

Sports selection of volley-ball players: genetic criteria to define motor endowments (information 2)

Alisa Ablikova¹
Leonid Serhiyenko²

¹Lviv State University of Physical Culture, Lviv, Ukraine
²Mykolayiv Regional Institute of Human development of the International University "Ukraine", Mykolayiv, Ukraine

Purpose: to define genetic criteria which can be used while selecting gifted volley-ball players.

Material & Methods: the study involved 50 high class volley-ball players and 50 women at the age of 20–29 years old. There were used methods of theoretical analysis and general conclusion, systematic analysis, genealogic methods of genetics, methods of dermatoglyphic and serologic analyses.

Results: family gift for going in for sport was detected. At was revealed that gifted volley-ball players had peculiar finger tips prints and distribution of blood groups: the system AB0 in comparison with the total population.

Conclusions: the obtained quantitative characteristics of finger dermatoglyphic, some blood groups and rhesus-factor as genetic markers of motor endowments of volley-ball players are proposed.

Keywords: genetic markers, motor endowments, sports selection, genealogical method.

Introduction

Now hereditary conditionality of sports endowments is obvious. Only a talented person possessing a certain set of genetic prerequisites to this activity can achieve high sports results. The sports genetics allows carrying out the prediction of sports endowments of a person.

Sports genetics is rather young science. Its development is intensively carried out in Ukraine [5; 6], abroad – Canada, the USA [11; 13], Russia [2; 10]. The course for students of specialty physical education and sport on sports genetics is developed and taught in Ukraine.

Provisions of sports genetics were realized practically in the system of the individual prediction of the development of various signs and abilities of a person and used successfully at various stages of sports training and selection. Practical criteria of the individual prediction are data on family sports endowments, features of genetic conditionality of signs (morphological, motive, psychophysiological) in the development, identification of the genetic markers which are defining predisposition to certain activity of a person or development of signs.

The essence of genetic marking is explained with the following regularities. The gene coding a certain property which is shown at late stages of ontogenesis is sometimes closely linked (or it is in a genetic zone of the same chromosome; pic. 1) with other gene (marker) which is forming external, easily observed sign already at the birth. The signs, which are controlled by them, tend to be inherited together, when coupling genes.

The graphic card of distribution of the genes on chromosomes which are controlling good health and physical development

of a person is shown in pic. 1. 170 genes and genetic zones are given in the card, which are connected with the interesting us signs and features of physical development, the number of which increases constantly with the development of biological science.

It is possible to judge not only the existence, but also the lack of predisposition in the development of the studied sign of a person at the identification of a sign-marker [4].

However studying of genetic markers of endowments to high achievements in separate sports is studied not enough.

Communication of the research with scientific programs, plans, subjects

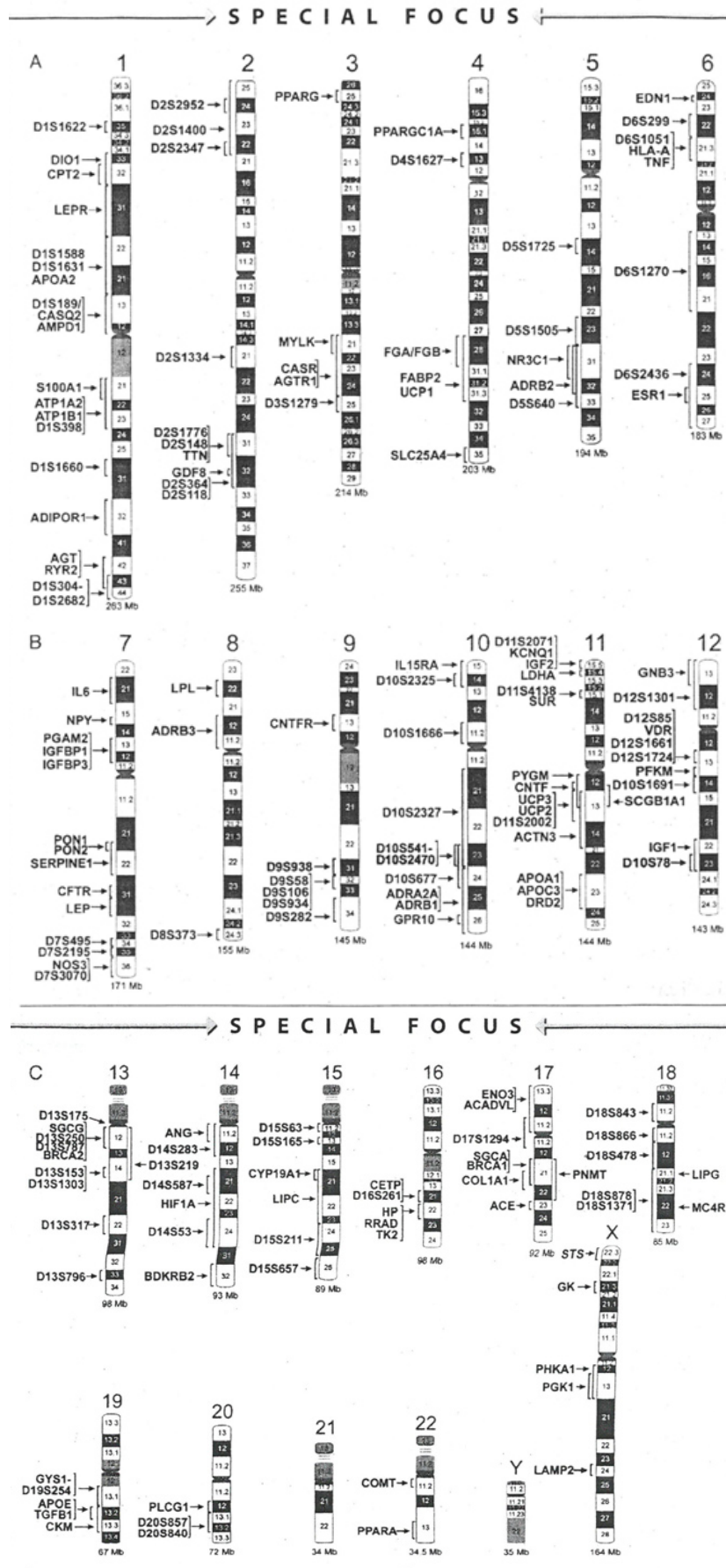
The work is performed in the compliance "The consolidating plan of the research work in the sphere of physical culture and sport for 2011–2015" of the Ministry of Ukraine for family, youth and sport on the subject "Theoretic-methodical bases of individualization of the educational and training process in game sports" (No. of the state registration is 0112U002001).

The purpose of the researches

To define genetic criteria which are possible for using at the selection of the gifted volleyball players.

Material and Methods of the research

Methods of the theoretical analysis and generalization, the system analysis, the genealogical method of genetics, methods of the dermatoglyphic and serologic analysis were used in the work. 50 high-class female volleyball players, 50 girls of the general population who didn't engage in sports, at the age of 20–29 years old took part in the researches.



Pic. 1. The card of an arrangement of genes and genetic zones which are controlling a phenotype of physical development and good physical health in chromosomes of a person [13]

Results of the research and their discussion

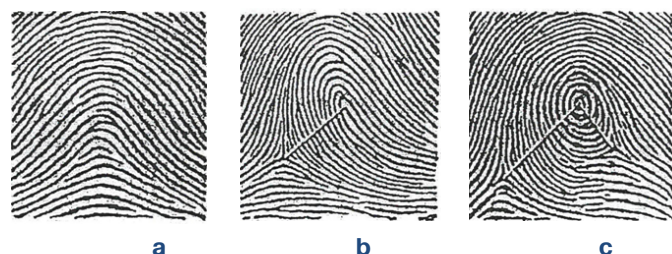
Genealogical researches. It turned out in the genealogical research of the qualified female volleyball players that parents of sportswomen had often high physical activity and good results in different types of sport in young years. It was revealed that sportswomen have 56,4% of fathers and 32,7% of mothers who engaged in sports earlier. Whereas there were 27,8% and 11,4% in the compared group of youth at 20–29 years old which don't engage in sports according to fathers and mothers who were sportsmen earlier. In 8,3% families of the qualified female volleyball players both parents played sports earlier, and not sportsmen of such families had only 2,8%.

These results can be compared to earlier conducted researches of R. Kovár [12]. Results of researches on sports activity of parents of outstanding sportsmen of different types of sport are given in tab. 1. As we see, family enthusiasm for sport of probands – volleyball players in many respects coincides with family motive endowments of representatives also of other populations and sports. This genetic regularity allows claiming that family motive endowments can be informative criterion in the system of sports selection of young volleyball players.

Dermatoglyphic researches. Three main papillary patterns of fingers (pic. 2) were defined in the researches: A – arches, L – loops, W – whorls, and also the fourth option of difficult (compound) dermatoglyphic patterns of fingers of hands (type LW) (pic. 3). Two options of loopback patterns were compared: U – an ulnar loop which is open in the ulnar (fibular) part and R – is open in the radial (tibial) part. The quantity of combs on separate fingers of the right and left hands and totally on right, left and two hands were counted. It is possible to get acquainted with a full technique of the analysis of dermatoglyphic of fingers of hands in the monograph of L. P. Sergienko [9].

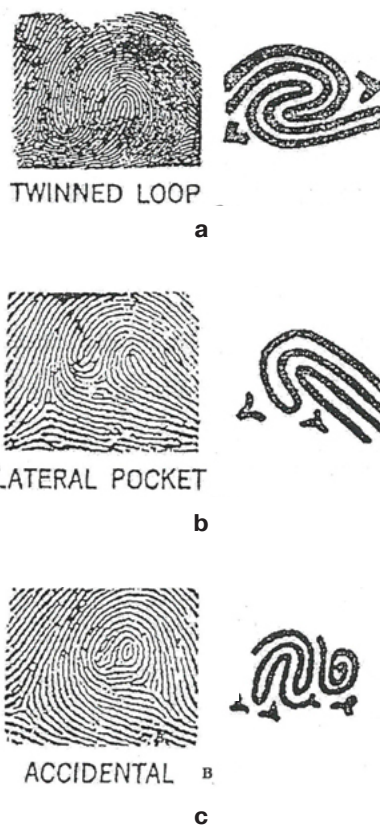
Table 1
Sports activity of parents of outstanding Czech sportsmen

Sports activity	Father	Mother	Both parents
Sports activity	56,8	35,0	26,8
High sports results	39,2	21,6	18,5
Average sports results	57,7	69,0	44,3
Insignificant sports results	3,1	9,4	—



Pic. 2. Main types of papillary patterns of fingers:
a – an arch, the number of deltas exactly 0, a numerical indicator of combs is equal to 0; – a loop, the number of deltas – 1, a numerical indicator – 13; b – a whorl, the number of deltas – 2, a numerical indicator – 17 (according to the bigger left miscalculation)

The qualified volleyball players had the following distribution of types of patterns of fingers (tab. 2) in comparison with the control group of not training women. We see the essential distinction of percentage of arc dermatoglyphs at two groups of the investigated. The occurrence of the simplest patterns is more (18,7%) at women of the general population, than at sportswomen is (8,5%). There aren't essential distinctions on loopback patterns at two investigated groups (U+R=59,3 and 58,1% respectively at the engaged and not engaged in sports). At the same time patterns distribution of difficult (whorl) differ at the investigated. Sportswomen have more frequent occurrence of difficult patterns (W+LW=32,2%), than at women of the general population (W+LW=23,2%).



Pic. 3. Various types of difficult (compound) dermatoglyphic patterns of fingers of hands:
a – a double loop (TL conventionally), b – a lateral pocket loop (LPL conventionally), c – three-deltoid patterns (ACC conventionally)

The local distribution of the comb account on separate fingers of the right and left hand was defined at two groups of the investigated in the researches (tab. 3). The average amount of occurrence of quantity of combs is from 12 till 20 on separate fingers at sportswomen, and at women of the general population is from 10 till 17. The total quantity of combs on the right and left hand (TRC) also differs at sportswomen and women of the general population: respectively 154,6 and 128,5. Separately the essential distinctions are revealed on 4 fingers: RC-1 the left hand, RC-2 the right hand, RC-3 – the right and left hands. In all cases sportswomen had big absolute measures of the comb account, than at the women who don't engage in sports. TRC variations was within 140–160 at sportswomen, and at women of the general population – 120–130 (the level of distinctions is high $p < 0,01$).

Comparing these results to our previous researches (L. P. Serhiyenko, 1995; L. Serhiyenko, 1999), we will note the following (tab. 4). The children, who are having higher development of high-speed abilities, (the ability which is basic for volleyball players) have a big occurrence on fingers of hands of difficult patterns (type W) and a smaller occurrence of simple patterns (type A). These distinctions are even more expressed (from 12,8 till 27,3%) when comparing the sportsmen – sprinters with fingers who don't engage in sports. For example, it is revealed from 5 till 8 of whorl types of patterns on two hands at masters of sports – men [9].

The similar indicators are received in many respects in the researches of T. F. Abramova, T. M. Nikitina, N. N. Ozolin [1]. A proportion of types of patterns (A, L, W) at volleyball players made respectively 0–62,7–37,3%. Indicators of TRC were 145,0±41,3 of combs.

The above-stated material allows claiming that it is possible to use the following informative dermatoglyphic criteria at the sports selection of young volleyball players:

– type of patterns of fingers of hands. The quantity of whorl patterns on two hands has to make from about 30 to 40% at the gifted volleyball players; the occurrence of difficult (whorl) patterns will be most often within 20–25% at the children who aren't predisposed to this entrance of sport;

– the total comb account on two hands (TRC) can be the second criterion of dermatoglyphic. As a rule, it is ranging from 140 till 160 combs at the children who are predisposed to volleyball classes, and at the children who don't have such predisposition – ranging from 120 till 130 combs.

Serologic researches. Blood groups of the system AB0 and a Rhesus factor of female volleyball players and people of the general population were studied in the serologic researches. The data were undertaken from medical records of participants of the researches.

The distribution of blood groups at the qualified female volleyball players is presented in tab. 5. The distribution of blood groups is given in the control group and people of the Ukrainian population for comparison in this table. Comparisons show that blood group I(0) occurs most often at the qualified female volleyball players. It is twice more often observed at sportswomen, than in the control group of women, and for 16% in comparison with the population data. The insignificant percentage is noted on the II(A) blood group at female volleyball players. Women of the control group and people of the general population have insignificant differences. The third blood group exceeds occurrence of III(B) at sportswomen, as in the control group, and population almost twice. The fourth blood group occurs rather seldom at all people, besides female volleyball players with such blood group weren't revealed at all.

Table 2

Distribution of the main types of patterns of fingers at the qualified female volleyball players and the group of women who don't engage in sports, %

Contingent of the investigated	n	Types of patterns of fingers of hands				
		A	U	R	W	LW
Sportswomen	50	8,5	54,8	4,5	25,4	6,8
Women of the general population	50	18,7	56,0	2,1	15,3	7,9

Table 3

Quantity of combs (RC) on fingers of the right and left hands at sportswomen and women of the general population

The comb account on fingers	Right hand			Left hand		
	Sportswomen	Not sportswomen	p	Sportswomen	Not sportswomen	P
RC-1	15,5±1,4	14,1±1,7	>0,05	16,5±1,2	12,1±1,4	<0,05
RC-2	17,2±0,4	12,6±1,3	<0,05	15,1±1,1	14,4±1,7	>0,05
RC-3	20,0±1,2	16,9±1,9	<0,05	18,2±1,3	13,7±1,2	<0,05
RC-4	12,1±0,9	10,9±1,0	>0,05	13,2±1,9	10,4±1,6	>0,05
RC-5	14,5±1,6	11,8±0,9	>0,05	12,3±1,7	11,6±1,4	>0,05
Amount	79,3±1,4	66,3±2,6	<0,05	75,3±1,2	62,2±1,8	<0,05

Table 4

Distribution of the main types of patterns of fingers (total indicators of two hands) at children at 11–17 years old of the Ukrainian population with high and low development of high-speed abilities

Indicators	Sex	Types of patterns of fingers, %		
		A	L	W
High motive reaction	M–W	3,8	59,8	56,4
Low motive reaction	M–W	9,4	67,8	22,8
High speed of run	M–W	6,8	62,4	30,8
Low speed of run	M–W	10,0	68,0	22,0

The presence of a Rhesus factor at the examined sportswomen to the control group of women who didn't engage in sports is given in table 6. As we see, female volleyball players have generally positive Rhesus factor (+Rh).

Comparing the obtained data with the generalized results of the serologic researches (L. P. Sergienko, 2004), we will note that the I(0) blood group, as a rule, is associated with high development of high-speed and power abilities and most often occurs at sportsmen of high-speed strength sports. This blood group is a genetic marker of good health and considerable prospects to physical development. The third blood group III(B), as a rule, meets at the people who are more often having high coordination abilities. It is associated with motive activity which provides complex manifestation of motive abilities in the changing situations (for example, such which occur in sports). We will remind that high-speed and power and coordination abilities are basic sports success of volleyball players. The positive Rhesus factor, as a rule, characterizes a high predisposition of a person to the development of anaerobic efficiency [7].

The above-stated results of the serologic researches allow claiming that informative criteria of high prospects to classes at the individual forecast in the system of sports selection by volleyball can be:

- existence of I(0) or III(B) of a blood group. Besides, in our opinion, sportsmen with the I(0) blood group can be more perspective as forwards, and with the III (B) blood group – setter;

- existence of a positive Rhesus factor (+Rh) at occurrence of I(0) and III(B) of blood groups.

It is methodologically justified to carry out the genetic prediction of prospects of young volleyball players at the second and third stages of sports selection. Features of the development of morphological features, motive abilities and family sports endowments are defined at the second stage. And genetic

markers are used in the system of the sports prediction at the third stage of sports selection (selection for the improvement in a certain sport is carried out here).

The regularities which were received on the selection of female volleyball players, in our opinion, can be extrapolated to the man's contingent of sportsmen.

Conclusions

1. The results of the genealogical researches allow claiming that family motive endowments can be informative criterion in the system of sports selection of young volleyball players.

2. Dermatoglyphic criteria in the individual prediction of motive endowments of volleyball players are:

- existence of difficult type of dermatoglyphic pattern of fingers of hands. The quantity of whorl patterns on two hands has to make from 30 till 40% at the gifted volleyball players;

- existence of the bigger, than on average in population number of the total comb account on two hands (TRC). As a rule, it is ranging from 140 till 160 combs at the children who are predisposed to classes with volleyball.

3. Blood groups of the system AB0 can be criteria of predisposition to volleyball classes. A serologic marker can be I(0) and III(B) of blood group at a positive Rhesus factor (+Rh) at the perspective volleyball players. Sportsmen with the I(0) blood group are more predisposed to performance of functions of forwards, and with the III(B) blood group to performance of functions of setters.

Prospects of further researches

Further the researches of features of formation at the gifted volleyball players of such genetic markers can be of interest: iridologic, odontologic, morphometric, molecular.

Table 5

Distribution of blood groups at the qualified female volleyball players, at women of the investigated group and people of the Ukrainian population, %

The investigated group	Blood groups			
	I(0)	II(A)	III(B)	IV(AB)
Female volleyball players (n=50)	56	12	32	0
The control group of women (n=50)	28	42	18	12
The Ukrainian population (L. P. Serhiyenko, 2004)	40	37	17	6

Table 6

Distribution of a Rhesus factor on blood groups at the female volleyball players and women who don't engage in sports professionally, %

The investigated groups	Blood groups and Rhesus factor							
	I(0)		II(A)		III(B)		IV(AB)	
	+Rh	-Rh	+Rh	-Rh	+Rh	-Rh	+Rh	-Rh
Female volleyball players (n=50)	83,3	16,7	100,0	0,0	66,7	33,0	0,0	0,0
The control group of women (n=50)	66,7	33,3	60,0	40,0	75,0	25,0	33,3	66,7

Conflict of interests. The authors declare that there is no conflict of interests.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Abramova, T. F., Nikitina, T. M. & Ozolin, N. N. 1995, [The possibility of using finger dermatoglyphics in sports selection] *Teoriya i praktika fizicheskoy kultury* [Theory and Practice of Physical Culture]. Vol. 3, pp. 10–15. (in Russ.)
2. Akhmetov, I. I. 2009, *Molekulyarnaya genetika sporta* [Molecular genetics of sports]. Moscow: Sovetskiy sport, 268 p. (in Russ.)
3. Ilin, V. M., Drozdovska S. B., Lizogub, V. S. & Bezkopilnyy O. P. 2013, *Osnovi molekulyarnoi genetiki m'yazovoi diyalnosti* [Fundamentals of Molecular Genetics of muscular activity]. Kyiv: Olimp. I-ra, 112 p. (in Ukr.)
4. Lilin, Ye. T., Bogomazov, Ye. A. & Gofman-Kadoshnikov, P. B. 1983, *Meditsinskaya genetika dlya vrachey* [Medical genetics for physicians]. Moscove: Meditsina, 144 p. (in Russ.)
5. Serhiyenko, L. P. 1995, [Individual prognosis speed abilities man Dermatoglyphic markers] *Nauka v olimpiyskom sporte* [Science in the Olympic sport]. Vol. 3 No 2, pp. 37–41. (in Russ.)
6. Serhiyenko, L. P. 2004, *Osnovy sportivnoy genetiki* [Fundamentals of sports genetics]. Kyiv: Vishcha shkola, 631 p. (in Russ.)
7. Serhienko, L. & Lishevskaya, V. 2007, [Genetic prediction capacity for endurance guys for serological markers system Rh] *Aktualni problemi rozvitku rukhu «Sport dlya vsikh: dosvid, dosyagnennya, tendentsii: Materiali II Mizhnarodnoi nauk.-prakt. konf. (24–25 travnya 2007 r.)* [Actual problems of the movement “Sport for all: experience, achievements, trends: Materials II International nauk. and practical. Conf. (24-25 May 2007)], T. 1, Ternopil : TNPU, p. 193–199. (in Ukr.)
8. Serhienko, L. P. 2009, *Sportivna genetika* [Sporting genetics]. Ternopil: Navchalna kniga – Bogdan, 944 p. (in Ukr.)
9. Serhiyenko, L. P. 2012, *Dermatoglifika, zdorovye, sport* [Dermatoglyphics, health, sports]. Ternopil: Navchalna kniga–Bogdan, 272 p. (in Russ.)
10. Sologub, Ye. B. & Taymazov, V. A. 2000, *Sportivnaya genetika* [Sport genetics]. Moscow: Terra-Sport, 127 s. (in Russ.)
11. Bouchard, C., Malina, R. M., Perusse, L. 1997, *Genetics of fitness and physical performance*. Champaign, IL. : Human Kinetics, 400 p.
12. Kovář, R. 1979, Pohilovč, vèkonost a deditnost, *Sbornik Vedecke rady ů GSTY Olimpia*, Praha, S. 104–126.
13. Roth, S. M. *Genetics Primer for Exercise Science and Health*. Champaign, IL. : Human Kinetics, 2007, 176 p.
14. Serhiyenko L. Genet Markers in the Prediction of the Development of Sportsmen's Speed Abilities, Proceedings of the 4-th Annual Congress of the European College of Sport Science SPORT SCIENCE'99 in Europe (Roma, 14–17 July 1999). Roma University Institute of Motor Science, 1999, pp. 5.

Received: 01.03.2016.

Published: 30.04.2016.

Alisa Ablikova: PhD (Physical Education and Sport); Lviv State University of Physical Culture: Kostuhka str., 11, Lviv, 79007, Ukraine.

ORCID.ORG/0000-0001-7206-9590

E-mail: alisa_ablikova@mail.ru

Leonid Serhiyenko: Doctor of Science (Pedagogy), Professor; Mykolayiv Regional Institute of Human development of the International University “Ukraine”: 2nd Viyskova Street, 22, Mykolayiv, 54003, Ukraine.

ORCID.ORG/0000-0001-6443-0315

E-mail: slp48@ukr.net