

## Peculiarities of sensory motion reactions by students of KSAPC

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**Purpose:** to establish the features of the manifestation of sensorimotor reactions by students of various specializations of KSAPC.

**Material & Methods:** analysis of scientific and methodological information, generalization of best practical experience, psychophysiological methods of research, methods of mathematical statistics. 72 first-year students of the KSAPC, engaged in various sports, aged from 17 to 19, took part in the research. Participants were divided into 4 groups of 18 people: 1 – cyclical sports (track and field, cycling, tourism); 2 – complex coordination sports (sports and artistic gymnastics, acrobatics, sports dances); 3 – sports games (football, basketball, volleyball, handball); 4 – martial artists (freestyle and Greco-Roman wrestling, judo, boxing). Athletes were qualified from the 2nd category to the candidate for master of sports.

**Results:** in the course of the study it was determined that the best indicators of sensorimotor reactions were observed among students of martial artists, and then - in representatives of sports games, complex coordination and cyclic sports. The greatest differences from the results of the assessment of the level of sensorimotor reactions of martial artists were marked with cyclical sports (from 6% to 12%), followed by complex coordination sports (from 3% to 6%) and sports games (from 1% to 5%).

**Conclusions:** conducted research confirmed the importance of psychophysiological characteristics of athletes of various sports as success factors.

**Keywords:** students, sports, sensorimotor indicators, comparative analysis.

### Introduction

Diagnosis of the functional conditions of the athlete's body is one of the topical areas of modern sports science. High sports achievements are closely connected with the psychophysiological functions of a person. It is known that the total dedication in training activity and the competitive results achieved by the athlete are largely due to the level of development of psychosensory abilities [6; 13; 14; 17].

Since the psychophysiological functions of man represent the biological foundation of the individual-typological features of the higher nervous system, they characterize the process of formation and improvement of special motor skills in conditions of training and competitive activity. The functional state of psychophysiological functions can be an indicator of both the level of preparedness of an athlete, and the development of his processes of fatigue and overstrain [1; 2; 5; 20].

Objective criteria for the current functional state of the central nervous system are indicators of sensorimotor reactions of varying degrees of complexity [8; 10; 18].

The parameters of sensorimotor reactions are one of the most accessible and at the same time sufficiently accurate neurophysiological indicators reflecting the dynamics of the speed of nervous processes and their switching, motor coordination, overall performance and activity of the central nervous system in various fields of activity, including mental performance of students [12; 15; 16; 19]. This makes it possible to

obtain information to recommend to students the most suitable type of physical activity for them and to predict success in the chosen sport.

**Relationship of research with scientific programs, plans, themes.** The research was carried out in accordance with the theme of the research work of the Kharkov State Academy of Physical Culture "Psycho-sensory regulation of the motor activity of athletes of situational sports" (state registration number 0116U008943).

**Purpose of the study:** to establish the features of the manifestation of sensorimotor reactions by students of various specializations of KSAPC.

*Objectives of study:*

– to determine the parameters of sensorimotor reactions in KSAPC students;

– to carry out a comparative analysis of the parameters of sensorimotor reactions in students of various sports of KSAPC.

### Material and Methods of the research

To solve the research problems, the following methods were used: analysis of scientific and methodological information, generalization of best practical experience, psychophysiological methods of research, methods of mathematical statistics.

72 first-year students of the Kharkov State Academy of Physical Culture (KSAPC), engaged in various sports, aged from 17 to 19, took part in the research. Participants were divided into 4 groups of 18 people: 1 – cyclical sports (track and field, cycling, tourism); 2 – complex co-ordination sports (sports and artistic gymnastics, acrobatics, sports dances); 3 – sports games (football, basketball, volleyball, handball); 4 – single combat (freestyle and Greco-Roman wrestling, judo, boxing). Athletes were qualified from the 2nd category to the candidate for master of sports.

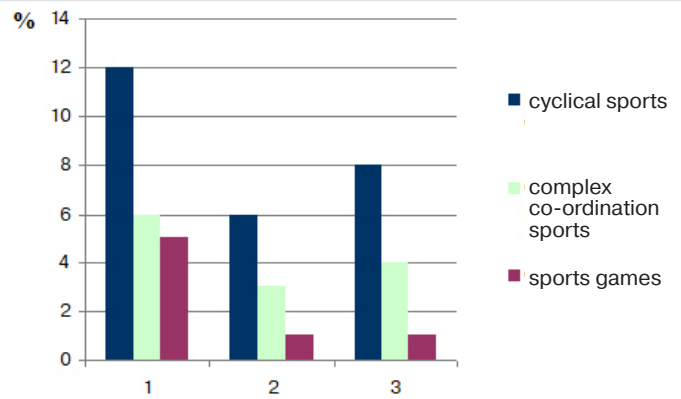
## Results of the research and their discussion

Based on the analysis of scientific and methodological information and generalization of best practical experience, it was established that the specifics of competitive activity of an athlete leaves its imprint on the level of development of leading sensorimotor reactions that ensure high sports achievements [3; 4; 9].

Evaluation of sensorimotor reactions was performed using tests developed for tablet PCs [2; 11]: visual motor reaction (simple reaction); reaction to a moving object (complex reaction); reaction of choice (complex reaction).

Table 1 presents the results of testing the sensorimotor responses of students of KSAPC.

The coefficient of variation was used to determine the homogeneity of the sample observations. The obtained data testify to the homogeneity of the parameters of a simple visual-motor reaction and the selection reaction of the examined athletes, since the coefficient of variation lies in the range from 6,2% to 14,9%. The reaction rates for a moving object have a high coefficient of variation in all groups (from 29,0% to



**Fig. 1. Differences in the results of assessing the level of sensorimotor responses from those of athletes (1 – reaction to a moving object; 2 – selection reaction; 3 – simple visual-motor reaction).**

36,0%), which is explained by the low qualification of athletes who individually have a prediction of the situation (anticipation) (Table 2).

Analysis of Tables 3, 4, 5, 6 allows us to speak of both the similarity of the functional state of the participants in the study ( $p > 0,05$ ) and the differences between the groups of students, the reliability of the differences are observed between martial artists and athletes of complex co-ordinating sports in testing simple visual- motor reaction ( $t = 2,16; p < 0,05$ ).

Comparing the parameters of the sensorimotor reactions of the subjects, it was established that in all tests, the figures of the combatants are higher than those of other groups. The greatest differences from the results of the assessment of the level of sensorimotor reactions of martial artists were noted with cyclic sports (response to a moving object by more than

**Table 1**  
Indicators of sensorimotor reactions of students KSAPC (n=72),  $\bar{X} \pm m$

| No. | Indicators of sensorimotor reactions | 1 group      | 2 group      | 3 group      | 4 group      |
|-----|--------------------------------------|--------------|--------------|--------------|--------------|
| 1.  | A simple visual-motor reaction (ms)  | 237,25±8,60  | 225,87±3,88  | 219,81±3,86  | 217,40±3,27  |
| 2.  | Selection reaction (ms)              | 688,27±18,34 | 665,59±15,41 | 650,80±12,81 | 647,81±18,95 |
| 3.  | Reaction to a moving object (ms)     | 25,72±2,24   | 24,10±1,71   | 23,86±1,73   | 22,74±1,82   |

**Remark.** 1 group – cyclical sports (track and field, cycling, tourism); 2 group – complex co-ordination sports (sports and artistic gymnastics, acrobatics, sports dances); 3 group – sports games (football, basketball, volleyball, handball); 4 group – single combats (freestyle and Greco-Roman wrestling, judo, boxing).

**Table 2**  
Coefficient of variation in the parameters of the sensorimotor responses of students of KSAPC (n=72), %

| No. | Indicators of sensorimotor reactions | 1 group | 2 group | 3 group | 4 group |
|-----|--------------------------------------|---------|---------|---------|---------|
| 1.  | A simple visual-motor reaction (ms)  | 14,9    | 7,1     | 7,3     | 6,2     |
| 2.  | Selection reaction (ms)              | 11,0    | 9,6     | 8,1     | 12,1    |
| 3.  | Reaction to a moving object (ms)     | 36,0    | 29,0    | 30,0    | 33,1    |

**Remark.** 1 group – cyclical; 2 group – complex co-ordination sports; 3 group – sports games; 4 group – single combats.

**Table 3**  
Reliability of differences in the parameters of sensorimotor reactions of students of cyclic sports with other groups

| No. | Indicators of sensorimotor reactions | Groups                |                      |                      |
|-----|--------------------------------------|-----------------------|----------------------|----------------------|
|     |                                      | 1 and 2               | 1 and 3              | 1 and 4              |
| 1.  | A simple visual-motor reaction (ms)  | $t = -1,21; p > 0,05$ | $t = 1,11; p > 0,05$ | $t = 1,67; p > 0,05$ |
| 2.  | Selection reaction (ms)              | $t = -0,95; p > 0,05$ | $t = 0,74; p > 0,05$ | $t = 0,73; p > 0,05$ |
| 3.  | Reaction to a moving object (ms)     | $t = -0,57; p > 0,05$ | $t = 0,10; p > 0,05$ | $t = 0,54; p > 0,05$ |

**Remark.** 1 group – cyclical; 2 group – complex co-ordination sports; 3 group – sports games; 4 group – single combats.

**Table 4**  
**Reliability of differences in the parameters of sensorimotor reactions of students of complex coordination sports with other groups**

| No. | Indicators of sensorimotor reactions | Groups         |                          |                 |
|-----|--------------------------------------|----------------|--------------------------|-----------------|
|     |                                      | 2 and 3        | 2 and 4                  | 2 and 1         |
| 1.  | A simple visual-motor reaction (ms)  | t=1,85; p>0,05 | <b>t=2,16; p&lt;0,05</b> | t=-1,21; p>0,05 |
| 2.  | Selection reaction (ms)              | t=1,67; p>0,05 | t=1,53; p>0,05           | t=-0,95; p>0,05 |
| 3.  | Reaction to a moving object (ms)     | t=0,66; p>0,05 | t=1,03; p>0,05           | t=-0,57; p>0,05 |

**Remark.** 1 group – cyclical; 2 group – complex co-ordination sports; 3 group – sports games; 4 group – single combats.

**Table 5**  
**Reliability of differences in the parameters of sensorimotor reactions of students of game sports with other groups**

| No. | Indicators of sensorimotor reactions | Groups         |                |                |
|-----|--------------------------------------|----------------|----------------|----------------|
|     |                                      | 3 and 4        | 3 and 1        | 3 and 2        |
| 1.  | A simple visual-motor reaction (ms)  | t=0,48; p>0,05 | t=1,11; p>0,05 | t=1,85; p>0,05 |
| 2.  | Selection reaction (ms)              | t=0,13; p>0,05 | t=0,74; p>0,05 | t=1,67; p>0,05 |
| 3.  | Reaction to a moving object (ms)     | t=0,45; p>0,05 | t=0,10; p>0,05 | t=0,66; p>0,05 |

**Remark.** 1 group – cyclical; 2 group – complex co-ordination sports; 3 group – sports games; 4 group – single combats.

**Table 6**  
**Reliability of the differences in the parameters of the sensorimotor reactions of students of martial artists with other groups**

| No. | Indicators of sensorimotor reactions | Groups         |                          |                |
|-----|--------------------------------------|----------------|--------------------------|----------------|
|     |                                      | 4 and 1        | 4 and 2                  | 4 and 3        |
| 1.  | A simple visual-motor reaction (ms)  | t=1,67; p>0,05 | <b>t=2,16; p&lt;0,05</b> | t=0,48; p>0,05 |
| 2.  | Selection reaction (ms)              | t=0,73; p>0,05 | t=1,53; p>0,05           | t=0,13; p>0,05 |
| 3.  | Reaction to a moving object (ms)     | t=0,54; p>0,05 | t=1,03; p>0,05           | t=0,45; p>0,05 |

**Remark.** 1 group – cyclical; 2 group – complex co-ordination sports; 3 group – sports games; 4 group – single combats.

12%, response to a choice of 6%, a simple visual-motor reaction by 8%), then – with complex-coordinated sports (reaction to moving object by 6%, response of choice by 3%, simple visual-motor reaction by 4%) and sports games (response to a moving object is better by 5%, response of choice by 1%, simple visual-motor reaction by 1%) (Figure 1).

The higher parameters of the sensorimotor reactions of martial artists are explained by the specifics of the competitive and training activity, which forms the skills to quickly analyze, evaluate and predict the situation and make timely decisions during the fight.

The received data testify to the importance of the psychophysiological state of athletes as a factor determining success in various sports.

This analysis revealed that in the planning of the training process is necessary to develop a set of special exercises aimed at the development of sensorimotor reactions specific to the sport. This is also confirmed by the results of research presented in scientific works (V. A. Taimazov, Ya. V. Golub, 2004; I. S. Belenko, 2009; Podrigalo, V. and et. al., 2017).

Data on psychophysiological features in various sports are supplemented. So, I. S. Belenko (2009) studied the psychophysiological features of representatives of sports games; N. O. Martusevich, E. A. Kondratenkova (2015) studied the psychophysiological state of sportsmen of game and cyclic sports; A. N. Veraksa, S. V. Leonov, A. E. Gorova (2011) conducted psychological testing in rhythmic gymnastics; S. Iermakov and et. al. (2016) studied the psychophysiological

characteristics of athletes in martial arts.

## Conclusions

On the basis of the analysis of scientific and methodological information and generalization of best practical experience it was established that the specifics of the competitive activity of athletes in various sports leaves their imprint on the level of development of the leading sensorimotor reactions.

In the course of the study, it was determined that the best indicators of sensorimotor reactions were observed in students of martial artists, followed by representatives of sports games, complex coordination and cyclic sports. The greatest differences from the results of the assessment of the level of sensorimotor reactions of martial artists are marked with cyclic sports (reaction to a moving object is higher by 12%, the response of choice is 6%, a simple visual-motor reaction by 8%), then – with hardcore sports (reaction to moving object by 6%, response of choice by 3%, simple visual-motor reaction by 4%) and sports games (response to a moving object by more than 5%, response by 1%, simple visual-motor reaction by 1%).

The level of preparedness of the participants in the study determines their optimal functional state of the neuromuscular system, emphasizes the formation of the necessary skills and skills. This is evidenced by the absence of significant differences in the results of most of the indicators used.

The conducted research confirmed the importance of psychophysiological features of sportsmen of various sports as success factors.

The application of psychophysiological methods is a promising way of predicting the success of athletes.

**Further research** will be aimed at determining the relationship between physical development and psychophysiological indicators of students of various sports.

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