I make the right decisions	24	2.12	0.99	0.20
4. In a cross rally I choose the right moment to open down the line	24	3.75	1.15	0.23
5. Before my opponent hits the ball, I move toward the right spot	24	2.66	1.52	0.31
6. I choose the right moment to change the direction of the ball	24	2.95	1.16	0.23
7. When my opponent serves, I quickly move to the right spot	24	2.95	1.36	0.27
8. When I want to disrupt my opponent, I change the (top) spin of my balls	24	3.00	1.25	0.25
9. I quickly see where my opponent is standing with my service	24	2.91	1.34	0.27
10. I incorporate the experiences of earlier points in my decisions	24	2.4583	1.17	0.24
11. When I want to disrupt my opponent, I change the height of my balls	24	2.95	1.36	0.27
12. Before my opponent hits a drop shot, I move forward	24	2.95	1.54	0.31
13. When I notice that my tactical plan is not working, I quickly adjust my game	24	2.91	1.47	0.30
14. I quickly see when my opponent changes the direction of the ball	24	3.45	1.55	0.31
15. When I am in an attacking position, I see where the open space is	24	3.79	1.41	0.28
16. When I'm at the net, I quickly see where my opponent is hitting the ball	24	3.16	1.40	0.28
17. I make productive decisions on my next shot	24	3.45	1.41	0.28
18. I know in advance the service direction of the opponent	24	2.75	1.39	0.28
19. I make the right decisions at the right time	24	3,20	1,02	0.20
20. I choose to keep the ball on the court to win a point	24	3.29	1.19	0.24
21. Changing my shots at the right time	24	2.87	1.32	0.27
22. Being in the right place at the right time	24	2.83	1.23	0.25
23. I have gaming intelligence	24	2.83	1.43	0.29
24. Making the right decisions when my opponent is under pressure	24	3.00	1.28	0.26
25. I take a productive position on the court	24	3.41	1.24	0.25
26. I determine the depth of the incoming ball	24	2.79	1.31	0.26
27. I take the right position when my opponent puts pressure on me	24	3.20	1.31	0.26
28. I recognize game situations	24	3.95	1.16	0.23
29. I quickly recognize the weaknesses of my opponent	24	3,.70	1.23	0.25
30. My position is in the middle of the court when I put pressure on my opponent	24	3.37	1.17	0.23
31. I attack by responding to my opponent's defensive ball	24	3.58	1.17	0.24

Table 3

Descriptive statistics of psychological, psychophysiological and neurological indicators of a tennis players (n = 24)

Indexes	N	$\bar{x}$	S	m
Latency time choice response 1 attempt (ms)	24	15.66	1.55	0.31
Latency time choice response 2 attempt (ms)	24	16.16	1.57	0.32
Latency time choice response 3 attempt (ms)	24	16.95	1.68	0.34
Time of the latent period of a simple visual-motor connection reaction (ms)	24	369.50	49.46	10.09
Errors in the test for determining the latency time of a simple visual-motor reaction (number)	24	0.83	1.00	0.20
Mean square deviation of the latency time of a simple visual-motor reaction (ms)	24	2.79	0.06	0.01
The time of the latent period of the selection reaction in the feedback mode (ms)	24	500.41	30.26	6.17
Errors in the test for determining the latency of the choice reaction in the feedback mode (number)	24	22.83	1.83	0.37
Mean squared deviation of individual values of the latent time of the choice reaction in the feedback mode (ms)	24	4.10	0.17	0.03
Minimum signal exposure time in feedback mode (ms)	24	465.83	26.02	5.31
Total test execution time in feedback mode (s)	24	109.37	3.33	0.68
Time to reach the minimum exposure of the signal in the feedback mode (s)	24	79.04	8.93	1.82
Romberg's test (s)	24	96.70	11,.10	2.26
Eysenck Personality Inventory	24	4.16	1.94	0.39
Tapping test (ms)	24	5.41	0.84	0.17
The time of the latent period of the discrimination reaction (ms)	24	564.08	18.32	3.74
Errors in the test for determining the latent time of the discrimination reaction (number)	24	4.45	3.62	0.73
Mean square deviation of the latency of the discrimination reaction (ms)	24	3.84	0.57	0.11

Table 4

Factor analysis of the results of the Tactical Skills Questionnaire of tennis players 11–13 years old using the Varimax method (n = 24)

Items	Component			
	1 "Sense of play"	**2 "Game intelligence"**	**3 "Recogni-zing game situations"**	**4 "Adaptability"**
Quantity of tactical skills ("1" = almost never and "5" = almost always)				
1. I use the weak spot of my opponent	.813			
2. I quickly see where my opponent is serving to	.833			
3. When I am under pressure from my opponent, I make the right decisions	.886			
4. In a cross rally I choose the right moment to open down the line	.354	.426		
5. Before my opponent hits the ball, I move toward the right spot	.844			
6. I choose the right moment to change the direction of the ball		-.409	-.360	
7. When my opponent serves, I quickly move to the right spot	.427			
8. When I want to disrupt my opponent, I change the (top) spin of my balls		.314		.408
9. I quickly see where my opponent is standing with my service		.408		.450
10. I incorporate the experiences of earlier points in my decisions	-.390		-.494	

Continuation Table 4

Items	Component			
	1 "Sense of play"	**2 "Game intelligence"**	**3 "Recogni-zing game situations"**	**4 "Adaptability"**
11. When I want to disrupt my opponent, I change the height of my balls		-.400		.585
12. Before my opponent hits a drop shot, I move forward	**.623**	-.343		
13. When I notice that my tactical plan is not working, I quickly adjust my game		.673		.369
14. I quickly see when my opponent changes the direction of the ball		-.572		
15. When I am in an attacking position, I see where the open space is	.344		.563	
16. When I'm at the net, I quickly see where my opponent is hitting the ball			-.456	-.507
Quality of tactical skills ("1" = very mediocre and "5" = very good)				
17. I make productive decisions on my next shot		-.681		.398
18. I know in advance the service direction of the opponent				.445
19. Making the right decisions at the right time				
20. I choose to keep the ball on the court to win a point	.337		.600	
21. Changing my shots at the right time	-.356	**.577**		.427
22. Being in the right place at the right time			-.675	
23. I have gaming intelligence	.473	.400		-.302
24. Making the right decisions when my opponent is under pressure				.382
25. I take a productive position on the court			.356	
26. I determine the depth of the incoming ball	-.546	**.543**		
27. I take the right position when my opponent puts pressure on me			.409	.343
28. I recognize game situations	.375		.504	-.376
29. I quickly recognize the weaknesses of my opponent			**,602**	
30. My position is in the middle of the court when I put pressure on my opponent		-.359	.397	-.313
31. I attack by responding to my opponent's defensive ball	-.367			-.317

opponent hits a drop shot, I move forward" (r=0.623). One of the types of playing styles is the counter strike style. In draws, this is manifested in holding the ball in the court for a long time at an average pace, waiting for a favorable moment to attack. Counter-punchers are characterized by high rates of endurance and speed endurance, thus the factor was called "Sense of play".

The second factor included answers to questionnaire No. 13 "When I notice that my tactical plan is not working, I quickly adjust my game" (r=0.673), question No. 21 "Changing my shots at the right time" (r=0.577), question No. 26 "I determine the depth of the incoming ball" (r=0.543). The answers of the players included in this component tend to predict some game situations, are able to vary different styles of play adapting to the opponent's game, analyze game situations well and make the right decisions in time. The style of player data corresponds to the universal and according to the detected indicators, the factor is called "Game intelligence".

The third factor included answers to question No. 29 "I quickly recognize the weaknesses of my opponent" (r=0.602), question No. 20 "I choose to keep the ball on the court to win a point" (r=0.600), question No. 15 "When I am in an attacking position, I see where the open space is" (r=0.563). Players whose answers are included in this factor are good at recognizing game situations in the ball play, and have the ability to "see the court". More often than not, these players choose a style of play along the back line, have attacking shots from the rebound and high accuracy of hits. Thus, this factor was characterized as "Recognizing game situations".

The fourth factor is called "Adaptability", it includes answers to questions No. 11 "When I want to disrupt my opponent, I change the height of my balls" (r=0.585), question No. 9 "I quickly see where my opponent is standing with my service" (r=0.450), question No. 18 "I know in advance the service direction of the opponent" (r=0.445). These indicators are characterized as moderate, demonstrate the ability of tennis players to adapt to the opponent's game, analyze the opponent and arrange their game accordingly.

Table 5 presents the relationship of psychological, psychophysiological and neurological indicators with the identified factors of the survey of tactical skills of tennis players.

The indicator "Errors in the test for determining the latency time of a simple visual-motor reaction (number)" indicates that errors in the test for determining the latency period of a simple visual-motor reaction have a moderate positive correlation with the "Sense of play" factor (r=0.421), and this correlation is statistically significant (p=0.040). This may indicate that effective bug management may be important for improving the feel of the game in players. A statistically significant moderate

Table 5

Correlation matrix of indicators of psychological, psychophysiological and neurological indicators of tennis players to the components of the Tactical Skills Questionnaire (n=24)

Indicators		"Sense of play"	"Game intelligence"	"Recognizing game situations"	"Adaptability"
Time of the latent period of a simple visual-motor connection reaction (ms)	Pearson correlation (r)	0.212	0.062	-0.212	-0.114
	Value (bilateral) (p)	0.320	0.774	0.320	0.596
	N	24	24	24	24
Errors in the test for determining the latency time of a simple visual-motor reaction (number)	Pearson correlation (r)	0.421*	-0.067	-0.317	0.067
	Value (bilateral) (p)	0.040	0.755	0.131	0.755
	N	24	24	24	24
Mean square deviation of the latency time of a simple visual-motor reaction (ms)	Pearson correlation (r)	0.519**	0.000	-0.128	0.104
	Value (bilateral) (p)	0.009	0.999	0.552	0.628
	N	24	24	24	24
The time of the latent period of the discrimination reaction (ms)	Pearson correlation (r)	-0.138	0.217	-0.244	-0.112
	Value (bilateral) (p)	0.521	0.308	0.251	0.603
	N	24	24	24	24
Errors in the test for determining the latent time of the discrimination reaction (number)	Pearson correlation (r)	0.159	-0.021	-0.064	0.257
	Value (bilateral) (p)	0.459	0.922	0.768	0.225
	N	24	24	24	24
Mean square deviation of the latency of the discrimination reaction (ms)	Pearson correlation (r)	-0.102	0.036	-0.015	0.000
	Value (bilateral) (p)	0.636	0.866	0.943	1.000
	N	24	24	24	24

Continuation Table 4

Indicators		"Sense of play"	"Game intelligence"	"Recognizing game situations"	"Adaptability"
The time of the latent period of the selection reaction in the feedback mode (ms)	Pearson correlation (r)	-0.091	0.190	-0.286	-0.005
	Value (bilateral) (p)	0.674	0.375	0.176	0.982
	N	24	24	24	24
Errors in the test for determining the latency of the choice reaction in the feedback mode (number)	Pearson correlation (r)	-0.322	-0.288	-0.060	0.268
	Value (bilateral) (p)	0.125	0.172	0.779	0.205
	N	24	24	24	24
Mean squared deviation of individual values of the latent time of the choice reaction in the feedback mode (ms)	Pearson correlation (r)	-0.312	0.075	-0.293	-0.085
	Value (bilateral) (p)	0.138	0.728	0.165	0.691
	N	24	24	24	24
Minimum signal exposure time in feedback mode (ms)	Pearson correlation (r)	0.007	0.286	-0.286	0.069
	Value (bilateral) (p)	0.974	0.176	0.176	0.750
	N	24	24	24	24
Total test execution time in feedback mode (s)	Pearson correlation (r)	-0.231	0.418*	0.154	0.152
	Value (bilateral) (p)	0.276	0.042	0.472	0.478
	N	24	24	24	24
Time to reach the minimum exposure of the signal in the feedback mode (s)	Pearson correlation (r)	0.003	0.150	-0.484*	0.074
	Value (bilateral) (p)	0.989	0.485	0.016	0.731
	N	24	24	24	24
Romberg's test (s)	Pearson correlation (r)	0.049	-0.216	-0.335	-0.006
	Value (bilateral) (p)	0,.820	0.310	0.109	0.978
	N	24	24	24	24
Eysenck Personality Inventory	Pearson correlation (r)	-0.312	-0.158	-0.120	0.274
	Value (bilateral) (p)	0.137	0.462	0.577	0.194
	N	24	24	24	24
Tapping test (ms)	Pearson correlation (r)	0.481*	0.128	0.089	-0.286
	Value (bilateral) (p)	0.017	0.551	0.681	0.175
	N	24	24	24	24
Latency time choice response 1 attempt (ms)	Pearson correlation (r)	0.607**	-0.091	0.258	-0.381
	Value (bilateral) (p)	0.002	0.672	0.224	0.067
	N	24	24	24	24
Latency time choice response 2 attempt (ms)	Pearson correlation (r)	0.545**	-0.121	0.214	-0.265
	Value (bilateral) (p)	0.006	0.574	0.315	0.211
	N	24	24	24	24
Latency time choice response 3 attempt (ms)	Pearson correlation (r)	0.532**	0.119	0.082	-0.353
	Value (bilateral) (p)	0.007	0.580	0.702	0.091
	N	24	24	24	24

** – The correlation is significant at 0.01 (bilateral).

* – The correlation is significant at the level of 0.05 (bilateral).

positive relationship was found between “Mean square deviation of the latency time of a simple visual-motor reaction” and the “Sense of play” factor (r=0.519) at significance (p=0.009). This may indicate that the feel of the game influences the variability in reaction time. In the context of tennis, variability in reaction time can affect tennis players’ readiness for different tactical situations. There is also a statistically significant moderate positive relationship between “Tapping test (ms)” and the feeling of the game (r=0.481) at significance (p=0.017). This means that players with higher values of the “Sense of play” factor may have greater speed or better coordination of movements. Also, 1 factor with significant correlation indicators included the indicators “Latency time choice response 1 attempt (ms)” (r=0.607) (c=0.002), “Latency time choice response 2 attempt (ms)” (r=0.545) (p=0.006) and “Latency time choice response 3 attempt (ms)” (r=0.532) (p=0.007), which is characterized by a higher rate of choice of responses in attempts and indicates the ability to maintain a high rate of reaction and accurately determine the optimal decisions in the game.

Total test execution time in feedback mode (s) (r=0.418) (p=0.042) has the greatest impact on the “Game intelligence” factor, and this may indicate that tennis players pay more attention to detail, analysis of situations and the choice of optimal strategies in the match. The most significant indicator in the “Recognizing game situations” factor was “Time to reach the minimum exposure of the signal in the feedback mode (s)” (r=-0.484) (p=0.016). This may indicate greater sensitivity and speed of reaction of tennis players to the signals entered, which can be important in the game for effective decision-making and the execution of appropriate actions.

Figure 1 shows the percentage of severity of each factor in each athlete.

Based on the data provided, it was found that the “Sense of play” factor includes player No. 15, he has the highest score (100%), which may indicate a high level of feeling of the game, and player No. 8, has the lowest score (16.67%), which may indicate a less pronounced feeling of the game compared to other players.

The “Game intelligence” factor includes: player No. 24, has the highest score (100%), which indicates a high level of intelligence of the game; Player No. 18, he has the lowest score (4.17%), which may indicate less developed gaming intelligence. The "Recognizing game situations" factor includes player No. 15, who again has the highest score (100%), indicating

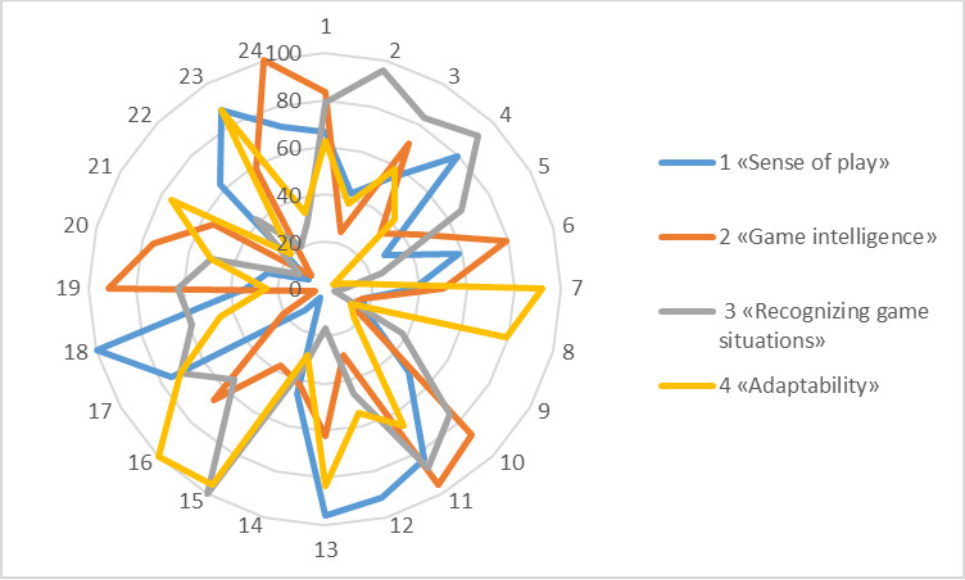

Fig. 1. The percentage value of the expression of each factor of each athlete

a high ability to recognize game situations, and player No. 21, who has the lowest score (8.33%), which may indicate a less developed ability to recognize game situations.

The "Adaptability" factor consists of player No. 15, who again has the highest score (100%), indicating a high level of adaptability in the game, and player No. 5, who has the lowest score (4.17%), which may indicate a less pronounced ability to adapt in the game.

Consequently, player No. 15 stands out from the rest in all four factors, which may indicate his overall high level of tennis and skill in all aspects. Players No. 8, No. 18, No. 21 and No. 5 show less high scores in various factors, which may indicate areas for further improvement in their tennis game.

Discussion. In the modern scientific and methodological literature, the problem of tactical training of tennis players is little or completely absent data on the aspects of tennis player training and what impact it has on the achievement of success in tennis [3–21]. The study is the first to highlight the factors that influence the formation of the individual style of play of tennis players.

To learn the tactical skills of players, it is important to consider both the "quality" and the "quantity" of these skills. Quality is determined by the skill level of the players in the tactical skills detected, while the quantity refers to how often the players use their tactical skills. Both aspects can affect the outcome of the match. For example, the effectiveness of a game depends on the ability of players to make the right decisions about their next actions. Thus, the level of skill in performing these actions affects the success in the match. Additionally, players who regularly make the right choices for the next shot end up ahead of those who sometimes make the right decision. This shows that the outcome of the game is also determined by the player's ability to make the right decisions at the right moment.

Thus, in this study, a questionnaire for self-assessment of tennis players' tactical skills was developed and applied, which consists of 31 questions, the answers to which determine the leading tactical skills and abilities. With the help of this survey, we obtained data on the peculiarities of the course of the game of tennis players, their preferences for decision-making, and the property of "seeing the court".

To analyze the answers, to assess the ability of tennis players to make decisions and react to different game situations and to summarize information about the level and quality of tactical skills of each player, factor analysis using the principal component method and the Varimax rotation method with Kaiser normalization was used. We relied on the results of research by scientists Kozina, Kozin, Boychuk, Skaliy, Zelenskiy, Honcharenko, etc. [15; 16; 24; 25], who study the training of athletes in various sports using multivariate analysis methods. The factor analysis in our study helped to identify the main factors influencing the tactical skills of tennis players. According to the results of the analysis, four factors have been identified that have a significant contribution to the formation of tennis players' playing style:

1. "Sense of play": this factor is related to the player's ability to understand the game, identify vulnerabilities to the player, and exploit them.

2. "Game intelligence": this factor indicates the ability to react quickly to the opponent's game, make the right decisions and adapt during the match.

3. "Recognizing game situations": players with this factor can quickly identify game situations and make the right decisions according to the circumstances.

4. "Adaptability": this factor reflects the player's ability to adapt to different game conditions and change their strategy accordingly.

Thus, the analysis made it possible to identify the key components that form the tactical aspects of tennis players' play. This can be helpful for coaches and athletes in preparing for matches, improving tactical strategies, and improving game efficiency.

Having identified the leading factors of introspection of tennis players' tactical skills at the next stage, we needed to determine the psychological, psychophysiological and neurophysiological indicators that have a significant impact on the formation of these factors and how they are related. Based on the data, we can focus on some key aspects:

1. Factor 1 ("Sense of play"). There is a positive correlation (r=0.212) with the latency time of the simple visual-motor response, and this may indicate that players with a more pronounced sense of play tend to react faster. The high correlation (r=0.607) with the latent response time to the selection in the first attempt indicates that this factor may be important for successful selections in the game. An overall high correlation with the tempo test (r=0.481) may indicate that players with a higher level of "Sense of play" have a better response to the pace demands of the game.

2. Factor 2 ("Game intelligence"): the found average correlation (r=0.418) with the total time to complete the test in the feedback mode can indicate the ability of the player's intelligence to adapt to new conditions and the speed of decision-making. Players with a higher level of "game intelligence" tend to be effective and adapt their game to different circumstances.

3. Factor 3 ("Recognizing game situations"): The positive correlation (r=0.286) with the latency period of the feedback selection may indicate that players with a higher level of "Recognizing game situations" have better adaptability to the conditions of the feedback game. This factor affects players' ability to recognize the game in different situations and adapt their decisions quickly.

4. Factor 4 ("Adaptability"). The overall correlation of this factor with trials indicates that "Adaptability" may be key to a successful tennis game. A negative correlation with temperament and a negative correlation with the number of errors in the test may indicate that players with a higher level of adaptability can better control their actions and strategies across players.

Hence, the ability to react quickly, make effective choices, and adapt to different situations are key elements for tennis players. Testing such characteristics can assist coaches in formulating individual training programs to improve players' weaknesses. This data can be used to develop personalized training programs and approaches for each player in order to maximize their potential and improve their performance on the court.

Measuring the severity of each factor in each observer provided us with more detailed insight into individual differences between participants. This can be useful in understanding exactly what aspects of each factor, its severity, affect each player's performance. The advantages of this approach are: individualization of training (knowing which aspects of each factor are more pronounced in a particular player, the coach can create more individualized training programs); directed work on weaknesses (identifying specific areas where severity is lowest allows you to accurately identify the weaknesses of the players. Thus, the coach can develop a strategy to improve these aspects; optimization of game strategies (understanding which factors affect the weaknesses of the players). the success of the players, can help coaches and players optimize their game strategies by focusing on strengths and working on weaknesses; selection of optimal training methods (taking into account individual differences, the coach can determine the optimal training methods for each player, which can lead to faster and more effective development); monitoring of dynamics (repeated measurements allow you to track the dynamics of changes in the severity of factors in each player over time, which is important for assessing the effectiveness of training.

It can be concluded that the psychometric assessment of the tactical skills of tennis players contributes to a more effective individualization of the training process and can help each player develop according to his unique strengths and weaknesses, thereby forming his own style of playing.

Conclusions

1. The data of scientists [12; 17; 21] were analyzed and supplemented that the psychometric assessment of the tactical skills of tennis players at the age of 11–13 years can have an important impact on the formation of their individual style of play. The assessment of such skills allows you to obtain objective information about the level of players in a number of key tactical aspects. The first is individual development: each player has a unique style of play, and identifying his tactical strengths and weaknesses allows him

to work effectively on the development and improvement of this style. Secondly, it is strategic game planning: psychometric assessment of tactical skills provides coaches and athletes with information to develop game strategies; The ability to choose the right tactical decisions can have a significant impact on a player's success on the court. Thirdly, it is the optimization of training: knowing the tactical strengths and weaknesses of the players allows coaches to choose effective exercises and training to improve specific aspects of the game, this can make training more focused and effective.

2. The survey among tennis players aged 11–13 made it possible to identify psychological, psychophysiological and neurophysiological indicators that have the greatest contribution to the formation of the style of play. With the use of factor analysis by the method of main components, 4 factors that characterize 4 tactical styles of players have been identified and the most significant indicators that have an impact on the formation of this factor have been identified. The foundation in the formation of the style of play is a complex of psychophysiological indicators and psychological properties of athletes. Identification of relationships between indicators allows both the coach and the player to orient themselves to identify indicators of the tendency to choose one or another style of playing, which significantly affects the success of the game activity.

3. The direction of tactical training will be effective only if the training program is correctly selected separately for each player. Therefore, we recommend planning and organizing training in accordance with the individual capabilities of the athletes' nervous system, their psychophysiological readiness. Thus, an individual factor analysis of neurological and psychological indicators allows us to allocate indicators-predictors of the way tennis players play and the formation of their successful strategy.

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Conflict of interest

The authors declare that there is no conflict of interest.

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