

ORIGINAL ARTICLE

Peculiarities of time perception function development in students under the influence of physical activity of different orientation

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ABSTRACT

Aim: The aim is to investigate the influence of physical activity of different orientations on the development of the time perception function in students.

Materials and Methods: The research, which was conducted in 2023-2024, involved 195 students aged 17-20 (males), who were divided into two experimental (A and B) and one control (C) groups: group A (n = 65) included students who were engaged in high-speed and strength sports during their studies, group B (n = 61) – students who were involved in endurance sports, and group C (n = 69) – students who were not engaged in sports. The development peculiarities of time perception function were evaluated using V. L. Maryshuk's method.

Results: It has been established that there are insignificant ($p > 0.05$) changes in the average values of the time perception function under the influence of endurance physical activity. In contrast, under the influence of high-speed and strength loads there is a statistically significant ($p < 0.05$-0.001) improvement in the time perception function in students. Compared to students who did not do sports, the function of time perception in students engaged in high-speed and strength sports is significantly ($p < 0.05$).

Conclusions: The results obtained can be used to select and orient young people in certain sports and implement medical and biological control of the educational and training process.

KEYWORDS: physical activity, time perception function, students

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INTRODUCTION

Chronobiological peculiarities of time and space perception as complex elements of human cognition are one of the leading factors limiting the success of sports activity in most sports [1, 2]. According to scientists [3, 4], the function of time perception is a universal indicator of the efficiency and success of competitive activity: the more accurate the perception of time, the more successful the activity. Concerning the function of time perception in athletes of different sports, few studies have answered, for example, the possibility of a specific impact of training loads of different orientations on the dynamics of the formation and development of the mentioned function. The study of the influence of training of varying nature and orientation on the function of time perception, in our opinion, will expand not only the theoretical arsenal of knowledge about the patterns of temporal regulation of the functions of the body of athletes and the mechanisms of adaptation to sports training, but also can be a practical platform for solving several issues related to the sports selection and orientation of young people in particular sports and the implementation of medical and biological control of the training process [5-7].

In our previous work, we presented the research study's results on the peculiarities of changes in the function of time perception in young athletes aged 13-16 years of specialized sports institutions, depending on the orientation of their training process [8]. The general conclusion of this work is the establishment of the specificity of the influence of trainings of different orientations (on strength, speed, and endurance) on the mental function of young athletes at the stage of specialized basic training. However, the issue of studying the influence of different sports on the formation and development of the time perception function at a later stage of long-term training – at the stage of sports excellence (17 years and older) remains unknown. That is why the latter prompted us to conduct a similar research on the influence of training loads of different orientations on time perception function development in students of 17-20 years old of specialized sports educational institutions.

AIM

The aim is to investigate the influence of physical activity of different orientations on the development of the time perception function in students.

MATERIALS AND METHODS

The research, which was conducted in 2023-2024, involved 195 students aged 17-20 (males), who were divided into two experimental (A and B) and one control (C) groups: group A (n=65) included students who were engaged in high-speed and strength sports (boxing, wrestling, athletics (sprinting, hurdling, jumping, shot put and discus throwing)), group B (n=61) included students who were engaged in endurance sports (skiing, cycling, swimming for 200, 400 and 1500 meters), and group C (n=69) included students who were not engaged in sports. Students of groups A and B studied at the Brovary Higher School of Physical Culture (Kyiv oblast, Ukraine), and students of group C – at the Borys Grinchenko Kyiv Metropolitan University (Kyiv, Ukraine).

RESEARCH METHODS

Theoretical analysis and generalization of scientific and methodological literature, pedagogical observation, testing, statistical analysis.

The peculiarities of time perception function development were evaluated according to the method of Maryshuk V.L. [9]. Its essence lies in the following: the experimenter by striking a pencil on the surface of the table gives a countdown of the beginning, and at the next strike – the end of a specific (in seconds) time interval; the subject, in turn, should reproduce the time interval set by the experimenter also by striking a pencil on the surface of the table, with the help of which the beginning and end of the time interval were determined. The range of time intervals was from 6 to 12 seconds. Each individual was asked to complete the above test task in 10 attempts. The following indicators were determined: the sum of errors made by the subject and the accuracy of time perception (accuracy of time interval estimation). The following formula determined the last indicator (accuracy of time interval estimation):

$A = 100 – (S2 \cdot 100 / S1)$,

where A is the accuracy of time interval estimation, %;

S1 – the sum of time intervals determined by the experimenter. For all subjects, this indicator was the same and amounted to 89 seconds, and the components of this sum (time intervals) were set in the following sequence: 8→11→6→10→7→12→6→9→9→11 seconds;

S2 – the sum of the subject's errors, seconds.

PROCEDURE

Evaluation of the research results was carried out according to the data of the comparative analysis of the first and second (in a year) stages of the students' examination according to the following scheme: separately for each sport, for groups of students by sports, comparative analysis A, B, C. Tests were carried out in the morning (from 9 to 12 o'clock, not earlier than 2 hours after eating). One or two days before the examination, the students were asked to reduce physical activity by 50% in volume and intensity, not to use tonic and sedative pharmacological drugs, and on the day of testing – strong tea or coffee. All students were healthy during the examination period.

STATISTICAL ANALYSIS

Mathematical statistics were used to process the data obtained. The reliability of the difference between the indicators was determined using the Student's t-test. The reliability of the difference was set at $p<0.05$. All results were presented as M±m, where M – arithmetic mean; m – error of arithmetic mean. This research followed the regulations of the World Medical Association Declaration of Helsinki. Informed consent was obtained from all participants who took part in this research.

RESULTS

The research results of the indicators of the time perception function in students who were engaged in high-speed and strength sports (group A) are given in Table 1.

The analysis of results showed that according to the data of the repeated (in a year) examination, the indicator of time perception accuracy significantly improved in all sportsmen (boxers, wrestlers, track and field athletes) of group A ($p<0.01$). In parallel with the improvement of this indicator, the number of made errors decreased statistically significantly ($p<0.001$).

According to the data of Table 2, the diametrically opposite character of changes in the indicators of the time perception function is registered among cyclists, skiers, and swimmers – representatives of endurance sports (group B). It was found that all students of this group had no statistically significant difference in changes of indicators of time perception accuracy and sum of made errors ($p>0.05$).

Similar dynamics of changes of the studied indicators are observed in students who do not participate in sports (group C). That is, there are insignificant differences in average values of indicators of the sum of errors and time perception accuracy according to the data of the first (I) and second (II) stages of the research ($p>0.05$), (Table3).

Taking into account the similar character of changes of the indicators of the time perception function in students who mainly develop certain motor qualities (high-speed and strength qualities or endurance), we analyzed changes of the time perception function separately in students of groups A and B (Table 4). It was found that the representatives of sports of high-speed and strength character (group A) noted statistically significant improvement of time perception accuracy and a significant decrease in the sum of the made errors ($p<0.001$). In contrast, students of endurance sports (groupB) registered insignificant differences in values of the studied indicators ($p>0.05$).

Below is the comparative analysis of the changes in the studied indicators in students of groups A, B, and C (Table 5). It was found that the sum of errors is significantly lower in students of group A compared to groups B and C, both according to the data of the first stage of the research

Table 1. Indicators of the time perception function in students engaged in high-speed and strength sports (group A) according to the data of the first (I) and second (II) stages of the research

Indicators	I	II	t	p
Boxers				
Number of students	(n=22)	(n=0)		
Sum of errors, s	4.9±0.53	2.1±0.42	4.14	<0.001
Time perception accuracy, %	95.2±0.55	97.7±0.43	3.58	<0.01
Wrestlers				
Number of students	(n=21)	(n=21)		
Sum of errors, s	5.0±0.55	2.2±0.39	4.15	<0.001
Time perception accuracy, %	94.9±.58	97.4±0.45	3.41	<0.01
Track and field athletes				
Number of students	(n=22)	(n=21)		
Sum of errors, s	5.2±0.61	2.0±0.42	4.32	<0.001
Time perception accuracy,%	94.2±0.69	97.6±0.58	3.77	<0.01

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

Table 2. Indicators of the time perception function in students engaged in endurance sports (group B) according to the data of the first (I) and second (II) stages of the research

Indicators	I	II	t	p
Cyclists				
Number of students	(n=22)	(n=20)		
Sum of errors, s	6.9±0.63	6.7±0.68	0.22	>0.05
Time perception accuracy,%	91.4±0.70	91.5±0.77	0.10	>0.05
Skiers				
Number of students	(n=17)	(n=17)		
Sum of errors, s	7.2±0.72	7.1±0.63	0.10	>0.05
Time perception accuracy,%	92.0±0.78	92.1±0.71	0.09	>0.05
Swimmers				
Number of students	(n=22)	(n=21)		
Sum of errors, s	6.5±0.61	6.3±0.53	0.25	>0.05
Time perception accuracy,%	91.5±0.69	91.7±0.62	0.22	>0.05

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

Table 3. Indicators of the time perception function in students who did not play sports (group C) according to the data of the first (I) and second (II) stages of the research

Indicators	I	II	t	p
Number of students	(n=69)	(n=66)		
Sum of errors, s	7.1±0.55	7.0±0.63	0.12	>0.05
Time perception accuracy,%	92.0±0.64	92.1±0.71	0.10	>0.05

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

Table 4. Indicators of the time perception function in students of groups A and B according to the data of the first (I) and second (II) stages of the research

Indicators	I	II	t	p
Group A				
Number of students	(n=65)	(n=62)		
Sum of errors, s	5.0±0.56	2.1±0.35	4.39	<0.001
Time perception accuracy,%	94.8±0.62	97.6±0.44	3.68	<0.001
Group B				
Number of students	(n=61)	(n=58)		
Sum of errors, s	6.9±0.40	6.0±0.56	1.31	>0.05
Time perception accuracy,%	92.8±0.69	93.0±0.63	0.21	>0.05

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

Table 5. Comparative analysis of the sum of errors in students of groups A, B and C according to the data of the first (I) and second (II) stages of the research

Stages	Group A [1]	Group B [2]	Group C [3]	t; [p1–p2]	t; [p1–p3]	t; [p2–p3]
I	5.0±0.56	6.9±0.40	7.1±0.55	2.76; <0.01	2.68; <0.01	1.47;>0.05
II	2.1±0.35	6.0±0.56	7.0±0.63	5.91; <0.001	6.80; <0.001	1.19;>0.05

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

Table 6. Comparative analysis of the time perception accuracy in students of groups A, B, and C according to the data of the first (I) and second (II) stages of the research

Stages	Group A [1]	Group B [2]	Group C [3]	t; [p1–p2]	t; [p1–p3]	t; [p2–p3]
I	94.8±0.62	92.8±0.69	92.0±0.64	2.16; <0.05	3.14; <0.01	0.85;>0.05
II	97.6±0.44	93.0±0.63	92.1±0.71	5.99; <0.001	6.59; <0.001	0.95;>0.05

Legend: t – value of Student's t-test; p – level of statistical significance of differences.

(p<0.01) and the second stage (p<0.001). No statistically significant differences were found between the indicators of students of groupsB and C (p>0.05).

Accordingly, Table 6 presents the comparative analysis of the accuracy of time perception in three groups of students. It was found that the time perception accuracy is significantly higher in students engaged in high-speed and strength sports than in students involved in endurance sports and those who were not engaged in sports (p<0.05-0.001) both according to the data of the first and second stages of the research. At the same time, there were no significant differences like changes of this indicator between students of groups B and C (p>0.05).

DISCUSSION

There is a large arsenal of studies on the impact of various sports on the perception of time as a mental process of reflection in an individual's mind of holistic images, objects or phenomena under their direct influence on the sensory organs [10-12]. This type of research is relevant because the time perception function plays an essential role in human adaptation to the effects of various environmental factors, one of which is physical activity [13, 14]. However, the results of studies by different authors on the actualized problem of the influence of sports activity on the peculiarities of the development of time perception are polar. Thus, according to Edwards A.M. et al. [2], the slightest error in the value of an individual unit of time concerning an astronomical minute is observed in athletes of cyclic sports, whose activities are not limited by space or time, respectively, the error is more significant in representatives of situational sports, and the largest – in acyclic sports. At the same time Behm D.G. and Carter T.B. [3] note that the closest to the actual countdown is the individual perception of time intervals in martial arts athletes (boxing, wrestling). The authors explain the results of their research by the fact that the duration of a sports match (for example, a round in boxing) is not determined by the timer (the latter is under the control of the referee), but rather by the athlete's feelings – their "internal clock". Studying the genetic features of

time perception in athletes, scientists [1, 4] established the hereditary determination of the reproduction of periods of different durations. The research of Khoroshukha M.F. et al. [8, 9] may also be interesting, in which the authors testify to the possibility of using serological markers of blood groups in genetic prediction of the development of the quality of time perception in young athletes.

Summarizing the data of the research, we conclude that even though the main mental functions (perception, attention, memory, thinking) are characterized by a pronounced genetic heredity and are poorly corrected through physical education, we believe that the focus of physical activity specializes the peculiarities of the time perception function development. Thus, if students under the influence of endurance training (skiing, cycling, swimming) record insignificant changes in the time perception accuracy and the sum of errors, then under the influence of training that mainly develops high-speed and strength qualities (boxing, wrestling, athletics), a significant ($p<0.01$-0.001) improvement in indicators is observed. In students who do not go in for sports, there were no significant differences like changes in the studied indicators ($p>0.05$). The same changes in indicators of the time perception function were also revealed in athletes of two groups (by the direction of physical loads): group A, high-speed and strength sports, and group B, endurance sports. In particular, it was found that the improvement of the time perception function was observed only in students of group A, while in group B the nature of changes in indicators was unreliable. The fact that students with the same type of physical activity did not find significant differences in the indicators of the time perception function ($p > 0.05$) is evidence of the specific effect of physical activity on the body functions of people of different ages, sexes and occupations [15-23].

CONCLUSIONS

It was found that the orientation of physical activity specializes the peculiarities of the development of the time perception function in students aged 17-20 years of specialized sports educational institutions. The comparative analysis of changes in the indicators of the time perception function in three groups of students shows that under the influence of physical activity aimed at the development of high-speed and strength qualities, significantly better values of the time perception function are recorded compared to students who mainly develop endurance, as well as to students who do not play sports. Students who are not engaged in endurance sports have the same pattern of changes in the time perception function as students who are not engaged in sports. The results can be used to select and orient young people in particular sports and implement medical and biological control of the educational and training process.

PROSPECTS FOR FURTHER RESEARCH

It is planned to investigate the influence of physical activity of different orientation on the development of the time perception function in female students specializing in various sports.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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