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Formation of professionalism of 12-14-year-old hockey players: interdependence of psychophysiological characteristics with the effectiveness of forwards in hockey

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Abstract. In modern sports there is a tendency to develop the speed of movement, the speed of decision-making. The primary signal to any external influence is the response of our body. The faster the reaction rate of our body, the more successful we are in a particular sport, where these indicators are important. Hockey is no exception. It is extremely important for a hockey player to make quick and effective decisions. Considering the above, there is the question: is the speed of reaction important for the performance of forwards? *The purpose of the work* is to analyze the probability of the interdependence of the characteristics of psychophysiological functions during the formation of the professionalism of hockey players with the performance of forwards in ice hockey at the age of 12-14. *Materials and methods* – testing was carried out using psychophysiological and psychological diagnostics on special equipment. Eighty young hockey players aged 12 to 14 participated in the study. *Results of the study and their discussion.* The psycho-physiological qualities and performance of hockey forwards were analyzed during the research. It is very important for 12-14-year-old forwards to score goals and be able to pass to a goal, as this is a very strong argument for the scouting services. In professional hockey the need for a forward to play productively is very high. The study examined the influence of psychophysiological qualities on abandoned goals and assists, and as a result, we can offer information about the characteristics of psychophysiological functions during the formation of the professionalism of a hockey player in percentage probability. *Conclusion*. According to the studies, we can say that there is no direct relationship between the performance of hockey forwards and high results in the framework of psychophysiological functions. It means that if there is a need to select a high-scoring player when selecting forwards for hockey teams, these criteria are not entirely accurate to apply.

Keywords: psychology; psychophysiology; hockey; reaction to a moving object; noise immunity; attention; simple visual-motor reaction; discrimination reaction; choice reaction

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Становление профессионализма хоккеистов 12-14 лет: взаимозависимость психофизиологических характеристик с результативностью нападающих в хоккее с шайбой

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Аннотация. *Введение*. В современном спорте прослеживается тенденция к развитию скорости передвижения, скорости принятия решений. Первичный сигнал на любое внешнее воздействие – это ответная реакция нашего организма. И чем быстрее скорость реакции нашего организма, тем мы более успешны в том или ином виде спорта, где важны данные показатели. И хоккей здесь не является исключением. Для хоккеиста крайне важно принимать быстрые и эффективные решения. Принимая во внимание вышеизложенное, возникает вопрос: важна ли скорость реакции для результативности нападающих? *Цель работы* – анализ вероятности взаимозависимости характеристик психофизиологических функций в период становления профессионализма хоккеистов с результативностью нападающих в хоккее с шайбой в возрасте 12-14 лет. *Материалы и методы* – тестирование проходило с использованием психофизиологической и психологической диагностики на специальном оборудование. Всего в исследование участвовало 80 юных хоккеистов в возрасте от 12 до 14 лет. *Результаты исследования и их обсуждение.* В связи с проведенными исследованиями были проанализированы психофизиологические качества и результативность нападающих в хоккее. Наиболее важно для нападающих в возрасте 12-14 лет забрасывать шайбы в ворота соперника и уметь выполнить передачу на гол. В профессиональном хоккее необходимость нападающего играть результативно очень высока. В исследовании было рассмотрено влияние психофизиологических качеств на заброшенные шайбы и голевые передачи, и в итоге можем предложить информацию о характеристиках психофизиологических функций в период становления профессионализма хоккеиста в процентной вероятности. *Заключение*. По итогам проведенных исследований можно сказать, что прямой взаимосвязи между результативности нападающих в хоккее и высокими показателями в рамках психофизиологических функций нет. И при отборе нападающих в хоккейные команды данные критерии не совсем точны для применения, если существует необходимость отобрать результативного игрока.

Ключевые слова: психология; психофизиология; хоккей; реакция на движущийся объект; помехоустойчивость; внимание; простая зрительно-моторная реакция; реакция различения, реакция выбора

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Introduction. The Ministry of Sports developed a federal standard that divides children's and youth hockey into the following stages of sports training:

– stage of initial training;

– training stage (stage of sports specialization);

– stage of improvement of sportsmanship;

– stage of higher sportsmanship (Tretyak, Rotenberg, Bure, 2020).

Exactly at the age of 12-14, the stage of sports specialization (training stage) takes place. At this stage coaches need to decide on the professional direction of the players, i.e., the distribution of hockey players by roles, taking into account the psychological and psychophysiological component (Dennis, 2018). The defining characteristic of a highly qualified forward player is his performance, namely the ability to score goals and give assists to his partners (Tarasov, 1988).

V.P. Guba and V.V. Marinich (Guba and Marinich, 2014) considered the concept of selection of children in football and hockey, taking into account physiological indicators of young athletes. A comparison between different sports was also carried out by V.V. Mezentsev in his article "The comparative characteristic of indicators of psychomotility at young hockey players with the ball and the washer in the preparatory period of the year cycle" (Mezentsev, 2017). In this study, we would like to analyze the interdependence of the characteristics of psychophysiological functions with the performance of forwards in hockey.

We should note that an effective forward is one of the roles that a coach can develop in hockey players (Mayorov, 1968). At the stage of higher sportsmanship, coaches can make sports selection for each specific role (Briel, 1980). For example, no coach will make a sports selection of forwards, recruiting players only able to attack, as this will lead to an imbalance in game combinations (Kostka, 1976). In addition, with the selection described above, there will be no forwards capable of performing defensive functions. In this regard, at the stage of sports specialization, coaches lay a certain foundation for the future roles of the forwards, their professional orientation (Smith and Smoll, 2012). It is worth mentioning that there are also different roles for defensemen (Tabrum, 2012).

The issue of the interdependence of psychophysiological characteristics with the performance of forwards in hockey was studied in previous articles where other methods of statistical processing were used (Zapparov, Fukin, 2021, Zapparov, 2022).

The main goal is to analyze the probability of the interdependence of the psychophysiological functions characteristics during the formation of the professionalism of hockey players with the performance of forwards in ice hockey at the age of 12-14. Is there a relationship between effective performance in hockey and the data of testing their psychophysiological qualities? For comparative analysis, we took the average number of goals and assists per game during the competitive season. In addition, for a deeper analysis, we considered each psychophysiological quality separately and compared it with the average number of goals scored and assists made per game. The study examined the following terms that are used in hockey: "score"", "sniper" and "passer". A "scorer" is the player who scores the most points during the competitive period. A "sniper" is a player who shoots the biggest amount of puck to the opponent's mesh during the competitive season. A "passer" is a player who makes the most assists to his partners during the competitive season (Hardy, Holman, 2018). The study examines the question of whether there is a relationship between psychophysiological qualities and effective performance in general and separately.

Research hypothesis. The indicators of the speed of a simple visual-motor reaction, the speed of the reaction of discrimination, the speed of the choice reaction, concentration and stability of attention, noise immunity and reaction to a moving object will reveal the ability of forwards to achieve results at the stage of sports specialization in hockey.

The theoretical basis. In the course of the development of hockey players in youth sports, the process of sports selection takes place within the framework of sports training (physical, technical, tactical, theoretical and psychological). During this process, coaches need to determine the roles of the players in the team. In order to achieve high results for 12-14-year-old hockey players, the coach focuses on players who are able to score a large number of points throughout the competition. In this regard, coaches need to determine the starting points and criteria to determine the ability of forwards to score a large number of points.

In modern sports, there is a tendency to develop the speed of movement, the speed of decision-making (Savin, 2003). The primary signal to any external influence is the response of our body (Pocock, Richards C., Richards D., 2017). Moreover, the faster the reaction rate of our body, the more successful we are in a particular sport, where these indicators are important (Muller, 2001). Hockey is no exception. It is extremely important for a hockey player to make quick and effective decisions (Karandin, 1997; Brennan, 2009).

The study considered the question of the interdependence of the characteristics of psychophysiological functions at the stage of sports specialization. The determination of high performance is important for the performance of forwards according to the following criteria:

– the speed of various types of reactions;
– noise immunity;
– attention.

Conducting psychophysiological testing will help to correlate high performance in tests and the performance of hockey forwards in the formation of professionalism at the stage of sports specialization.

Methodology and methods. The method which makes it possible to determine whether there is a statistical difference in psychophysiological qualities between effective forwards with the average points per game >=1.50 (Table 2) and forwards whose average points per game are <=0.50 (Table 1) was considered in the study. The difference of one point is significant here. It plays an important role in the selection. The average number will be found for all statistical indicators. If, however, we evaluate separately the effective actions of goals and assists, then such a difference as 1 point will already be rare and, therefore, the difference will be 0.9. So the average number of goals or assists per game will be >=1.00 (Tables 3, 5) and <=0.10 (Tables 4, 6). Tables 1, 2, 3, 4, 5 and 6 provide information on the following indicators:

– the speed of a simple visual-motor reaction (SVMR);
– speed of discrimination reaction;
– speed of choice reaction;
– assessment of attention;
– noise immunity;
– reaction to a moving object (RMO), namely the number of accurate reactions, the number of advances and the number of delays.

Table 1

Forwards with an average number of points scored per game is <=0.50

Таблица 1

Нападающие, у которых среднее количество набранных очков за игру <=0,50

Average goals + assists	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noisy immunity	RMO
						The number of accurate reactions %
0,10	251	331	364	315	403	30%
0,15	233	280	376	290	315	64%
0,17	217	280	371	298	353	48%

0,20	229	290	338	283	372	52%
0,21	251	336	446	310	337	46%
0,23	226	310	370	288	391	44%
0,23	221	317	366	335	397	54%
0,23	234	341	401	298	331	56%
0,25	272	273	376	298	430	64%
0,25	249	357	441	353	362	26%
0,26	213	333	342	304	350	68%
0,28	490	345	421	346	457	38%
0,28	320	297	530	361	383	22%
0,29	216	275	409	311	328	62%
0,30	234	313	411	319	378	48%
0,33	241	389	392	287	354	78%
0,33	195	217	310	279	354	62%
0,35	294	256	355	326	418	48%
0,35	234	323	407	327	421	48%
0,35	226	267	392	303	334	58%
0,39	225	323	563	277	372	38%
0,39	181	237	294	273	319	70%
0,40	266	286	339	363	391	62%
0,40	209	236	275	321	386	40%
0,40	214	265	435	309	413	44%
0,41	226	332	330	270	335	48%
0,43	185	242	270	287	458	68%
0,44	218	280	308	297	358	44%
0,45	230	261	476	299	381	60%
0,45	217	273	319	280	338	28%
0,48	211	299	352	287	346	42%
0,50	187	235	338	267	351	48%
0,50	219	317	432	350	342	48%
The average	**237,4**	**294,4**	**380,3**	**306,4**	**371,5**	**50%**

Table 2

Forwards with an average number of points per game >=1.50

Таблица 2

Нападающие, у которых среднее количество набранных очков за игру > =1,50

Average goals + assists	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noisy immunity	RMO
						The number of accurate reactions %
1,50	230	318	372	295	332	54%
1,55	227	348	452	317	345	54%
1,67	218	285	367	327	393	54%

1,68	228	275	429	301	320	52%
1,78	211	257	355	308	382	54%
1,95	230	318	468	300	367	60%
2,25	215	256	368	277	325	40%
2,31	261	309	546	314	378	50%
The average	**227,5**	**295,8**	**419,6**	**304,9**	**355,3**	**52%**

According to the analysis results in the competitive season, 33 forwards have an average performance per game of <=0.50 and 8 forwards an average of >=1.50.

Table 3

Forwards with an average number of goals scored per game <=0.10

Таблица 3

Нападающие, у которых среднее количество заброшенных шайб за игру <=0,10

Average goals	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noisy immunity	RMO
						The number of accurate reactions %
0,00	241	389	392	287	354	78%
0,00	226	310	370	288	391	44%
0,05	251	331	364	315	403	30%
0,06	251	336	446	310	337	46%
0,07	229	290	338	283	372	52%
0,08	233	280	376	290	315	64%
0,08	234	341	401	298	331	56%
0,08	221	317	366	335	397	54%
0,08	217	280	371	298	353	48%
0,09	213	333	342	304	350	68%
The average	**231,6**	**320,7**	**376,6**	**300,8**	**360,3**	**54%**

Table 4

Forwards with an average number of goals scored per game >=1.00

Таблица 4

Нападающие, у которых среднее количество заброшенных шайб за игру >=1,00

Average goals	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noisy immunity	RMO
						The number of accurate reactions %
1,00	243	326	359	331	374	46%
1,14	230	318	468	300	367	60%
1,25	215	256	368	277	325	40%
1,38	261	309	546	314	378	50%
The average	**237,25**	**302,25**	**435,25**	**305,5**	**361**	**49%**

According to the results of the analysis of the competitive season, 10 forwards had an average number of goals scored per game <=0.10 and 4 forwards scored an average of >=1.00.

Table 5

Forwards with an average number of assists per game <=0.10

Таблица 5

Нападающие, у которых среднее количество результативных передач за игру <=0,10

Average assists	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noisy immunity	RMO
						The number of accurate reactions %
0,00	227	235	327	304	439	40%
0,00	249	357	441	353	362	26%
0,00	320	297	530	361	383	22%
0,05	251	331	364	315	403	30%
0,06	218	280	308	297	358	44%
0,08	233	280	376	290	315	64%
0,08	272	273	376	298	430	64%
0,08	217	280	371	298	353	48%
0,10	230	261	476	299	381	60%
0,10	214	265	435	309	413	44%
The average	**243,1**	**285,9**	**400,4**	**312,4**	**383,7**	**44%**

Table 6

Forwards with an average number of assists per game >=1,00

Таблица 6

Нападающие, у которых среднее количество результативных передач за игру > =1,00

Average assists	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noise immunity	RMO
						The number of accurate reactions %
1,00	218	285	367	327	393	54%
1,00	228	275	429	301	320	52%
1,00	215	256	368	277	325	40%
1,00	218	264	367	296	335	30%
1,06	211	257	355	308	382	54%
The average	**218**	**267,4**	**377,2**	**301,8**	**351**	**46%**

According to the results of the analysis of the competitive season, 10 forwards had an average number of assists per game <=0.10 and 5 forwards scored an average of >=1.00.

Table 7

Comparison of forwards by their performance

Таблица 7

Сравнение нападающих по их результативности

Average goals + assists	SVMR	Discrimination reaction	Choice reaction	The assessment of attention	Noise immunity	RMO The number of accurate reactions %
<=0,50	237,4	294,4	380,3	306,4	371,5	50%
>=1,50	227,5	295,8	419,6	304,9	355,3	52%
Average goals	**SVMR**	**Discrimination reaction**	**Choice reaction**	**The assessment of attention**	**Noise immunity**	**RMO The number of accurate reactions %**
<=0,10	231,6	320,7	376,6	300,8	360,3	54%
>=1,00	237,25	302,25	435,25	305,5	361	49%
Average assists	**SVMR**	**Discrimination reaction**	**Choice reaction**	**The assessment of attention**	**Noise immunity**	**RMO The number of accurate reactions %**
<=0,10	243,1	285,9	400,4	312,4	383,7	44%
>=1,00	218	267,4	377,2	301,8	351	46%

According to the results of the comparison (Table 7), we can say that successful forwards have a better developed simple visual-motor reaction and noise immunity. The discrimination reaction, the reaction to a moving object and attention are on the same level compared to the forwards, whose average performance is <=0.50. It is also necessary to note the fact that the choice reaction is better developed among ineffective players.

Players with the most goals scored against the opponent have a more developed discrimination reaction speed. For all other indicators forwards with the number of goals scored against the opponent's goal is <= 0.10 have an advantage.

The most logical results of the comparative analysis are for forwards who, during the competitive season, completed >=1.00 assists per game on average. For all psycho-physiological qualities the results are on average better than those of the forwards with the average effectiveness of passes <= 0.10.

The psycho-physiological qualities and performance of forwards in hockey were analyzed during the research (Zapparov and Fukin, 2021). It is most important for forwards aged 12-14 to score goals and be able to pass to a goal. In professional hockey, the need for a forward to play productively is very high. The study examined the influence of psychophysiological qualities on abandoned goals and assists, and as a result, it is possible to consider the interdependence of the characteristics of psychophysiological functions during the formation of the professionalism of a hockey player in percentage probability with the performance of forwards. So when dividing the entire list of test forwards in hockey, it is possible to use Table 8. We indicated the percentage of the probability that the list will contain a “scorer”, “sniper” or “passer” for each psychophysiological quality.

Table 8

Interdependence of psychophysiological functions during the formation of the professionalism of a hockey player in percentage probability with the effectiveness of forwards

Таблица 8

Взаимозависимость психофизиологических функций в период становления профессионализма хоккеиста в процентной вероятности с результативностью нападающих

Rating (G + A)		**First 25%**	**From 26 to 50 %**	**From 51 to 75 %**	**From 76 to 100 %**
Psychophysiological qualities	SVMR	0,245	0,26	0,27	0,225
	Discrimination reaction	0,25	0,26	0,265	0,225
	Choice reaction	0,22	0,275	0,23	0,275
	The assesment of attention	0,25	0,25	0,28	0,22
	Noise immunity	0,265	0,245	0,265	0,225
	Reaction to a moving object	0,215	0,3	0,225	0,26
Rating (Goals)		**First 25%**	**From 26 to 50 %**	**From 51 to 75 %**	**From 76 to 100 %**
Psychophysiological qualities	SVMR	0,25	0,26	0,245	0,245
	Discrimination reaction	0,26	0,25	0,27	0,22
	Choice reaction	0,21	0,275	0,235	0,28
	The assessment of attention	0,235	0,245	0,275	0,245
	Noise immunity	0,255	0,24	0,285	0,22
	Reaction to a moving object	0,205	0,31	0,22	0,265
Rating (Assists)		**First 25%**	**From 26 to 50 %**	**From 51 to 75 %**	**From 76 to 100 %**
Psychophysiological qualities	SVMR	0,245	0,24	0,295	0,22
	Discrimination reaction	0,24	0,26	0,265	0,235
	Choice reaction	0,215	0,27	0,255	0,26
	The assessment of attention	0,255	0,265	0,25	0,23
	Noise immunity	0,27	0,26	0,25	0,22
	Reaction to a moving object	0,235	0,305	0,215	0,245

Conclusion. Based on the results of the studies of psychophysiological functions, we can say that there is no direct relationship between the performance of forwards in hockey and high performance in tests to determine the speed of a simple visual-motor reaction, discrimination reaction, choice reaction, attention assessment, noise immunity and reaction to a moving object. So, when selecting forwards for hockey teams, these criteria are not entirely accurate to apply if there is a need to choose a high-scoring player.

References

Brill, M.S. (1980), *Otbor v sportivnyh igrah* [Selection in sports games], Fizkul'tura i sport, Moscow, Russia.

Guba, V.P. and Marinich, V.V. (2014), "Comparative analysis of psychophysiological indicators

of young athletes involved in football and hockey", *Sports psychologist*, 2 (33), 6874 (In Russian).

Karandin, Yu.L. (1997), *Hokkej po pravilam* [Hockey by the rules], Sibir', Novosibirsk, Russia.

Kostka, V. (1976), *Sovremennyj hokkej* [Modern hockey], Fizkul'tura i sport, Moscow, Russia.

Lychagin, D.M. (2001), *Hokkej v voprosah i otvetah* [Hockey in questions and answers], SO RAN, Novosibirsk, Russia.

Mayorov, B. A. (1968), *Hokkej dlya yunoshej* [Hockey for youth], Fizkul'tura i sport, Moscow, Russia.

Mezentsev, V.V. (2017), "The comparative characteristic of indicators of psychomotility at young hockey players with the ball and the washer in the preparatory period of the year cycle", *Physical education and sports in modern society*, 150-152 (In Russian).

Savin, V.P. (2003), *Teoriya i metodika hokkeya* [Theory and methodology of hockey], Akademiya, Moscow, Russia.

Tarasov, A.V. (1988), *Hokkej bez tajn* [Hockey without secrets], Molodaya gvardiya, Moscow, Russia.

Tretyak, V.A., Rotenberg, R.B. and Bure, P.V. (2020), *Nacional'naya programma sportivnoj podgotovki po vidu sporta "hokkej"* [National program of sports training in the sport "hockey"]. Moscow, Russia.

Zapparov, I.I. (2022), "Influence of psychophysiological functions on the ability of hockey forwards to perform effective assists at the age of 12-14", *Research Result. Pedagogy and Psychology of Education*, 8 (4), 147-159, DOI: 10.18413/2313-8971-2022-8-4-0-11. (In Russian).

Zapparov, I.I. and Fukin, A.I. (2021), "The role of the rate of simple visual-motor reaction, the discrimination reaction and the choice reaction to the pucks shot by hockey forwards at the age of 12-14 years", *Research Result. Pedagogy and Psychology of Education*, 7 (4), 114-125, DOI: 10.18413/2313-8971-2021-7-4-0-9.

Brennan, D. (2009), *USA Hockey Small area competitive games*, USA Hockey, Colorado Springs, USA.

Dennis, P. (2018), "*Sport Psychology Tips for Hockey Players and Coaches*", available at: https: // books.apple.com/us/book/sport-psychology-tips-for-hockey-players-and-coaches/id1407296279 (Accessed 11 March 2023).

Hardy, S., Holman, A. (2018), *Hockey: a global history (sport and society)*, University of Illinois Press, USA.

Muller, S. (2001), *The Complete Player: The Psychology of Winning Hockey*, Stoddart Publishing, Toronto, Canada.

Pocock, G., Richards, C. and Richards, D. (2017), *Human Physiology Fifth Edition*, Oxford University Press, Oxford, UK.

Smith, R. and Smoll, F. (2012), *Sport Psychology for Youth Coaches: Developing Champions in Sports and Life*, Rowman & Littlefield Publishers, Lanham, USA.

Tabrum, M. (2012), *USA Hockey Coaching Education Program Level 1*, USA Hockey, Colorado Springs, USA.

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