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USE OF DERMATOGLYPHIC PARAMETERS OF THE MEDIUM AND PROXIMAL PHALANGES OF FINGERS FOR INTEGRATED LEGAL-MEDICAL IDENTIFICATION OF A PERSON

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Ключові слова: *судова медицина, ідентифікація особи, дерматогліфічні параметри*
Ключевые слова: *судебная медицина, идентификация личности, дерматоглифические параметры*

Abstract. Use of dermatoglyphic parameters of the medium and proximal phalanges of fingers for integrated legal-medical identification of a person. Kotsiubynska Yu.Z., Kozan N.M. *The aim of the study is to search for the possibilities of forensic identification criteria through integrated study of the nature of correlative relationships between the dermatoglyphic parameters of the middle and proximal phalanges of the fingers together with gender and ethno-territorial belonging of persons and identify factor criteria for the diagnosis of unknown person's phenotype. The material for the study was dermatoglyphs of middle and proximal phalanges of fingers of 480 persons belonging to males and females of different ethno-territorial groups of the Carpathian region, obtained digitally using the Futronic's FS 80 USB 2.0 optical scanner and reformatted from bitmaps to vector graphic objects using algorithm VeriFinger 6.6/Mega Matcher 4.4 Identification Technology Algorithm. The results of quantitative and qualitative study of the morphological elements of dermatoglyphic parameters were subjected to one- and multivariate statistical analysis. Significant differences were found between in incidence of dermatoglyphic parameters in the males and females of the Boiko, Lemko, Hutsul, Opillia, Pokuttia and control groups during the study. On the basis of the obtained result, diagnostic phenotypic complexes of dermatoglyphic parameters of middle and proximal phalanges of the fingers of representatives of different ethno-territorial groups of the Carpathian region were formed, and thus the register of identification criteria was expanded, which can be further used as a separate self-sufficient identification system, as well as together with dermatoglyphic parameters of hands and feet in complex identification expertise.*

Реферат. Використання дерматогліфічних параметрів середніх і проксимальних фаланг пальців рук для комплексної судово-медичної ідентифікації особи. Коцюбинська Ю.З, Козань Н.М. *Мета дослідження полягала в пошуку нових судово-медичних ідентифікаційних критеріїв шляхом інтегрованого вивчення характеру корелятивних зв'язків між дерматогліфічними параметрами середніх та проксимальних фаланг пальців рук та статевою й етнотериторіальною приналежністю осіб для визначення факторних дерматогліфічних критеріїв діагностики фенотипології невідомої особи. Об'єктом дослідження стали дерматогліфічні параметри середніх та проксимальних фаланг пальців рук, отриманих цифровим методом з використанням оптичного сканера Futronic's FS80 USB 2.0. Надалі якість отриманих сканів покращували шляхом перетворення растрових відбитків у векторні графічні об'єкти з використанням алгоритму VeriFinger 6.6 / MegaMatcher 4.4 Identification Technology Algorithm. Результати, одержані при кількісному і якісному вивченні морфологічних елементів дерматогліфів, оброблялися методом одно- і багатовимірного статистичного аналізу. У ході дослідження встановлені достовірні відмінності між частотою зустрічання дерматогліфічних параметрів в осіб чоловічої і жіночої статі бойківської, лемківської, гуцульської, опільської, покутської та контрольної груп ($p<0.05$). У ході дослідження сформовані діагностичні комплекси дерматогліфічних параметрів середніх і проксимальних фаланг пальців рук у представників різних етнотериторіальних груп Прикарпаття, які в подальшому можуть використовуватися як окрема самодостатня система ідентифікаційних ознак, так і в комплексі з іншими дерматогліфічними параметрами рук та ніг, що дозволить підвищити достовірність результатів дерматогліфічного методу ідентифікації як складової частини DVI-interpol.*

At present the problem of developing reliable criteria for identifying an unknown person is extremely urgent. Taking into consideration the geopolitical situation in the world, natural disasters with mass casualties, it is important to develop reliable, short-lived, and materially burdensome methods for predicting the external recognition features of an unknown person. In these circumstances, the first question arises as to the relevance of the use of the dermatoglyphic method for identification purposes in the context of modern issues of forensic identification of an unknown person. [1, 4, 8, 10, 12] It should also be noted that in international practice, the set of all integration professional achievements related to the identification of persons and the organization of forensic medical examinations is conditioned and controlled by the international organization ICPO-Interpol, which has combined not only an intellectual human resource, but also a set of sophisticated identification algorithms adapted to various catastrophes [2, 7, 9, 14]. It is not superfluous to mention that the methodology developed by Interpol Disaster Victim Identification, as one of the basic methods, includes the method of dermatoglyphic identification, which is due to its material gravity, high informativeness, and the ability to obtain results in short time limits.

Insufficient theoretical and applied methodological recommendations for the complex use of dermatoglyphic parameters of the middle and proximal phalanges of the fingers for identification purposes, attracts attention and opens new prospects for study. Currently available to study a number of scientific works done by Shpak L.Y. (2003) [6], devoted to the study of dermatoglyphic parameters of the middle and proximal phalanges of the fingers, to some extent cover the problem of studying the dermatoglyphic parameters of the middle and proximal phalanges of the fingers. In particular, the researcher introduced a complete and generalized classification of patterns of the middle and proximal phalanges of the fingers.

Also, in the study of the possibility of using dermatoglyphic parameters of the middle and proximal phalanges of the fingers for identification purposes, such people as Chistikina T.A., Zoroastrov O.M., Kolomys V.E were engaged [5]. The authors studied the prevalence of finger patterns of the distal, middle, and proximal phalanges of the fingers of the population of the Tyumen region, and developed dermatoglyphic diagnostic complexes.

However, despite the full amount of work carried out, the results of the studies do not provide a holistic view of the structure and significance of the relationship between the dermatoglyphs of the middle and proximal phalanges of the fingers and the external-recognition parameters of the person, do not reveal the full identification potential of these relationship either.

Aim: to expand forensic identification criteria through integrated study of the nature of correlative relations between the dermatoglyphic parameters of the middle phalanges of the fingers and the gender and ethno-territorial identity of the individual, and thus to determine the factor dermatoglyphic criteria for the diagnosis of phenotype. The obtained results can be further applied to neural network forecasting and 3D – modeling of human external recognition features, and thus to increase the competence of the forensic expert for performing identification expertise.

MATERIALS AND METHODS OF RESEARCH

The dermatoglyphic parameters of the middle and proximal phalanges of the fingers, obtained from 480 male and female gender aged between 18-59 years who identified themselves as representatives of the Hutsul, Boiko, Lemko, Opillia, Pokuttia ethno-territorial groups, and control group of people that live on the territory of Ivano-Frankivsk region were used as the study material. The criteria for inclusion in the study groups were voluntary consent of the person, absence of genetic pathology, pathology of the endocrine system and musculoskeletal system, age over 18 and under 59 years. The criteria for exclusion were refusal at any stage, presence of genetic pathology, pathology of the endocrine system and musculoskeletal system, age under 18 years and over 59 years.

The scope and methods of research work do not contradict the basic principles of the Helsinki Declaration on Biometric Research (1974), adapted at the 41st Hong Kong International Assembly (1989), in which a person acts as their object. The basic principles such as respect for the individual, awareness of the individual, risk assessment of harm and benefit were adhered to during the study.

The dermatoglyphic parameters of the middle and proximal phalanges of the fingers were obtained digitally by scanning them with a Futronic'sFS80 scanner and improved by converting raster prints to vector graphics using the VeriFinger 6.6/MegaMatcher 4.4 IdentificationTechnologyAlgorithm.

Subsequently, the data obtained by quantitative and qualitative study of the morphological elements forming the dermatoglyphic parameters of the middle and proximal phalanges of the fingers were subjected to one- and multidimensional statistical analysis. Statistical analysis of the data obtained was performed by calculating the derived parameters and coefficients using Microsoft Excel. The main statistical analysis software package was STATISTICA 12 (License ZZS9990000099100363DEMO-L). During the study it was determined: correlation between ethno-territorial, gender and type of dermatoglyphic pattern and frequency of its occurrence, as well as average arithmetic meaning $(\overline{X})$, average square error of arithmetic mean ($S_{\overline{X}}$), mean squared deviation (δ), t-distribution of Student's and error possibility (P), ANOVA, etc. [11, 13].

RESULTS AND DISCUSSION

For the purpose of correct statistical analysis of the raw data in order to determine the factor dermatoglyphic criteria, which can be further used in the identification of unknown persons, there was conducted the examination of distribution data type that is taken by the variable. The Shapiro-Wilk test was used to check for normality. The auxiliary method of checking for normality is the Kolmogorov-Smirnov consistency criterion and graphical analysis. Fig. 1 shows the data distributions for the Hdr and Vu variables in the middlephalanx. As it can be seen from the figure, the distribution of data is close to normal, and the Shapiro-Wilk and Kolmogorov-Smirnov criteria confirm this statement.

Based on the data presented in Fig. 1, the Shapiro-Wilk criteria is 0.92, which with a probability of 92% indicates that the distribution is normal. It should also be noted that in this analysis, the p-level is greater than 0.05 (0.28), which allows us to reject the null hypothesis about absence of normal data distribution. The check for normality of other pairs of variables (category – dermatoglyphic feature) reflects similar results of the Shapiro-Wilk criteria, values of which range from 0.70 to 0.95.

In the course of the scientific research, conducted by comparing the obtained average values of manifestations of certain dermatoglyphic features on the middle phalanges of the fingers, it was established the possibility to determine the belonging of an unknown person to the respective ethno-territorial group and to conduct sexual differentiation within the group. It should be noted that this trend was determined and in persons belonging to the female sex group as well (Table 1).

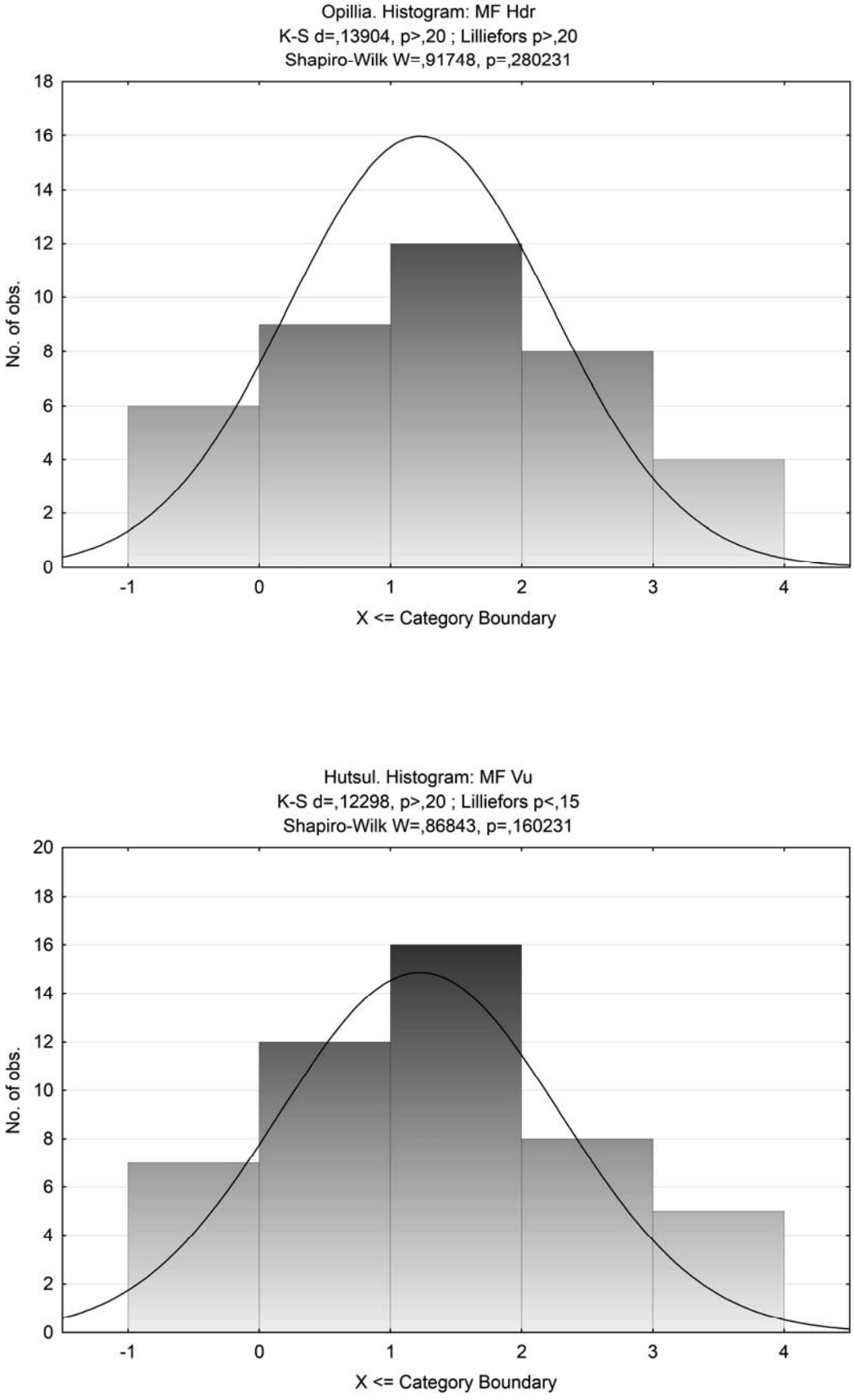

Fig. 1. Histograms of data distribution of variables Hdr (Opillia) and Vu (Hutsuls)

Table 1

Frequency of manifestation (%) of dermatoglyphic parameters, which are most common in men of the studied ethno-territorial groups

Male	Hutsul	Lemko	Boiko	Control	Opillia	Pokuttia
S	11,25	15,31	18,43	11,56	8,12	10,93
Lu	11,25	19,37	12,5	4,68	10,31	11,56
Lr	11,25	19,68	12,5	8,12	10,93	13,75
Hdu	0,93	4,68	5,93	1,56	8,75	5,00
Hdr	0,93	5,93	10,00	6,25	15,31	2,81
Vm	6,25	2,81	1,87	4,68	0,625	15,00
Vu	15,31	0,93	2,81	2,18	5,00	7,50
Vr	10,00	2,18	4,37	3,75	1,875	5,00

Statistically significant ($p<0.05$) sample of male individuals who identified themselves as representatives of the Hutsul ethno-territorial group was found to be different from the other study groups by the highest frequency of occurrence in the middle phalanx of such dermatoglyphic parameters as Vu, Vr. The defining dermatoglyphic parameters for women in this group are: Vm, Cl, Fu, Fr. As for the male members of the Lemko ethno-territorial group, the most common middle phalanges are: Lu, Lr. Women of the Lemko ethno-territorial group differ from other ethno-territorial groups with the highest frequency of manifestation of L/Su, L/Sr, which were often encountered in combination with Lu, Lr. The men of the Boiko ethno-territorial group differ from the other studied groups by the highest frequency of S, Hdr. And women from this group have the highest frequency of manifestation: Adu, Adr, S (Table 2).

As for the males, who identified themselves as representatives of the Opillia ethno-territorial group, the most common among this group were the following dermatoglyphic features: Hdr, Hdu, which distinguished them from the representatives of other ethno-territorial groups (Table 1). Among women of this group, the following dermatoglyphic patterns are crucial: ApNu, ApNr and, to a lesser extent – Hdr, Hdu. Individuals of male sex belonging to Pokuttia ethno-territorial group, are characterized with the greatest frequency of such dermatoglyphic parameters as Vm, Lr, Lu, and individuals of female sex accordingly – Fu, Fr, in this they are similar to women – Hutsuls, but most often these patterns were encountered in combination with Vm and this distinguishes them from representatives of other ethno-territorial groups (Table 2).

Among men of the control group, which consisted of persons who lived in the territory of Ivano-Frankivsk region and did not belong to any of the above ethno-territorial groups, the most common were such characteristics as S and Lr, but their numerical characteristics did not exceed the values of the men of Boiko and Lemko ethno-territorial groups (Table 1). The women in the control group were characterized by the highest manifestation of DaN and S (Table 2).

The main objective of our study was to search for factor dermatoglyphic criteria, localized on the middle phalanges of the fingers, which would allow to differentiate the sexual and ethno-territorial identity of a particular person. The solution to this problem was implemented by searching for a model that would describe the relationship between ethnic and gender belonging and dermatoglyphic parameters on the middle phalanges of the fingers, namely, using classical statistical methods of analysis of variance (ANOVA) and Post-hoc test, and modern methods based on Deep learning and creating Deep Neural Network.

Analysis of variance is a group of statistical methods that identify discrepancies between the average variables. It is one of the main methods of statistical analysis that allows us to evaluate the effect of a variable on a factor (a categorical variable, which in our case is ethno-territorial

affiliation). Depending on the type of data and their distribution, there are different subtypes of ANOVA. In this case, we used one-factor ANOVA for the independent samples. The statement of the main task in this case is as follows: "Does ethno-territorial belonging affect the quantitative manifestation of dermatoglyphic features on the hands (of women/men)". Necessary conditions for conducting ANOVA are the equality of variance in groups, that is, normally distributed variables. As it is shown above, all of these conditions are met.

The ANOVA test for women and men (Table 3) shows that there are significant differences in the manifestation of variables in these groups ($p<0.001$). Dermatoglyphic parameters on middle phalanges, which mainly define ethno-territorial affiliation in males are: Vu, Vr, Lu, Lr, S, Hdr, Hdu, Vm, Lr. For women such characteristics are: Vm, Cl, Fu, Fr, Lsu, LSr, Adu, Adr, S, ApNu, ApNr, Fu, Fr, DaN. Other dermatoglyphic parameters that are decisive in establishing ethno-territorial affiliation ($p<0.05$) are: for men: Adu, Adr, Adsr, ApNu, ApNr, ApLr, Dhu, Fu, Fr, NdNu, Lsr; for women: Hdu, Hdr, Adsu, Adsr, ApLr, Vr, NdNu, NdNr, Npu. As the analysis of variance shows, the level of influence of these features is significantly lower, so they can be considered as an auxiliary criterion.

Table 2

Frequency of manifestation (%) of dermatoglyphic parameters most common in women of the studied ethno-territorial groups

Female	Hutsul	Lemko	Boiko	Control	Opillia	Pokuttia
S	6,87	11,87	9,68	9,37	7,50	7,18
Lu	8,12	9,06	10,93	7,50	8,75	6,87
Lr	8,12	9,37	10,00	7,81	9,68	7,18
Hdu	0,93	4,06	5,62	2,81	8,12	2,18
Hdr	1,25	5,00	5,93	6,56	7,81	3,12
Vm	6,25	3,12	4,37	1,87	2,50	7,81
Cl	15,00	1,56	0,62	1,25	0,31	0,93
Fu	9,06	2,81	0,62	4,37	0,93	11,87
Fr	8,43	1,56	0,93	7,50	0,62	12,50
Lsu	1,25	14,06	1,87	1,87	0,62	0,62
Lsr	0,62	12,18	0,31	1,56	0,93	0,62
Adu	2,18	0,93	12,81	2,81	1,87	4,37
Adr	1,25	3,12	14,06	1,25	0,62	0,62
DaN	1,25	1,56	0,93	15,31	6,87	2,50
ApNu	1,87	1,87	5,00	2,18	15,31	1,25
ApNr	1,87	2,81	2,18	1,87	14,37	1,56

Table 3

Results of ANOVA test for women (a) and men(b)

a

Variable	Analysis of Variance MFF Marked effects are significant at p < ,05 and p < ,00450						
	SS	MS	SS	MS	F	p<0.05	p <0.0045
MF Hdu	8.63	1.73	87.30	0.37	4.63	0.00	0.00
MF Hdr	7.37	1.47	90.03	0.38	3.83	0.00	0.00
MF Adu	24.63	4.93	62.70	0.27	18.39	0.00	0.00
MF Adr	35.42	7.08	78.88	0.34	21.02	0.00	0.00
MF Adsu	0.65	0.13	12.75	0.05	2.39	0.04	0.04
MF Adsr	0.33	0.07	3.60	0.02	4.33	0.00	0.00
MF ApNu	37.58	7.52	62.15	0.27	28.30	0.00	0.00
MF ApNr	32.57	6.51	80.43	0.34	18.95	0.00	0.00
MF ApNsr	1.02	0.20	9.48	0.04	5.04	0.00	0.00
MF Ladu	0.09	0.02	4.88	0.02	0.84	0.52	0.52
MF Ladr	2.67	0.53	26.13	0.11	4.78	0.00	0.00
MF ApLu	2.69	0.54	33.28	0.14	3.78	0.00	0.00
MF ApLr	5.04	1.01	37.53	0.16	6.28	0.00	0.00
MF DaN	40.47	8.09	64.03	0.27	29.58	0.00	0.00
MF DaLu	0.42	0.08	6.38	0.03	3.09	0.01	0.01
MF Vr	2.62	0.52	49.78	0.21	2.46	0.03	0.03
MF Vm	6.82	1.36	75.48	0.32	4.23	0.00	0.00
MF Dhr	0.54	0.11	8.13	0.03	3.10	0.01	0.01
MF Ahu	0.47	0.09	6.33	0.03	3.48	0.00	0.00
MF Ahr	1.03	0.21	12.15	0.05	3.98	0.00	0.00
MF Fu	26.77	5.35	88.63	0.38	14.14	0.00	0.00
MF Fr	31.07	6.21	89.43	0.38	16.26	0.00	0.00
MF Cl	42.44	8.49	88.03	0.38	22.56	0.00	0.00
MF NdNu	1.27	0.25	23.53	0.10	2.53	0.03	0.03
MF NdNr	2.05	0.41	16.60	0.07	5.78	0.00	0.00
MF Npu	0.53	0.11	9.20	0.04	2.71	0.02	0.02
MF Npr	0.08	0.02	3.85	0.02	1.01	0.41	0.41
MF Dn	5.12	1.02	14.38	0.06	16.67	0.00	0.00
MF NdAdu	0.33	0.07	3.60	0.02	4.33	0.00	0.00
MF Vus	0.50	0.10	7.35	0.03	3.18	0.01	0.01
MF Lsu	35.42	7.08	51.98	0.22	31.89	0.00	0.00
MF Lsr	27.83	5.57	40.90	0.17	31.85	0.00	0.00

b

Variable	Analysis of Variance Marked effects are significant at p < ,00450 and p < ,05						
	SS	MS	SS	MS	F	p<0.05	p<0.0045
MF S	17.18	3.44	252.80	1.08	3.18	0.01	0.01
MF Lu	28.37	5.67	185.43	0.79	7.16	0.00	0.00
MF Lr	19.48	3.90	232.45	0.99	3.92	0.00	0.00
MF Hdu	10.68	2.14	90.50	0.39	5.52	0.00	0.00
MF Hdr	34.30	6.86	111.10	0.47	14.45	0.00	0.00
MF Adu	3.48	0.70	42.50	0.18	3.84	0.00	0.00
MF Adr	3.54	0.71	38.63	0.17	4.29	0.00	0.00
MF Adsu	0.38	0.08	16.80	0.07	1.07	0.38	0.38
MF Adsr	1.05	0.21	15.60	0.07	3.15	0.01	0.01
MF ApNu	4.88	0.98	49.10	0.21	4.65	0.00	0.00
MF ApNr	2.87	0.57	47.53	0.20	2.83	0.02	0.02
MF ApNsu	0.07	0.01	10.43	0.04	0.32	0.90	0.90
MF ApLr	1.12	0.22	18.38	0.08	2.85	0.02	0.02
MF DaN	17.07	3.41	69.23	0.30	11.54	0.00	0.00
MF Vu	35.70	7.14	103.70	0.44	16.11	0.00	0.00
MF Vr	11.09	2.22	80.38	0.34	6.46	0.00	0.00
MF Vm	34.58	6.92	105.75	0.45	15.30	0.00	0.00
MF Dhu	1.63	0.33	29.55	0.13	2.59	0.03	0.03
MF Fu	3.49	0.70	39.18	0.17	4.17	0.00	0.00
MF Fr	10.10	2.02	42.30	0.18	11.17	0.00	0.00
MF NdNu	1.89	0.38	12.18	0.05	7.26	0.00	0.00
MF NdNr	0.30	0.06	11.55	0.05	1.22	0.30	0.30
MF Npu	0.47	0.09	19.03	0.08	1.16	0.33	0.33
MF Npr	1.19	0.24	33.98	0.15	1.64	0.15	0.15
MF Vms	0.08	0.02	7.65	0.03	0.51	0.77	0.77
MF Lsu	0.68	0.14	22.50	0.10	1.42	0.22	0.22
MF Lsr	7.53	1.51	69.65	0.30	5.06	0.00	0.00

As it can be seen from the table III, differences in the manifestation of dermatoglyphic parameters among representatives of different ethno-territorial groups are significant. In order to identify in which pairs these differences are significant, it was decided to carry out appropriate post-hoc tests and graphical analysis. In the diagrams shown in Fig. 2, a graphical representation of the average manifestations of the variables Lu and Vr, and the corresponding standard error and confidence interval are presented.

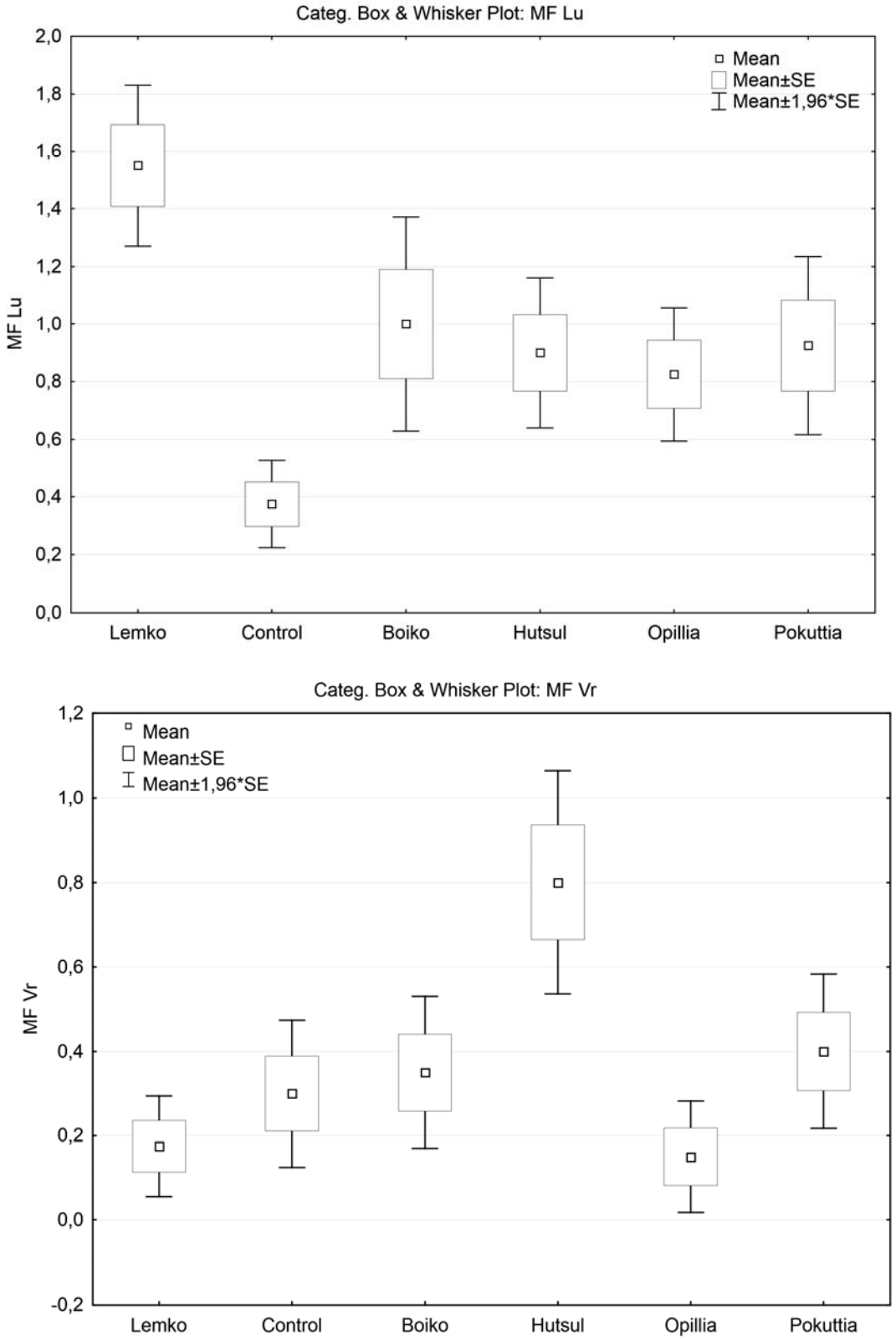

Fig. 2. Graphical representation of average (Mean) of Lu and Vr variables in different ethno-territorial groups, standard error (Mean SE) and 95% confidence interval (Mean 1.96 SE)

After applying the Post-hoc test (Tukey HSD test), we obtained results that allowed us to confirm the results of the ANOVA test and graphical analysis.In the tab. IV data Tukey HSD test for Vr and Lu features are presented.

Table 4

Tukey HSD test data for characteristics Vr and Lu (men)

	Tukey HSD test; Variable: MF Vr Marked differences are significant at p<0.05					
	{1}	{2}	{3}	{4}	{5}	{6}
Lemko {1}		0.932	0.765	0.000	1.000	0.520
Control {2}	0.932		0.999	0.002	0.863	0.974
Boiko {3}	0.765	0.999		0.008	0.647	0.999
Hutsul {4}	0.000	0.002	0.008		0.000	0.028
Opillia {5}	1.000	0.863	0.647	0.000		0.397
Pokuttia {6}	0.520	0.974	0.999	0.028	0.397	

	Tukey HSD test; Variable: MF Vr Marked differences are significant at p<0.0045					
	{1}	{2}	{3}	{4}	{5}	{6}
Lemko {1}		0.932	0.765	0.000	1.000	0.520
Control {2}	0.932		0.999	0.002	0.863	0.974
Boiko {3}	0.765	0.999		0.008	0.647	0.999
Hutsul {4}	0.000	0.002	0.008		0.000	0.028
Opillia {5}	1.000	0.863	0.647	0.000		0.397
Pokuttia {6}	0.520	0.974	0.999	0.028	0.397	

	Tukey HSD test; Variable: MF Lu Marked differences are significant at p<0.05					
	{1}	{2}	{3}	{4}	{5}	{6}
Lemko {1}		0.000	0.064	0.014	0.004	0.021
Control {2}	0.000		0.021	0.088	0.210	0.064
Boiko {3}	0.064	0.021		0.996	0.952	0.999
Hutsul {4}	0.014	0.088	0.996		0.999	1.000
Opillia {5}	0.004	0.210	0.952	0.999		0.996
Pokuttia {6}	0.021	0.064	0.999	1.000	0.996	

Етнос	Tukey HSD test; Variable: MF Lu Marked differences are significant at p<0.0045					
	{1}	{2}	{3}	{4}	{5}	{6}
Lemko {1}		0.000	0.064	0.014	0.004	0.021
Control {2}	0.000		0.021	0.088	0.210	0.064
Boiko {3}	0.064	0.021		0.996	0.952	0.999
Hutsul {4}	0.014	0.088	0.996		0.999	1.000
Opillia {5}	0.004	0.210	0.952	0.999		0.996
Pokuttia {6}	0.021	0.064	0.999	1.000	0.996	

As it can be seen in Table 4, at the intersection of each group there is the level of significance for each of the pairs. For example, at the intersection of the control group and the Lemko, the significance level is close to zero (0.00002), indicating that the differences in the manifestation of the Lu sign for these groups are very significant, that is, exactly this characteristic is decisive in forecasting ethno-territorial affiliation. On the other hand, the manifestation of this characteristic (Lu) in the control group and the Hutsul is greater than 0.05 (0.088), indicating that there are no differences in the manifestation of the characteristic Lu for these groups. This approach is also relevant for other pairs and features.

According to Mishalov V.D., Serebrennikova A.A., Klimas L.A., Gunas V.I. [7], there is a high heterogeneity according to the qualitative and quantitative indicators of finger dermatoglyphics between a number of such administrative-territorial groups: between residents of central and southern (22, 22% of indicators), central and eastern (20.37% of indicators) central and western (15.74% of indicators), northern and southern (17.59% of indicators), northern and western (16.67% of indicators), northern and eastern (15.74%), western and eastern (12.04%) and southern and eastern (12.04%) regions of Ukraine. It was found significant homogeneity in the qualitative and quantitative indicators of finger dermatoglyphics, which is characteristic of men, residents of the northern and central regions of Ukraine (differences are recorded by 7 (6.48%) indicators), as well as men living in the southern and western regions of the country (differences are recorded by 10-9.26% indicators concerning only qualitative signs). The obtained results made it possible to identify two dermatoglyphic complexes in the territory of Ukraine: local north-central and local south-western. High taxonomic value for intra-population differentiation of the local level have the types of patterns with high intensity of crest formation and capacity of patterns, especially III and IV fingers of the right hand and I and II fingers of the left hand.

According to Segeda S.P. [13], the population of Prykarpattya belongs to the central complex, widespread in some areas of the Middle Dnieper, Southern Volyn and Galicia. which is marked by the most “western” combination of dermatoglyphic features, namely: average Dl10 (12,72–13,12), medium-high Kummins index (8,40–8,63), low and moderate percentages of triradius t (53.0-58.6%), high frequency of patterns on hypothenar (34.6-38.7%), and medium frequency of interdigital extra triradiuses (16.1-19.1%). Our studies confirmed the data of Segeda S.P, but allowed to differentiate in the complex the phenotypic characteristics inherent in the population of the western region of Ukraine, specific to the certain ethno-territorial groups living in the Carpathian region. However, the above mentioned authors did not consider compact and relatively closed settlements of ethnic group within these regions. For example, in the territory of Transcarpathia there are compact settlements of Hungarians, Romanians, Lemkos, etc., who are genetically the so-called "clean lines", i.e they do not practice marriage with representatives of other ethnic groups. In the Carpathian region there are also compact settlements of ethnic groups, for example, Hutsuls, Boykos, Lemkos, etc. Of course, one should not neglect the influence of migration processes, epigenetic factors, etc. However, the studying of the phenotypic traits of particular ethnic groups (including dermatoglyphic ones) makes it possible to answer many questions regarding the origin and evolution of ethnic groups, migration processes, and the influence of epigenetic factors on phenotype manifestation.

Thus, we have established reliable factor dermatoglyphic criteria, localized on the middle phalanges of the fingers, that can be used with certainty in the forensic identification of an unknown person, and as a self-sufficient system of signs and supplement and at the same time confirm the authenticity of a number of known methods.

CONCLUSIONS

The modern approach to the identification process is characterized by the integration interaction of segmental components and ensures the complexity of the data comparison process. In addition, the worldwide experience of DVI functioning argues for the feasibility of using the dermatoglyphic method as one of the basic methods for identifying an unknown person. Therefore, the search for new identification criteria and algorithms within the dermatoglyphic method is relevant, which in its turn will allow to increase the objectivity and evidence of identification expertise.

Conflict of interests. The authors declare no conflict of interest.

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