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Original Article

Influence of blood types serologic markers on development of concentration function of young 13-16 year old athletes

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Abstract.
The article tackles influence of blood type markers on the development of 13-16-year-old athletes' psychic function of concentration. Young teenage (n=110) athletes (male) were part of the research. They were divided into two groups based on kinds of sports classification by A. H. Dembo: group A – speed-and-power kinds of sports (n=56); group B – endurance kinds of sports (n=54). Control group consisted of students aged 13-16 (n=106) and students aged 18-21 (n=235) who did not participate in sports. Research of concentration function was conducted by the proof-correction test with use of V. Ya. Anifimov's table. The fact of possible use of blood groups in genetic prognostication of concentration development has been established. It has been revealed that individuals having O(I) and AB(IV) blood types possess the best associative tied with various features of concentration, while individuals having A(II) blood type - the worst one. No differences between characteristics of changes in concentration features of teenagers going in for various kinds of sports have been revealed.
Key words: **serologic markers, blood types, psychic functions, concentration, young athletes**.

Introduction

Elite sports experience shows that not every young athlete who has always dreamt about becoming an Olympic champion, reached high level in sports mastery due to "natural selection", despite using scientifically-proven methods of training [1, **13** et al.] Only a small number of talented youth reached high level. Psychological aspects of sports selection play a significant role, which envisages athletes gaining specific individual's psychological qualities that, along with other features of human body provide sports and health-improving effect of training and competition activity [**9**].

A number of researchers [**4, 5, 6** et al.] note that such components of training and competition activity as psychological processes, namely thinking, memory, and concentration, remain key features for effective dealing with lengthy and intensive physical, and in some cases mental workload (the letter requires rapid and accurate evaluation of situation, ability to think and make decisions from young athletes under conditions of physical and emotional fatigue etc.)

At present, scientists from various countries have revealed associative ties between serologic markers of blood types and scope of the development of motion qualities, morpho-functional and psychological features, development and course of some illnesses etc. Thus, M. N. Fox, L. S. Webber, T. F Thurmon, G. S. Berenson [**12**] revealed associative ties between ABO system blood types and the development of cardio-vascular diseases; E. A. Strikalenko, L. P. Serhiynko, L. I. Serhiynko [**15**] and E. A. Strikalenko, L. I. Serhiynko [**16**] revealed associative ties with the development of motion abilities of elite athletes, which enables focusing of children and teenagers on specific types of sports activity; respectfully V. Lyshevskoiu, S. Shepoval [**14**] – with the development of speed qualities of men and women etc. Finally, L. P. Sergiyenko [10] established the aforementioned ties with the development of psychological features (concentration and thinking) of mainly adults (students and servicemen.) At the same time, in our previous works [11], we have noted the fact of a specific influence of orientation of educational and training process on the basic features of teenagers' psychological functions who participated in sports. Thus, we have revealed that physical workload of speed and power character resulted in the improvement of integral index of concentration function – efficiency ratio (however, due to the speed of characters viewing, not due to accuracy of performance), while increase of the aforementioned coefficient under endurance workload is achieved through increase of the index of performance accuracy, not through speed of characters viewing. Taking into account everything mentioned above, the issue of influence of blood type serologic markers on the development of concentration function of young teenage athletes specializing in kinds of sports of various training orientation is still urgent.

Materials and methods

Young athletes (male) aged 13-16 (n=10) from Brovary Higher School of Physical Culture (experimental group) took part in the research. They were divided into two groups according to the classification

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of kinds of sports by A. H. Dembo: group A (n=56) – speed-and-power kinds of sports (boxing, freestyle wrestling); group B (n=54) – endurance kinds of sports (skiing, cycling). The control group was divided into two subgroups: subgroup 1 – students aged 13-16 from Brovary comprehensive school #3 who did not participate in sports (n-106); subgroup 2 – freshmen – seniors aged 18-21 (n=235) from National Pedagogical Dragomanov University (n=249) and Borys Grinchenko Kyiv University (n=86) who also did not participate in sports.

Analysis of concentration function was done by proof-correction test using V. Ya. Anfimov's table. It contains randomly printed letters of Russian alphabet (total of 2000 characters) that are arranged in 40 lines, 50 characters in each. Every participant was asked to find letters "K" i "X" in each line. Test duration was two minutes. The test was administered for every participant individually.

The following indices that characterize concentration function were determined: *the number of characters viewed* (A, units), *the number of correct choices* (B, units), *the number of mistakes* done throughout entire test (**Cmist**, units) [**3, p.55-58]**, and concentration that was evaluated by such components as viewing speed, accuracy and efficiency coefficients [6]:

– *characters viewing speed* was determined using formula:

$$Sp = \frac{A}{120}, \text{ in which} \qquad (1)$$

Sp – speed of characters viewing, conventional units,
A – **total number of characters viewed by the participant in two minutes, units**,
120 – test duration, s;
– *accuracy coefficient* was determined using formula:

$$AC = \frac{N}{A}, \text{ in which} \qquad (2)$$

AC – accuracy coefficient, conventional units,
N – the number of correct choices, units,
A – **total number of characters viewed by the participant in two minutes, units**;
– *efficiency coefficient* was determined using formula:

$$Ec = Sp \times Ac, \text{ in which} \qquad (3)$$

Ec – efficiency coefficient, conventional units,
Sp – characters viewing speed, conventional units,
EC – accuracy coefficient, conventional units.

The test was administered in an isolated room before noon (9 am – 12 pm, no sooner than 2 hours after consuming food.) One-two days prior to testing, participants were asked to decrease volume and intensity of their physical workload by 50%, not to consume tonic and sedative drugs, and strong tea or coffee on the day of testing. Data on blood types were taken from participants' health records. Individuals without data on their blood types were not allowed to participate in testing. During the analysis, accuracy of difference between individuals having different ABO system blood types was determined with the help of Student's t-criterion. These participants represented experimental group (young athletes) and control group (students of schools and universities.) The aim of the article is to analyze influence of blood type serologic markers on development of concentration function of young athletes aged 13-16. Methods of research: theoretical analysis and generalization of scientific and methodological references, pedagogical survey, testing, statistics methods.

Results

Table 1 represents data of associative tie of blood types with various features of concentration function of young athletes aged 13-16 without taking into account specific character of their kinds of sports.

Table 1

Indices of concentration function of young athletes aged 13-16 (without taking into account specific character of kinds of sports) having different blood types X±m, (n=110), conventional units

№	Blood types	n	Concentration					
			A	N	Cmist	Sp	AC	Ec
1	0(I)	34	74,1±1,12	62,1±0,95	12,1±0,77	0,62±0,009	0,83±0,009	0,52±0,008
2	A(II)	31	73,2±1,35	58,7±1,26	14,5±1,00	0,61±0,011	0,80±0,012	0,49±0,011
3	B(III)	25	73,9±1,18	61,6±0,95	12,3±1,02	0,62±0,010	0,84±0,013	0,51±0,008
4	AB(IV)	20	73,6±1,51	62,0±1,55	11,6±1,01	0,62±0,012	0,84±0,014	0,52±0,013
Validity of difference		P1-P2	>0,05	<0,05	>0,05	>0,05	>0,05	<0,05
		P1-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P1-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P3	>0,05	>0,05	>0,05	>0,05	<0,05	>0,05
		P2-P4	>0,05	>0,05	>0,05	>0,05	<0,05	>0,05
		P3-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05

When analyzing data from this table, the following should be noted: 1) the number of characters viewed (A) was not valid (P>0,05) with individuals of all four blood types; 2) the number of correct choices (N) was higher with athletes having 0(I) blood type compared to their peers that had A(II) blood type (P<0,05), while comparative analysis of individuals having B(III) and AB(IV) blood types did not reveal significant differences (P>0,05); 3) the number of mistakes made throughout entire test (**Cmist**) did not vary with teenagers having different blood types (P>0,05); 4) statistically valid differences in the analysis of characters viewing speed (Sp) of all participants (P>0,05) were not revealed; 5) value of accuracy coefficient (AC) was the highest with individuals having B(III), AB(IV) and 0(I) blood types; the lowest – with individuals having A(II) blood type. As a result, probable difference between individuals having A(II), B(III) and A(II), AB(IV) blood types (P<0,05 in both cases) has been established. Moreover, a tendency to improvement of the aforementioned coefficient with young athletes having 0(I) blood type compared to other individuals having A(II) blood type (0,83±0,009 conventional units with teenagers having 0(I) blood type versus 0,80±0,012 conventional units with their peers having A(II) blood type, t=2,00 at P>0,05) was observed;) finally, efficiency coefficient (Ec) was higher with individuals having 0(I) blood type compared to those having A(II) blood type (P<0,05), while no probably differences were revealed between individuals having B(III) and AB(IV) blood types (P>0,05). In general, we may assume that young athletes having 0(I) blood type had the best associative tie with various features of concentration, while those having A(II) type had the worst one.

The next two tables (tables 2 and 3) show data of comparative analysis of concentration function with teenage athletes who specialized in kinds of sports with various training orientation according to kinds of sports classification by A. H. Dembo (group A – speed-and-power kinds of sports, group B – endurance kinds of sports).

Table 2

Indices of concentration function of young athletes aged 13-16 who primarily developed speed-and-power qualities (group A) having different blood types, X±m, (n=56), conventional units

№	Blood types	n	Concentration					
			A	N	Cmist	Sp	AC	Ec
1	0(I)	19	78,1±1,10	64,6±0,92	13,5±1,01	0,65±0,009	0,82±0,010	0,53±0,008
2	A(II)	15	78,7±1,42	62,0±1,93	16,7±1,15	0,66±0,012	0,79±0,016	0,52±0,017
3	B(III)	12	78,6±1,09	64,3±1,21	14,3±1,43	0,66±0,009	0,82±0,017	0,54±0,010
4	AB(IV)	10	77,1±1,43	64,9±1,85	12,2±1,67	0,64±0,012	0,84±0,021	0,54±0,016
Validity of difference		P1-P2	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P1-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P1-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P3-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05

Table 3

Indices of concentration function of young athletes aged 13-16 who primarily developed endurance qualities (group B) having different blood types, X±m, (n=54), conventional units

№	Blood types	n	Concentration					
			A	N	Cmist	Sp	AC	Ec
1	0(I)	15	69,2±1,28	58,9±1,45	10,3±1,07	0,58±0,010	0,85±0,015	0,49±0,012
2	A(II)	16	68,1±1,30	55,6±1,26	12,4±1,45	0,57±0,011	0,82±0,019	0,47±0,010
3	B(III)	13	69,5±1,02	59,1±1,07	10,5±1,30	0,58±0,009	0,85±0,018	0,50±0,009
4	AB(IV)	10	70,1±2,21	59,1±2,20	11,0±1,19	0,59±0,018	0,84±0,018	0,49±0,018
Validity of difference		P1-P2	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P1-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P1-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P3-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05

As we can see, we have not revealed statistically valid differences between various indices of concentration with young athletes aged 13-16 (P>0,05), some of whom chiefly developed their speed and power qualities (table 2), while others – endurance (table 3).

The obtained indices of concentration with school students aged 13-16 who did not participate in sports (control group) are given in table 4.

Table 4

Indices of concentration function of young athletes aged 13-16 having different blood types, X±m, (n=106), conventional units

№	Blood types	n	Concentration					
			A	N	Cmist	Sp	AC	Ec
1	0(I)	28	74,4±1,06	65,7±0,95	8,7±0,57	0,62±0,009	0,89±0,007	0,55±0,008
2	A(II)	30	73,2±1,11	61,9±0,75	11,3±0,77	0,61±0,009	0,85±0,009	0,52±0,006
3	B(III)	26	73,8±1,31	62,2±1,14	11,7±0,87	0,62±0,011	0,84±0,010	0,52±0,010
4	AB(IV)	22	73,5±1,27	64,5±1,20	9,0±0,49	0,61±0,011	0,88±0,006	0,54±0,010
Validity of difference		P1-P2	>0,05	<0,01	<0,05	>0,05	<0,01	<0,01
		P1-P3	>0,05	<0,05	<0,05	>0,05	<0,001	<0,05
		P1-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P3	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P4	>0,05	>0,05	<0,05	>0,05	<0,05	>0,05
		P3-P4	>0,05	>0,05	<0,05	>0,05	<0,01	>0,05

This table shows that participants with different blood types have no probable difference in values of the number of characters viewed throughout the entire test (A) (P>0,05). However, there is a valid increase of the number of correct choices (B) among participants having 0(I) blood type compared to individuals having A(II) (P<0,01) and B(III) (P<0,05). A lower number of mistakes was made by students having 0(I) and AB(IV) blood types compared to their peers having A(II) and B(III) blood types (P>0,05 in both cases). No significant differences between the values of Sp index of individuals having different blood types (P>0,05) have been found. At the same time, we have revealed that better values of AC index are registered with students having 0(I) and AB(IV) blood types compared to individuals having A(II) and B(III) types (P<0,05–0,001). Respectfully, the difference between values of accuracy coefficient of individuals having з 0(I) and AB(IV) blood types and those having A(II) and B(III) types (P>0,05) was invalid. Finally, efficiency coefficient (Ec) was better among individuals having 0(I) and AB(IV) blood types (0,55±0,008 conventional units with participants having 0(I) blood type and 0,54±0,010 conventional units with those having AB(IV) type respectfully.) However, the difference of the value of Ec index was valid only with students having 0(I) and A(II) blood types (at P<0,01) and 0(I) and B(III) (at P<0,05) respectfully.

Analysis of scientific references [7] shows that attention, durability and concentration improves with time. Thus, we may assume that various features of concentration function are more expressed in adult or young age rather than in teen age. That is why we have conducted long-term research of the issue of influence of blood type serologic markers on the development of concentration function with students aged 18-21who did not participate in sports in higher educational establishments. The results of this research are shown in table 5.

Table 5

Indices of concentration function of students aged 18-21 studying in higher educational establishments having different blood types, X±m, (n=335), conventional units

№	Blood types	n	Concentration					
			A	N	Cmist	Sp	AC	Ec
1	0(I)	102	72,8±1,45	65,8±1,49	7,0±0,75	0,61±0,012	0,90±0,010	0,55±0,012
2	A(II)	132	64,8±1,32	56,4±1,28	11,3±0,85	0,56±0,010	0,83±0,012	0,47±0,011
3	B(III)	59	65,3±2,08	56,7±2,42	8,5±0,94	0,54±0,017	0,85±0,019	0,47±0,020
4	AB(IV)	42	70,0±1,56	62,7±1,88	7,2±1,25	0,58±0,013	0,90±0,018	0,52±0,016
Validity of difference		P1-P2	<0,001	<0,001	<0,001	<0,01	<0,001	<0,001
		P1-P3	<0,01	<0,01	>0,05	<0,01	<0,05	<0,01
		P1-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
		P2-P3	>0,05	>0,05	<0,05	>0,05	>0,05	>0,05
		P2-P4	<0,05	<0,01	<0,01	>0,05	<0,01	<0,05
		P3-P4	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05

When analyzing these data, it should be noted that young athletes having 0(I) blood type had better values of concentration function in all indices compared to their peers having A(II) blood type (P<0,01–0,001) and compared to individuals having B(III) blood type (P<0,05–0,01 respectfully) in most indices (except for Cmist index). No probable difference in all indices of concentration function between individuals having з 0(I) and AB(IV) blood types (P>0,05) have been found. Moreover, students having AB(IV) blood type, like individuals having 0(I) type had better values of concentration features in most indices (except for Sp; P>0,05) compared to individuals having A(II) blood type (P<0,05–0,01). Also, no statistically proven difference in all indices of concentration function between individuals having AB(IV) and B(III) blood types (P>0,05) have been found. Based on these data we may assume that individuals having 0(I) and AB(IV) blood types have better associative ties with various features of concentration, while individuals having A(II) type – worse ones.

Discussion

Analyzing the character of changes of concentration features depending on ABO system blood types serological markers with young athletes aged 13-16 (without taking into account orientation of their training process), it should be noted that genetic disposition to development of psychological features, mentioned by L. P. Sergiyenko [10] takes place. Thus, it has been found that athletes having 0(I) blood type had better values of integral index of concentration function – efficiency coefficient (Ec) compared to those having A(II) blood type (P<0,05). In most indices that characterize features of concentration, no probable differences between individuals having A(II), B(III) and AB(IV) blood types (P>0,05) were revealed. In general, this makes us believe that the best associative tie with various features of concentration are inherent to young athletes having 0(I) blood type, while the worst ones – to those having A(II) type.

The fact that no valid differences in indices of concentration function among athletes with different orientation of training process (according to classification by A. H. Dembo) proves specific influence of physical workload on functioning of people of various age and professions [2, 11 et al.]

Results of the research of control group (students of comprehensive schools who did not participate in sports) show that the best associative tie with various features of concentration is inherent to individuals having 0(I) blood type, while the worst one – to individuals having A(II) type.

Finally, long-term analysis of students proves that the best associative tie is still inherent to individuals having not only 0(I) blood type, but also AB(IV) type, while the worst tie is inherent to those having A(II) type. The letter proves that concentration features as well as features of other psychological functions are more expressed in adult or young age rather than in teen age [7, 11].

It should also be noted that the results of our research do not correlate with those of L. P. Sergiyenko. Thus, the researcher concludes that: "… individuals having A(II) blood type have the best associative ties with various features of concentration, while individuals having O(I) type – the worst one." [10, p.105]. We assume that the question of possibility or impossibility to use blood types serologic markers in genetic prognostication of concentration function development as well as human's other psychological features (thinking, memory, perception) is debatable and, therefore, needs further research.

Conclusions

Based on the results of long-term research, we conclude that use of ABO system blood type serologic markers is possible in genetic prognostication of development of concentration features of students (athletes and students who previously have not participated in sports). In general, we have found that individuals having O(I) and AB(IV) blood types had the best associative ties with various features of concentration, while those having A(II) type – the worst one.

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

References:

Volkov L.V. (1997). *Theory of sports selection: capabilities, endowment, talent.* Kyiv: Vezha. – 128 p.

Dembo A. H. (1980). *Urgent problems of contemporary sports medicine.* Moscow: Fizkultura i sport. – 295 p.

Kabashnyuk V.O.,Havrylkevych V.K. (2013). Psychophysiology: Textbook. Lviv: Novyi Svit -2000. – 200 p.

Lebedyev S. I., Tyrin O. Yu. (2016). Influence of Training Process by the Program of Children and Youth Comprehensive School psychophysiological qualitied of footballers aged 10-12. *Slobozhanskyi naukovyi visnyk, 1 (51),* 38–42.

Lukavenko Ye. H. (2002). Development of Intellectual Abilities of Students with the Help of Sports Orientation. *Педагогіка Pedagogika, psykhologiya ta medyko-biologichni problem fizychnogo vykhovannya I sportu, 28,* 22–26.

Lushchak A.R. (2001). *Diagnostics of Psychophysical Preparedness of Cadets Studying in Ministry of Internal Affairs of Ukraine Colleges*. Ivano-Frankivsk. – 66 p.

Lushchak A.R. (2001). Data of Diagnostics of Psycholophysiological Results of Analysis of Cadets, 1-3 year of studies of Prykarpattya Branch of National Academy of Internal Affairs of Ukraine (results of outcome data). *Pedagogika, psykhologiya ta medyko-biologichni problemy fizychnogo vykhovannya is sportu*, *13,* 11–15.

Makuts T. B. (2015). Peculiarities of Concentration of Tennis Players Aged 14-15 and its Influence of the Efficiency of Competition Activity. *Scientific journal of National Pedagogical Dragomanov University. Edt. № 15. "Naukovo-pedagogichni problemy fizychnoyi kultury (fizychna kultura I sport)", 12 (67) 15,* 82–85.

Rodionov A. V. (2006). Problems of Sports Psychology. *Teoriya i praktika fizicheskoy kultury, 6,* 2–4.

Srgiyenko L. P. (2007). Urgent Psychological Problems of Sports Slection. *Scientific herald of T.G. Shenvchenko State Pedagogical University, Edt. 44, Series: pedagogichni nauky. Fizychne vykhovannya ta sport. Edt. 44.* 99–105.

Khoroshukha M. F. (2014). *Fundamentals of Young Athletes' Health: monograph*. Kyiv. НУБіП of Ukraine. – 722 p.

Fox M.N., Webber L.S., Thurmon T.F., Berenson G.S. (1986). ABO blood group associations with cardiovascular risk factor variables. II Blood pressure, obesity and their anthropometric covariables the Bogutusa Heart Study. *Human Biology, Vol. 58, N 4,* 549–584.

Hastie P., Sinelnikov O. A., Guarinoc A. J. (2009). The development of skill and tactical competencies during a season of badminton. *European Journal of Sport Science, 9,* 133–140.

Lyshevska V, Shepoval S. (2017). Serological markers in the prognosis of the development of human speed abilities. *Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві, N 4(40)*, 53–59.

Strikalenko E.A., Serhiynko L.P., Serhiynko L.I. (2003). Blood groups and physical development of a person. *New ideas in sport sciences*, 229–231.

Strikalenko E., Serhiynko L. (2003). Blood groups in the system of prognosis of children's predisposition to the sports activity. *Sport kinetics*, 125.