ORIGINAL ARTICLE

INFLUENCE OF SEROLOGICAL MARKERS OF BLOOD GROUPS UPON THE DEVELOPMENT OF VISUAL MEMORY IN HIGH SCHOOLERS AND STUDENTS

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Mykhailo F. Khoroshukha[1], Grygoriy P. Griban[2], Anatolii I. Bosenko[3], Natalia A. Lyakhova[4], Alla M. Harlinska[2], Pavlo P. Tkachenko[5], Anna A. Bondar[6]

[1]BORIS GRINCHENKO KYIV UNIVERSITY, KYIV, UKRAINE
[2]ZHYTOMYR IVAN FRANKO STATE UNIVERSITY, ZHYTOMYR, UKRAINE
[3]THE STATE INSTITUTION "SOUTH UKRAINIAN NATIONAL PEDAGOGICAL UNIVERSITY NAMED AFTER K.D. USHYNSKY", ODESA, UKRAINE
[4]POLTAVA STATE MEDICAL UNIVERSITY, POLTAVA, UKRAINE
[5]POLISSIA NATIONAL UNIVERSITY, ZHYTOMYR, UKRAINE
[6]VINNYTSIA INSTITUTE OF TRADE AND ECONOMICS OF STATE UNIVERSITY OF TRADE AND ECONOMICS, VINNYTSIA, UKRAINE

ABSTRACT

The aim: To investigate the influence of serological markers of blood groups of the AB0 system upon the development of short-term visual memory in high schoolers and students.

Materials and methods: The research involved 13-16-year-old high schoolers (boys) (n = 139) who were involved in various sports: group A – speed and strength sports (n = 74); group B – endurance sports (n = 65). The control group consisted of 13-16-year-old high schoolers (n = 106) and 17-20-year-old students (n = 212) who were not engaged in sports. The study of short-term visual memory was conducted using the"Memory for geometric shapes"method.

Results: It was found that high schoolers and students with the 0(I) blood group have the best associative coupling with the properties of short-term visual memory.

Conclusions: The use of serological markers of blood groups according to the AB0 system is possible in the genetic prediction of the development of visual memory in high schoolers and students. Herewith, the associative coupling is more pronounced in juvenility than in adolescence.

KEY WORDS: serological markers, blood group, visual memory, high schoolers, students

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INTRODUCTION

Not only individual and typological features of higher nervous activity (strength and functional mobility of nervous processes) but also the level of development of such mental properties of individuals as attention, thinking, and memory play great importance in ensuring effective physical and mental activity in sports that require from athletes quick and accurate assessment of situations, ability to think and make decisions in conditions of physical and emotional fatigue of their organisms, etc.[1-3].

It is known that the function of visual memory is an active process in various spheres of human activities, and in sports practice, like other mental functions (attention, logical thinking, time perception), it directly affects the effectiveness of sports activities [4-6]. In addition, from the results of our previous studies [7], we know about the fact of the specific influence of the orientation of the training process on the development of the main mental properties of adolescents who were engaged in various sports. In particular, it was found that there was an improvement in visual memory function under the influence of endurance physical activity, while there were insignificant changes in the above-mentioned property under the influence of speed and strength loads.

In this regard, the issue of using serological markers of blood groups in the genetic prediction of the development of visual memory function in high schoolers and students engaged in various sports is relevant. The study of this problem is not only theoretical but also practical. Knowledge about the influence of serological markers of blood groups upon the development of visual memory can be used in the practice of genetic

Table I. Assessment of visual memory of high schoolers and students (in points)

Number of correct answers	14	13	12	11	9-10	7-8	5-6	4	3	2
Number of points	10	9	8	7	6	5	4	3	2	1

Table II. Indicators of visual memory function in 13-16-year-old high schooler athletes with different blood groups (not taking into account the specifics of sports), X ± m, (n = 139)

No	Blood groups	n	Visual memory	
			Number of errors, pcs.	Score, points
1	0(I)	46	2.9±0.24	7,2±0,20
2	A(II)	43	3.4±0.28	6,9±0,22
3	B(III)	28	3.5±0.32	6,7±0,23
4	AB(IV)	22	3.5±0.33	6,7±0,26
Reliability of the difference		p1-p2	>0.05	>0.05
		p1-p3	>0.05	>0.05
		p1-p4	>0.05	>0.05
		p2-p3	>0.05	>0.05
		p2-p4	>0.05	>0.05
		p3-p4	>0.05	>0.05

Table III. Indicators of visual memory function in 13-16-year-old high schoolers with different blood groups who were engaged in speed and strength sports (group A), X ± m, (n = 74)

No	Blood groups	n	Visual memory	
			Number of errors, pcs.	Score, points
1	0(I)	24	3.2±0.32	7.0±0.26
2	A(II)	23	3.8±0.38	6.6±0.27
3	B(III)	15	3.7±0.50	6.6±0.35
4	AB(IV)	12	3.6±0.48	6.7±0.36
Reliability of the difference		p1-p2	>0.05	>0.05
		p1-p3	>0.05	>0.05
		p1-p4	>0.05	>0.05
		p2-p3	>0.05	>0.05
		p2-p4	>0.05	>0.05
		p3-p4	>0.05	>0.05

psychological and pedagogical counseling of young people on the problems of their choice of sports and professional activities.

THE AIM

The aim is to investigate the influence of serological markers of blood groups of the AB0 system upon the development of short-term visual memory in high schoolers and students.

MATERIALS AND METHODS

The research involved 13-16-year-old high schoolers (boys) (n = 139) of the Brovary Higher School of Physical Culture (Brovary, Kyiv oblast) (the experimental group) who were engaged in various sports: group A (n = 74) – speed and strength sports (boxing, wrestling, track-and-field athletics: sprinting, hurdling, jumping, shot put and discus throwing); group B (n = 65) – endurance sports (skiing, cycling, swimming: 200, 400 and 1500 m). The control group consisted of 13-16-year-old high schoolers (n = 106) and 17-20-year-old students (n = 212) who were not engaged in sports. The research on the influence of serological blood group markers on the development of visual memory of high schoolers and students was conducted in the period from 2019 to 2022.

The study of individual characteristics of short-term visual memory was conducted using the "Memory for geometric shapes" method, which was proposed by M. V. Makarenko et al [8, 9]. During this test, the subject of interest was presented with forms depicting 7

Table IV. Indicators of visual memory function in 13-16-year-old high schoolers with different blood groups who were engaged in speed and strength sports (group B), X ± m, (n = 65)

No	Blood groups	n	Visual memory	
			Number of errors, pcs.	Score, points
1	0(I)	22	2.6±0.35	7.5±0.31
2	A(II)	20	2.9±0.39	7.3±0.35
3	B(III)	13	3.3±0.38	6.8±0.32
4	AB(IV)	10	3.4±0.48	6.8±0.39
Reliability of the difference		p1-p2	>0.05	>0.05
		p1-p3	>0.05	>0.05
		p1-p4	>0.05	>0.05
		p2-p3	>0.05	>0.05
		p2-p4	>0.05	>0.05
		p3-p4	>0.05	>0.05

Table V. Indicators of visual memory function in 13-16-year-old high schoolers with different blood groups who were not engaged in sports, X ± m, (n = 106)

No	Blood groups	n	Visual memory	
			Number of errors, pcs.	Score, points
1	0(I)	28	2.8±0.34	7.4±0.30
2	A(II)	30	3.2±0.34	7.1±0.26
3	B(III)	26	3.2±0.28	7.0±0.24
4	AB(IV)	22	3.0±0.28	7.1±0.25
Reliability of the difference		p1-p2	>0.05	>0.05
		p1-p3	>0.05	>0.05
		p1-p4	>0.05	>0.05
		p2-p3	>0.05	>0.05
		p2-p4	>0.05	>0.05
		p3-p4	>0.05	>0.05

Table VI. Indicators of visual memory function in 17-20-year-old students with different blood groups who were not engaged in sports, X ± m, (n = 212)

No	Blood groups	n	Visual memory	
			Number of errors, pcs.	Score, points
1	0(I)	67	2.0±0.19	8.1±0.16
2	A(II)	65	2.6±0.23	7.6±0.19
3	B(III)	45	2.5±0.30	7.7±0.26
4	AB(IV)	35	2.6±0.41	7.6±0.32
Reliability of the difference		p1-p2	<0.05	<0.05
		p1-p3	>0.05	>0.05
		p1-p4	>0.05	>0.05
		p2-p3	>0.05	>0.05
		p2-p4	>0.05	>0.05
		p3-p4	>0.05	>0.05

geometric shapes. The subject had to memorize their location within 30 seconds, and then reproduce the given figures on the registration form within 45 seconds. The test task was performed twice using similar forms. We counted the number of shapes correctly drawn and placed in the registration form (correct answers) and the number of errors made by the subject of interest. Based on the results of the two tasks, the state of the

individual's "visual memory" was assessed in terms of conditional points (Table I).

The tests were conducted in an isolated room in the morning (from 9 to 12 o'clock, no earlier than 2 hours after eating). One or two days before the examination, high schoolers and students were asked to reduce physical activity by 50 % in volume and intensity, not to take tonic and sedative pharmaceuticals, and not to drink strong tea or coffee on the day of testing. Blood group data was taken from the subjects' medical records. This research followed the regulations of the World Medical Association Declaration of Helsinki. Each subject voluntarily participated in the research. All high schoolers and students were healthy during the survey period. In the course of the research, the reliability of the difference between the studied high schoolers and students with different AB0 blood groups was determined using the parametric Student's t-test. The difference was considered statistically significant at the 95 % significance level ($p < 0.05$).

RESULTS

The results of associative coupling of blood groups with properties of visual memory function of 13-16-year-old high schooler athletes without taking into account specifics of their sports are presented in Table II.

It was found that the number of errors made by high schooler athletes (not taking into account the specifics of sports) when performing the"Memory for geometric shapes" test remains practically the same for most of them, and therefore no statistically significant differences ($p > 0.05$) were found among persons of four blood groups. There were also no significant differences ($p > 0.05$) in the number of points in the assessment of visual memory in high schooler athletes.

The data of the comparative analysis of indicators of the function of short-term visual memory in high schooler athletes who specialized in sports with different training orientations (group A – speed and strength sports, group B – endurance sports) are presented in Tables III and IV.

As can be seen from Tables III and IV, we did not find a statistically significant difference ($p > 0.05$) between the indicators of visual memory function (number of errors and total score) in 13-16-year-old high schoolers who were engaged in various sports.

Table V presents the results of the research on visual memory function in 13-16-year-old high schoolers who did not play sports. The data of this table show that there is no significant difference in the values of the registered indicators characterizing the function of short-term visual memory between high schoolers of all four blood groups ($p > 0.05$).

From our previous studies [10-13] it is known that stability, the concentration of attention, perception of time, and logical thinking in young people improve over the years, and therefore, in our case, we can assume that the function of visual memory will also be more pronounced in juvenility than in adolescence. In this regard, we conducted the research on the influence of serological markers of blood groups upon the development of short-term visual memory function in 17-20-year-old students of higher educational institutions who were not engaged in sports (Table VI). The data in this table show that students with the 0(I) blood group had significantly better values in terms of the number of errors and the overall score in the development of their visual memory compared to students with the A(II) blood group ($p < 0.05$). While no statistically significant difference was found between students belonging to the B(III) and AB(IV) blood groups ($p > 0.05$). Therefore, it can be assumed that students with the 0(I) blood group had the best associative coupling with visual memory function.

DISCUSSION

Studies [14] have found that there is a close correlation relationship between the academic performance of high schoolers and university students and the volume (efficiency) of short-term visual memory, which ranges from $r = 0.26$ to 0.39. Similarly, researchers [1, 15] found a positive relationship between the development of the working memory of young children and their academic performance in primary school and the research [16], respectively, established a high associative coupling between memory function and mathematical performance of primary schoolers. Studies [17, 18] have shown associative coupling between serological markers of blood groups of the AB0 system and the possibilities of developing motor skills in athletes, which allows for the orientation of gifted children and adolescents to certain types of sports activities, and adults (men and women), respectively, to the development of certain motor skills. Research [13] shows that blood group markers can be used in the genetic prediction of mental properties of attention and logical thinking in adults. Our previous studies analyze the influence of serological blood group markers upon the development of logical thinking, attention, and time perception in young athletes (boys and girls) of adolescent age [10-12].

The generalized conclusions of the above works are as follows: 1) the use of serological markers of blood groups of the AB0 system is possible in the genetic prediction of the development of mental properties of thinking, attention, and perception; 2) the best associa-

tive coupling with various properties of logical thinking is observed in individuals with the A(II) and 0(I) blood groups, and the worst – in the AB(IV) and B(III) groups; 3) adolescent athletes with the 0(I) blood group have the best associative coupling with different properties of attention, and respectively, the worst – with the A(II) group; 4) and finally, young athletes with the B(III) blood group have the best associative coupling with the properties of time perception, while the worst associative coupling cannot be established.

The conducted analysis of visual memory function indicators depending on serological markers of blood groups of the AB0 system of 13-16-year-old high schooler athletes (with and without taking into account the orientation of the sport) shows the absence of significant differences between individuals with the 0(I), A(II), B(III) and AB(IV) blood groups ($p > 0.05$). We also found no significant difference between the indicators of short-term visual memory function ($p > 0.05$) when studying the peculiarities of visual memory development in high schoolers with different blood groups who were not engaged in sports. The results of the study of students who were not engaged in sports indicate that the best associative coupling with visual memory properties was found in individuals with the 0(I) blood group, while the worst one remains unclear. It can be assumed that the properties of visual memory, similar to other mental functions (attention, perception, thinking), are more pronounced in juvenility than in adolescence.

CONCLUSIONS

The use of serological markers of blood groups according to the AB0 system is possible in the genetic prediction of the development of visual memory in high schoolers and students, regardless of their social employment. It is worth noting that the associative coupling in the subjects of interest is more pronounced in juvenility than in adolescence. In general, based on the results of the research, we conclude that individuals with the 0(I) blood group have the best associative coupling with the properties of short-term visual memory, while the worst coupling cannot be determined.

PROSPECTS FOR FURTHER RESEARCH

It is planned to study in more depth the possibilities of using serological blood group markers in the genetic prediction of the development of human mental functions (attention, memory, perception).

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ORCID and contributionship:
Mykhailo F. Khoroshukha: 0000-0001-5024-5792[A,B]
Grygoriy P. Griban: 0000-0002-9049-1485[D]
Anatolii I. Bosenko: 0000-0003-3472-0412[C]
Natalia A. Lyakhova: 0000-0003-0503-9935[E]
Alla M. Harlinska: 0000-0001-7859-8637[D]
Pavlo P. Tkachenko: 0000-0003-4407-8611[F]
Anna A. Bondar: 0000-0001-6051-1898[B,C]

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CORRESPONDING AUTHOR

Grygoriy P. Griban
Zhytomyr Ivan Franko State University
40 Velyka Berdychivska st., 10002 Zhytomyr, Ukraine
tel: +380973341092
e-mail: gribang@ukr.net

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