

Original Article

## Influence of blood type serologic markers on development of the function of logical thinking of athletes aged 17-20

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Published online: June 30, 2019

(Accepted for publication: June 02, 2019)

DOI:10.7752/jpes.2019.02153

### Abstract.

The articles tackles influence of blood type serological markers on development of psychic function of logical thinking of young athletes aged 17-20. Athletes (male) of teen age (n=132) took part in the research. Based on classification of kinds of sports by A. H. Dembo, they were divided into two groups: group A – speed-and-power kinds of sports (n=69); group B – endurance kinds of sports (n=63). Control group included students aged 17-20 (n=131) who did not do any sport. Analysis of the function of logical thinking was done using “numeric series” method by M.V. Makarenko. Quantitative indices of thinking function evaluation were as follows: the number of correct answers given by participants for a period of time, speed of thinking, general evaluation of thinking. The fact of possible application of blood types in genetic prognosis of thinking development has been detected. It has been revealed that individuals having A(II) and O(I) blood types have the best associative ties with various features of logical thinking, while those having AB(IV) blood type – the worst one.

**Keywords:** psychic functions, logical thinking, research, athletes, students, teen age.

### Introduction

Based on research of many authors [2, 3, 5 et al.], we see that young athletes need not only to be physically prepared but also have appropriate level of development of such psychic features of a personality as concentration, memory, and thinking in order to be able to execute long and rather intense physical and sometimes intellectual exercises (the latter require athletes to show quick and accurate evaluation of situations, ability to think and make decisions under conditions of physical and emotional fatigue etc.)

There is also a number of modern research that reveal associative ties between blood types serologic markers of ABO system and features of motor qualities development, morpho-functional and psychic features of individuals who are engaged in physical culture and sports. Thus, research by E. A. Strikalenko, L. P. Serhiyenko, L. I. Serhiyenko [12] та E. A. Strikalenko, L. I. Serhiyenko [13] defined associative ties between blood types and development of motor abilities of high-qualification athletes, which will allow orientation of children and teenagers on certain types of sports activity; respectively, V. Lyshevskoiu, S. Shepoval [11] – ties with the development of speed features of males and females. The research by L. P. Serhiyenko [6] defined the aforementioned ties with the development of psychic features of concentration and logical thinking of adult individuals.

In our previous research [8, 10], we analyze influence of blood type serologic markers on the development of psychic function of concentration and memory of young athletes aged 13-16. Namely, it was noted that genetic disposition to the development of the aforementioned psychic features of young athletes takes place. However, we, along with other researchers, assume that it is more expressed in adult age than in teen age.

It should also be mentioned that the research by M. F. Khoroshukha [9] reveals the fact of a specific influence of training process orientation on basic features of psychic functions of young teen-age athletes who do various kinds of sports. Namely, it has been revealed that under influence of endurance physical workload, improvement of indices of the function of logical thinking is observed, while under influence of speed-and-power workload, we observe insignificant changes of this function.

Given the aforementioned, the issue of influence of blood type serologic markers on the development of the function of logical thinking of athletes older than teenagers who specialize in kinds of sports of various physical orientation still remains urgent and unsolved.

### Materials and methods

Athletes (male) aged 17-20 (n=132) from Brovary Higher College of Physical Culture (experimental group) took part in the research. Based on classification of kinds of sports by A.H. Dembo [1], they were divided into two groups: group A (n=69) – speed-and-power kinds of sports (boxing, wrestling); group B (n=63) –

endurance kinds of sports (skiing, cycling). Control group of the participants included students aged 17-20 from National Pedagogical Dragomanov University who were not engaged in sports (n=131).

The analysis of the function of logical thinking was done using “numeric series” method by M.V. Makarenko, V.A. Pukhovyi, N.V. Kolchenko, Yu.L. Maydykovyi and others [4]. A participant was given forms with missing numbers in series (overall number of misses was 10). The participant was to correctly choose numbers that would supplement the series. 10 minutes were given to complete this task. In case the task was completed earlier, time lapsed was registered. Quantitative indices of evaluation of the function of logical thinking were as follows: 1) the number of correct answers given by a participant; 2) speed of thinking (in standard units); 3) overall evaluation of logical thinking (in grades). The letter was done using the scheme by the aforementioned authors [4]:

Evaluation, grades	6	5	4	3	2	1	0
Correct answers, number	10	9	8	7	6	4-5	1-3

Speed of thinking was calculated using the following formula:

$$Sth = \frac{A}{t}, \text{ in which:}$$

*Sth*– speed of thinking, standard units,

*A*–correct answers, number,

*t*–time lapsed, minutes.

The test was done in isolated room before noon (from 9 am to 12 pm, at least two hours after consuming food). 1-2 days before the test, the participants were asked to lowers physical workload by volume and intensity by 50%, not to use tonic and tranquilizing medicines; not to consume tea or coffee on the day of the test.

Data on blood types were taken from participants’ medical records. Individuals, having no data on their blood types were not allowed to participate in the test.

During the research, true differences between individuals having various ABO system blood types from experimental (athletes) and control (students) group were defined using parametric Student’s t-criterion.

The aim of the article is to analyze influence of blood type serologic markers on development of the function of logical thinking of teen age athletes.

Methods of research: theoretical analysis and generalization of academic and methodological literature, pedagogical survey, methods of statistics.

## Results

The search of features of the function of logical thinking of athletes aged 18-20 having different ABO system blood types using the method of “numeric series” with no consideration to the specifics of their kinds of sports (table 1) proves the following: 1) teenagers having A(II) blood type gave fewer correct answers compared to their peers having B(III) ( $P<0,05$ ) and AB(IV)( $P<0,01$ ) blood types; 2) no true differences between individuals having 0(I) and A(II) blood types ( $P>0,05$ ) were found, although the tendency to a bigger number of correct answers is traced with athletes having A(II) blood type; 3) as a result, individuals having A(II) blood type are characterized with probably higher speed of thinking compared to participants having 0(I), B(III), and AB(IV) blood types ( $P<0,01$  in all cases). Analysis of general evaluation of the aforementioned feature shows that its highest values, as expected, were registered with athletes having A(II) blood type compared to their peers having B(III) and AB(IV) blood types (respectively,  $P<0,01$  in both cases). No statistically true differences of “evaluation” index of the function of logical thinking of individuals having A(II) and 0(I) blood types ( $P>0,05$ ) were found. Based on the aforementioned, we may assume that athletes having 0(I) blood type, like individuals having A(II) blood types, can also have strong associative tie with features of the function of logical thinking; athletes having AB(IV) and B(III) blood types – weak associative tie.

Table 1

Indices of the function of logical thinking of athletes aged 17-20 (with no consideration to kinds of sports) having different blood types,  $X \pm m$ , (n=132)

№	Blood type	n	Logical thinking		
			Correct answers, number	Speed of thinking, standard units	Evaluation, grades
1	O(I)	42	$4,1 \pm 0,24$	$0,4 \pm 0,02$	$0,9 \pm 0,16$
2	A(II)	38	$4,8 \pm 0,32$	$0,5 \pm 0,03$	$1,4 \pm 0,25$
3	B(III)	28	$3,8 \pm 0,21$	$0,4 \pm 0,02$	$0,6 \pm 0,12$
4	AB(IV)	24	$3,6 \pm 0,20$	$0,4 \pm 0,02$	$0,6 \pm 0,12$
Tue difference		P1–P2	$>0,05$	$<0,01$	$>0,05$
		P1–P3	$>0,05$	$>0,05$	$>0,05$
		P1–P4	$>0,05$	$>0,05$	$>0,05$
		P2–P3	$<0,05$	$<0,01$	$<0,01$
		P2–P4	$<0,01$	$<0,01$	$<0,01$
		P3–P4	$>0,05$	$>0,05$	$>0,05$

The next two tables (table 2 and 3) present data of comparative analysis of indices of logical thinking function of teenagers who specialize in kinds of sports with various training orientation according to classification of kinds of sports by A.H. Dembo (group A – speed-and-power kinds of sports, group B – endurance kinds of sports).

Based on data in table 2 we see the following: 1) no true differences between indices of “correct answers” and “evaluation” of the aforementioned psychological function of teenagers having all 4 blood types who primarily develop speed-and-power qualities (group A) were found; 2) speed of thinking remains higher with athletes having A(II) blood type compared to their peers having O(I), B(III), and AB(IV) blood types ( $P < 0,05$  in all cases); 3) changes of the three indices of logical thinking function did not have statistically true difference ( $P > 0,05$ ) between individuals having B(III) and AB(IV) blood types.

Table 2

Indices of the function of logical thinking of athletes aged 17-20 who primarily develop speed-and-power qualities (group A) having different blood types,  $\bar{X} \pm m$ , (n=69)

№	Blood types	n	Logical thinking		
			Correct answers, number	Speed of thinking, standard units	Evaluation, grades
1	O(I)	22	$3,4 \pm 0,25$	$0,3 \pm 0,03$	$0,5 \pm 0,13$
2	A(II)	20	$3,6 \pm 0,21$	$0,4 \pm 0,02$	$0,5 \pm 0,11$
3	B(III)	14	$3,3 \pm 0,27$	$0,3 \pm 0,03$	$0,4 \pm 0,13$
4	AB(IV)	13	$3,2 \pm 0,26$	$0,3 \pm 0,03$	$0,4 \pm 0,14$
True difference		P1–P2	$>0,05$	$<0,05$	$>0,05$
		P1–P3	$>0,05$	$>0,05$	$>0,05$
		P1–P4	$>0,05$	$>0,05$	$>0,05$
		P2–P3	$>0,05$	$<0,05$	$>0,05$
		P2–P4	$>0,05$	$<0,05$	$>0,05$
		P3–P4	$>0,05$	$>0,05$	$>0,05$

Based on table 3, we conclude that representatives of endurance kinds of sports having A(II) blood type have the best associative ties with various features of logical thinking. Thus, they show truly better (at  $P < 0,01$ – $0,001$ ) values of the three indices of this feature compared to the individuals having B(III) and AB(IV) blood types, as well as truly better (at  $P < 0,05$ ) values of “correct answers” index compared to their peers having O(I) blood type. However, it should also be noted that no probable difference ( $P > 0,05$ ) in the two following indices: speed of thinking and general evaluation of this test was found between individuals having O(I) and A(II) blood types. Also, no true differences between the indices of the function of logical thinking ( $P > 0,05$ ) of athletes having B(III) and AB(IV) blood types were found.

Table 3

Indices of the function of logical thinking of athletes aged 17-20 who primarily develop endurance qualities (group B) having different blood types,  $\bar{X} \pm m$ , (n=63)

№	Blood types	n	Logical thinking		
			Correct answers, number	Speed of thinking, standard units	Evaluation, grades
1	O(I)	20	$4,9 \pm 0,36$	$0,5 \pm 0,04$	$1,4 \pm 0,27$
2	A(II)	18	$6,2 \pm 0,46$	$0,6 \pm 0,05$	$2,4 \pm 0,41$
3	B(III)	14	$4,3 \pm 0,29$	$0,4 \pm 0,03$	$0,9 \pm 0,18$
4	AB(IV)	11	$4,1 \pm 0,25$	$0,4 \pm 0,03$	$0,9 \pm 0,16$
True difference		P1–P2	$<0,05$	$>0,05$	$>0,05$
		P1–P3	$>0,05$	$>0,05$	$>0,05$
		P1–P4	$>0,05$	$>0,05$	$>0,05$
		P2–P3	$<0,01$	$<0,01$	$<0,01$
		P2–P4	$<0,001$	$<0,01$	$<0,01$
		P3–P4	$>0,05$	$>0,05$	$>0,05$

Data of analysis of logical thinking function of students aged 17-20 who are not engaged in sports are given in table 4. Based on this information we see that truly better values of the three indices of logical thinking are observed, on one hand with students having A(II) blood type compared to their peers having B(III) and AB(IV) types ( $P < 0,001$  in all cases), on the other hand – with students having O(I) blood type compared to individuals having B(III) and AB(IV) blood types (respectively,  $P < 0,01$ – $0,001$ ). At the same time, no significant differences between indices of “correct answers” and “evaluation” of logical thinking function of individuals having O(I) and A(II) blood types ( $P > 0,05$ ) were found, although the values of speed of thinking index were better (at  $P < 0,01$ ) with students having A(II) blood type compared to those having O(I) type. We assume that the

letter can prove that the highest indices of development of logical thinking function can be peculiar to individuals having A(II) and O(I) blood types, while the lowest ones – to individuals having AB(IV) and B(III) types.

Table 4

Indices of the function of logical thinking of athletes aged 17-20 who are not engaged in sports having different blood types,  $\bar{X} \pm m$ , (n=131)

№	Blood types	n	Logical thinking		
			Correct answers, number	Speed of thinking, standard units	Evaluation, grades
1	O(I)	41	$5,3 \pm 0,22$	$0,5 \pm 0,02$	$1,7 \pm 0,17$
2	A(II)	37	$5,5 \pm 0,23$	$0,6 \pm 0,02$	$1,8 \pm 0,19$
3	B(III)	28	$3,6 \pm 0,17$	$0,4 \pm 0,02$	$0,6 \pm 0,11$
4	AB(IV)	25	$3,5 \pm 0,16$	$0,4 \pm 0,02$	$0,4 \pm 0,10$
True difference		P1–P2	$>0,05$	$<0,01$	$>0,05$
		P1–P3	$<0,001$	$<0,01$	$<0,001$
		P1–P4	$<0,001$	$<0,01$	$<0,001$
		P2–P3	$<0,001$	$<0,001$	$<0,001$
		P2–P4	$<0,001$	$<0,001$	$<0,001$
		P3–P4	$>0,05$	$>0,05$	$>0,05$

## Discussion

Analyzing the character of changes of various indices of logical thinking function of athletes aged 17-20 and their peers (students of higher educational establishments who are not engaged in sports), depending on ABO system blood types serologic markers, it should be noted that genetic disposition to development of a person's psychic features, studied by L. P. Serhiynko [6] and proved by data from our earlier research [8, 10], takes place. Thus, based on analysis of athletes (without taking into account orientation of their training process), it has been revealed that individuals having A(II) blood type have better (at  $P < 0,05-0,01$ ) values of the function of logical thinking by most indices compared to athletes having B(III), AB(IV), and O(I) blood type.

The fact that no true differences between values of function of thinking ( $P > 0,05$ ) among athletes with different orientation of training process (according to classification of kinds of sports by A.H. Dembo), once again proves specific influence of training workload with different orientation on the body function of people of different age and professions [1, 9 et al.].

Data of analysis of control group (students from higher educational establishments who are not engaged in sports) show that the best associative tie with various features of logical thinking is peculiar to individuals having A(II) and O(I) blood types, while the worst one is peculiar to individuals having AB(IV) and B(III) types.

However, results of our research contradict with those by L.P. Seghiyenko. In one of his paper, he concludes that «... individuals having AB(IV) blood type are most inclined to high development of thinking. It is probably impossible to define the worst associative tie» [6, c. 104–105]. We assume that the question of whether it is possible to use blood type serologic markers in genetic prognosis of the function of logical thinking as well as other psychic features of a person (concentration, memory, perception) is still debatable, therefore needs further research.

We consider data by M. F. Khoroshukha[7] to be specifically interesting. They refer to adults (teachers of higher educational establishments). All participants were divided into two groups: group A – teachers of the humanities as well as natural science and geography subjects (Ukrainian and foreign languages linguistics, biology, geography); group B – teachers of hard science (mathematics, physics, computer science). By all indices of the function of logical thinking, as expected, the group of teachers of hard science at high 0.1% level of statistical value (at 0,001) had better values of this function than the ones from group A. Based on this, we had a chance to poll teachers of hard science who work in comprehensive schools and higher educational establishments of various levels of accreditation in order to define their blood types. 713 individuals (both sexes), residents of 20 oblasts of Ukraine, including Autonomous Republic of Crimea, city of Kyiv, Byelorussia, Moldova, Russian Federation were polled. Based on this poll, it has been found that individuals having A(II) blood type (48,2 %) are most inclined to high development of the function of logical thinking; individuals having O(I) type (28,3 %) are less inclined, while those having AB(IV) (7,2 %) and B(III) (16,3 % respectively) are the least inclined.

We consider evidence regarding possibility to form a team of workers of various specialization (for instance, pedagogical staff) with consideration to their blood types serologic markers to be specifically interesting. As results of the poll done with teachers of hard science from educational institutions of various accreditation show, there are staffs that are formed (the reason in unknown) with individuals having one or two blood types. It can be proved by the following examples [7].

*Example one.* Of 8 teachers of hard science (mathematics, physics, computer science) from Kyiv-Svyatoshyn classical gymnasium (city of Boyarka, Kyiv oblast) 5 individuals had 0(I) blood type, while three others - A(II) type (table 5).

Table 5

Blood types of teachers of hard science from Kyiv-Svyatoshyn classical gymnasium (city of Boyarka, Kyiv oblast)

№	Teacher's last name	Subject	Blood type
1	Opanasyuk S.P.	mathematics	0(I)
2	Bondar M.M.	mathematics	0(I)
3	Vitsenko L.S.	mathematics	0(I)
4	Sokolenko N.A.	mathematics	0(I)
5	Yaremenko N.S.	mathematics	0(I)
6	Levanda N.M	mathematics	A(II)
7	Sova N.U.	mathematics	A(II)
8	Vorozhbyk T.G.	mathematics	A(II)

*Example two.* Similar to example one, of 8 teachers of hard science (mathematics, physics, computer science) from Myrogoshcha comprehensive school (urbanized settlement of Myrogoshcha, Rivne oblast) 5 individuals had 0(I) blood type, while three others - A(II) type (table 6).

Table 6

Blood types of teachers of hard science from Myrogoshcha comprehensive school (urbanized settlement of Myrogoshcha, Rivne oblast)

№	Teacher's last name	Subject	Blood type
1	Bendyuk V.I.	physics	0(I)
2	Hats M.M.	mathematics	0(I)
3	Kedys L.Ya.	mathematics	0(I)
4	Kedys I.I.	mathematics	0(I)
5	Yurchuk L.P.	інформатика	0(I)
6	Shved M.G.	physics	A(II)
7	Haloyukh N.M.	mathematics	A(II)
8	Berezovskyi I.F.	computer science	A(II)

*Example three.* Of 4 teachers of hard sciences from Irpin comprehensive school №12 (city of Irpin, Kyiv Oblast) all had A(II) blood type (table 7).

Table 7

Blood types of teachers of hard science from Irpin comprehensive school №12 (city of Irpin, Kyiv Oblast)

№	Teacher's last name	Subject	Blood type
1	Piskun O.V.	mathematics	A(II)
2	Voloshovska N.V.	physics	A(II)
3	Hontsovskia N.V.	physics	A(II)
4	Zhovytok L.A.	mathematics	A(II)

We assume that the aforementioned facts can give information to think over for practicing psychologists, sociologists and those who are interested in this issue.

## Conclusions

Application of ABO system blood type serologic markers is possible in genetic prognosis of development of the function of logical thinking of young athletes (junior and teen age) and their peers (individuals who are not engaged in sport). Based on the results of a multi-year research of people belonging to various categories, we conclude that individuals having A(II) and 0(I) blood types have the best associative ties with various features of logical thinking, while individuals having B(III) and especially AB(IV) type – the worst ones.

**Conflicts of interest.** The authors report no conflicts of interest.

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