



A study of the relationship between physical fitness, physical and psychological development and their impact on the level of special training among seven-year-old hockey players

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Abstract

Objective of the study is to identify the relationship between indicators of physical fitness, physical and psychological development and manifestations of special fitness in hockey players aged seven.

Methods and structure of the study. 27 young hockey players took part in the experiment: the average age was 7.1 ± 0.22 years; the training experience was 2.3 ± 0.22 years; the average weekly training volume was 11.6 ± 2.5 hours. The following body sizes and proportions were studied; variable components of body weight; abilities: psychomotor, cognitive and motor (30 m sprint; 3x10 m shuttle run; 3x10 m alternating running (regular, side-by-side, back-to-back); long jump from a standing position; grip strength) in conjunction with the results of standardized tests. tests evaluating special training in hockey, using Spearman correlation analysis.

Results and conclusions. It has been established that the formation of special sports skills among hockey players in the second year of training at the sports and recreation stage of training at a medium-low level of correlation mainly depends on the degree of physical fitness, to a lesser extent on the development of psychomotor skills, morphofunctional and cognitive characteristics. In athletes aged seven, the level of special training is mainly determined by the ability to resist interference, the speed and strength characteristics of the legs, the state of autonomic regulation and the formation of a specific muscular balance of the body.

Keywords: hockey, morphofunctional and psychological features, body proportions, physical fitness, special fitness, age seven years.

Introduction. Early initiation of organized sports practice has become a paradigm of modern society. The main problem in sports activities for young children is the insufficient development of physiological and psychological capabilities, which limit the body's adaptation to physical activity and the proper acquisition of special technical skills [11].

The discrepancy between the level of development of the child's body and the requirements of the content of training in an additional sports training program can manifest itself in functional disorders, muscle imbalances and injuries, including craniocerebral injuries, early psychological burnout, provoking not only withdrawal from sports, but prolonging the disturbances in the processes of further growth and development [6].

The sports and health stage as a promising and prognostic one in the process of long-term sports training is aimed at forming the readiness of the child's body to meet the requirements for enrollment in the initial training stage [7]. In one of the popular sports for children, "hockey" (ice hockey), classes at the sports and health stage begin at five and continue until seven years of age with the need to achieve the standards for enrollment in the stage of initial sports training at the age of 8 in general, including the development of speed, speed-strength, strength qualities, and special training, assessing the technical skill of moving on skates [8].

The development of a seven-year-old child is determined by the variable passage of a half-height jump



and the transition to active differentiation processes against the background of a change in social status and the volume of motor activity at the beginning of school education, which is manifested in morpho-functional, functional, cognitive and motor development and is determined by standardized tests [9]. The simultaneous criticality of the ontogenesis period and the transition period in long-term sports training actualizes the search for growth and development indicators, including morphofunctional and cognitive development, influencing the achievement of special training standards in young hockey players aged seven years, including due to the practical absence of systematic research on this topic [12].

Objective of the study is to identify the relationship between indicators of physical fitness, physical and psychological development and manifestations of special fitness in hockey players aged seven.

Methods and structure of the study. Subjects: 27 young hockey players: age - 7.1 ± 0.22 years; training experience - 2.3 ± 0.22 years; number of classes per week - 11.6 ± 2.5 hours. The following methods were used to assess the comprehensive development of the child's body, taking into account the total dimensions and proportions of the body and limbs; labile components of body weight (anthropometry, caliperometry); cognitive abilities (visual- and verbal-logical, visual-spatial and analytical-synthetic (Raven's color progressive matrices) thinking, attention in the Bourdon test, mediated memory), manifestations of fine and gross motor skills, including the tapping test, simple and complex visual-motor reactions (SVMR, RDO and noise immunity); 30 m run; shuttle run, 3x10 m; alternating running (T-test: smooth, 10 m; side step with leg change, 5 m x 2; backwards, 10 m); grip strength, kg, % (wrist dynamometry, DK-25), standing jump [1-4].

The functional state of the cardiovascular and autonomic nervous system was assessed by the indicators of heart rate, systolic and diastolic blood pressure, heart rate variability (lying and standing) [10]. Posture was assessed using the method of computer optical topography according to the integral indices of disorders in the frontal, horizontal and sagittal planes (APC "Metos").

The assessment of special training (SP), including coordination abilities, speed qualities, movement technique, braking and maneuverable skating was carried out in standard tests: skating 36 m facing and backwards; shuttle run 6x9 m; slalom running with and without a puck, "eight" face forward, back-

ward forward [5]. For the integrated assessment (IA) of the SP, the average values and standard deviation were determined based on the results of each test for further calculation of the assessment on a five-point scale: $X \pm 0.5\sigma$ – 3 points; $X + (-) 1.0\sigma$ – 4 (2) points; $> X + (-) 1.0\sigma$ – 5 (1) points. The examinations were conducted in the morning with the informed consent of the parents.

Results and conclusions. It was found that the volume of training load, as a modeling effect, does not show any connection with the SP indicators, but weakly ($r=0.38-0.48$) correlates with a number of growth and development indicators of seven-year-old hockey players. The greatest volume of training correlates with the least time ($r=-0.40$ and -0.43) in tests requiring coordination of movements of the whole body (alternating running and running with a side step with a change of legs), and, on the contrary, with the least manifestation of speed-strength abilities of the legs ($r=-0.42$), strength of the left hand ($r=-0.48$), reactivity in simple and complex visual-motor tests (VMT, attention, $r=0.38-0.39$).

This indicates that the positive effect of the volume of training on the formation of motor skills does not exclude the need for individual dosing of the training load. On the contrary, the IO SP is associated with a unidirectional increase in motor and psychological indicators, which include noise immunity ($r=-0.70$), speed-strength abilities of the legs ($r=0.67$), strength of the left hand, kg, % ($r=0.47-0.51$), spatial thinking and reaction accuracy ($r=0.43-0.45$), indicating the most important signs of a child's growth and development for the formation of special sports skills when playing hockey.

SP indicators are most often interconnected with physical fitness indicators (47% of all relationships), less often – psychomotor abilities (29%), body build (16%) and cognitive function (8%). The greatest significance in determining SP from the side of growth and development indicators at this age belongs to two indicators – the ability to noise immunity and speed-strength abilities of the legs (average $r=0.51$ and -0.52). Noise immunity is associated with the results in each of the SP tests ($r=0.40-0.62$) with a priority effect on the results in backward skating and shuttle skating ($r=0.61-0.62$); the value of the long jump with two legs is inversely proportional to the time in skating in five out of six tests ($r=0.40-0.61$) with the greatest connection with the time in backward skating and small figure eight ($r=0.60-0.61$), without revealing a reliable effect on the time of the shuttle run.



The most complex conditionality, including body shape indicators (pelvis width/shoulder width), physical fitness (standing long jump, left hand strength in kg and %), cognitive (analytical and spatial thinking) and psychomotor (reaction accuracy, attention and noise immunity) properties are found in the results of 36 m backward skating ($r=0.39-0.62$). The complication of technical actions in figure-eight skating with puck dribbling is largely associated with the development of speed-strength abilities of the legs ($r=-0.61$), noise immunity ($r=-0.52$) and left hand strength ($r=-0.47$), and to a lesser extent – with the reaction accuracy in the RDO test ($r=0.39$).

The results of the SP tests are also associated with the functional state of the body at rest, which is especially clearly manifested in the results of the 36 m forward skating and figure-eight skating tests. Hockey players with higher HR values ($r=0.38-0.57$), shorter RR intervals ($r=-0.41-0.53$), prevalence of sympathetic regulatory influences LF/HF ($r=0.39-0.51$) and a smaller contribution of respiratory waves HF% ($r=-0.40-0.43$) to the overall spectrum of HRV, i.e. greater tension of the mechanisms of vegetative regulation, are distinguished by lower SP.

Significant relationships between SP indicators of seven-year-old hockey players and the state of posture, as a “mirror” of the established muscle balance, vary from 0.44 to 0.50. The time in the most difficult SP tests (slalom) improves, the IO increases as the index of impairment in three planes increases, mainly due to the sagittal plane (torso tilt back, flattening of the thoracic kyphosis, increased lumbar lordosis), which is combined with a decrease in results with an increase in frontal impairments (distortions).

Conclusions. The development of special sports skills in hockey players in the second year of training at the sports and health stage of training at a medium-weak level of communication is determined mainly by the level of physical fitness, to a lesser extent by the development of psychomotor, morphofunctional and cognitive properties. The level of special training in seven-year-old hockey players is primarily approximated by the ability to noise immunity and the speed-strength qualities of the legs, the functional state of the mechanisms of vegetative regulation, the formation of a specific muscle balance of the body.

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