Publication date: 01.12.2021
DOI: 10.51871/2588-0500_2021_05_04_29
UDC 796.332.6+159.91/ 796.015.132

PHYSICAL AND TECHNICAL FITNESS, PSYCHOPHYSIOLOGICAL FEATURES OF SOCCER PLAYERS WITH HEARING LOSS

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Key words: physical fitness, technical fitness, soccer players with hearing loss, futsal, psychophysiological features.

Annotation. The presented article provides data on the study of indicators of physical and technical fitness of soccer players with varying degrees of hearing loss in comparison with those of healthy soccer players. The survey involved 48 male athletes playing futsal: the main group (MG) – 16 people (2 teams) – soccer players with hearing loss, control group (GC) of 16 people (2 teams) – soccer players with hearing loss and comparison group (GC) – 16 soccer players with normal hearing. In the course of the study, it was found that the soccer players of the main group and the control group with hearing loss have lower indices of general, special physical and technical fitness in relation to the indices of soccer players with normal hearing. The psychophysiological features of soccer players with hearing loss are manifested in the formation of a moderately weak and weak type of the nervous system, with reduced indicators of the maximum rate of movements, a reaction to a moving object, a slowed down simple and complex visual-motor reaction.

Introduction. The popularity of futsal among people of different ages and genders is well known. The game is more accessible to the broad masses than classic soccer, since its inventory is simple, it is emotional and does not require the development of a wide range of indicators of the physiological systems of the organism, which makes it attractive for people with disabilities.

Revealing the psychophysiological features of athletes playing futsal is of sufficient scientific and practical interest. This is due to the fact that today there is a lack of scientific research on many aspects of the game. In particular, the relationship between many psychophysiological and technical-tactical indicators of healthy athletes and people with physical limitations has not been described.

In the field of futsal methodology, one of the main resources for improving the skill of athletes is to improve the indicators of physical, technical and tactical fitness. In this regard, a significant amount of research work is devoted to the

development and improvement of these particular aspects of the game [1-3]. Meanwhile, there are practically no works devoted to the study of features of psychophysical and technical-tactical training in futsal, as well as features of directed adaptation of the organism of soccer players with hearing loss to the conditions of futsal, although adaptive sports are no less spectacular and socially significant [4-6].

The aim of the research was an attempt to study the level of physical and technical fitness, psychophysiological parameters of soccer players with hearing loss in comparison with healthy athletes.

Methods and organization. The work is based on the results of pedagogical research carried out in laboratory conditions, during futsal training sessions aimed at studying the physical and technical fitness of soccer players with hearing loss in relation to healthy athletes. The study was carried out at the Department of Anatomy and Sports Medicine of the Kuban State University of Physical Culture, Sports and Tourism, the Department of Physical Education of the Kuban State Agrarian University named after I.T. Trubilin, as well as in the "Iskra" physical culture and sports club for disabled people. The survey involved 48 male athletes (table 1), playing futsal: the main group (MG) – 16 people (2 teams) – soccer players with hearing loss, control group (CG) of 16 people (2 teams) – soccer players with hearing loss and comparison group (GC) – 16 soccer players with normal hearing.

Table 1

Distribution of the test subjects

Studied groups	Degree of hearing loss	Average hearing thresholds (speech perception)	Number of subjects
MG	Severe	71-90 dB (cry at the ear)	5
	Deafness	>91 dB (none)	11
CG	Severe	71-90 dB (cry at the ear)	6
	Deafness	>91 dB (none)	10
GC	None	Normal hearing	16

When studying the level of development of motor abilities of soccer players with hearing impairments, a series of tests of the Laboratory of Theory and Methodology of Soccer of the All-Russian Scientific Research Institute of Physical Culture was used. Following parameters were studied: starting and distance speed, speed ability, special (speed) endurance and power ability. The speed quality rating is based on the result of a 50-meter run from a standing start and the registration time for the first 10 meters. The equipment used was a photoelectric sensor, originally installed at a distance of 10 m and 50 m from each other, and the “Electronics MK-1” digital time meters. The assessment of speed and strength abilities was determined on the basis of the level of jumping ability (jumping height). The athlete

performed a vertical jump from the contact platform. The time of the unsupported phase (airborne phase) was recorded by the F-209 time meter and converted into centimeters. Strength abilities were determined according to the data of the back dynamometry. Special physical fitness was assessed in the following tests: running 30 meters with dribbling (s), speed-strength endurance in the test "running 5x30 meters with dribbling" (s), proper power abilities – in the test "throwing the ball for distance" (m). Technical fitness was studied according to the following test results: "dribbling the ball, dribbling around stands and goal-kicking" (s), "kicking the ball for accuracy".

To study the psychophysiological features of soccer players, we used the "Research BioMouse" hardware complex of the NeuroLab company. Following test results were studied: simple visual-motor reaction, complex visual-motor reaction, reaction to a moving object, finger-tapping test.

Statistical processing of the obtained results was carried out using the STATISTICA 6.0 analysis package.

When examining athletes, all bioethical requirements were met according to the 1964 Declaration of Helsinki.

All participants were subject to the same requirements regarding the testing procedure.

Results and discussion. The analysis of the pilot study results demonstrated the following (table 2): there were no significant differences in the main indicators of general and special physical fitness between the groups of soccer players with hearing loss, except for the distance speed in the test – 50 meters from a standing start. Meanwhile, it is obvious from the table 2 that, in relation to the comparison group, soccer players with hearing loss have lower indicators of starting and distance speeds, indicators of speed-strength abilities and dexterity.

Despite this, the indicators of technical fitness among soccer players with hearing loss turned out to be significantly lower (table 3). This can be clearly seen in the "Dribbling the ball, dribbling posts and hitting the goal" test and in the "Kicking the ball for accuracy" test.

One of the integral indicators of the property of the strength of the nervous system is the maximum frequency of movements or tapping. The following was found: in the groups of soccer players with hearing loss, such indicators as the number and the frequency of taps were significantly lower than in the group of healthy soccer players (table 4).

Table 2

Indicators of general and special physical fitness of soccer players of the studied groups

Motor qualities	Test tasks	Studied groups, M±m		
		MG (n =16)	CG (n =16)	GC (n =16)
General physical fitness				
The starting speed	10 m run from a standing start (s)	1,8±0,03	1,8±0,02	1,7±0,01°
Remote speed	50 m run from a standing start (s)	6,5±0,7	6,8±0,4*	6,4±0,1°
Speed endurance	7x50 m shuttle run	65,3±1,7	64,2±2,3	63,1±0,7
Speed and power abilities	Abalakov jump test	45,8±0,9	45,3±0,7	43,2±0,5°
Power abilities	Back dynamometry	48,5±1,3	49,3±0,7	48,3±1,2
Special physical fitness				
Agility	Running 30 meters with driving the ball (s)	4,5±0,03	4,6±0,04	4,4±0,02°
Speed and power endurance	Running 5x30 meters while dribbling (s)	23,6±1,2	25,1±2,0	24,1±1,8
Proper power abilities	Throwing the ball with your hands for distance (m)	24,4±0,3	23,1±0,5	23,3±0,4

Note: * – the significance of differences ($p<0,05$) between the indicators of the main group (MG) and the control group (CG); ° – the significance of differences ($p<0,05$) in relation to the indicators of healthy soccer players (GC)

Table 3

Indicators of technical fitness of soccer players of the studied groups

Test tasks	Studied groups, M±m		
	MG (n =16)	CG (n =16)	GC (n =16)
Dribbling around stands and goal-kicking (s)	8,7±0,01	8,9±0,02*	8,5±0,01°
Kicking the ball for accuracy (number of hits)	7,0±0,1	8,0±0,1*	9,0±0,1°

Note: * – the significance of differences ($p<0,05$) between the indicators of the main group (MG) and the control group (CG); ° – the significance of differences ($p<0,05$) in relation to the indicators of healthy soccer players (GC)

Table 4

Indicators of the finger-tapping test of the studied groups

Indicators	Studied groups, M±m		
	MG (n =16)	CG (n =16)	GC (n =16)
Number of taps	214,3±12,3	215,2±12,4	232,2±10,1º
Frequency of taps (Hz)	7,2±0,3	7,3±1,5	8,2±0,3º

Note: * – the significance of differences ($p<0,05$) between the indicators of the main group (MG) and the control group (CG); ° – the significance of differences ($p<0,05$) in relation to the indicators of healthy soccer players (GC)

Analysis of the distribution of the intragroup number of soccer players with different levels of functional mobility of nervous processes made it possible to establish that soccer players with normal hearing are much more likely to have a high level of functional mobility than in groups of soccer players with hearing loss. So, for example, such groups of soccer players have a convex type of curve, when the pace increases to the maximum in the first 10-15 seconds of work; subsequently, by 25-30 seconds, it decreases below the initial level, occurs in approximately 30-50% of cases, while in the group of soccer players with normal hearing, this option predominates and amounts to 70% (fig. 1).

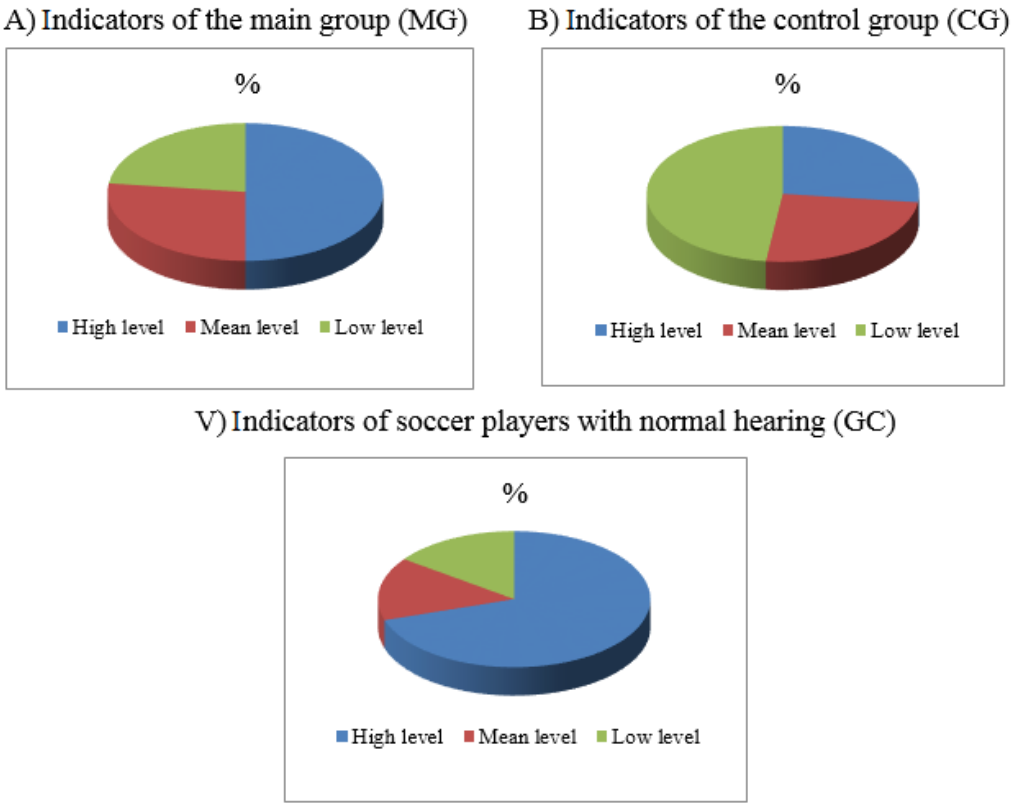

Fig. 1. The level of functional mobility of nervous processes according to the finger-tapping test

Among the important indicators that reflect not only the psychophysiological reactions of an athlete, but also the level of their fitness are the simple visual-motor reaction (SVMR) and complex visual motor reaction (CVMR), as well as reaction to a moving object (RMO). RMO is considered as a reaction to anticipation of an event, the strength of which depends on the speed of movement of the object being watched, and as a temporary reflex. This indicator is used as a physiological test to determine the level of relationship between the processes of excitation and inhibition in the cerebral cortex, both in a state of relative rest and under the influence of physical activity. According to the RMO indicators, one can to a certain extent judge the stability of the functioning of the nervous system. Complex motor reactions, such as a reaction to a moving object (ball) or a choice reaction, when from several

possible actions it is required to instantly choose one that is adequate for a given situation (they are found in sports characterized by a constant and sudden change in the situation of actions (futsal)). Most of the complex motor reactions in game sports are "choice" reactions. The time interval spent on performing a single movement (for example, hitting a ball) also characterizes speed abilities.

We found that in the groups of soccer players with hearing loss (MG and CG), these indicators are significantly higher than in soccer players with normal hearing (GC) (table 5). In our opinion, a decrease in the time for SVMR and CVMR and an increase in technical readiness are possible as a result of the correction of the training process of deaf and hard of hearing soccer players.

Table 5

Indicators of the time of simple (SVMR) and complex (CVMR) reactions of the studied groups

Indicators	Studied groups, M±m		
	MG (n=16)	CG (n=16)	GC (n=16)
SVMR (ms)	195,2±7,2	213,1±7,2	144,3±8,3º
CVMR (ms)	432,3±10,3	450,2±2,4	328,2±16,5º
RMO (s)	0,35±0,3	0,37±0,4	0,21±0,1º

Note: * – the reliability of differences ($p<0,05$) between the indicators of the main group (MG) and the control group (CG); ° – the reliability of differences ($p<0,05$) in relation to the indicators of healthy soccer players (GC)

Conclusion. Thus, it was found in the course of the research that the soccer players of the MG and the CG with hearing loss impairment have lower indices of general, special physical and technical fitness in relation to the indices of soccer players with normal hearing. The psychophysiological features of soccer players with hearing loss are manifested in the formation of a moderately weak and weak type of the nervous system, with reduced indicators of the maximum rate of movements, a reaction to a moving object, a slowed down simple and complex visual-motor reaction. Thus, the obtained data indicate the need to take into account lower initial indicators of the degree of development of physical qualities, technical skills and psychophysiological abilities when planning training loads for soccer players with hearing loss as compared with healthy people.

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