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Dermatoglyphics of Children with Family-Hereditary Deafness — Fluctuating Asymmetry

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The fluctuating asymmetry level of finger ridge count, palm ridge count, *atd* angle and finger patterns type on the homologous digits is studied in children with family-hereditary deafness. The investigation encloses 53 boys and girls with family-hereditary deafness, as well as a control group of 260 healthy boys and girls. The results show a trend to higher fluctuating asymmetry level of *palm ridge count, angle atd* and *finger patterns type* for the children with family-hereditary deafness compared to the healthy ones, while those of *finger ridge count* is lower. The diversions of fluctuating asymmetry level between deaf and healthy children, are not very high. This fact indirectly leads to the conclusion that the disturbances' degree of homeostasis development of the organism for the deaf children is not very appreciable, as well.

Key words: dermatoglyphic features, fluctuating asymmetry, children with family-hereditary deafness.

Introduction

The fluctuating asymmetry, random deviations from organism's bilateral symmetry, is accepted as one of the best indicators about developmental homeostasis. On the basis of this understanding is grounded the idea that the genetically factors, or the environmental factors leading to disturbances in the normal development of organism, exert a negative influence on the control when bilateral morphological structures are formed. So, the disturbances' degree of perfect body bilateral symmetry, assessed by the fluctuating asymmetry, gives possibilities of the mechanisms that control the homeostasis to be defined.

The aim of the present investigation is to be assessed the fluctuating asymmetry level of four dermatoglyphic features (finger ridge count, palm ridge count, *atd* angle and finger patterns type) in children with family-hereditary deafness.

Material and Methods

Object of the investigation are 53 children (30 boys and 23 girls) with family-hereditary deafness (FHD). The papillar patterns are read by the method of Cummins and Midlo [1] and the *atd* angle is evaluated by the criterion of Sharma [2].

The fluctuating asymmetry level of finger and palm ridge count and *atd* angle is determined by the *coefficient of indetermination (I-r²)*, and for the finger patterns — by the degree of finger patterns discordance on pair fingers [3].

The data about fluctuating asymmetry (FA) for the dermatoglyphic features of FHD children are compared with analogous data for healthy children (129 boys and 131 girls) [4].

Results and Discussion

The correlation coefficients between ridges count on homologous fingers; right and left "a-b", "b-c" and "c-d" palm ridge count and *atd* angle are determined in connection with the assessment of FA about the three quantitative dermatoglyphic features (Table 1). The comparative analysis of coefficient values shows presence of big correlation dependence between the bilateral indices of the three features, as for the healthy, so for the FHD children. Available is a common tendency to more high correlation degree about finger ridge count in the FHD children, and about palm ridge count and *atd* angle — in the healthy ones. Highest inter-group difference ($P<0.05$) for boys is established between the correlation coefficients about ridge counts on the V digit pairs and the total ridge count, as for the girls it is highest about "c-d" ridge count.

Opposite to the presented results about correlation analysis, a common tendency to lower fluctuating asymmetry level is available for finger ridge count in the FHD children, and for palm ridge count and *atd* angle — in the healthy ones (Table 2). The homologous fingers arrangement according to the fluctuating asymmetry level for the FHD children (♂ — II>I>III>IV>V; ♀ — II>IV>I>III>V) considerably differ from this for healthy ones (♂ — I>II≥ V >III>IV; ♀ — III>I>II>IV>V). For the FHD children from both sexes highest FA is established

Table 1. Correlation between finger ridge count, palm ridge count and atd angle of children with family-hereditary deafness and healthy children

Features	Correlations (r)							
	boys				girls			
	FHD	controls	t	*P*	FHD	controls	t	*P*
Finger ridge count								
I	0.7095	0.6715	0.3607	*P*>0.05	0.7726	0.6963	0.6223	*P*>0.05
II	0.6845	0.7108	0.2740	*P*>0.05	0.5537	0.7294	1.2621	*P*>0.05
III	0.8046	0.7275	0.8012	*P*>0.05	0.8125	0.6455	1.4305	*P*>0.05
IV	0.8541	0.7600	1.2260	*P*>0.05	0.7382	0.7651	0.2839	*P*>0.05
V	0.8814	0.7124	2.3040	***P*<0.05**	0.8505	0.7969	0.6410	*P*>0.05
I-V	0.9528	0.8657	2.3516	***P*<0.05**	0.9241	0.8968	0.4751	*P*>0.05
Palm ridge count								
a-b	0.8270	0.7027	1.4148	*P*>0.05	0.7032	0.5877	0.7885	*P*>0.05
b-c	0.6715	0.7561	0.8181	*P*>0.05	0.5550	0.6632	0.6654	*P*>0.05
c-d	0.6306	0.6923	0.4701	*P*>0.05	0.2718	0.6992	2.4792	***P*<0.05**
a-d	0.8410	0.8486	0.1544	*P*>0.05	0.6371	0.7405	0.7998	*P*>0.05
***atd* angle**	0.3523	0.6485	1.9499	*P*>0.05	0.5641	0.5650	0.0565	*P*>0.05

Table 2. Fluctuating asymmetry measure of finger ridge count, palm ridge count and atd angle of children with family-hereditary deafness and healthy children

Features	Coefficient of indetermination ($1-r^2$)					
	boys			girls		
	FHD	controls [C]	difference [FHD-C]	FHD	controls [C]	difference [FHD-C]
Finger ridge count						
I	0.4966	0.5491	-0.0525	0.4031	0.5152	0.1121
II	0.5315	0.4948	0.0367	0.6934	0.4680	0.2254
III	0.3526	0.4707	-0.1181	0.3398	0.5833	-0.2435
IV	0.2705	0.4224	-0.1519	0.4551	0.4146	0.0405
V	0.2230	0.4925	-0.2695	0.2766	0.3650	-0.0884
I-V	0.0921	0.2506	-0.1585	0.1461	0.1958	-0.0497
Palm ridge count						
a-b	0.3160	0.5062	-0.1902	0.5056	0.6546	-0.1490
b-c	0.5490	0.4283	0.1207	0.6919	0.5602	0.1317
c-d	0.6023	0.5207	0.0816	0.9261	0.5111	0.4150
a-d	0.2926	0.2799	0.0127	0.5942	0.4517	0.1425
***atd* angle**	0.8759	0.5794	0.2965	0.6818	0.6808	0.0010

about II digit pairs, and lowest — about V digit pairs. Diverse from the FHD children, in the healthy boys FA is highest for I digit pairs, and in healthy girls — for III ones. The lowest FA for IV digit pairs are found in the healthy boys and for the V digit pairs — in the healthy girls. The trend to which the fluctuating asymmetry levels of palm ridge count decreases for FHD and healthy children differ considerably, as well. For the FHD boys and girls the FA decreases in the same direction submitted in the descendent formula: "c-d" > "b-c" >"a-b". In contrast to the FHD children, for healthy boys the FA decreases in the direction "c-d" >"a-b" >"b-c", and for healthy girls it is "a-b" >"b-c" >"c-d".

The data analysis of the investigation shows a trend toward lower coincidence degree of the papillary patterns' type on the homologous fingers in the FHD children compared to the healthy ones (Table 3). The FA calculated by the discordance level of papillary patterns' type on homologous fingers is higher in the FHD children than in the healthy ones (Table 4). The consecutiveness of homologous fingers for the FHD and the healthy boys and girls according to the FA differs insignificantly. For the FHD boys it decreases in the direction II>I=III>IV>V homologous digits, as for the FHD girls it is II>III>I=IV>V. For the healthy boys the FA decreases in the direction II>I>III=IV>V homologous digits, as for the healthy girls it is II>III>IV>I>V.

Conclusions

The results from the elaborated by us dermatoglyphic investigation show a trend to higher fluctuating asymmetry level of *palm ridge count, angle atd* and *finger patterns type* for the children with family-hereditary deafness compared to the healthy children. The fluctuating asymmetry level of *finger ridge count* for the children with family-hereditary deafness is predominantly lower than for the healthy ones. The variations of dermatoglyphic fluctuating asymmetry follow the same direction for both sexes of the studied FHD and healthy children. As is well known, the fluctuating asymmetry level is assumed as an indicator of different unfavorable (endogenous and/or exogenous) factors for the developmental homeostasis, as well as for its ability to overcome the influence of such factors. Along these lines the higher values

Table 3. Coincidence of finger patterns for homologous fingers of children with family-hereditary deafness and healthy children

Homologous fingers	Boys						Girls					
	FHD		controls		t	*P*	FHD		controls		t	*P*
	X	SD	X	SD			X	SD	X	SD		
I	0.6562	0.4826	0.7132	0.4540	0.5891	*P*>0.05	0.6800	0.4761	0.7752	0.4191	0.8997	*P*>0.05
II	0.6250	0.4919	0.5581	0.4985	0.6693	*P*>0.05	0.5600	0.5066	0.4961	0.5019	0.5587	*P*>0.05
III	0.6562	0.4826	0.7519	0.4336	0.9966	*P*>0.05	0.6000	0.5000	0.7209	0.4503	1.0850	*P*>0.05
IV	0.6875	0.4709	0.7519	0.4336	0.6846	*P*>0.05	0.6800	0.4761	0.7519	0.4336	0.6767	*P*>0.05
V	0.7812	0.4200	0.8295	0.3776	0.5779	*P*>0.05	0.9200	0.2769	0.8605	0.3478	0.9194	*P*>0.05

Table 4. Discordance of finger patterns for homologous fingers of children with family-hereditary deafness and healthy children

Homologous fingers	Boys			Girls		
	FHD	controls [C]	Difference [FHD-C]	FHD	controls [C]	Difference [FHD-C]
I	0.3438	0.2868	0.0570	0.3200	0.2248	0.0952
II	0.3750	0.4419	—0.0669	0.4400	0.5039	—0.0639
III	0.3438	0.2481	0.0957	0.4000	0.2791	0.1209
IV	0.3125	0.2481	0.0644	0.3200	0.2481	0.0719
V	0.2188	0.1705	0.0483	0.0800	0.1395	—0.0595

of the fluctuating asymmetry about more features in the children with family-hereditary deafness could be accepted as an indicator about genetic control disturbances along the formation of their dermatoglyphic features, i.e. as an indicator for developmental homeostasis. The diversions of fluctuating asymmetry level for the deaf children towards this for the healthy ones, are not very high. This fact indirectly leads to the conclusion that the degree of disturbances in the developmental homeostasis of the organism for the children with family-hereditary deafness is not very appreciable, as well.

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