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INVESTIGATION OF BILATERAL NON-METRIC TRAITS IN A SAMPLE FROM THE 10TH CENTURY

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Abstract

Non-metric traits are thought to be under genetic control, and therefore they have a great importance in population comparisons. In this paper data are presented on the frequencies of some bilateral traits in a sample from Sárrétudvari-Hízóföld (Hungary). The problem of differences in side frequencies end the dependence between sides for traits also were examined. It is found that generally in the sample there is no significant difference in the frequencies of traits between the two sides. However in most cases these traits show significant side dependence.
Key-words: historical anthropology, non-metric traits, side dependence, bilateral occurrence.

Introduction

Since non-metric traits are thought to be under genetic control (BERRY, 1968), they are considered as possible elements in the construction of biological distance measures between osteological samples (BERRY, 1974a; SJØVOLD, 1973).

Many of these traits are bilateral, they may appear on both sides of the skeleton.

The purpose of this study was: (1) to present data on the occurrences of some of these bilateral non-metric traits, (2) to study the differences in side frequencies, (3) to examine the independence of occurrence from side to side.

Materials and methods

Data were collected from a sample of a 10th century cemetery from Sárrétudvari-Hízóföld. For this investigation this sample consists of all ages and both sexes. Although the expression of many traits appears to be influenced by age, sex and the incidence of other traits (HERZOG, 1968; CORRUCCINI, 1974), these factors should not influence the level of bilateral asymmetry; if they are strictly under genetic control, age, sex and trait independence should affect both sides equally (TRINKAUS, 1978). Ten traits on skulls and 11 on the postcranial skeleton were taken into consideration (Table 1.). In order to

calculate frequencies of occurrence the method proposed by GREEN et al.(1979) was followed, so the side was used as a unit.

The side dependence of the traits was assessed by means of the chi-squared statistic. The data were arranged in a two-by-two contingency table:

		Right side	
		Present	Absent
Left side	Present	a	b
	Absent	c	d

Table 1. Incidence of non-metric traits

Traits		%
Cranium		
Fronto-temporal articulation	7/123	5.69
Epipteric bone present	6/111	5.41
Ossicle at asterion	48/205	23.41
Parietal notch bone present	44/251	17.53
Lambdoid ossicle present	211/243	86.83
Parietal foramen absent	139/299	46.49
Foramen spinosum open	34/187	18.18
Posterior condylar canal patent	127/169	75.15
Anterior condylar canal double	60/297	20.20
Condylar facet double	3/234	1.28
Atlas		
Transverse foramen incomplete	8/198	4.04
Anterior notch	1/210	0.48
Posterior notch	60/209	28.71
Posterior foramen	22/214	10.28
Posterior bridge	16/236	6.78
Lateral bridge	2/224	0.89
Articular facet	17/234	7.26
Scapula		
Acromial bone	8/133	6.02
Suprascapular foramen	4/108	3.70
Humerus		
Septal aperture	45/287	15.68
Calcaneus		
Anterior calcaneal facet double	115/305	37.70

Table 2. Chi-squared values and side to side correlation for 21 traits

Traits	a	b	c	d	r	χ_1^2	χ^2
Fronto-temporal articulation	1	1	0	36	0.697	1.000	18.486
Epipteric bone present	1	0	1	28	0.695	1.000	14.483
Ossicle at asterion	5	11	12	27	0.005	0.043	0.001
Parietal notch bone present	7	9	10	54	0.275	0.053	6.050
Lambdoid ossicle present	92	5	3	3	0.392	0.500	15.863
Parietal foramen absent	45	25	14	15	0.148	3.103	2.183
Foramen spinosum open	1	10	6	20	0.163	1.000	0.986
Posterior condylar canal patent	37	6	4	1	0.052	0.400	0.131
Anterior condylar canal double	8	20	11	57	0.141	2.613	1.919
Condylar facet double	1	0	1	97	0.703	1.000	48.995
Atlas							
Transverse foramen incomplete	2	1	2	74	0.558	0.333	24.619
Anterior notch	0	1	0	93	-	1.000	-
Posterior notch	16	15	6	53	0.485	3.857	18.899
Posterior foramen	3	8	6	74	0.216	0.286	4.242
Posterior bridge	4	5	3	95	0.465	0.500	23.089
Lateral bridge	0	2	0	98	-	2.000	-
Articular facet	3	7	2	96	0.386	2.778	16.065
Scapula							
Acromial bone	1	1	1	41	0.476	0.000	9.977
Suprascapular foramen	1	0	0	30	1.000	-	31.000
Humerus							
Septal aperture	15	10	3	104	0.653	3.769	56.293
Calcaneus							
Anterior calcaneal facet double	45	11	3	78	0.790	4.571	85.472

$a+b+c+d$ = total number of possible cases
χ_1^2 is the chi-square value for side difference in trait frequency
χ^2 is the chi-squared value for side to side dependence
r is the side to side trait correlation

The test statistic was:

$$\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$$

According to GREEN et al. (1979) the chi-squared statistic in showing the difference between the frequencies of the sides was:

$$\chi_1^2 = \frac{(b-c)^2}{b+c}$$

The critical χ^2 value at the 0.05 significance level with one degree of freedom was 3.841. The formula calculating the correlations was:

$$r = \left[\frac{(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)} \right]^{1/2}$$

Results

Table 1. presents the data for the frequencies of traits. The most frequent traits are the following: lambdoid ossicle present (86.83%), posterior condylar canal patent (75.15%) and parietal foramen absent (46.49%). The most rare are: anterior notch (0.48%), lateral bridge (0.89%) and condylar facet double (1.28%).

Tests for differences between side frequencies (Table 2.) show a significant difference (at the 5% level) twice for the postcranial skeleton. The anterior calcaneal facet double and posterior notch were significantly more frequent on the left side. On crania we could not find any significant difference between side frequencies. Table 2. present the data for the test for independence for the 21 bilateral traits in this sample. Significant dependences (at the 5% level) are found for five traits on the cranium and nine on the postcranial skeleton. Observed correlations are positive for all of these traits and range from 0.005 to 1.000. The correlation in the case of suprascapular foramen (1.000) is unrealistic and may due to the low number of observations. A relatively strong correlation, between sides in the manifestation of the trait, can be found in the following cases: anterior calcaneal facet double (0.790), condylar facet double (0.703), fronto-temporal articulation (0.697) and epipteric bone present (0.695).

Conclusions

Our conclusions are as follows:

1) In most cases there is no significant difference in the trait frequencies between the two sides.

2) From 21 examined traits 14 show a significant side dependence. A relatively strong correlation can be pointed out in this sample. This may confirm the hypothesis of a genetic basis that may realises the bilateral manifestation of traits (BRASILI-GUALANDI et al., 1989), while environmental stress factors may cause the unilateral appearance.

The importance of the study of both skeletal sides before drawing any conclusion concerning the genetic or acquired nature of traits is therefore emphasized.

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