

INTERCONNECTION OF SPEED, POWER AND SPEED-POWER ABILITIES OF PROFESSIONAL HOCKEY PLAYERS ON ICE AND OUT OF ICE

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Abstract. *Purpose:* determination of correlation's degree between speed, power and speed-power abilities of professional hockey players on ice and out of ice. *Material:* 65 professional hockey players of age from 16 to 33 years old were tested. 75 highly qualified coaches were questioned. *Results:* The found out interconnections between 11 indicators of speed, power and speed power qualities supplement knowledge about transfer physical qualities. We detected high interconnection between speed and speed-power abilities, manifested by sportsmen in exercises on ice and on land. We registered moderate level of interconnection between static (absolute) power and speed abilities of hockey players. We proved hypothesis about possibility of start speed (power) transfer in different conditions of its manifestation. *Conclusions:* the received data permit to correct hockey players' training program, considering new knowledge about transfer of one or the other physical qualities on sportsmen's training.

Key words: hockey, control, testing, correlation, exercises, skill.

Introduction

Physical training is rather popular and topical subject of researches. Interest to it does not weaken at the present time as well. Obviously, high rate of sport achievements' rising requires constant specification and renewal of knowledge on this subject. A lot of scientific researches are devoted to hockey on ice [1, 2, 4-8, 11-26]. Alongside with it, competition functioning in specific conditions of ice arena sets rather many questions to practitioners and theoreticians of this kind of sports [8, 21].

It should be noted that situation with scientific-methodic provisioning in hockey is rather ambiguous. For example, in children-junior hockey there are all required recommendations on planning of training and control over it, which are in the form of programs and other normative documents [13, 21, 27-29]. In professional hockey solution of such problems is entrusted to clubs. Every club is a system with full autonomy for solution of all training tasks. Absence of own scientific provisioning in clubs resulted in the fact that in professional hockey a lot of scientifically not supported, voluntaristic decisions in many aspects of training are taken. The most serious drawback is absence of unified battery of tests in domestic professional hockey [5]. It made impossible to work out hockey players' model characteristics, without which effective control of sportsmen's training is impossible [6]. Moreover nowadays there are many discussions about how necessary can be testing of professional hockey player's general physical fitness [4]. There are opinions about secondary character of physical training [6]. Besides, there is negative attitude of some coaches to testing in general [5, 6].

By results of questioning, realized by us in 2014, from 75 highly qualified specialists 88% conducted testing at the beginning of pre-season camp trainings [6]. At the end of camp trainings, before regular championship, the progress of trainees is assessed only by 56% of specialists. Only 43% of the questioned try to objectively assess physical condition in the middle of game season. Final testing at the end of season is carried out by 53% of coaches. The data about periodical character of control witness that as minimum the half of the questioned has no clear control and physical fitness assessment system during all period of training and competitions (see fig.1).

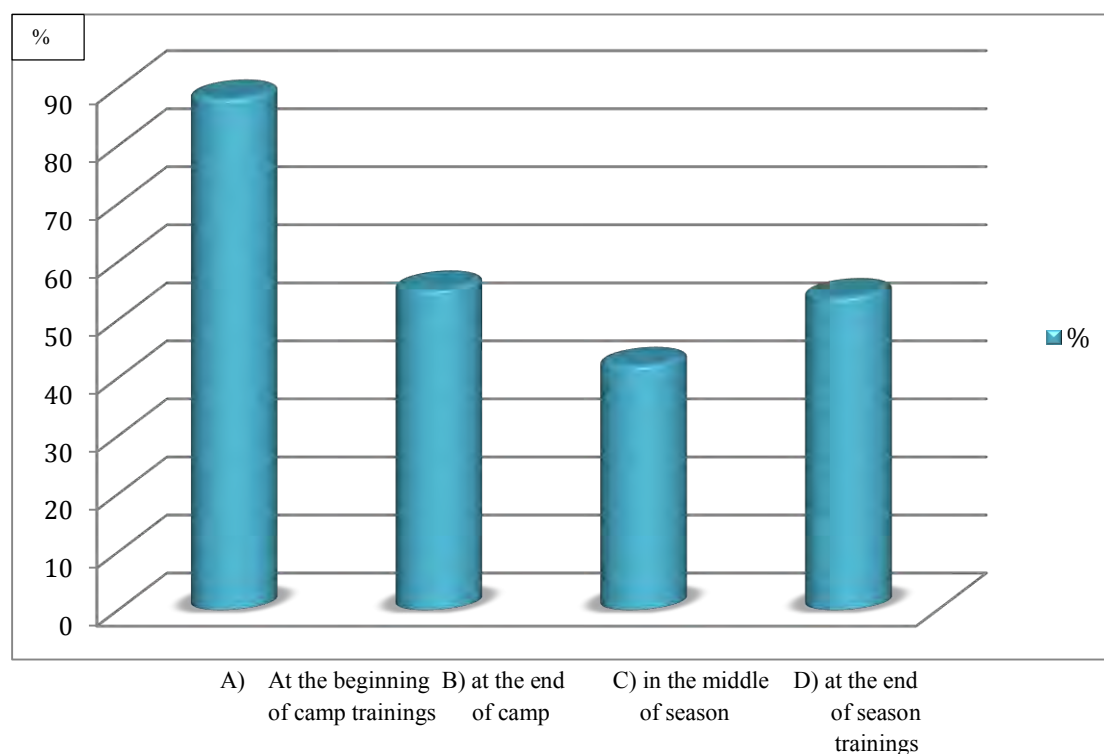


Fig. 1. Practical application of testing

The received data permit to assess the situation objectively. Most of coaches recognize importance of pedagogic control (testing). However, most of the questioned does not use it systemically and significant part of them – ignore it [5]. As a result, coach of physical conditions works out of ice arena and the second group of coaches train on ice. To certain extent they work independently due to absence of effective control over progress in general and special physical fitness and it does not permit to determine the degree of transfer quality from training hall to ice. The attempts to ensure transfer qualities in hockey locally were numerous, but often they were not supported by serious experimental researches [12, 14, 17, 30-46].

Purpose, tasks of the work, material and methods

The purpose of the research: determination of correlation's degree between speed, power and speed-power abilities of professional hockey players on ice and out of ice.

Methodic of the research:

Methodic of quickness testing:

For studying of interconnection of speed abilities, manifested on ice and on land) we chose 27.5 meters' run on skates, which is widely spread in North America [HockeyTech. – Mode of access: <http://www.hockeytech.com>. - Date of access: 12.06.2015.]. Then there is one more reliable test for assessment of this ability on land – 30meters' run [14, 17, 22]. Fore receiving more complete information we upgraded it a little. For this purpose we used highly preise system Swift. Sensors were located in the following sequence: first sensors – on start; second group – at 5 meters' distance, third – at 20th meter and forth group of sensors – 30 meters distance (finish). This technology permits to simultaneously measure start speed (0-5 meters), distance speed (20-30 meters) and general speed (0-30 meters)/ The same concerns testing on ice with the only remark: third group of sensors is at 17.5 meters' distance and forth – at 27.5 meters (finish).

Methodic of speed-power abilities' testing:

For this purpose we used standard test – long jump from the spot [13, 22].

Methodic of power abilities' testing:

Registration of power abilities was carried out with test for dead-lift with the help of poly-dynamometer. Poly-dynamometric testing of strength of 21 muscles' groups showed that this test reflects total power potential of sportsman [3]. To ensure safety sportsman was proposed top fulfill three attempts. In first attempt he fulfills dead-lift with force about 50% from maximal; in the second – with 75% and only in the third attempt – with maximal force (see fig.2).

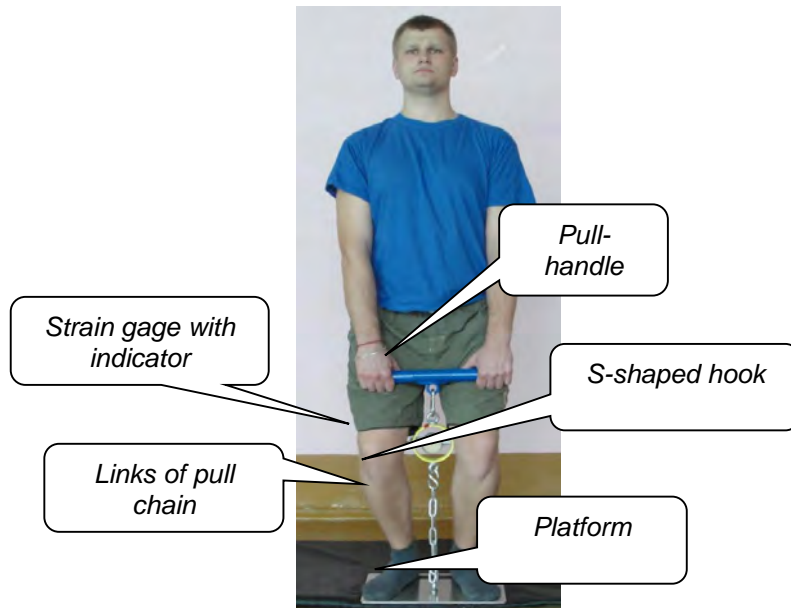


Fig.1. General view of dynamometric device for determination of dead-lift power and pulling force of legs' extensors, of foot muscles.

Characteristic of contingent: we have tested 65 professional hockey players: 25 of them – backs and 40 – forwards. In general the tested are representatives of Belarusian extra-league (supreme division of Belarusian hockey championship) and junior combined team of Belarusian Republic (up to 20 years old age).

Results of the research

The received in pedagogic control data were processed with Microsoft Excel “Descriptive Statistic” and “Correlation” [9]. Results of statistic processing are given in tables 1 and 2.

Table 1

Descriptive statistic

Tests	1	2	3	4	5	6	7	8	9	10	11
Mean value	1.16	1.17	4.13	1.43	1.41	5.01	1.19	1.26	4.53	233.92	241.5
Standard error	0.01	0.01	0.04	0.02	0.01	0.04	0.01	0.02	0.05	6.34	3.1

Notes: 1 – Start speed at first 5 meters of skating of 27.5 meters (sec); 2 – Distance speed (from 17.5 meters to 27.5 meters) in test 27.5 meters' skating (sec.). 3 - Skating of all 27.5 meters (sec.); 4 – Start speed at first 5 meters distance in 27.5 meters' skating backward test (sec.); 5 –Distance speed from 17.5 to 217.5 meters' distance in 27.5 meters' skating backward test (sec.); 6 – Skating backward of all 27.5 meters (sec.); 7 – Start speed at first 5 meters of 30 meters' run test (sec.); 8 – Distance speed (from 20 to 30 meters) in 30 meters' run test (sec.); 9 – 30 meters' run (sec.); 10 – Dead-lift registered by dynamometric device (kg); 11 – Long jump from the spot (cm).

Besides, we received correlation matrix:

Table 2

Correlation of testing results

	1	2	3	4	5	6	7	8	9	10
1	1									
2	0.72	1								
3	0.9	0.93	1							
4	0.69	0.62	0.71	1						
5	0.58	0.64	0.69	0,53	1					

	1	2	3	4	5	6	7	8	9	10
6	0.69	0.72	0.78	0,83	0.88	1				
7	0.58	0.60	0.66	0,54	0.31	0.46	1			
8	0.67	0.81	0.86	0.6	0.61	0.71	0.61	1		
9	0.74	0.86	0.91	0.67	0.61	0.74	0.73	0.96	1	
10	-0.55	-0.65	-0.64	-0.52	-0.58	-0.63	-0.27	-0.56	-0.54	1
11	-0.59	-0.73	-0.77	-0.59	-0.63	-0.72	-0.54	-0.86	-0.84	0.54

Notes: 1 – Start speed at first 5 meters of skating of 27.5 meters (sec); 2 – Distance speed (from 17.5 meters to 27.5 meters) in test 27.5 meters’ skating (sec.). 3 - Skating of all 27.5 meters (sec.); 4 – Start speed at first 5 meters distance in 27.5 meters’ skating backward test (sec.); 5 –Distance speed from 17.5 to 217.5 meters’ distance in 27.5 meters’ skating backward test (sec.); 6 – Skating backward of all 27.5 meters (sec.); 7 – Start speed at first 5 meters of 30 meters’ run test (sec.); 8 – Distance speed (from 20 to 30 meters) in 30 meters’ run test (sec.); 9 – 30 meters’ run (sec.); 10 – Dead-lift registered by dynamometric device (kg); 11 – Long jump from the spot (cm).

For assessment of power connection between correlation coefficients we used Cheddok’s scale [10]:

Table 3

Connection power between variables

Value	Interpretation
from 0 to 0,3	Very weak
from 0,3 to 0,5	Weak
from 0,5 to 0,7	Moderate
from 0,7 to 0,9	High
from 0,9 to 1	Very high

Analysis of correlation matrix permitted to make some conclusions and assumptions, For example dead-lift power has moderate correlation with all speed and speed power indicators. Exclusion is weak correlation between start speed in run on land and power abilities. This fact can be explained by measuring of power indicators in static conditions and have no relation to start speed.

However attention should be paid to the fact that absolute strength even in static mode renders rather significant influence on speed qualities on ice and on land. Long jump from the spot is of special interest because it is a commonly acceptable test for speed-power qualities. This test assesses sportsman’s power, if to process properly results of measurement. Correlation analysis results proved out hypothesis. Statistical processing of data showed high correlation of this test with five other. Besides, we found average level of its correlation with four speed and speed power tests. In this case our assumption about connection of jump result with start speed in run on land and in skating on ice was also confirmed.

In test 30 meters’ run we established the following: high correlation was registered in all tests of start and distance speed and moderate level – with technically very specific backward skating. The same situation takes place with indicators of distance speed in skating on ice and run on land. It permits for us to affirm that speed abilities of hockey players can be trained on land.

Start speed in 30 meters' run on land has moderate correlation with start speed in skating and even in skating backward. We detected high level of correlation of 30 meters' run test and speed test on ice ($r=0.91$). But expectations of high correlation of this indicator with long jump from the spot have not been met that requires further studying.

By testing results high correlation of 25.5 meters' skating on ice forward and backward is rather interesting. Obviously, professional contingent had professional level of skating technique and backward skating was not a limiting factor for the sportsmen. Both these tests were created not only for assessment of speed abilities but also for control over technique level.

Discussion

The received data confirmed available in literature data about interconnection of speed and speed power abilities within equal conditions: on run tract, swimming pool and so on [22]. Alongside with it, in hockey physical training is regarded (as a rule) in aspect of general physical training in fitness center, or special physical training on ice [18, 19]. The received by us results do not agree with opinion of some hockey specialists [17 et al.], who note absence of correlation between sportsman's speed potentials on ice and out of ice. Large sample of the tested in our research and up-to-date electronic means of registration permit for us to affirm that speed and speed power qualities can be transferred in the frames of their manifestation. The degree of transfer will depend on training period and sportsman's fitness. It is also important to note that it is necessary to specify the existing opinion about prevalence of power component over speed one [14]. It is connected with different modes of muscles' contractions.

In this research, for the first time in theory and practice we made attempt to study possibility of transfer of most important for hockey player qualities in different conditions of their manifestation on material of professional sports.

Conclusions:

We have found high correlation between speed and speed-power abilities, manifested by sportsmen in exercises on ice and on land. We detected moderate correlation between static (absolute) strength and speed abilities of hockey players. Hypothesis about possibility of start speed (power) transfer in different conditions of its manifestation has been proved.

The received data permit to correct training program, considering new knowledge about possible transfer of one or other physical qualities in preparation of sportsmen.

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Conflict of interests

The authors declare that there is no conflict of interests.

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