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Anthropological and epidemiological characterization of Great-Moravian population in connection with the social and economic structure

# Biological Diversity of Non-metric Traits in the Great Moravian Population – the Comparison of the Mikulčice Power Centre and its Hinterland

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*This study compares different socio-economic groups – Mikulčice castle, the sub-castle area (Kostelisko) and hinterland (Josefov) – on the basis of the variability of non-metric morphological traits. The primary goal was to determine the frequency of around 150 non-metric traits in the largest settlement agglomeration located in Kostelisko (425 graves), and to verify the relationship with sex, or the potential laterality differences in the case of bilateral traits. Then, based on the variability of non-metric traits, we compared individuals buried in the Mikulčice sub-castle with individuals buried on the site of the Mikulčice acropolis itself and in the "rural" burial site at Josefov in the hinterland of the Mikulčice power centre. Based on the incidence of non-metric morphological traits, the population group from the sub-castle area (Kostelisko) is closer to the group from the Mikulčice hinterland (Josefov) than to the individuals from Mikulčice castle. Similarly, the group from Josefov is more akin to the group from Kostelisko than to that from Mikulčice castle. This study supported the previous premise that non-metric traits have a greater predicative value when used to compare smaller population groups originating from a smaller territory.*

Key words: non-metric traits – morphology – biological variability – Early Medieval population – Great Moravian period

## 1. Introduction

Typically, the human skeleton demonstrates extensive variation of structure. This is supported by all sorts of morphological variants of individual bones. A number of these variants are considered to be so-called non-metric, discrete or eventually epigenetic traits. Generally, these involve slight anatomical variants from the common bone structure, which have a certain degree of heritability (the common state most often refers to the most frequently recorded situations within the relevant human population). Traits are predominantly determined genetically. External (environmental) and internal (physiological) factors affect their incidence, but their contribution is not deemed to be decisive. This at least is valid for cranial traits; it is not so unequivocal in the case of post-cranial traits. A number of these traits are associated with the locomotive, physical activity of the individual, i.e. the non-genetic component plays a more prominent role within the heritability of such traits. In the case of traits relating to ligament attachments, one may argue whether their genetic basis predominates or whether their incidence is contingent to physical activity and the stress exerted on the relevant muscle groups. Most non-metric traits have a low population incidence.

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Knowledge regarding the heritability of discrete traits comes mainly from studies on animals, due to the shortage of suitable human samples, i.e. the skeletal remains of biologically related individuals. The ideal study material comprises skeletal remains from family tombs (e.g. Rösing 1986a; Velemínský/Dobisíková 2005; Carson 2006). In general, it is accepted that non-metric morphological traits have greater heritability than classic metric variables, for which the polygenic pattern of inheritance is presumed (e.g. Rösing 1986b; Hauser/DeStafano 1989).

Both facts – genetic basis and low incidence – are a positive factor with regard to the application of non-metric traits when comparing population groups (e.g. Komesu et al. 2007). The predominant opinion is that their predicative value is highest especially for determining the affinity of population groups originating from smaller territories (e.g. Rösing 1986b; Sutter/Mertz 2004; Komesu et al. 2007). Comparison of geographically, chronologically or rather "racially" distant groups has often led to ambiguously interpreted results (e.g. Hallgrímsson et al 2004). Apart from being considered to be indicators of the biological relationships of population groups, they may also inform about evolutionary processes, about the relationship between anatomical modern human and his ancestors (e.g. Manzi/Vienna/Hauser 1996; Manzi/Gracia/Arsuaga 2000). The final degree of conformity of the incidence of non-metric traits may, under certain circumstances, also indicate the biological kinship of individuals (e.g. Alt/Vach 1998; Sjövold 1986; Česnys/Tutkuvienė 2007; Stojanowski et al. 2007).

There exist hundreds of morphological varieties (Saunders 1989). This is not the case of a homogenous group. The discrete character does not apply always and unambiguously. As part of the study of past populations, if we do not take into consideration dental traits, cranial non-metric traits are preferred unequivocally. This is conditional to the aforementioned fact that especially in the case of such traits heritability has been verified and is higher. Cranial traits are also more unequivocally defined and thus their evaluation is less problematic and as groups they are more homogenous. For example, all so-called epigenetic traits are found on the skull.

Attempts to classify traits have existed since the end of the nineteen-sixties (see Ossenberg 1969). If we do not take into consideration the classification according to localisation, i.e. the anatomical division, then traits are most often divided into hyperostotic and hypostotic traits (see Ossenberg 1969, 1977). Traits regarded as hyperostotic are those that have an appearance conditioned by "increased" bone formation. Hypostotic traits, on the other hand, are linked to a shortage of bone tissue, i.e. these are traits whereby bone development is not fully complete and early developmental stages persist into adulthood. The hyperostotic traits, then, include tori (e.g. the mandibular torus), bony bridges (e.g. hypoglossal canal bridging), tubercles (e.g. the precondylar tubercle), as well as vascular and nerve routes in the form of foramina, which occur as a consequence of new bone formation (e.g. the frontal foramen). The hypostotic group includes those changes relating to variations in cranial sutures, i.e. persistent sutures (e.g. the metopic suture), supernumerary ossicles (e.g. the lambda ossicle) or incomplete apertures for vascular and nerve junctions (e.g. oval foramen incompleteness) (e.g. Hanihara/Ishida 2001).

In the Great Moravian population, we used these traits to compare the biological variability of different socio-economic groups – Mikulčice castle, sub-castle and hinterland. The primary goal was to determine the frequency of selected non-metric traits at the largest burial site in the sub-castle area of the Mikulčice power centre, which was uncovered in the Kostelisko position. The relationship between trait incidence and sex, or eventually the preferential laterality of this incidence was tested for all traits.

## 2. Materials

Based on the incidence of non-metric traits, we compared three population groups.

- The burial site at the Kostelisko position. This is the largest burial site in the sub-castle area of

the Mikulčice power centre, where 425 graves have been uncovered. The burial site has not been dug completely. The skeletal remains of around 456 individuals have been found in the graves. Based on the grave equipment, it may be presumed that higher echelons of society were buried here. From a demographic aspect, females and non-adult individuals are more frequently represented. (Velemínský 2000; Velemínský et al. 2005).

- The burial site within the Mikulčice acropolis (castle). The incidence of traits was evaluated in nearly 1000 individuals who were buried principally by the I$^{st}$-II$^{nd}$ and III$^{rd}$ church (Stloukal 1963, 1964, 1967, 1969; Stloukal/Vyhnánek 1976). It is highly probable that the highest echelons of society lived within the acropolis. Approx. 30 cranial non-metric traits were evaluated (Czarnetzki 1972).
- The burial site at Josefov within the Mikulčice hinterland. Approx. 170 graves were uncovered in this location. It is presumed that a predominantly agrarian, socially weaker section of the Great Moravian population was buried here (Hanáková/Stloukal 1966; Stránská et al. 2002). At the Josefov burial site, a nearly identical group of non-metric traits was studied as in the case of the Kostelisko group (Bartoníček 2000; Unzeitigová 2000).

## 3. Methods

We evaluated the incidence of roughly one hundred fifty non-metric traits on the skeletons, of which ninety were located on the skulls and sixty-two on the bones of the post-cranial skeleton. Our methodology was based on the work of Finnegan/Faust (1974), Reinhard/Rösing (1985), Czarnetzki et al. (1985), Hauser/DeStefano (1989) and Velemínský (1999). For purposes of subsequent evaluation, we divided the traits into several groups, according to their character or function. This distribution cannot be taken in complete strictness, as the classification of certain traits is problematic. These traits related to:

A - Skull sutures (Epigenetic variants).
B - Presence, absence or nature of foramens – vascular outlets or nerve routes.
C - Presence, absence or nature of joint facets and their alterations.
D - Disorders of ossification, non-junction of the ossification centres or their absence.
Ea - Hyperostotic activity, with the presence of osseous tori, tubercles, spines or bridges.
Eb - Changes in the region of muscle/ligament attachments – loss of bone tissue or fibrous ossification resulting in the genesis of osseous prominences (enthesopathies). This is associated with marked long-term stress acting upon relevant muscle groups. According to Ossenberg (1977) these are termed hypostotic traits.

A list of the studied traits is included in Table 1. The name of the given trait is followed by the abbreviation of the bone, where the given trait was located.

Table 1. List of evaluated non-metric morphological traits.

A. traits related to cranial sutures (epigenetic variants)

| |
|---|
| sutura metopica |
| sutura supranalis |
| fissura metopica |
| ossiculum metopicum |
| sutura parametopica |
| ossiculum suturae coronalis |
| ossiculum internasalis |
| ossiculum praefrontale |
| lamina orbitalis partita |
| os zygomaticum partitum |
| fissura zygomatica transversa |
| sutura infraorbitale |
| sutura incisiva |
| ossiculum medianum palatinum anterior |
| ossiculum medianum palatinum posterior |
| ossiculum epiptericum |
| sutura frontotemporalis |
| processus frontalis ossis temporalis |
| processus temporalis ossis frontalis |

processus parietalis ossis sphenoidalis
ossiculum bregmaticum
ossiculum suturae sagittalis
ossiculum incisurae parietalis
ossiculum parietale partitum
ossiculum suturae squamosae
squama temporalis partialis
sutura. squamomastoidea
processus mastoideus bipartitus
ossiculum lambdae
ossiculum suturae lambdoideae
os Incae
processus interparietalis
sutura mendosa
ossiculum asterii
ossiculum suturae occipitalis

B. Traits related to presence, absence or nature of foramina – outlet of vascular or nerve routes or character of its course („bridging“)

sulcus frontalis
foramen frontale et incisura frontalis
foramen frontale
incisura frontalis
foramen supraorbitale et incisura suprorbitalis
foramen supraorbitale
incisura supraorbitalis
foramen nasale absens
foramen zygomaticum absens
foramen ethmoidale absens
canalis opticus partitus
foramen infraorbitale absens
foramen infraorbitale partitum
foramen parietale absens
foramen parietale inferior
processus parietalis squamae temporalis
foramen squamae superior
foramen mastoideum intrasuturam
foramen mastoideum extrasuturam
foramen tympanicum
foramen occipitale
foramen condylare
canalis condylaris
canalis condylaris intermedius
foramen hypoglossale bipartitum
foramen spinosum incompletum
foramen ovale incompletum
foramen ovale et spinosum confluens
foramen Vesalii
foramen ovale partitum
foramen mentale partitum
foramen mentale absens
foramen mandibulare accessoria
foramen processus transversi partitum C1-7
for.pr.trans.part.C1
for.pr.trans.part.C2
for.pr.trans.part.C3
for.pr.trans.part.C4
for.pr.trans.part.C5
for.pr.trans.part.C6
for.pr.trans.part.C7
foramen processus transversi apartum C1-7
for.pr.trans.apart.C1
for.pr.trans.apart.C2
for.pr.trans.apart.C3
for.pr.trans.apart.C4
for.pr.trans.apart.C5
for.pr.trans.apart.C6
for.pr.trans.apart.C7
ponticuli basales ossis sphenoidalis
processus pterygo-spinosus
processus pterygo-alaris
ponticuli sellae
ponticulus clinoideus medius
ponticulus carotico-clinoideus
ponticuli interclinoidei
taeniae interclinoidae
ponticulus mylohyoideus
ponticuli atlantis
ponticulus atlantis lateralis
ponticulus atlantis. posterior
foramen suprascapulare

C. Traits related to presence, absence or character of joint facets and their changes

facies condylaris bipartita
facies articularis superior partita (C 1)
facies articularis costalis (C7)
facies articularis costalis (L1)
facies articularis sacralis accessoria (Sa, Co)
facies articularis costalis accessoria (Cl)

| |
|---|
| facies articularis acromialis |
| facies articularis acromialis absens |
| facies articularis proccesus coracoidei |
| facies articularis carpalis partita (Ra) |
| facies articularis trochlearis partita (Ul) |
| incisura radialis partita (Ul) |
| facies lunata partita (Co) |
| facies Poirieri (Fe) |
| riding facet (Fe) |
| facies Charlesi (Fe) |
| fac.articularis condylaris media (Fe) |
| facies articularis tibiae accessoria medialis (Ti) |
| facies articularis tibiae accessoria lateralis (Ti) |
| facies articularis talaris anterior et media (Ca) |
| facies articularis talaris anterior et media communis (Ca) |
| facies articularis talaris anterior bipartita (Ca) |
| facies articularis talaris media bipartita (Ca) |
| facies articularis talaris absens (Ca) |
| facies articularis calcanea anterior et media (Ta) |
| facies articularis calcanea anterior et media communis (Ta) |
| facies articularis calcanea anterior absens (Ta) |
| facies articularis medialis talaris (Ta) |
| processus trochlearis tali lateralis (Ta) |
| processus trochlearis tali medialis (Ta) |
| foramen supratrochleare (Hu) |
| incisura faciei lunatae (Co) |
| plate formation (Fe) |
| fossa Alleni (Fe) |

D. Traits related to disorders of ossification, non-junction of the ossification centres or their absence

| |
|---|
| assimilatio atlantis |
| ossiculum dens axis |
| spina bifida sacralis |
| vertebrae absentes |
| vertebrae accessoriae |
| fenestratio sterni |
| ossiculum acromii |
| ossiculum coracoideum |
| ossiculum styloideum radii |
| ossiculum styloideum ulnae |
| synostosis acetabuli incompleta |
| patella multipartita |
| ossiculum trigonum tali |
| depressio biparietalis circumscripta |

EA. Traits related to hyperostotic activity, with the presence osseous tori, tubercles, spines or bridges

| |
|---|
| spina trochlearis |
| tuberculum marginale |
| tuberculum zygomaxillare |
| torus palatinus |
| torus maxillaris |
| spina suprameatica |
| depressio suprameatica |
| torus acusticus |
| torus occipitalis |
| processus retromastoideus |
| tuberculum praecondylare |
| tuberculum pharyngeum |
| processus paracondylaris |
| torus mandibularis |
| processus supracondylaris |
| foramen supracondylare |
| trochanter tertius |

EB. Traits related to changes in the area of muscle/ligament attachments – loss of bone tissue or fibrous ossification resulting in the genesis of osseous prominencies (enthesopathies). According to Ossenberg (1977) hypoostotic traits.

| |
|---|
| fossa pharyngea |
| linea nuchae suprema |
| fossa costoclavicularis |
| fossa pectoralis major |
| fossa teres |
| fossa bicipitis |
| fossa hypotrochanterica |
| crista hypotrochanterica |
| fossa gastrocnemica |
| incisura musculi vasti lateralis (Pa) |
| fossa musculi vasti lateralis(Pa) |
| fossa solei |
| crista solei |

We expressed the incidence of bilaterally incident non-metric traits in two forms. As the so-called "average incidence of trait per individual" i.e. the number of individuals with the trait present on one or eventually both sides divided by the total number of individuals evaluated (e.g. Sjøvold 1986). The difference between unilateral and bilateral incidence is thus ignored. This method

of expression does not take into account those cases, where only the bone from one side of the body has been preserved. The average incidence of unilateral traits was calculated similarly. Another form of calculation involved the so-called "average incidence on the (non-concrete) side of the skull". Here, the number of sides with the given trait present is divided by the number of sides where this presence could be verified. Thus, in the case of completely preserved skeletons, the number of "cases" doubles. This method, which is most widely used (e.g. Hauser/DeStefano 1989), does not take into consideration the laterality differences of trait incidence. Finally, it is also possible to determine the "average incidence for a concrete side", where the number of "right side" trait incidences is divided by the number of "right side" bones evaluated. The same applies to the left-side manifestation of traits. This process takes into account the difference between unilateral and bilateral incidence, and the laterality of incidence may subsequently enable the inference of the average incidence per individual.

During evaluation, we took into consideration sexual dimorphism, the correlation between the incidence of traits and the age of individuals, and in the case of bilateral traits the preference for a symmetrical/asymmetrical incidence. To verify the difference in the incidence of non-metric traits in both sexes, and to verify the laterality preference in the case of bilateral traits, we used tests for the comparison of nominal traits in independent selection – four-field tables (Tables 2 x 2), Yates correction of the chi square test, Fisher's test of homogeneity and McNemar's test (e.g. Zvára 1998, 1999). The starting null hypothesis presumed that the trait occurs with the same probability in the groups compared. We used the aforementioned tests only to determine whether a concurrence in the incidence does or does not exist, not to determine how great the eventual difference (dependence) of trait frequency is in the groups compared. The test calculations were conducted with the aid of the STATISTICA 5.0 (StatSoft, Inc.) software and Microsoft Excel 2000.

We used the so-called measure of divergence (MD) and mean measure of divergence (MMD) to verify the biological distance between the population groups on the basis of non-metric traits (e.g. Sjøvold 1973, 1977; Zvára 1999). This basically involves the determination of the degree of non-similarity of the measured probabilities (Zvára 1999). We also used this test criterion to verify the probable incidence of traits in groups with different grave equipment. The starting null hypothesis presumes that a trait occurs with the same probability in both compared groups.

If the groups were compared only on the basis of the incidence of one trait, the measure of divergence (MD) was calculated.

$$MD = (\theta_1 - \theta_2) - (\frac{1}{n_1} + \frac{1}{n_2})$$

The condition governing its calculation is the arcusin transformation of the average incidence of the trait in both groups.

$$\theta_1 = \arcsin(1 - 2p_1) \qquad \theta_2 = \arcsin(1 - 2p_2)$$

We verified the fact, whether the value of MD is statistically significant at the 95% confidence interval on the basis of the formula (Zvára 1999):

$$MD - 1{,}96\sqrt{s^2_{MD}}\ , \quad MD + 1{,}96\sqrt{s^2_{MD}}$$

Where the value 1.96 is the critical value of normal distribution and $s^2_{MD}$ is the estimate of variance. The variance of the degree of divergence was calculated using the formula:

$$S^2_{MD} = 2(\frac{1}{n_1} + \frac{1}{n_2})(2\arcsin(1 - 2p_1) - \\ - \arcsin(1 - 2p_2))^2 + (\frac{1}{n_1} + \frac{1}{n_2})$$

If among the compared populations there is no difference in the probability of incidence of the trait, the following applies:

$$S^2_{MD} = 2(\frac{1}{n_1} + \frac{1}{n_2})^2$$

The confidence interval characterises the interval, which with 95% probability includes the real value of the given parameter. If the null hypothesis

applies, then the value of MD has a zero median value, i.e. if the 95% confidence interval for MD includes zero, then at the 5% level of significance the starting null hypothesis cannot be rejected. On the contrary, if it does not include zero, then the null hypothesis is rejected.

When we compared the groups on the basis of trait groups, we calculated the mean measure of divergence (MMD), which is the average of measures of divergence for the individual traits compared. A precondition for the application of MMD is the independence of the traits compared.

$$MMD = \frac{1}{k} \sum_{i=1}^{k} \left[(\arcsin(1-2p_{1i}))^2 - \arcsin(1-2p_2))^2 - (\frac{1}{n_{1i}} + \frac{1}{n_{2i}})\right]$$

Determination of the 95% confidence interval is the same as in the case of MD. If the interval does not include a zero value, we may conclude that both groups differ in the incidence of traits at the 5% level of significance (Zvára 1999).

Where

$$S_{MMD} = \frac{2}{k^2} \sum_{i=1}^{k} (\frac{1}{n_{1i}} + \frac{1}{n_{2i}}) \left[2(\arcsin(1-2p_{1i}) - \arcsin(1-2p_{2i}))^2 + (\frac{1}{n_{1i}} + \frac{1}{n_{2i}})\right]$$

$$S^2_{MMD} = \frac{2}{k^2} \sum_{i=1}^{k} (\frac{1}{n_{1i}} + \frac{1}{n_{2i}})^2$$

Another means of verifying the validity of the concurrence of trait incidence probability in two populations, the statistical provability of the MD (MMD) value, has been previously proposed by Sjøvold (1973):

MD will be significant at the 5% level of significance if the following is true:

$$MD \geq 3\,(\frac{1}{n_1} + \frac{1}{n_2})$$

MD will be significant at the 1% level of significance, if the following is true:

$$MD \geq 6\,(\frac{1}{n_1} + \frac{1}{n_2})$$

As long as we tested the concurrence of two MD values acquired on the basis of the comparison of the incidence of the same trait in three population groups, i.e. the values $MD_{12}$ and $MD_{13,}$ we applied Zvára's procedure (oral communication; Zvára 1999). We proceeded analogically in the case of the values of the mean measure of divergence ($MMD_{12}$ , $MMD_{13}$).

$$Z = \frac{MD_{12} - MD_{13}}{\sqrt{\text{var}_{12} + \text{var}_{13} - 2\text{cov}}}$$

Where the statistical provability of the difference of both values is determined by the level of probability p (p=0.05, p=0.01, p=0.005).

$$\text{var}_{12} = 2^*\left[\frac{1}{n_1} + \frac{1}{n_2}\right] * \left[2\,(\arcsin(1\text{-}2^*p_1) - (\arcsin(1-2p_2))^2 + (\frac{1}{n_1} + \frac{1}{n_2})\right]$$

$$\text{var}_{13} = 2^*\left[\frac{1}{n_1} + \frac{1}{n_2}\right] * \left[2\,(\arcsin(1\text{-}2^*p_1) - (\arcsin(1-2p_3))^2 + (\frac{1}{n_1} + \frac{1}{n_3})\right]$$

$$\text{cov} = \frac{2}{n_1} * \left[\frac{1}{n_1} + 2^*\,(\arcsin(1\text{-}2p_i)) - (\arcsin(1-2p_2))^* *(\arcsin(1\text{-}2p_1)) - (\arcsin(1-2p_3))\right]$$

## 4. Results and Discussion

The primary goal of this work was to determine the incidence of non-metric morphological traits in individuals buried at the Kostelisko position and to determine the average frequency of traits for the population group representing the Mikulčice sub-castle. Subsequently, in view of our other objectives, we verified in the case of all traits whether there exist statistically conclusive differences in their incidence among both sexes. This relationship must be kept in mind when we compare population groups with different demographic structures. If there exist statistically significant differences, it is better to exclude the given traits from the comparison, or it is necessary to take this fact into consideration when interpreting results. In the case of bilateral traits, we tested the preference of laterality and symmetrical incidence.

## 4.1 Non-metric traits in the Mikulčice-Kostelisko group

On the bones from the Mikulčice-Kostelisko burial site, we evaluated the incidence of approximately one hundred fifty non-metric traits, of which around ninety were cranial traits. The average frequencies of individual traits are listed in Table 2. In the case of traits located on paired bones, we calculated not only the average incidence expressed per individual, but also the average incidence of laterality (for a non-specified side).

In the case of the first calculation, relatively frequent situations whereby only one bone out of a pair lacking the trait is preserved are not included, as the presence of the trait on the other side could not be ruled out. If the trait is present, the „individual"is included. The fact whether a trait occurs symmetrically or only unilaterally is thus not taken into consideration. Expression of the incidence of bilateral non-metric traits on a non-specified side testifies to both aforementioned properties. The average population frequencies thus acquired are for this reason always lower. We consider this expression of the average incidence to be more objective. The calculation of the average incidence using various methods is also necessary for the potential comparison with other research.

### *4.1.1 Relationship between the incidence of non-metric traits and sex.*

We verified whether the incidence of a certain trait is influenced by the sex of an individual with the aid of the four-field table, the so-called Yates correction, a modification of the chi-square test for low frequency and Fisher's test. As mentioned previously, this relationship must be taken into consideration when comparing population groups with various demographic structures. The frequency of individual traits in males and females, as well as the values of the test criterion and the relevant level of significance are listed in Table 3. In the case of bilateral traits, we used average "side" frequency for our comparison. Statistically significant values of test criteria are differentiated by the type of script. If the trait was more frequent in males, values are in bold type. If it was more frequent in females, values are in bold italics. If the value *p* in the table is zero (less than 0.001), we exclude the independence of incidence at the 0.001 level of significance. Traits with a statistically different incidence in both sexes are summarised in Table 4.

The incidence of facies *articularis calcanea anterior et media communis* was borderline statistically significant. This, logically in view of the incidence of *facies articularis calcanea anterior et media*, occurred more frequently in females. In the case of analogical traits on the calcaneus, there were no such differences; a junction between the anterior and central calcaneal articular facet was more frequent. A similar situation was also observed in the case of articular surfaces on the posterior side of the lower section of the femur– *facies Charlesi* and *facies articularis condylaris media*. In males, the incidence of an independent *facies Charlesi* was more frequent, while in females the articular surface of the internal condyle- *facies articularis condylaris media* was elongated. These traits are also placed in the context of frequent persistence in a position necessary for the hyper-dorsal flexion

Table 4. Non-metric morphological traits with a statistically different incidence in both sexes.
Explanatory notes: * level of significance p = 0.05 ** level of significance p = 0.01 *** level of significance p = 0.001

| incidence more frequent among males | | | incidence more frequent among females |
|---|---|---|---|
| sutura supranasalis*** | proc.trochl.tali lat. (Ta)* | fos. costoclavicularis*** | oss. epiptericum* |
| oss. sut. lambdoideae* | depr. suprameatica*** | fos. pectoralis major** | for. hypogl. part.** |
| vertebrae accessoriae** | spina suprameatica* | fos. bicipitis ** | |
| fac. art. sup. part. (C1)*** | torus acusticus*** | fos. hypotrochanterica** | |
| facies Poirieri (Fe)* | torus occipitalis* | | |
| fac. art. calc. ant. et med. (Ta)* | tuberc.praecondylare* | | |

of the joints between the instep ossicles and phalanges. An example of this may be any activity during which it is necessary to crouch and weight is placed on the knee and ankle (Ubelaker 1979; Capasso et al. 1999).

The results (see Table 4) indicate a generally more frequent incidence of isolated accessory articular facets in males than in females, where the trend is rather towards a prolongation of the articular surface or the fusion of facets. In males, there was also a greater incidence of traits in the areas of ligament/muscle attachments, which are placed in the context of more significant stress being placed on the relevant muscle groups, and of hyperostotic traits.

In females, there was a greater incidence of foramen supratrochleare on the humerus, but this difference was not statistically significant ($\chi^2$ = 2.99).

### *4.1.2 Bilateral non-metric morphological traits*

In the case of bilaterally present morphological traits, there may exist differences in laterality incidence, or a symmetrical incidence may be preferred.

#### *4.1.2.1 Preference of laterality incidence*

In traits located on paired bones, the frequency of incidence may be expressed for a concrete side. One may then monitor whether the given trait does not occur more frequently on a certain side. Table 5 includes the average incidence on the right and left side in the case of bilateral traits. This table also contains a verification of laterality preference in incidence, for which we again used the four-field tables and Yates correction, the modification of the chi-square test for low frequency. Apart from this, we also applied McNemar's test, as "both" traits occur on the same object. When using the first two test criteria (depending on frequency), for all traits, no statistically significant difference in incidence on the right and left side was found. McNemar's test showed statistically significant differences in the case of five traits (see Table 6).

#### *4.1.2.2 Asymmetrical incidence of morphological traits*

We then verified, whether bilateral non-metric traits occur more often bilaterally (symmetrically) or unilaterally (asymmetrically). Verification of the preference for a symmetrical or asymmetrical

Table 6. Bilateral morphological traits with a statistically preferred incidence on a concrete side.
Explanatory notes: * level of significance, chi-square test p = 0.05 ** level of significance p = 0. 01 *** level of significance p = 0.001

| incidence more frequent at right side | | | incidence more frequent at left side |
|---|---|---|---|
| fac. art. acces. cost. (Cl)** | fac. art. tal. ant. et media com. (Ca) * | for. condylaris | sulcus frontalis *** |
| | spina suprameatica * | | |

Table 8. Bilaterally occurring morphological traits with a preferred symmetrical or asymmetrical incidence.
Explanatory notes: see Tab. 6

| trait with a preferred symmetrical incidence | | | trait with a preferred asymmetrical incidence |
|---|---|---|---|
| sutura infraorbitale*** | fac. art. tal. ant. et med. com. (Ca)*** | tuber. zygomax.*** | for. et inc. supraorb.*** |
| sutura incisiva*** | fac. art. calc. ant. et med. com. (Ta)*** | | |
| | depr. suprameatica*** | for. supraorbitale*** | |
| oss. sut. lambdoideae** | inc. fac. lunatae (Co)*** | spina suprameatica*** | for. hypogl. part.*** |
| fac. art. acromialis** | for. et inc. frontalis*** | linea nuchae supr.*** | fossa teres* |
| fac. art. cond. media (Fe)*** | incisura frontalis*** | crista hypotrochant.** | |
| fac. art. tib. acc. lat. (Ti)*** | for. pr. trans. part. C1-7** | | |
| fac. art. tal. ant. et med. (Ca)*** | tuber. marginale*** | | |

incidence is included in Table 7. Listed first are the frequencies of possible combinations of presence/absence. Next, we list the actual values of test criteria with the relevant level of significance (four-field table, Yates correction). A statistically significant preference for symmetrical incidence was found in nineteen morphological traits, while an asymmetrical incidence was more frequent only in the case of four traits (see Table 8).

## 4.2 Comparison of the Mikulčice power centre and its hinterland on the basis of non-metric traits.

In the following section, we compared the individuals buried at Kostelisko, i.e. in the area of Mikulčice sub-castle, with individuals buried on the territory of the Mikulčice acropolis (Czarnetzki 1972) and the "rural" burial site at Josefov within the hinterland of the Mikulčice power centre (Bartoníček 2000; Unzeitigová 2000), based on the variability of non-metric traits.

### *4.2.1 Mikulčice sub-castle (Kostelisko) and Mikulčice castle*

We first tried to determine whether the occurrence of non-metric traits differs in two probably different socio-economical groups and at the same time within one locality. The comparative data was provided by the research of Czarnetzki (1972), which studied the incidence of around forty morphological traits on the skeletons from Mikulčice burial sites I, II and III (e.g. Stloukal/ Vyhnánek 1976). We included twenty-four of these in our evaluation. The basis of his group was formed of individuals buried near the three-aisled basilica (Mikulčice burial site II). Our study, thus basically compares the most extensive burial site on the territory of Mikulčice castle and sub-castle. Both burial sites show from an archaeological aspect a number of analogies (grave inventory, superposition of graves, similar arrangement of burial holes) (e.g. Staňa 1997). From a demographic aspect, though, they are considerably different (index of masculinity, representation of adults/children, average neonatal lifespan etc.) (Velemínský et al. 2005). The demographic indicators support the general premise that the older section of the population, mainly males, lived in the castle.

For comparison, we used the frequency of traits expressed as the average incidence per person (see Table 2). This same method was also used by Czarnetzki (1972) to express incidence. We verified the difference in the incidence of the aforementioned twenty two morphological traits by calculating the measure of divergence (MD). Taking into consideration the determination of the MD confidence interval, we also calculated the variance of this statistical criterion ($S^2_{MD}$). If the confidence interval did not contain zero, the difference was at the 5% level of significance. Significant values are listed in the table in medium bold type. To verify the statistical significance of MD, we also used the "weaker" test criterion, Sjøvold's procedure (1973). Significant values are then in italics. We consider

Table 10. Comparison of the burial site at Kostelisko with the group of individuals form Mikulčice castle (Czarnetzki 1972) on the basis of the incidence of morphological traits with the aid of the mean measure of divergence. The traits in which both groups differed statistically significantly are in bold type.
Explanatory notes: MMD=mean measure of divergence; $S^2_{MMD}$= dispersion of MMD; MDD±1,96 $S^2_{MMD}$=dispersion endpoints

| trait group | MMD | S2mmd | MDD-1,96 S2mmd | MDD+1,96 S2mmd |
|---|---|---|---|---|
| cranial sutures | 0,01867 | 0,00208 | -0,07069 | 0,10803 |
| vessel and nervous foramina | 0,45944 | 0,00589 | 0,30901 | 0,60988 |
| hyperostotic traits | 0,06653 | 0,00152 | -0,00985 | 0,14292 |
| areas of muscle/fibrous insertions | 0,15312 | 0,00537 | 0,00945 | 0,29678 |
| | | | | |
| Total | 0,1621 | 0,00086 | 0,10469 | 0,21951 |

the first method of verification of MD statistical significance to be more conclusive (Table 9).

Results of the comparison of individuals from Kostelisko and the acropolis are listed in Table 9. A statistically significant difference with regards to varaince of the measure of divergence (Zvára 1999) was found in the case of five traits. The greatest difference was in the incidence of the *incisura supraorbitalis*, followed by the foramen infraorbitale partitum, the *foramen hypoglossalis bipartitus*, the *torus acusticus* and the *fossa hypotrochanterica*. According to Sjøvold´s criteria, a further six traits differed in incidence at the same level of significance – the *ossiculum suturae lambdoidea*, the extension of the articular surface of the *caput femoris* on the anterior side of the femoral neck (plate formation, *facies Poirieri*), the foramen supraorbitale, the *fossa pectoralis major et teres*, the *fossa solei*. This means that both groups differed in the incidence of all traits associated with places of muscle/ligament attachment (Table 10).

In the next step, we calculated the mean measures of divergence (MMD) with the help of MD values. The MMD determines the degree of convergence or divergence of the compared groups on the basis of a set of morphological traits. MMD is an average value of MD. We calculated the mean measure of divergence in part on the basis of the MD values of traits of the same character or function, and in part for the whole group of compared traits. With regard to the verification of the level of significance, we once again calculated the variance ($S^2_{MMD}$) and determined the endpoints of the ninety five percent confidence interval. Similarly as in the case of MD, if the interval did not reach a zero value, we considered the incidence of the group of traits to be different at a 5% level of significance; these values are in medium-bold type (see Table 10). The resulting MMD values show that the compared groups differ in the incidence of traits relating to vascular and nerve apertures and to traits associated with sites of muscle attachments; while the incidence of traits in the area of cranial sutures and those of hyperostotic character is more or less similar (Table 10). The resulting value of the mean measure of divergence is 0.16210. Some authors multiply the values of MMD and MD by one thousand for greater clarity; we then get a value of 162.1.

### *4.2.2 Mikulčice sub-castle (Kostelisko) and Mikulčice hinterland (Josefov)*

The second population group with which we compared the Kostelisko burial site was Josefov. This is a Great Moravian burial site with around 170 graves. It was located approx. ten kilometres northwest of the Mikulčice-Valy locality. It is generally presumed that members of the agricultural settlement were buried here. Compared to the Mikulčice burial site, the grave inventory was very poor. Burials of females and children clearly predominated at this burial site. In view of this fact, hypotheses have been formulated regarding the possible displacement of males into nearby Mikulčice for reasons of work or military service. From a demographic aspect, Kostelisko is not too different from Josefov (Hanáková/Stloukal 1966; Stloukal/Vyhnánek 1976; Stránská et al. 2002), but there exist differences in the representation of graves with a wealthy inventory (for example swords) (Unzeitigová 2000). This is thus a more or less opposite situation to that when comparing Kostelisko with individuals buried in the castle. This comparison was supposed to show to what extent the incidence of morphological non-metric traits differs, despite the geographically close localities. It may be seen as the verification of the concurrence (difference) of people living in the central, "rich" settlement agglomeration and the inhabitants of the smaller, poorer, rural settlement.

The selection of traits evaluated for the Josefov burial site was identical to the traits studied in Kostelisko (Bartoníček 2000; Unzeitigová 2000). The methodology of evaluating individual traits was unified with the authors. We thus had the opportunity to compare both population groups on the basis of nearly all monitored traits; we were able to select also the laterality expression of bilateral traits.

With regards to the comparability of MMD values between Kostelisko and Josefov, which

characterise the difference between the inhabitants of Mikulčice castle and Kostelisko or Josefov, we compared both groups on the basis of the same traits, on which the previous comparison had been based. The results are illustrated by Table 11. With regards to the confidence interval, both groups differ at the 5% level of significance in the case of only two traits– torus palatinus and torus acusticus. If we verify the statistical significance of MD using Sjøvold's method, there will be a difference in the incidence of another eight traits (Table 11). The mean measure of divergence has a statistically significant value only on the case of those traits associated with points of muscle/ligament insertion. The resultant mean measure of divergence has a value of 0.08738 (87.4).

Table 12a. Comparison of the burial site at Kostelisko and the burial site at Josefov (Bartoníček 2000; Unzeitigová 2000) using the mean measure of divergence (on the basis of the same traits as in the case of the castle/sub-castle comparison). The traits in which both groups differed statistically significantly are in bold type. For explanatory notes see Tab. 10.

| trait group | MMD | $S^2$mmd | MDD-1,96 $S^2$mmd | MDD+1,96 $S^2$mmd |
|---|---|---|---|---|
| cranial sutures | **0,29402** | 0,005463 | 0,14916 | 0,43888 |
| vessel and nervous foramina | 0,09566 | 0,01305 | -0,12827 | 0,31959 |
| hyperostotic traits | **0,39762** | 0,00402 | 0,27336 | 0,52187 |
| areas of muscle/fibrous insertions | **0,36048** | 0,01279 | 0,13884 | 0,58211 |
| | | | | |
| Total | **0,31234** | 0,00204 | 0,22377 | 0,4009 |

Table 12b. Comparison of the burial site at Kostelisko and the burial site at Josefov (Bartoníček 2000; Unzeitigová 2000) using the mean measure of divergence The traits in which both groups differed statistically significantly are in bold type. For explanatory notes see Tab. 10.

| trait group | MMD | $S^2$mmd | MDD-1,96 $S^2$mmd | MDD+1,96 $S^2$mmd |
|---|---|---|---|---|
| cranial sutures | **0,17384** | 0,0021 | 0,08409 | 0,26359 |
| ossification' abnormalities | -0,02653 | 0,02715 | -0,34946 | 0,2964 |
| articular facets | **0,50029** | 0,0072 | 0,33395 | 0,66664 |
| "disorder" of articular facets | **0,467** | 0,01348 | 0,23944 | 0,69456 |
| vessel and nervous foramina | **0,4424** | 0,00895 | 0,25703 | 0,62778 |
| hyperostotic traits | **0,20078** | 0,00394 | 0,07782 | 0,32375 |
| areas of muscle/fibrous insertions | **0,40092** | 0,00542 | 0,25657 | 0,54528 |
| | | | | |
| Total | **0,32248** | 0,00125 | 0,25321 | 0,39176 |

Table 14. Comparison of the population groups from the castle and hinterland (Josefov) using the mean measure of divergence. The traits in which both groups differed statistically significantly are in bold type. For explanatory notes see Tab. 10.

| trait group | MMD | $S^2$mmd | MDD-1,96 $S^2$mmd | MDD+1,96 $S^2$mmd |
|---|---|---|---|---|
| cranial sutures | 0,10939 | 0,036 | -0,0822 | 0,22700 |
| vessel and nervous foramina | **0,89057** | 0,02434 | 0,58479 | 1,19635 |
| hyperostotic traits | **0,50288** | 0,00525 | 0,3608 | 0,64496 |
| the areas of muscle/fibrous insertions | 0,3662 | 0,00288 | -0,0687 | 0,14189 |
| | | | | |
| Total | **0,31883** | 0,00186 | 0,2344 | 0,40325 |

When we compared the incidence of all monitored morphological traits in the case of both localities, the incidence of the following nine traits was at the 5% level of significance: *facies articularis carpalis partita, facies aricularis trochlearis partita, facies Poirieri, incisura faciei lunatae*, *canalis condylaris, spina trochlearis, torus palatinus, torus acusticus and crista solei*. With the exception of the *canalis condylaris*, these traits occurred more frequently in Kostelisko. Tables 12a and 12b testifies to the small differences between both localities. Only the mean measure of divergence, calculated on the basis of the incidence of traits relating to the character of joint surfaces, had a statistically significant value. The total MMD is 78.2 (0.07816) that is lower than in the previous case, where the comparison was based only on the smaller group of traits. If we take into consideration that MMD is an average value, then this situation with regard to the individual MDs is logical.

### *4.2.3 Mikulčice castle and Mikulčice hinterland (Josefov)*

We then compared the population groups from the castle and hinterland. The MD value of two traits lay on the 5% statistical level of significance – *torus palatinus* and *trochanter tertius*. In the case of Sjøvold's verification of the level of significance, these groups differ in the incidence of seven traits, including two already mentioned (see Table 13). The mean measure of divergence is significant at the 5% level only for the group of traits with a hyperostotic character. The resulting value of MMD is approximately 99 (0.9891).

Josefov thus again, as in the comparison with Kostelisko, showed a lower incidence of traits that essentially involve hyperostotic activity (tori, tubercles etc.) (Table 14). If we again take into consideration certain previous verifications of the dependence of the incidence of morphological traits on sex (e.g. Česnys 1986), it cannot be ruled out that the small percentual representation of these traits is affected by the demographic composition of the group from Josefov, where females predominate. On the other hand, the index of masculinity in Kostelisko is similarly low (Velemínský et al. 2005).

### *4.2.4 Mikulčice castle, Mikulčice sub-castle (Kostelisko) and Mikulčice hinterland (Josefov)*

Verification of the degree of divergence of MD values acquired on the basis of the comparison of the incidence of the same trait in the Kostelisko, Mikulčice castle and Josefov groups was conducted in accordance with the procedure proposed by K. Zvára (1999, oral communication). We always tested two MD values acquired by comparing one group with two others on the basis of the same trait. For example, the MD value between the groups Kostelisko/castle was compared with the MD determined between Kostelisko and Josefov. The resultant values, so-called Z-criteria- are listed in Tables 15-17.

In table 15, MD is compared between the group from the sub-castle area (Kostelisko) and the group from Mikulčice hinterland (Josefov) and between the group from the sub-castle and the group from Mikulčice castle. In the incidence of *foramen condylaris absens, foramen hypoglossalis bipartitus* and *processus marginalis*, Kostelisko was more remote from the population group from Mikulčice castle than from the burial site at Josefov. In all cases, the difference was at the 1% level of statistical significance. In the case of the *torus palatinus* trait, the situation was opposite. Kostelisko was more remote from Josefov than from the castle group. The difference was approx. at the 5% level of significance. Kostelisko differed from the castle in the incidence of more traits than in the case of the population group from Josefov.

Table 16 contain a comparison of MD values between the group from the Mikulčice hinterland (Josefov) and that from the sub-castle (Kostelisko) and of MD values between the group from the hinterland and Mikulčice castle. In the incidence of *ossicula suturae lambdoideae*, Josefov differed more significantly from Kostelisko than from the group from Mikulčice castle (p=0.05). While in the incidence of the enlargement of the articular surface of the head on the femoral neck, the *foramen condylaris*, the *foramen hypoglossalis bipartitus* and the *processus marginalis* (p=0.001) there was a more significant difference between

Table 15. Verification of the differences in MD values acquired by comparing the population group from the subcastle (Kostelisko) with the burial site at Josefov (Bartoníček 2000; Unzeitigová 2000) and with individuals from Mikulčice castle (Czarnetzki 1972).
Explanatory notes: n=number of individuals; x=number of cases, where the trait occurred; MD12=measure of divergence between the 1st and 2nd group, MD13= measure of divergence between the 1st and 3rd group; Z-criterion; p=level of significance reached

| | Mikulčice subcastle (Kostelisko) | | Mikulčice-hinterland (Josefov) | | Mikulčice-castle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n1 | x1 | n2 | x2 | n3 | x3 | MD12 | MD13 | Z | p |
| sutura metopica | 297 | 23 | 117 | 12 | 967 | 98 | 0,0050 | 0,0112 | -0,2606 | 0,7944 |
| oss. sut. coronalis | 151 | 4 | 86 | 11 | 698 | 30 | 0,3370 | 0,0088 | 3,1448 | 0,0017 |
| oss. epiptericum | 75 | 19 | 54 | 18 | 394 | 76 | 0,0751 | 0,0437 | 0,3166 | 0,7515 |
| sut. frontotemp. | 121 | 3 | 51 | 1 | 457 | 12 | -0,0251 | -0,0103 | -0,3629 | 0,7167 |
| oss. bregmatic. | 217 | 1 | 93 | - | 719 | 1 | -0,0089 | 0,0005 | -0,2526 | 0,8006 |
| oss. sut. sagittal. | 180 | 13 | 103 | 10 | 692 | 30 | 0,0024 | 0,0254 | -0,5326 | 0,5943 |
| oss. lambdae | 99 | 20 | 87 | 13 | 702 | 125 | 0,0273 | -0,0017 | 0,6583 | 0,5103 |
| oss. sut. lambdoid. | 175 | 42 | 89 | 44 | 658 | 281 | 1,9394 | 0,6767 | 10,3673 | 0,0000 |
| fac. condyl. bipartita | 87 | 5 | 43 | 3 | 476 | 10 | -0,0291 | 0,0643 | -1,2549 | 0,2095 |
| enlargement of cap. femoris | 53 | 19 | 53 | 5 | 406 | 210 | 1,2167 | 0,1803 | 3,1422 | 0,0017 |
| for.et inc. suprorb. | 210 | 19 | 98 | 4 | | | | | | |
| for. ethmoidale absens | 101 | 2 | 39 | 2 | 241 | 4 | 0,0275 | -0,0127 | 0,4723 | 0,6367 |
| for. infraorb. absens | 115 | - | 80 | 2 | | | ..... | | | |
| for. condylaris absens | 126 | 35 | 49 | 7 | 545 | 477 | 0,0839 | 1,7045 | -4,9057 | **0,0000** |
| for. hypogl. bipart. | 179 | 50 | 52 | 13 | 546 | 15 | -0,0204 | 0,6020 | -4,7159 | **0,0000** |
| proc. marginalis absens | 161 | 44 | 50 | 10 | 521 | 483 | 0,0037 | 2,2253 | -7,4069 | **0,0000** |
| torus palatinus | 221 | 44 | 71 | 1 | 605 | 147 | 0,4535 | 0,0050 | 2,2786 | **0,0227** |
| torus acusticus | 217 | 41 | 75 | 3 | 882 | 33 | 0,2287 | 0,2544 | -0,2100 | 0,8336 |
| tuberc. pharyng. absens | 196 | 55 | 56 | 19 | 583 | 194 | -0,0068 | 0,0060 | -0,2682 | 0,7886 |
| troch. tertius | 84 | 20 | 39 | 4 | 668 | 194 | 0,0975 | 0,0007 | 0,5804 | 0,5616 |
| linea nuchae supr. | 94 | 39 | 81 | 21 | | | | | | |
| fossa pector.maj. | 121 | 12 | 64 | 13 | 760 | 98 | 0,0627 | -0,0008 | 0,7173 | 0,4732 |
| fossa teres | 128 | 11 | 62 | 8 | 748 | 111 | -0,0044 | 0,0292 | -0,6548 | 0,5126 |
| fossa hypotroch. | 160 | 18 | 66 | 24 | 824 | 349 | 0,3513 | 0,5301 | -1,0997 | 0,2715 |
| fossa solei | 99 | 28 | 67 | 14 | 733 | 129 | 0,0046 | 0,0539 | -0,8326 | 0,4050 |

Table 16. Verification of the differences in MD values acquired by comparing the population group from the hinterland (Josefov) (Bartoníček 2000; Unzeitigová 2000) with Kostelisko and with individuals from Mikulčice castle (Czarnetzki 1972).
Explanatory notes: see Tab. 15

| | Mikulčice-hinterland (Josefov) | | Mikulčice-subcastle (Kostelisko) | | Mikulčice-castle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n1 | x1 | n2 | x2 | n3 | x3 | MD12 | MD13 | Z | p |
| sutura metopica | 117 | 12 | 297 | 23 | 967 | 98 | -0,0042 | -0,0096 | 0,2364 | 0,8132 |
| oss. sut. coronalis | 86 | 11 | 151 | 4 | 698 | 30 | 0,1454 | 0,0854 | 0,7908 | 0,4290 |
| oss. epiptericum | 54 | 18 | 75 | 19 | 394 | 76 | -0,0008 | 0,0823 | -1,0909 | 0,2753 |

| | Mikulčice-hinterland (Josefov) | | Mikulčice-subcastle (Kostelisko) | | Mikulčice-castle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n1 | x1 | n2 | x2 | n3 | x3 | MD12 | MD13 | Z | p |
| sut. frontotemp. | 51 | 1 | 121 | 3 | 457 | 12 | -0,0266 | -0,0198 | -0,2123 | 0,8319 |
| oss. bregmatic. | 93 | - | 217 | 1 | 719 | 1 | 0,0031 | -0,0066 | 0,3345 | 0,7380 |
| oss. sut. sagittal. | 103 | 10 | 180 | 13 | 692 | 30 | -0,0072 | 0,0347 | -1,1282 | 0,2592 |
| oss. lambdae | 87 | 13 | 99 | 20 | 702 | 125 | -0,0024 | -0,0069 | 0,1090 | 0,9132 |
| oss. sut. lambdoid. | 89 | 44 | 175 | 42 | 658 | 281 | 0,2699 | 0,0055 | 2,2135 | **0,0269** |
| fac. condyl. bipartita | 43 | 3 | 87 | 5 | 476 | 10 | -0,0322 | 0,0340 | -0,8829 | 0,3773 |
| enlargement of cap. femoris | 53 | 5 | 53 | 19 | 406 | 210 | 0,3972 | 0,9408 | -2,3743 | **0,0176** |
| for. et inc.suprorb. | 98 | 4 | 210 | 19 | | | | | | |
| for. ethmoidale absens | 39 | 2 | 101 | 2 | 241 | 4 | -0,0051 | 0,0096 | -0,2454 | 0,8062 |
| for. infraorb.absens | 80 | 2 | 115 | - | | | | | | |
| for. condylaris absens | 49 | 7 | 126 | 35 | 545 | 477 | 0,0839 | 2,6817 | -6,4092 | **0,0000** |
| for. hypogl. bipart. | 52 | 13 | 179 | 50 | 546 | 15 | -0,0204 | 0,4890 | -2,2477 | **0,0246** |
| proc.marginalis absens | 50 | 10 | 161 | 44 | 521 | 483 | 0,0037 | 2,7582 | -6,1364 | **0,0000** |
| torus palatinus | 71 | 1 | 221 | 44 | 605 | 147 | 0,4535 | 0,6131 | -1,3618 | 0,1733 |
| torus acusticus | 75 | 3 | 217 | 41 | 882 | 33 | 0,2287 | -0,0143 | 1,7735 | 0,0761 |
| tuberc. pharyng.absens | 56 | 19 | 196 | 55 | 583 | 194 | -0,0068 | -0,0194 | 0,2966 | 0,7668 |
| troch. tertius | 39 | 4 | 84 | 20 | 668 | 194 | 0,0975 | 0,2093 | -1,0684 | 0,2854 |
| linea nuchae supr. | 81 | 21 | 94 | 39 | | | | | | |
| fossa pector.maj. | 64 | 13 | 121 | 12 | 760 | 98 | 0,0627 | 0,0233 | 0,5977 | 0,5500 |
| fossa teres | 62 | 8 | 128 | 11 | 748 | 111 | -0,0044 | -0,0143 | 0,1607 | 0,8724 |
| fossa hypotroch. | 66 | 24 | 160 | 18 | 824 | 349 | 0,3513 | -0,0013 | 1,7103 | 0,0872 |
| fossa solei | 67 | 14 | 99 | 28 | 733 | 129 | 0,0046 | -0,0093 | 0,1782 | 0,8585 |

Table 17. Verification of the differences in MD values acquired by comparing individuals from Mikulčice castle (Czarnetzki 1972) with the burial site at Josefov (Bartoníček 2000; Unzeitigová 2000) and with the burial site at Kostelisko. Explanatory notes: see tab. 15

| | Mikulčice-subcastle (Kostelisko) | | Mikulčice-hinterland (Josefov) | | Mikulčice-castle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n1 | x1 | n2 | x2 | n3 | x3 | MD12 | MD13 | Z | p |
| sutura metopica | 967 | 98 | 297 | 23 | 117 | 12 | 0,0026 | -0,0096 | 0,6570 | 0,5112 |
| oss. sut. coronalis | 698 | 30 | 151 | 4 | 86 | 11 | 0,0002 | 0,0854 | -1,0828 | 0,2789 |
| oss. epiptericum | 394 | 76 | 75 | 19 | 54 | 18 | 0,0053 | 0,0823 | -0,7531 | 0,4514 |
| sut. frontotemp. | 457 | 12 | 121 | 3 | 51 | 1 | -0,0104 | -0,0198 | 0,2601 | 0,7948 |
| oss. bregmatic. | 719 | 1 | 217 | 1 | 93 | - | -0,0022 | -0,0066 | 0,1561 | 0,8760 |
| oss. sut. sagittal. | 692 | 30 | 180 | 13 | 103 | 10 | 0,0085 | 0,0347 | -0,5226 | 0,6012 |
| oss. lambdae | 702 | 125 | 99 | 20 | 87 | 13 | -0,0078 | -0,0069 | -0,0260 | 0,9792 |
| oss. sut. lambdoid. | 658 | 281 | 175 | 42 | 89 | 44 | 0,1531 | 0,0055 | 1,8097 | 0,0703 |
| fac. condyl. bipartita | 476 | 10 | 87 | 5 | 43 | 3 | 0,0238 | 0,0340 | -0,1089 | 0,9133 |
| enlargement of cap. femoris | 406 | 210 | 53 | 19 | 53 | 5 | 0,0820 | 0,9408 | -2,9203 | **0,0035** |
| for. et inc. suprorb. | | | 210 | 19 | 98 | 4 | | | | |
| for. ethmoidale absens | 241 | 4 | 101 | 2 | 39 | 2 | -0,0135 | 0,0096 | -0,2826 | 0,7774 |
| for. infraorb. absens | | | 115 | - | 80 | 2 | | | | |

| | Mikulčice-sub-castle (Kostelisko) | | Mikulčice-hinter-land (Josefov) | | Mikulčice-castle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n1 | x1 | n2 | x2 | n3 | x3 | MD12 | MD13 | Z | p |
| for. condylaris absens | 545 | 477 | 124 | 57 | 49 | 7 | 0,8540 | 2,6817 | -3,6298 | **0,0003** |
| for. hypogl. bipart. | 546 | 15 | 179 | 50 | 52 | 13 | 0,6020 | 0,4890 | 0,4871 | 0,6262 |
| proc. marginalis absens | 521 | 483 | 161 | 44 | 50 | 10 | 2,2253 | 2,7582 | -1,0085 | 0,3132 |
| torus palatinus | 605 | 147 | 221 | 44 | 71 | 1 | 0,0050 | 0,6131 | -3,0668 | **0,0022** |
| torus acusticus | 882 | 33 | 217 | 41 | 75 | 3 | 0,2544 | -0,0143 | 3,3578 | **0,0008** |
| tuberc. pharyng. absens | 583 | 194 | 196 | 55 | 56 | 19 | 0,0060 | -0,0194 | 0,7226 | 0,4699 |
| troch. tertius | 668 | 194 | 84 | 20 | 39 | 4 | 0,0007 | 0,2093 | -1,2567 | 0,2089 |
| linea nuchae supr. | | | 94 | 39 | 81 | 21 | | | | |
| fossa pector.maj. | 760 | 98 | 121 | 12 | 64 | 13 | -0,0008 | 0,0233 | -0,3795 | 0,7043 |
| fossa teres | 748 | 111 | 128 | 11 | 62 | 8 | 0,0292 | -0,0143 | 0,9124 | 0,3615 |
| fossa hypotroch. | 824 | 349 | 160 | 18 | 66 | 24 | 0,5301 | -0,0013 | 4,0997 | 0,0000 |
| fossa solei | 733 | 129 | 99 | 28 | 67 | 14 | 0,0539 | -0,0093 | 0,9983 | 0,3182 |

Josefov and the series of skeletal remains from the castle than between Josefov and Kostelisko. The population group from the Mikulčice hinterland (Josefov) thus differs from the castle group in the incidence of more traits than from the sub-castle group.

The final results of the MD comparison between the skeletal groups from Mikulčice castle and the other two groups form the basis of Table 17. The group from the castle differed significantly from the sub-castle group (Kostelisko) than from the hinterland group (Josefov) in the incidence of *torus acusticus* (0.01) and *fossa hypotrochanterica* (p=0.001). On the contrary, it differed more from Josefov in the incidence of the elongation of *caput femoris* (p=0.01), *foramen condylaris* (0.001) and *torus palatinus* (0,01). The population group from the castle differed statistically from the Kostelisko group in the incidence of two traits, and from the Josefov group in the incidence of three traits, i.e. its difference from both groups is similar.

## 5. Summary

If we were to summarise all of the above, then the following apply:

- we studied approximately 155 non-metric morphological traits on the skeletons from the Mikulčice-Kostelisko burial site
- in view of the goal of this work, we divided the non-metric traits into five groups according to their character or function
- the relationship between incidence and sex was demonstrated in these traits; in males, *sutura supranasalis, depressio suprameatica, fossa costoclavicularis, facies articularis superior partita, torus acusticus* (p=0.001), *fossa pectoralis major, fossa hypotrochanterica, fossa bicipitis, vertebrae accessoriae* (p=0.01), *ossicula suturae lambdoideae, facies Poirieri, facies articularis calcanea anterior et media, processus trochlearis tali lateralis, spina suprameatica, torus occipitalis and tuberculum praecondylare* (p=0.05) occurred more frequently; in females, *foramen hypoglossale partitum* and *ossiculum epiptericum* occurred more frequently
- in males, non-metric traits associated with changes at the site of muscle attachments and hyperostotic traits occurred more frequently
- in males, isolated articular accessory facets occurred more frequently; in females, there was rather a tendency towards elongation, fusion of the articular surface (*facies articularis calcanea anterior et media* resp. *facies articularis calcanea anterior et media communis*; *facies Charlesi* or *facies condylaris media*)

- a clear preference for the incidence on a concrete side was not demonstrated in any of the bilaterally occurring traits
- a symmetrical incidence was significantly more frequent in the following bilateral traits – *sutura infraorbitale, sutura incisiva, facies articularis calcanea anterior et media, facies articularis calcanea anterior et media communis, facies articularis talaris anterior et media*, *depressio et spina suprameatica, tuberculum zygomaxillare, facies condylaris media, facies articularis tibiale accessoria lateralis, incisura frontalis, tuberculum marginale, linea nuchae suprema, crista hypotrochanterica* (p=0.001), *incisura faciei lunatae* and *ossicula suturae lambdoideae, facies articularis acromialis, crista hypotrochanterica* (p=0.01)
- an asymmetrical incidence was more frequent only in the case of the *foramen suparorbitale*, *foramen hypoglossalis partitum* (p=0.001), *fossa teres* (p=0.05)
- the burial sites at Kostelisko, in the sub-castle of the Mikulčice power centre differed statistically significantly from the Mikulčice castle group in the incidence of: *incisura supraorbitalis, foramen infraorbitale partitum, foramen hypoglossalis bipartitus, torus acusticus* and *fossa hypotrochanterica* (p=0.05)
- the burial site at Kostelisko differed statistically significantly from the burial site at Josefov in the Mikulčice hinterland in the incidence of *torus palatinus* and *torus acusticus* (p=0.05)
- the population group from Mikulčice castle differed statistically significantly from the burial site at Josefov in the incidence of *torus palatinus* and *trochanter tertius* (p=0.05);

- if we compare the groups from Mikulčice castle, sub-castle and hinterland, the following apply:
  - Kostelisko differed from Mikulčice castle in the incidence of traits relating to vascular and nerve apertures and in the incidence of the group of traits associated with sites of muscle attachment
  - Josefov differed from the other two groups in the incidence of traits with a hyperostotic character.
  - Mikulčice castle significantly differed from Kostelisko in the incidence of two traits, and from Josefov in the incidence of three traits;
- if we compare the values of the measure of divergence for all comparisons, the following apply:
  - Kostelisko significantly differed from Josefov only in the incidence of one trait, while it differed from Mikulčice castle in the incidence of three traits
  - Josefov differed significantly from Kostelisko in the incidence of one trait, while it differed from Mikulčice castle in the incidence of four traits
  - Summary of the values of the mean measure of divergence MMD:
    Kostelisko – Josefov
    87.4 ($S^2_{mmd}$ = 0.00197)
    Mikulčice castle – Josefov
    98.9 ($S^2_{mmd}$ = 0.00231)
    Kostelisko – Mikulčice castle
    162.1 ($S^2_{mmd}$ = 0.00086)

According to the incidence of non-metric morphological traits, the population group from the sub-castle area (Kostelisko) is closer to the group from Mikulčice hinterland (Josefov) than to individuals from Mikulčice castle. Similarly, the group from Josefov is more similar to that from Kostelisko than to the group from Mikulčice castle.

## 6. Conclusion

There exist tens of non-metric morphological traits, but not all have the same predictive value, an unequivocal methodology of evaluation. Naturally, the selection of traits has a fundamental importance for the comparison of population groups. If we are to compare three groups on the basis of two different groups of traits, it is not improbable that we will acquire completely different results. The fact that the group from Kostelisko was compared with the Josefov group (Bartoníček 2000; Unzeitigová 2000) and with the Mikulčice castle group (Czarnetzki 1972) on the basis of a more or less same group of non-metric traits may be considered to be a positive

aspect of this study. This fact is not that usual. In Central Europe, the incidence of non-metric traits has been studied on only very few skeletal series. From this aspect, only the series from the Great Moravian era has been systematically processed within the territory of our country. Apart from the series compared in this study, this includes the burial site at Dolní Věstonice (e.g. Hrnčířová 2007). Naturally, the insufficient preservation and representation of skeletal remains in prehistoric burial sites is a limiting factor. It would be meaningful to complexly evaluate the incidence of non-metric traits for the whole prehistoric period, or the archaeological culture.

Attempts at "categorisation", the division of non-metric traits exist since the time, when they were used for population comparisons as a "group of traits" (see Ossenberg 1969, 1977). In view of their diversity, every division or classification is problematic. This also applies in the case of dividing traits into groups according to similarities in character, function or location, which we applied in this work. Comparison of the Great Moravian population groups ultimately showed a difference only in the case of such defined groups (e.g. Table 10). The suitability of this approach will be borne out only by subsequent research.

This study supported the previous premise that non-metric traits have a greater predicative value when used to compare smaller population groups originating from a smaller territory (e.g. Rösing 1986b) than when used to compare geographically, chronologically or racially or ethnic groups.

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Table 2. Incidence of non-metric traits, expressed as average per individual and per non-specific side in the case of bilateral traits.

| trait | Incidence on Individual | | | Incidence on Side | | |
|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % |
| sutura metopica | 297 | 23 | 7,7 | | | |
| sutura supranalis | 216 | 132 | 61,1 | | | |
| fissura metopica | 261 | 4 | 1,5 | | | |
| ossiculum metopicum | 262 | - | - | | | |
| sut. parametop. | 217 | - | - | 492 | - | - |
| oss. sut. coronalis | 151 | 4 | 2,6 | 341 | 4 | 1,2 |
| ossiculum internasalis | 93 | - | - | | | |
| ossiculum praefrontale | 98 | 3 | 3,1 | 208 | 3 | 1,4 |
| lam. orbit. partita | 11 | 1 | 9,1 | 45 | 1 | 2,2 |
| oss. zygom. part. | 138 | 3 | 2,2 | 382 | 3 | 0,8 |
| fiss. zygom. transv. | 113 | 9 | 8,0 | 319 | 13 | 4,1 |
| oss. sut. zygo-max. | 117 | 6 | 5,1 | 313 | 6 | 1,9 |
| sut. infraorbitale | 139 | 109 | 78,4 | 248 | 161 | 64,9 |
| sutura incisiva | 220 | 89 | 40,5 | 446 | 163 | 36,5 |
| oss. med. palat. anter. | 224 | - | - | | | |
| oss. med. palat. post. | 210 | - | - | | | |
| oss. epiptericum | 75 | 19 | 25,3 | 173 | 25 | 14,5 |
| sut. frontotemp. | 121 | 3 | 2,5 | 305 | 3 | 1,0 |
| proc. front. os. temp. | 92 | 7 | 7,6 | 245 | 9 | 3,7 |
| proc. temp. os. front. | 89 | 2 | 2,2 | 241 | 3 | 1,2 |
| proc. pariet. os. sphen. | 74 | 20 | 27,0 | 181 | 27 | 14,9 |
| oss. bregmatic. | 217 | 1 | 0,5 | | | |
| oss. sut. sagittal. | 180 | 13 | 7,2 | | | |
| oss. inc. pariet. | 106 | 17 | 16,0 | 257 | 20 | 7,8 |
| os pariet. part. | 188 | - | - | 438 | - | - |
| oss. sut. squam. | 53 | 1 | 1,9 | 164 | 2 | 1,2 |
| sq. tempor. part. | 103 | 2 | 1,9 | 303 | 3 | 1,0 |
| sut. squamom. | 148 | 29 | 19,6 | 373 | 38 | 10,2 |
| proc. mast. bipart. | 115 | 8 | 7,0 | 322 | 9 | 2,8 |
| oss. lambdae | 99 | 20 | 20,2 | | | |
| oss. sut. lambdoid. | 175 | 133 | 76,0 | 304 | 199 | 65,5 |
| os Incae | 244 | 3 | 1,2 | | | |
| proc. interpariet. | 232 | 4 | 1,7 | | | |
| sut. mendosa | 140 | 3 | 2,1 | 322 | 5 | 1,6 |
| oss. asterii | 109 | 10 | 9,2 | 256 | 14 | 5,5 |
| oss. sut. occipit. | 93 | 8 | 8,6 | 222 | 9 | 4,1 |
| | | | | | | |
| assimilatio atlantis | 141 | 1 | 0,7 | | | |
| oss. dens axis | 137 | 1 | 0,7 | | | |
| spina bifida sacralis | 74 | 4 | 5,4 | | | |

| trait | Incidence on Individual | | | Incidence on Side | | |
|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % |
| vert. absentes | 43 | 1 | 2,3 | | | |
| vert. accessoriae | 44 | 5 | 11,4 | | | |
| fenestratio sterni | 45 | - | - | | | |
| oss. acromii | 42 | 1 | 2,4 | 109 | 1 | 0,9 |
| oss. coracoid. | 45 | - | - | 136 | - | - |
| oss. styl. radii | 33 | - | - | 111 | - | - |
| oss. styl. ulnae | 17 | - | - | 63 | - | - |
| synost. acet. incompl. (co) | 110 | - | - | 245 | - | - |
| patella multipartita | 45 | - | - | 142 | - | - |
| oss. trigon. tali (Ta) | 99 | | - | 250 | - | - |
| | | | | | | |
| fac. condyl. bipartita | 87 | 5 | 5,7 | 215 | 7 | 3,3 |
| fac. art. sup. part. (C1) | 99 | 26 | 26,3 | 203 | 37 | 18,2 |
| fac. art. cost. C7 | 55 | 1 | 1,8 | 126 | 1 | 0,8 |
| fac. art. cost. L1 | 38 | - | - | 87 | - | - |
| fac. art. sacral. acces. (Sa) | 30 | 5 | 16,7 | 66 | 6 | 9,1 |
| fac. art. sacr. acc. (Co) | 50 | 8 | 16,0 | 116 | 9 | 7,8 |
| fac. art. acces. cost. (Cl) | 128 | 85 | 66,4 | 228 | 123 | 53,9 |
| fac. art. acromialis | 38 | 37 | 97,4 | 58 | 55 | 94,8 |
| fac. art. acromialis absens | 22 | 4 | 18,2 | 58 | 5 | 8,6 |
| fac. art. proc.corac. | 31 | 13 | 41,9 | 86 | 17 | 19,8 |
| fac. art. carp. part. (Ra) | 44 | 8 | 18,2 | 122 | 11 | 9,0 |
| fac. art. trochl. part. (Ul) | 63 | 30 | 47,6 | 138 | 44 | 31,9 |
| inc. radial. part. (Ul) | 50 | 2 | 4,0 | 139 | 2 | 1,4 |
| fac. lunata part. (Co) | 108 | - | - | 244 | - | - |
| facies Poirieri (Fe) | 53 | 12 | 22,6 | 141 | 17 | 12,1 |
| riding facet (Fe) | 93 | - | - | 251 | - | - |
| facies Charlesi (Fe) | 66 | 34 | 51,5 | 137 | 52 | 38,0 |
| fac. art. cond. media (Fe) | 68 | 40 | 58,8 | 135 | 61 | 45,2 |
| facies Charlesi+fac. art. cond. media (Fe) | 133 | 73 | 54,9 | 272 | 113 | 41,5 |
| fac. art. tib. acc. med. (Ti) | 30 | 6 | 20,0 | 91 | 7 | 7,7 |
| fac. art. tib. acc. lat. (Ti) | 70 | 63 | 90,0 | 112 | 87 | 77,7 |
| fac. art. tal. ant. et med. (Ca) | 135 | 75 | 55,6 | 268 | 120 | 44,8 |
| fac. art. tal. ant. et med. com. (Ca) | 146 | 96 | 65,8 | 274 | 156 | 56,9 |
| fac. art. tal. ant. bipart. (Ca) | 124 | 1 | 0,8 | 286 | 1 | 0,3 |
| fac. art. tal. med. bipart. (Ca) | 129 | - | - | 292 | - | - |
| fac. art. tal. ant. absens (Ca) | 126 | 9 | 7,1 | 280 | 10 | 3,6 |
| fac. art. calc. ant. et med. (Ta) | 125 | 30 | 24,0 | 271 | 44 | 16,2 |
| fac. art. calc. a. et m. com. (Ta) | 153 | 137 | 89,5 | 272 | 227 | 83,5 |
| fac. art. calc. ant. absens (Ta) | 114 | 3 | 2,6 | 274 | 4 | 1,5 |
| fac. art. med. tal. (Ta) | 59 | 4 | 6,8 | 171 | 6 | 3,5 |
| proc. troch. tali lat. (Ta) | 77 | 10 | 13,0 | 194 | 14 | 7,2 |

| trait | Incidence on Individual | | | Incidence on Side | | |
|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % |
| proc. troch. tali med.(Ta) | 42 | 36 | 85,7 | 70 | 49 | 70 |
| | | | | | | |
| for. supratroch. (Hu) | 100 | 28 | 28,0 | 226 | 35 | 15,5 |
| inc. fac. lunatae (Co) | 105 | 32 | 30,5 | 228 | 54 | 23,7 |
| plate formation (Fe) | 49 | 7 | 14,3 | 140 | 11 | 7,9 |
| fossa Alleni (Fe) | 65 | 4 | 6,2 | 187 | 5 | 2,7 |
| | | | | | | |
| sulcus frontalis | 153 | 77 | 50,3 | 309 | 107 | 34,6 |
| for. et inc.supratr. | 211 | 2 | 0,9 | 484 | 2 | 0,4 |
| for. et inc. frontalis | 253 | 242 | 95,7 | 453 | 412 | 90,9 |
| foramen frontale | 218 | 69 | 31,7 | 443 | 91 | 20,5 |
| incisura frontalis | 239 | 212 | 88,7 | 422 | 336 | 79,6 |
| for. et inc. suprorb. | 210 | 19 | 9,0 | 476 | 19 | 4,0 |
| foramen supraorb. | 213 | 17 | 8,0 | 486 | 17 | 3,5 |
| incisura supraorb. | 210 | 1 | 0,5 | 496 | 2 | 0,4 |
| for. nasale absens | 80 | 11 | 13,8 | 165 | 14 | 8,5 |
| for. zygomat. absens | 158 | 22 | 13,9 | 392 | 24 | 6,1 |
| for. ethmoidale | 101 | 99 | 98,0 | 169 | 164 | 97,0 |
| can. opticus part. | 83 | 1 | 1,2 | 198 | 1 | 0,5 |
| for. infraorb. absens | 115 | - | - | 303 | - | - |
| for. infraorb. part. | 116 | 8 | 6,9 | 292 | 12 | 4,1 |
| for. pariet. absens | 185 | 131 | 70,8 | 327 | 190 | 58,1 |
| for. pariet. inf. | 100 | - | - | 257 | - | - |
| proc. pariet. sq. temp. | 74 | 2 | 2,7 | 218 | 3 | 1,4 |
| for. squam. sup. | 78 | 3 | 3,8 | 243 | 4 | 1,6 |
| for. mastoid. intras. | 83 | 51 | 61,4 | 176 | 68 | 38,6 |
| for. mastoid. extras. | 115 | 88 | 76,5 | 193 | 112 | 58,0 |
| for. tympan. | 191 | 31 | 16,2 | 432 | 41 | 9,5 |
| for. marginale | 191 | 17 | 8,9 | 448 | 19 | 4,2 |
| for. occipitale | 174 | 22 | 12,6 | | | |
| for. condylare | 126 | 91 | 72,2 | 232 | 126 | 54,3 |
| can. condylaris | 124 | 67 | 54,0 | 243 | 92 | 37,9 |
| can. condyl. interm. | 114 | 4 | 3,5 | 278 | 4 | 1,4 |
| for. hypogl. bipart. | 179 | 50 | 27,9 | 359 | 55 | 15,3 |
| for. spin. incompl. | 76 | 31 | 40,8 | 185 | 41 | 22,2 |
| for. ovale incompl. | 96 | 3 | 3,1 | 257 | 5 | 1,9 |
| for. ovale et spin. confl. | 99 | 3 | 3,0 | 262 | 4 | 1,5 |
| for. Vesalii | 110 | 21 | 19,1 | 275 | 30 | 10,9 |
| for. ovale part. | 108 | 2 | 1,9 | 289 | 4 | 1,4 |
| for. mentale part. | 253 | 1 | 0,4 | 545 | 2 | 0,4 |
| for. mentale absens | 251 | 1 | 0,4 | 540 | 2 | 0,4 |
| sulc. myloh. absens | 161 | 2 | 1,2 | 420 | 4 | 1,0 |

| trait | Incidence on Individual | | | Incidence on Side | | |
|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % |
| for. mandib. access. | 132 | 17 | 12,9 | 349 | 21 | 6,0 |
| for. pr. trans. part. C1-7 | 52 | 49 | 94,2 | 77 | 69 | 89,6 |
| for. pr. trans. part. C1 | 37 | 1 | 2,7 | 117 | 1 | 0,9 |
| for. pr. trans. part. C2 | 66 | 2 | 3,0 | 160 | 2 | 1,25 |
| for. pr. trans. part. C3 | 45 | - | - | 123 | - | - |
| for. pr. trans. part. C4 | 54 | 5 | 9,3 | 131 | 5 | 3,8 |
| for. pr. trans. part. C5 | 54 | 22 | 40,7 | 126 | 31 | 24,6 |
| for. pr. trans. part. C6 | 56 | 42 | 75,0 | 106 | 60 | 56,6 |
| for. pr. trans. part. C7 | 30 | 9 | 30,0 | 79 | 10 | 12,7 |
| for. pr. trans. apart. C1-7 | 9 | 5 | 55,6 | 28 | 8 | 28,6 |
| for. pr. trans. apart. C1 | 35 | 3 | 8,6 | 109 | 5 | 4,6 |
| for. pr. trans. apart. C2 | 65 | 3 | 4,6 | 157 | 4 | 2,5 |
| for. pr. trans. apart. C3 | 39 | - | - | 116 | - | - |
| for. pr. trans. apart. C4 | 48 | - | - | 128 | - | - |
| for. pr. trans. apart. C5 | 44 | - | - | 129 | - | - |
| for. pr. trans. apart. C6 | 37 | - | - | 106 | - | - |
| for. pr. trans. apart. C7 | 29 | 1 | 3,4 | 86 | 1 | 1,2 |
| pont. os. sphenoid. | 99 | 8 | 8,1 | 239 | 8 | 3,3 |
| proc. pter.-spinos. | 94 | 3 | 3,2 | 241 | 3 | 1,2 |
| proc. pter.- alaris | 100 | 7 | 7,0 | 246 | 7 | 2,8 |
| ponticuli sellae | 80 | 14 | 17,5 | 169 | 23 | 13,6 |
| pont. clinoid medius | 91 | 12 | 13,2 | 188 | 18 | 9,6 |
| pont. carot.-clinoid. | 88 | 5 | 5,7 | 186 | 6 | 3,2 |
| pont. interclinoid. | 108 | 2 | 1,9 | 231 | 3 | 1,3 |
| taenie interclinoid. | 100 | 1 | 1,0 | 214 | 2 | 0,9 |
| pont. mylohyoid. | 158 | 12 | 7,6 | 400 | 13 | 3,3 |
| pont. atlantis | 76 | 6 | 7,9 | 180 | 8 | 4,4 |
| pont. atlantis lat. | 83 | 1 | 1,2 | 200 | 2 | 1 |
| pont. atlantis post. | 84 | 6 | 7,1 | 196 | 8 | 4,1 |
| for. suprascap. | 78 | 7 | 9,0 | 207 | 8 | 3,9 |
| depr. bipar. circum. | 235 | - | - | 515 | - | - |
| | | | | | | |
| spina trochlearis | 149 | 38 | 25,5 | 329 | 51 | 15,5 |
| tuberc. marginale | 161 | 117 | 72,7 | 321 | 173 | 53,9 |
| tuberc. zygomax. | 106 | 37 | 34,9 | 275 | 56 | 20,4 |
| torus palatinus | 221 | 44 | 19,9 | | | |
| torus maxillaris | 201 | 4 | 2,0 | 445 | 5 | 1,1 |
| depres. suprameat. | 204 | 113 | 55,4 | 407 | 172 | 42,3 |
| spina suprameat. | 205 | 111 | 54,1 | 406 | 170 | 41,9 |
| torus acusticus | 217 | 41 | 18,9 | 476 | 62 | 13,0 |
| torus occipitalis | 208 | 23 | 11,1 | | | |
| proc. retromast. | 122 | 7 | 5,7 | 279 | 12 | 4,3 |

| trait | Incidence on Individual | | | Incidence on Side | | |
|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % |
| tuberc. praecond. | 161 | 8 | 5,0 | 339 | 11 | 3,2 |
| tuberc. pharyng. | 196 | 141 | 71,9 | | | |
| proc. paracond. | 53 | 2 | 3,8 | 136 | 2 | 1,5 |
| torus mandibul. | 249 | 3 | 1,2 | 536 | 5 | 0,9 |
| proc. supracond. | 134 | 2 | 1,5 | 322 | 3 | 0,9 |
| for. supracond. | 156 | - | - | 365 | - | - |
| troch. tertius | 84 | 20 | 23,8 | 204 | 28 | 13,7 |
| | | | | | | |
| fossa pharyng. | 185 | 44 | 23,8 | | | |
| linea nuchae supr. | 94 | 39 | 41,5 | 191 | 75 | 39,3 |
| fossa costaclavic. | 113 | 35 | 31,0 | 247 | 48 | 19,4 |
| fossa pector.maj. | 121 | 12 | 9,9 | 305 | 17 | 5,6 |
| fossa teres | 128 | 11 | 8,6 | 312 | 12 | 3,8 |
| fossa bicipitis | 66 | 17 | 25,8 | 172 | 21 | 12,2 |
| fossa hypotroch. | 160 | 18 | 11,3 | 360 | 29 | 8,1 |
| crista hypotroch. | 125 | 57 | 45,6 | 247 | 85 | 34,4 |
| fossa gastrocn. | 72 | 6 | 8,3 | 164 | 9 | 5,5 |
| inc. musc. vasti lat.(Pa) | 41 | 12 | 29,3 | 125 | 16 | 12,8 |
| fossa. musc. vasti lat. | 41 | - | - | 138 | - | - |
| fossa solei | 99 | 28 | 28,3 | 253 | 43 | 17,0 |
| crista solei | 83 | 36 | 43,4 | 189 | 51 | 27,0 |

Table 3. Frequency of non-metric traits in male and female and verification of sexual differences using the Chi-square test, Yates correction or Fisher test.
Explanatory notes: traits for which statistically significant differences have been demonstrated are in bold type; in the case of higher incidence of traits in female they are in bold italics.

| trait | Male | | | Female | | | $\chi 2$ test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi 2$ | p | $\chi 2$ | p |
| sutura metopica | 72 | 5 | 6,9 | 125 | 6 | 4,8 | 0,4 | 0,528 | 0,1 | 0,757 |
| **sutura supranalis** | **61** | **54** | **88,5** | **93** | **48** | **51,6** | **22,4** | **0** | **20,82** | **0** |
| fissura metopica | 68 | - | - | 116 | 2 | 1,7 | 1,2 | 0,276 | 0,12 | 0,725 |
| ossiculum metopicum | 69 | - | - | 114 | - | - | | | | |
| sut. parametop. | 130 | - | - | 216 | - | - | | | | |
| oss.sut. coronalis | 102 | 2 | 2,0 | 160 | 2 | 1,3 | 0,2 | 0,647 | - | 0,953 |
| ossiculum internasale | 31 | - | - | 48 | - | - | | | | |
| ossiculum praefrontale | 67 | - | - | 103 | 3 | 2,9 | 2,0 | 0,159 | 0,66 | 0,416 |
| lam. orbit. partita | 11 | - | - | 21 | - | - | | | | |
| oss. zygom. part. | 101 | - | - | 167 | 2 | 1,2 | 1,2 | 0,270 | 0,14 | 0,710 |
| fiss. zygom. transv. | 87 | 3 | 3,4 | 139 | 6 | 4,3 | 0,1 | 0,745 | - | 0,980 |
| oss. sut. zygo-max. | 88 | 1 | 1,1 | 149 | 4 | 2,7 | 0,6 | 0,423 | 0,11 | 0,739 |
| sut. infraorbitale | 61 | 33 | 54,1 | 98 | 58 | 59,2 | 0,4 | 0,529 | 0,22 | 0,642 |
| sutura incisiva | 117 | 28 | 23,9 | 192 | 41 | 21,4 | 0,3 | 0,598 | 0,15 | 0,699 |

| trait | Male | | | Female | | | $\chi 2$ test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi 2$ | p | $\chi 2$ | p |
| oss. med. palat. anter. | 57 | - | - | 95 | - | - | | | | |
| oss. med. palat. post. | 51 | - | - | 89 | - | - | | | | |
| ***oss. epiptericum*** | ***66*** | ***5*** | ***7,6*** | ***85*** | ***16*** | ***18,8*** | ***3,9*** | ***0,048*** | ***3,04*** | ***0,081*** |
| sut. frontotemp. | 81 | - | - | 147 | 2 | 1,4 | 1,1 | 0,292 | 0,1 | 0,755 |
| proc. front. os. temp. | 76 | 3 | 3,9 | 119 | 3 | 2,5 | 0,3 | 0,574 | 0,02 | 0,891 |
| proc. temp. os. front. | 77 | - | - | 116 | 3 | 2,6 | 2,0 | 0,155 | 0,69 | 0,408 |
| proc. pariet. os. sphen. | 66 | 14 | 21,2 | 88 | 13 | 14,8 | 1,1 | 0,298 | 0,68 | 0,409 |
| oss. bregmatic. | 63 | - | - | 105 | - | - | | | | |
| oss. sut. sagittal. | 42 | 2 | 4,8 | 89 | 8 | 9,0 | 0,7 | 0,395 | 0,25 | 0,619 |
| oss. inc. pariet. | 84 | 8 | 9,5 | 129 | 11 | 8,5 | 0,1 | 0,803 | 0 | 0,997 |
| os pariet. part. | 110 | - | - | 201 | - | - | | | | |
| oss. sut. squam. | 57 | 2 | 3,5 | 79 | - | - | 2,8 | 0,935 | 0,91 | 0,339 |
| sq. tempor. part. | 82 | 2 | 2,4 | 138 | 1 | 0,7 | 1,1 | 0,289 | 0,21 | 0,646 |
| sut. squamom. | 62 | 5 | 8,1 | 149 | 12 | 8,1 | - | 0,998 | 0,08 | 0,783 |
| proc. mast. bipart. | 87 | 6 | 6,9 | 132 | 2 | 1,5 | 4,3 | 0,378 | 2,92 | 0,874 |
| oss. lambdae | 13 | 3 | 23,1 | 40 | 9 | 22,5 | - | 0,966 | 0,11 | 0,735 |
| **oss. sut. lambdoid.** | **74** | **52** | **70,3** | **142** | **80** | **56,3** | **3,97*** | **0,046** | **3,41** | **0,065** |
| os Incae | 62 | 1 | 1,6 | 100 | 1 | 1 | 0,12 | 0,731 | 0,15 | 0,698 |
| proc. interpariet. | 57 | - | - | 99 | 3 | 3,0 | 1,76 | 0,185 | 0,32 | 0,471 |
| sut. mendosa | 97 | 3 | 3,1 | 141 | 2 | 1,4 | 0,78 | 0,376 | 0,18 | 0,671 |
| oss. asterii | 86 | 4 | 4,7 | 129 | 6 | 4,7 | - | 1,000 | 0,11 | 0,741 |
| oss. sut. occipit. | 79 | 3 | 3,8 | 107 | 6 | 5,6 | 0,32 | 0,570 | 0,05 | 0,824 |
| | | | | | | | | | | |
| assimilatio atlantis | 37 | - | - | 72 | 1 | 1,4 | 0,52 | 0,471 | 0,12 | 0,733 |
| oss. dens axis | 40 | 1 | 2,5 | 75 | - | - | 1,89 | 0,169 | 0,1 | 0,748 |
| spina bifida sacralis | 27 | 2 | 7,4 | 41 | 1 | 2,4 | 0,95 | 0,329 | 0,14 | 0,709 |
| vert. absentes | 20 | - | - | 21 | 1 | 4,8 | 0,98 | 0,323 | - | 0,980 |
| **vert. accessoriae** | **18** | **5** | **27,8** | **24** | **0** | **0** | **7,57** | **0,059** | **5,15** | **0,023** |
| fenestratio sterni | 17 | - | - | 24 | - | - | | | | |
| oss. acromii | 36 | - | - | 70 | 1 | 1,4 | 0,52 | 0,471 | 0,12 | 0,734 |
| oss. coracoid. | 50 | - | - | 84 | - | - | | | | |
| oss. styl. radii | 46 | - | - | 63 | - | - | | | | |
| oss. styl. ulnae | 23 | - | - | 39 | - | - | | | | |
| synost. acet. incompl. (Co) | 98 | - | - | 138 | - | - | | | | |
| patella multipartita | 50 | - | - | 83 | - | - | | | | |
| oss. trigon. tali (Ta) | 76 | - | - | 154 | - | - | | | | |
| | | | | | | | | | | |
| fac. condyl. bipartita | 68 | 5 | 7,4 | 132 | 2 | 1,5 | 4,53 | 0,3333 | 2,96 | 0,0851 |
| **fac. art. sup. part. (C1)** | **59** | **22** | **37,3** | **111** | **14** | **12,6** | **14,05** | **0,0002** | **12,61** | **0,0004** |
| fac. art. cost. C7 | 34 | 1 | 2,9 | 72 | - | - | 2,14 | 0,1437 | 0,15 | 0,6996 |
| fac. art. cost. L1 | 19 | - | - | 55 | - | - | | | | |
| fac. art. sacral. acces. (Sa) | 22 | - | - | 46 | 6 | 13,0 | 3,15 | 0,0761 | 1,73 | 0,1878 |

| trait | Male | | | Female | | | $\chi 2$ test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi 2$ | p | $\chi 2$ | p |
| fac. art. sacr. acc. (Co) | 15 | 2 | 13,3 | 59 | 7 | 11,9 | 0,02 | 0,8765 | 0,08 | 0,7742 |
| fac. art. acces. cost. (Cl) | 75 | 46 | 61,3 | 112 | 71 | 63,4 | 0,08 | 0,7755 | 0,02 | 0,8957 |
| fac. art. acromialis | 17 | 15 | 88,2 | 41 | 40 | 97,6 | 2,13 | 0,1444 | 0,65 | 0,4188 |
| fac. art. acromialis absens | 19 | 4 | 21,1 | 41 | 3 | 7,3 | 2,38 | 0,1232 | 1,23 | 0,2672 |
| fac. art. proc. corac. | 33 | 7 | 21,2 | 51 | 8 | 15,7 | 0,42 | 0,5184 | 0,13 | 0,7232 |
| fac. art. carp. part. (Ra) | 50 | 7 | 14 | 71 | 4 | 5,6 | 2,48 | 0,115 | 1,58 | 0,2094 |
| fac. art. trochl. part. (Ul) | 41 | 14 | 34,1 | 85 | 27 | 31,8 | 0,07 | 0,7892 | - | 0,9486 |
| inc. radial. part. (Ul) | 43 | 2 | 4,7 | 84 | - | - | 3,97 | 0,0463 | 1,54 | 0,2152 |
| fac. lunata part. (Co) | 53 | - | - | 139 | - | - | | | | |
| **facies Poirieri (Fe)** | **39** | **10** | **25,6** | **70** | **7** | **10** | **4,65** | **0,031** | **3,54** | **0,0598** |
| riding facet (Fe) | 76 | - | - | 128 | - | - | | | | |
| facies Charlesi (Fe) | 45 | 22 | 48,9 | 80 | 30 | 37,5 | 1,06 | 0,303 | 0,71 | 0,3992 |
| fac. art. cond. media (Fe) | 43 | 16 | 37,2 | 80 | 41 | 51,3 | 2,22 | 0,1365 | 1,69 | 0,1938 |
| facies Charlesi+fac. art. cond. media (Fe) | 52 | 38 | 73,1 | 99 | 71 | 71,7 | 0,03 | 0,8594 | - | 0,9889 |
| fac. art. tib. acc. med.(Ti) | 24 | 4 | 16,7 | 59 | 2 | 3,4 | 4,48 | 0,0342 | 2,72 | 0,0989 |
| fac. art. tib. acc. lat. (Ti) | 27 | 21 | 77,8 | 74 | 58 | 78,4 | - | 0,9484 | 0,04 | 0,8355 |
| fac. art. tal. ant. et med. (Ca) | 85 | 39 | 45,9 | 153 | 71 | 46,4 | 0,01 | 0,9382 | 0 | 0,9536 |
| fac. art. tal. a. et m. com. (Ca) | 88 | 48 | 54,5 | 155 | 88 | 56,8 | 0,11 | 0,7366 | 0,04 | 0,84 |
| fac. art. tal. ant. bipart. (Ca) | 87 | 1 | 1,1 | 167 | - | - | 1,93 | 0,1651 | 0,11 | 0,7395 |
| fac. art. tal. med. bipart. (Ca) | 91 | - | - | 169 | - | - | | | | |
| fac. art. tal. ant. absens (Ca) | 86 | 1 | 1,2 | 163 | 6 | 3,7 | 1,31 | 0,253 | 0,55 | 0,4594 |
| **fac. art. calc. ant. et med. (Ta)** | **81** | **20** | **24,7** | **160** | **20** | **12,5** | **5,77** | **0,0163** | **4,93** | **0,0265** |
| fac. art. calc. a. et m. com. (Ta) | 83 | 64 | 77,1 | 159 | 138 | 86,8 | 3,71 | 0,0542 | 3,04 | 0,0813 |
| fac. art. calc. ant. absens (Ta) | 83 | 1 | 1,2 | 162 | 3 | 1,9 | 0,14 | 0,7053 | 0,02 | 0,8773 |
| fac. art. med. tal. (Ta) | 57 | 0 | 0 | 97 | 3 | 3,1 | 1,8 | 0,18 | 0,54 | 0,4611 |
| **proc. troch. tali lat. (Ta)** | **57** | **8** | **14,0** | **119** | **6** | **5,0** | **4,26** | **0,0391** | **3,12** | **0,0775** |
| proc. troch. tali med.(Ta) | 24 | 18 | 75 | 39 | 24 | 61,5 | 1,21 | 0,271 | 0,68 | 0,4091 |
| | | | | | | | | | | |
| for. supratroch.(Hu) | 64 | 8 | 12,5 | 100 | 25 | 25 | 3,79 | 0,0515 | 3,06 | 0,0805 |
| inc. fac. lunatae (Co) | 90 | 21 | 23,3 | 128 | 31 | 24,2 | 0,02 | 0,88 | - | 0,9917 |
| plate formation (Fe) | 42 | - | - | 70 | 7 | 10 | 4,48 | 0,0343 | 2,94 | 0,0866 |
| fossa Alleni (Fe) | 56 | 4 | 7,1 | 88 | 1 | 1,1 | 3,68 | 0,055 | 2,11 | 0,1464 |
| | | | | | | | | | | |
| sulcus frontalis | 85 | 28 | 32,9 | 127 | 53 | 41,7 | 1,67 | 0,1967 | 1,32 | 0,2515 |
| for. et inc.supratr. | 123 | 1 | 0,8 | 210 | 1 | 0,5 | 0,015 | 0,701 | 0,12 | 0,7257 |
| for. et inc. frontalis | 115 | 104 | 90,4 | 206 | 192 | 93,2 | 0,79 | 0,3747 | 0,45 | 0,5025 |
| foramen frontale | 112 | 23 | 20,5 | 193 | 53 | 27,5 | 1,82 | 0,1777 | 1,47 | 0,2261 |
| incisura frontalis | 108 | 84 | 77,8 | 186 | 147 | 79,0 | 0,06 | 0,8005 | 0,01 | 0,9161 |
| for. et inc. suprorb. | 120 | 7 | 5,8 | 210 | 4 | 1,9 | 3,66 | 0,0558 | 2,54 | 0,111 |
| foramen supraorb. | 121 | 7 | 5,8 | 213 | 4 | 1,9 | 3,7 | 0,0545 | 2,57 | 0,1087 |
| incisura supraorb. | 127 | - | - | 213 | - | - | | | | |
| for. nasale absens | 62 | 2 | 3,2 | 77 | 10 | 13,0 | 4,15 | 0,0417 | 3 | 0,0831 |

| trait | Male | | | Female | | | $\chi 2$ test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi 2$ | p | $\chi 2$ | p |
| for. zygomat. absens | 107 | 9 | 8,4 | 170 | 11 | 6,5 | 0,37 | 0,5435 | 0,14 | 0,712 |
| for. ethmoidale | 49 | 48 | 98,0 | 84 | 82 | 97,6 | 0,02 | 0,8986 | 0,23 | 0,6327 |
| can. opticus part. | 48 | - | - | 91 | 1 | 1,1 | 0,53 | 0,4661 | 0,11 | 0,7441 |
| for. infraorb. absens | 68 | - | - | 129 | - | - | | | | |
| for. infraorb. part. | 67 | 4 | 6,0 | 119 | 3 | 2,5 | 1,41 | 0,2354 | 0,62 | 0,4323 |
| depr. bipar. circum. | 69 | - | - | 223 | - | - | | | | |
| for. pariet. absens | 81 | 47 | 58,0 | 154 | 90 | 58,4 | 0 | 0,9509 | 0,01 | 0,9382 |
| for. pariet. inf. | 78 | - | - | 119 | - | - | | | | |
| proc. pariet. sq. temp. | 71 | 3 | 4,2 | 96 | - | - | 4,13 | 0,0421 | 2,08 | 0,149 |
| for. squam. sup. | 75 | 2 | 2,7 | 105 | 1 | 1,0 | 0,78 | 0,3758 | 0,09 | 0,7678 |
| for. mastoid. intras. | 67 | 29 | 43,3 | 84 | 33 | 39,3 | 0,25 | 0,6198 | 0,11 | 0,7417 |
| for. mastoid. extras. | 66 | 40 | 60,6 | 92 | 45 | 48,9 | 2,11 | 0,146 | 1,67 | 0,1963 |
| for. tympan. | 114 | 4 | 3,5 | 197 | 9 | 4,6 | 0,2 | 0,6527 | 0,02 | 0,876 |
| for. marginale | 111 | 4 | 3,6 | 195 | 11 | 5,6 | 0,63 | 0,4274 | 0,27 | 0,6043 |
| for. occipitale | 52 | 8 | 15,4 | 70 | 11 | 15,7 | - | 0,9604 | 0,04 | 0,8393 |
| for. condylare | 53 | 23 | 43,4 | 91 | 48 | 52,7 | 1,17 | 0,2791 | 0,83 | 0,363 |
| can. condylaris | 56 | 16 | 28,6 | 95 | 31 | 32,6 | 0,27 | 0,6027 | 0,11 | 0,7349 |
| can. condyl. interm. | 65 | 2 | 3,1 | 120 | 2 | 1,7 | 0,4 | 0,529 | 0,01 | 0,9202 |
| ***for. hypogl. bipart.*** | ***94*** | ***9*** | ***9,6*** | ***155*** | ***36*** | ***23,2*** | ***7,36*** | ***0,0067*** | ***6,47*** | ***0,011*** |
| for. spin. incompl. | 57 | 13 | 22,8 | 83 | 21 | 25,3 | 0,11 | 0,7353 | 0,02 | 0,8906 |
| for. ovale incompl. | 62 | 1 | 1,6 | 114 | 4 | 3,5 | 0,52 | 0,4696 | 0,06 | 0,8039 |
| for.ovale et spin. confl. | 70 | - | - | 142 | 1 | 0,7 | 0,5 | 0,4816 | 0,13 | 0,7174 |
| for. Vesalii | 69 | 11 | 15,9 | 125 | 15 | 12 | 0,6 | 0,4404 | 0,3 | 0,5813 |
| for. ovale part. | 71 | 1 | 1,4 | 132 | 1 | 0,8 | 0,2 | 0,6543 | 0,09 | 0,7663 |
| for. mentale part. | 130 | - | - | 235 | - | - | | | | |
| for. mentale absens | 130 | - | - | 233 | 2 | 0,9 | 1,12 | 0,2895 | 0,1 | 0,7491 |
| ponticulus mylohyoideus | 99 | 5 | 5,1 | 171 | 7 | 4,1 | 0,14 | 0,7131 | 0 | 0,9511 |
| sulc. myloh. absens | 108 | 2 | 1,9 | 181 | - | - | 3,38 | 0,0662 | 1,22 | 0,2697 |
| for. mandib. access. | 93 | 1 | 1,1 | 147 | 4 | 2,7 | 0,76 | 0,3845 | 0,16 | 0,6848 |
| for. pr. trans. part. C1-7 | 24 | 20 | 83,3 | 37 | 33 | 89,2 | 0,44 | 0,5081 | 0,07 | 0,7843 |
| for. pr. trans. part. C1 | 43 | 1 | 2,3 | 55 | - | - | 1,29 | 0,2556 | 0,02 | 0,9013 |
| for. pr. trans. part. C2 | 40 | - | - | 79 | 2 | 2,5 | 1,03 | 0,3102 | 0,07 | 0,7948 |
| for. pr. trans. part. C3 | 34 | - | - | 61 | - | - | | | | |
| for. pr. trans. part. C4 | 36 | 1 | 2,8 | 67 | 4 | 6,0 | 0,52 | 0,4723 | 0,06 | 0,8118 |
| for. pr. trans. part. C5 | 36 | 6 | 16,7 | 65 | 15 | 23,1 | 0,58 | 0,4471 | 0,25 | 0,614 |
| for. pr. trans. part. C6 | 33 | 19 | 57,6 | 55 | 32 | 58,2 | 1,89 | 0,1688 | 1,37 | 0,241 |
| for. pr. trans. part. C7 | 29 | 2 | 6,9 | 42 | 6 | 14,3 | 0,94 | 0,3331 | 0,34 | 0,5578 |
| for. pr. trans. apart. C1-7 | 12 | 4 | 33,3 | 12 | 2 | 16,7 | 0,89 | 0,3458 | 0,22 | 0,6374 |
| for. pr. trans. apart. C1 | 42 | 1 | 2,4 | 48 | 2 | 4,2 | 0,22 | 0,6378 | 0,01 | 0,9063 |
| for. pr. trans. apart. C2 | 41 | 2 | 4,9 | 78 | - | - | 3,87 | 0,0492 | 1,48 | 0,2237 |
| for. pr. trans. apart. C3 | 33 | - | - | 58 | - | - | | | | |
| for. pr. trans. apart. C4 | 35 | - | - | 66 | - | - | | | | |

| trait | Male | | | Female | | | $\chi 2$ test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi 2$ | p | $\chi 2$ | p |
| for. pr. trans. apart. C5 | 36 | - | - | 69 | - | - | | | | |
| for. pr. trans. apart. C6 | 33 | - | - | 53 | - | - | | | | |
| for. pr. trans. apart. C7 | 29 | 1 | 3,4 | 48 | - | - | 1,68 | 0,1953 | 0,07 | 0,7977 |
| pont. os. sphenoid. | 60 | 3 | 5 | 117 | 3 | 2,6 | 0,72 | 0,3966 | 0,17 | 0,6826 |
| proc. pter.-spinos. | 64 | - | - | 118 | 2 | 1,7 | 1,1 | 0,295 | 0,09 | 0,7621 |
| proc. pter.-alaris | 65 | 3 | 4,6 | 117 | 3 | 2,6 | 0,55 | 0,4577 | 0,1 | 0,757 |
| ponticuli sellae | 25 | 5 | 20 | 61 | 11 | 18,0 | 0,05 | 0,8314 | 0,01 | 0,9265 |
| pont. clinoid medius | 28 | 3 | 10,7 | 69 | 10 | 14,5 | 0,25 | 0,6206 | 0,03 | 0,8681 |
| pont. carot.-clinoid. | 30 | 2 | 6,7 | 69 | 1 | 1,4 | 1,94 | 0,164 | 0,57 | 0,4509 |
| pont. interclinoid. | 46 | 2 | 4,3 | 86 | - | - | 3,8 | 0,0514 | 1,44 | 0,2298 |
| taenie interclinoid. | 33 | 2 | 6,1 | 79 | - | - | 4,87 | 0,0273 | 2,03 | 0,1541 |
| pont. atlantis | 54 | 2 | 3,7 | 77 | 5 | 6,5 | 0,49 | 0,4846 | 0,09 | 0,7609 |
| pont. atlantis lat. | 60 | - | - | 90 | 2 | 2,2 | 1,35 | 0,2451 | 0,19 | 0,6629 |
| pont. atlantis post. | 60 | 2 | 3,3 | 88 | 5 | 5,7 | 2,81 | 0,0939 | 0,91 | 0,3403 |
| for. suprascap. | 58 | - | - | 94 | 7 | 7,4 | 4,53 | 0,0334 | 2,99 | 0,0837 |
| | | | | | | | | | | |
| spina trochlearis | 74 | 13 | 17,6 | 153 | 26 | 17,0 | 0,01 | 0,9144 | 0,01 | 0,9361 |
| tuberc. marginale | 90 | 62 | 68,9 | 140 | 82 | 58,6 | 2,49 | 0,1145 | 2,07 | 0,1502 |
| tuberc. zygomax. | 71 | 16 | 22,5 | 137 | 29 | 21,2 | 0,05 | 0,8204 | 0 | 0,9605 |
| torus palatinus | 56 | 11 | 19,6 | 93 | 26 | 28,0 | 1,29 | 0,2552 | 0,89 | 0,3462 |
| torus maxillaris | 113 | 3 | 2,7 | 188 | 1 | 0,5 | 2,43 | 0,1194 | 1,08 | 0,2994 |
| **depres. suprameat.** | **97** | **66** | **68,0** | **161** | **74** | **46,0** | **11,89** | **0,0006** | **11,02** | **0,0009** |
| **spina suprameat.** | **99** | **67** | **67,7** | **154** | **80** | **51,9** | **6,12**** | **0,0133** | **5,49** | **0,0191** |
| torus acusticus | 115 | 32 | 27,8 | 198 | 14 | 7,1 | 25*** | - | 23,37 | - |
| **torus occipitalis** | **58** | **14** | **24,1** | **82** | **7** | **8,5** | **6,49** | **0,0109** | **5,32** | **0,0211** |
| proc. retromast. | 87 | 6 | 6,9 | 122 | 5 | 4,1 | 0,8 | 0,3719 | 0,34 | 0,5627 |
| **tuberc. praecond.** | **85** | **6** | **7,1** | **167** | **2** | **1,2** | **6,3** | **0,0121** | **4,53*** | **0,0333** |
| tuberc. pharyng. | 56 | 50 | 89,3 | 92 | 73 | 79,3 | 2,45 | 0,1176 | 1,79 | 0,1807 |
| proc. paracond. | 47 | - | - | 68 | 2 | 2,9 | 1,41 | 0,2356 | 0,21 | 0,6451 |
| torus mandibul. | 131 | 3 | 2,3 | 232 | 2 | 0,9 | 1,27 | 0,26 | 0,43 | 0,511 |
| proc. supracond. | 92 | - | - | 155 | 2 | 1,3 | 1,2 | 0,274 | 0,13 | 0,7191 |
| for. supracond. | 106 | - | - | 177 | - | - | | | | |
| troch. tertius | 65 | 11 | 16,9 | 97 | 15 | 15,5 | 0,06 | 0,8041 | 0 | 0,9763 |
| | | | | | | | | | | |
| fossa pharyng. | 53 | 16 | 30,2 | 86 | 25 | 29,1 | 0,02 | 0,8883 | 0 | 0,9594 |
| linea nuchae supr. | 57 | 24 | 42,1 | 75 | 41 | 54,7 | 2,04 | 0,1528 | 1,57 | 0,2098 |
| **fossa costaclavic.** | **76** | **29** | **38,2** | **131** | **15** | **11,5** | **20,5** | **0** | **18,93** | **0** |
| **fossa pector. maj.** | **85** | **10** | **11,8** | **144** | **3** | **2,1** | **9,36** | **0,0022** | **7,64** | **0,0057** |
| fossa teres | 91 | 2 | 2,2 | 147 | 2 | 1,4 | 0,24 | 0,6253 | 0 | 0,9757 |
| **fossa bicipitis** | **50** | **12** | **24** | **85** | **4** | **4,7** | **11,22** | **0,0008** | **9,45** | **0,0021** |
| **fossa hypotroch.** | **104** | **15** | **14,4** | **182** | **8** | **4,4** | **9** | **0,0027** | **7,69** | **0,0059** |
| crista hypotroch. | 79 | 34 | 43,0 | 108 | 45 | 41,7 | 0,04 | 0,8513 | - | 0,97 |

| trait | Male | | | Female | | | χ2 test | | Yates'correction | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | χ2 | p | χ2 | p |
| fossa gastrocn. | 41 | 4 | 9,8 | 81 | 4 | 4,9 | 1,03 | 0,3099 | 0,39 | 0,5298 |
| inc. musc. vasti lat. (Pa) | 45 | 6 | 13,3 | 73 | 9 | 12,3 | 0,03 | 0,8736 | 0,02 | 0,9002 |
| fossa. musc. vasti lat. | 47 | - | - | 82 | - | - | | | | |
| fossa solei | 69 | 7 | 10,1 | 116 | 11 | 9,5 | 0,02 | 0,8832 | 0,01 | 0,9128 |
| crista solei | 48 | 15 | 31,3 | 83 | 32 | 38,6 | 0,71 | 0,401 | 0,42 | 0,5152 |

Table 5. The average incidence of bilateral non-metric traits on the right and left side and verification of laterality differences using the chi-square test, Yates correction or McNemar´s test.
Explanatory notes: traits with a statistically significant difference in laterality are in bold type.

| Trait | Right Side | | | Left Side | | | χ2 test | | Yates' correction | | McNemar test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Inci-dence | % | N | Inci-dence | % | χ2 | p | χ2 | p | χ2 |
| sut. parametop. | 250 | - | - | 242 | - | - | | | | | |
| oss. sut. coronalis | 167 | 1 | 0,6 | 174 | 3 | 1,7 | 0,23 | 0,335 | 0,21 | 0,644 | |
| ossiculum praefrontale | 102 | 1 | 1,0 | 106 | 2 | 1,9 | 0,30 | 0,584 | - | 0,973 | |
| lam. orbit. partita | 24 | - | - | 21 | 1 | 4,8 | 1,12 | 0,291 | - | 0,965 | |
| oss. zygom.part. | 185 | 1 | 0,5 | 197 | 2 | 1,0 | 0,28 | 0,599 | - | 0,956 | |
| fiss. zygom. transv. | 159 | 6 | 3,8 | 160 | 7 | 4,4 | 0,07 | 0,786 | - | 0,991 | |
| oss. sut. zygo-max. | 146 | 2 | 1,4 | 167 | 4 | 2,4 | 0,44 | 0,509 | 0,06 | 0,805 | |
| sut. infraorbitale | 125 | 80 | 64 | 123 | 81 | 65,9 | 0,09 | 0,760 | 0,03 | 0,863 | 2,6 |
| sutura incisiva | 224 | 82 | 36,6 | 222 | 81 | 36,5 | 0 | 0,979 | 0,01 | 0,943 | |
| oss. epiptericum | 85 | 11 | 12,9 | 88 | 14 | 15,9 | 0,31 | 0,579 | 0,11 | 0,735 | 2 |
| sut. frontotemp. | 154 | 3 | 1,9 | 151 | - | - | 2,97 | 0,085 | 1,31 | 0,253 | |
| proc. front. os.temp. | 121 | 5 | 4,1 | 124 | 4 | 3,2 | 0,14 | 0,706 | - | 0,970 | |
| proc. temp. os. front. | 118 | 1 | 0,8 | 123 | 2 | 1,6 | 0,3 | 0,589 | - | 0,971 | |
| proc. pariet. os. sphen. | 92 | 18 | 19,6 | 89 | 9 | 10,1 | 3,18 | 0,074 | 2,48 | 0,115 | |
| oss. inc. pariet. | 124 | 6 | 4,8 | 133 | 14 | 10,5 | 2,89 | 0,089 | 2,15 | 0,142 | 2 |
| os pariet. part. | 218 | - | - | 220 | - | - | | | | | |
| oss. sut. squam. | 81 | 1 | 1,2 | 83 | 1 | 1,2 | - | 0,986 | 0,48 | 0,488 | |
| sq. tempor. part. | 152 | 2 | 1,3 | 151 | 1 | 0,7 | 0,33 | 0,565 | 0 | 0,995 | |
| sut. squamom. | 189 | 17 | 9,0 | 184 | 21 | 11,4 | 0,6 | 0,441 | 0,36 | 0,548 | 2 |
| proc. mast. bipart. | 165 | 4 | 2,4 | 157 | 5 | 3,2 | 0,17 | 0,679 | 0,01 | 0,940 | |
| os. sut. lambdoid. | 161 | 110 | 68,3 | 143 | 89 | 62,2 | 1,24 | 0,265 | 0,99 | 0,321 | 2,6 |
| sut. mendosa | 163 | 3 | 1,8 | 159 | 2 | 1,3 | 0,18 | 0,673 | 0 | 0,978 | |
| oss. asterii | 125 | 7 | 5,6 | 131 | 7 | 5,3 | 0,01 | 0,928 | 0,03 | 0,853 | |
| oss. sut. occipit. | 109 | 4 | 3,7 | 113 | 5 | 4,4 | 0,08 | 0,776 | 0 | 0,956 | 0,2 |
| | | | | | | | | | | | |
| oss. acromii | 54 | - | - | 55 | 1 | 1,8 | 0,99 | 0,320 | 0 | 0,993 | |
| oss. coracoid. | 76 | - | - | 60 | - | - | | | | | |
| oss. styl. radii | 59 | - | - | 52 | - | - | | | | | |
| oss. styl. ulnae | 38 | - | - | 25 | - | - | | | | | |
| synost. acet. incompl. (co) | 126 | - | - | 119 | - | - | | | | | |

| Trait | Right Side | | | Left Side | | | $\chi^2$ test | | Yates' correction | | McNemar test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi^2$ | p | $\chi^2$ | p | $\chi^2$ |
| oss. trigon. tali (Ta) | 128 | - | - | 122 | - | - | | | | | |
| | | | | | | | | | | | |
| fac. condyl. bipartita | 110 | 5 | 4,5 | 105 | 2 | 1,9 | 1,19 | 0,276 | 0,5 | 0,480 | |
| fac. art. sup. part. (C1) | 101 | 20 | 19,8 | 102 | 17 | 16,7 | 0,33 | 0,563 | 0,16 | 0,692 | 0,7 |
| fac. art. cost. C7 | 64 | - | - | 62 | 1 | 1,6 | 1,04 | 0,308 | 0 | 0,987 | |
| fac. art. cost. L1 | 45 | - | - | 42 | - | - | | | | | |
| fac. art. sacral. acces. (Sa) | 34 | 4 | 11,8 | 32 | 2 | 6,3 | 0,61 | 0,436 | 0,12 | 0,726 | |
| fac. art. sacr. acc. (Co) | 60 | 6 | 10 | 56 | 3 | 5,4 | 0,87 | 0,350 | 0,34 | 0,557 | |
| fac.art. acces. cost. (Cl) | 121 | 70 | 57,9 | 107 | 53 | 49,5 | 1,58 | 0,209 | 1,26 | 0,261 | **7,3** |
| fac. art. acromialis | 28 | 27 | 96,4 | 30 | 28 | 93,3 | 0,28 | 0,595 | 0 | 0,951 | |
| fac. art. acromialis absens | 26 | 1 | 3,8 | 32 | 4 | 12,5 | 1,36 | 0,243 | 0,49 | 0,486 | |
| fac. art. proc. corac. | 52 | 11 | 21,2 | 34 | 6 | 17,6 | 0,16 | 0,690 | 0,01 | 0,903 | |
| fac. art. carp. part. (Ra) | 68 | 8 | 11,8 | 54 | 3 | 5,6 | 1,41 | 0,234 | 0,76 | 0,384 | |
| fac. art. trochl. part. (Ul) | 72 | 22 | 30,6 | 66 | 22 | 33,3 | 0,12 | 0,727 | 0,03 | 0,867 | |
| inc. radial. part. (Ul) | 72 | 2 | 2,8 | 67 | - | - | 1,89 | 0,169 | 0,44 | 0,508 | |
| fac. lunata part. (Co) | 126 | - | - | 118 | - | - | | | | | |
| facies Poirieri (Fe) | 69 | 9 | 13,0 | 72 | 8 | 11,1 | 0,12 | 0,725 | 0,01 | 0,926 | |
| riding facet (Fe) | 128 | - | - | 123 | - | - | | | | | |
| facies Charlesi (Fe) | 62 | 22 | 35,5 | 75 | 30 | 40 | 0,29 | 0,588 | 0,13 | 0,715 | |
| fac. art. cond. media (Fe) | 61 | 29 | 47,5 | 74 | 32 | 43,2 | 0,25 | 0,618 | 0,11 | 0,745 | |
| facies Charlesi+fac. art. cond. media (Fe) | 123 | 51 | 41,5 | 149 | 62 | 41,6 | - | 0,980 | 0,01 | 0,921 | |
| patella multipartita | 72 | - | - | 70 | - | - | | | | | |
| fac.art.tib. acc.med. (Ti) | 46 | 3 | 6,5 | 45 | 4 | 8,9 | 0,18 | 0,672 | - | 0,976 | |
| fac. art. tib. acc. lat. (Ti) | 61 | 50 | 82,0 | 51 | 37 | 72,5 | 1,42 | 0,233 | 0,93 | 0,335 | |
| fac. art. tal. ant. et med. (Ca) | 142 | 61 | 43,0 | 126 | 59 | 46,8 | 0,4 | 0,525 | 0,26 | 0,608 | |
| fac. art. tal. a. et m. com. (Ca) | 149 | 86 | 57,7 | 125 | 70 | 56,0 | 0,08 | 0,775 | 0,03 | 0,870 | **4** |
| fac. art. tal. ant. bipart. (Ca) | 149 | - | - | 137 | 1 | 0,7 | 1,09 | 0,296 | - | 0,966 | |
| fac. art. tal. med. bipart. (Ca) | 152 | - | - | 140 | - | - | | | | | |
| fac. art. tal. ant. absens (Ca) | 148 | 6 | 4,1 | 132 | 4 | 3,0 | 0,21 | 0,645 | 0,02 | 0,8901 | |
| fac. art. calc. ant. et med. (Ta) | 142 | 20 | 14,1 | 129 | 24 | 18,6 | 1,02 | 0,314 | 0,71 | 0,3993 | |
| fac. art. calc. a. et m. com. (Ta) | 146 | 124 | 84,9 | 126 | 103 | 81,7 | 0,5 | 0,481 | 0,29 | 0,5882 | |
| fac. art. calc. ant. absens (Ta) | 147 | 2 | 1,4 | 127 | 2 | 1,6 | 0,02 | 0,883 | 0,13 | 0,7207 | |
| fac. art. med. tal. (Ta) | 90 | 3 | 3,3 | 81 | 3 | 3,7 | 0,02 | 0,895 | 0,08 | 0,7758 | |
| proc. troch. tali lat. (Ta) | 97 | 7 | 7,2 | 97 | 7 | 7,2 | - | 1 | 0,08 | 0,7814 | |
| proc. troch. tali med. (Ta) | 12 | - | - | 9 | - | - | | | | | |
| | | | | | | | | | | | |
| for. supratroch. | 111 | 13 | 11,7 | 115 | 22 | 19,1 | 2,38 | 0,123 | 1,84 | 0,175 | 3,6 |
| inc. fac. lunatae | 121 | 30 | 24,8 | 107 | 24 | 22,4 | 0,18 | 0,675 | 0,07 | 0,793 | |
| plate formation | 67 | 5 | 7,5 | 73 | 6 | 8,2 | 0,03 | 0,868 | 0,02 | 0,882 | |
| fossa Alleni | 92 | 1 | 1,1 | 95 | 4 | 4,2 | 1,75 | 0,186 | 0,76 | 0,384 | |

| Trait | Right Side | | | Left Side | | | χ2 test | | Yates' correction | | McNemar test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | χ2 | p | χ2 | p | χ2 |
| | | | | | | | | | | | |
| sulcus frontalis | 151 | 48 | 31,8 | 158 | 59 | 37,3 | 1,05 | 0,305 | 0,82 | 0,365 | **8,2** |
| for. et inc. supratr. | 237 | 1 | 0,4 | 247 | 1 | 0,4 | - | 0,977 | 0,46 | 0,497 | |
| for. et inc. frontalis | 222 | 204 | 91,9 | 231 | 208 | 90,0 | 0,47 | 0,493 | 0,27 | 0,602 | 0,4 |
| foramen frontale | 218 | 45 | 20,6 | 225 | 46 | 20,4 | - | 0,959 | - | 0,947 | 0,3 |
| incisura frontalis | 208 | 169 | 81,3 | 214 | 167 | 78,0 | 0,67 | 0,413 | 0,49 | 0,485 | 0,3 |
| for. et inc. suprorb. | 235 | 11 | 4,7 | 241 | 8 | 3,3 | 0,58 | 0,448 | 0,27 | 0,600 | 0,5 |
| foramen supraorb. | 241 | 11 | 4,6 | 245 | 6 | 2,4 | 1,61 | 0,205 | 1,04 | 0,307 | 1,7 |
| incisura supraorb. | 243 | 1 | 0,4 | 253 | 1 | 0,4 | - | 0,977 | 0,46 | 0,496 | |
| for. nasale absens | 88 | 10 | 11,4 | 77 | 4 | 5,2 | 2,01 | 0,156 | 1,3 | 0,255 | |
| for. zygomat. absens | 193 | 13 | 6,7 | 199 | 11 | 5,5 | 0,25 | 0,618 | 0,08 | 0,773 | 0,1 |
| for. ethmoidale | 85 | 82 | 96,5 | 84 | 82 | 97,6 | 0,19 | 0,660 | - | 0,989 | |
| can. opticus part. | 97 | - | - | 101 | 1 | 1,0 | 0,97 | 0,326 | - | 0,984 | |
| for. infraorb. absens | 154 | - | - | 149 | - | - | | | | | |
| for. infraorb. part. | 147 | 6 | 4,1 | 145 | 6 | 4,1 | - | 0,981 | 0,07 | 0,787 | |
| depr. bipar. circum. | 257 | - | - | 260 | - | - | | | | | |
| for. pariet. absens | 156 | 84 | 53,8 | 171 | 106 | 62,0 | 2,22 | 0,136 | 1,9 | 0,168 | 3,0 |
| for. pariet. inf. | 131 | - | - | 126 | - | - | | | | | |
| proc. pariet. sq. temp. | 111 | 1 | 0,9 | 107 | 2 | 1,9 | 0,38 | 0,540 | - | 0,975 | |
| for. squam. sup. | 124 | 3 | 2,4 | 119 | 1 | 0,8 | 0,94 | 0,334 | 0,21 | 0,644 | |
| for. mastoid. intras. | 91 | 36 | 39,6 | 85 | 32 | 37,6 | 0,07 | 0,795 | 0,01 | 0,916 | 0,7 |
| for. mastoid. extras. | 100 | 59 | 59,0 | 93 | 53 | 57,0 | 0,08 | 0,777 | 0,02 | 0,891 | 0,2 |
| for. tympan. | 218 | 22 | 10,1 | 214 | 19 | 8,9 | 0,19 | 0,667 | 0,07 | 0,790 | 0,4 |
| for. marginale | 223 | 13 | 5,8 | 225 | 6 | 2,7 | 2,92 | 0,088 | 2,16 | 0,142 | 0,8 |
| for. condylare | 122 | 66 | 54,1 | 110 | 60 | 54,5 | - | 0,946 | - | 0,949 | **4,5** |
| can. condylaris | 124 | 45 | 36,3 | 119 | 47 | 39,5 | 0,27 | 0,607 | 0,15 | 0,702 | 0,3 |
| can. condyl. interm. | 141 | 3 | 2,1 | 137 | 1 | 0,7 | 0,96 | 0,328 | 0,23 | 0,635 | |
| for. hypogl. bipart. | 182 | 24 | 13,2 | 177 | 31 | 17,5 | 2,41 | 0,120 | 1,98 | 0,159 | 0,0 |
| for. spin. incompl. | 87 | 21 | 24,1 | 98 | 20 | 20,4 | 0,37 | 0,542 | 0,19 | 0,665 | 0,1 |
| for. ovale incompl. | 124 | 2 | 1,6 | 133 | 3 | 2,3 | 0,14 | 0,709 | 0,01 | 0,937 | |
| for. ovale et spin. confl. | 128 | 2 | 1,6 | 134 | 2 | 1,5 | - | 0,963 | 0,21 | 0,647 | |
| for. Vesalii | 134 | 15 | 11,2 | 141 | 15 | 10,6 | 0,02 | 0,883 | 0 | 0,964 | 0,5 |
| for.ovale part. | 140 | 2 | 1,4 | 149 | 2 | 1,3 | - | 0,950 | 0,19 | 0,659 | |
| for. mentale part. | 272 | 1 | 0,4 | 273 | 1 | 0,4 | - | 0,998 | 0,5 | 0,480 | |
| for. mentale absens | 270 | 1 | 0,4 | 270 | 1 | 0,4 | - | 1 | 0,5 | 0,479 | |
| pont. mylohyoid. | 205 | 7 | 3,4 | 195 | 6 | 3,1 | 0,04 | 0,849 | 0,01 | 0,927 | 0,1 |
| sulc. myloh. absens | 213 | 2 | 0,9 | 207 | 2 | 1,0 | - | 0,977 | 0,22 | 0,636 | |
| for. mandib. access. | 179 | 13 | 7,3 | 170 | 8 | 4,7 | 1,01 | 0,315 | 0,61 | 0,436 | |
| for. pr. trans. part. C1-7 | 42 | 38 | 90,5 | 35 | 31 | 88,6 | 0,07 | 0,785 | 0,01 | 0,919 | |
| for. pr. trans. part. C1 | 51 | 1 | 2,0 | 66 | - | - | 1,31 | 0,253 | 0,02 | 0,897 | |
| for. pr. trans. part. C2 | 79 | - | - | 81 | 2 | 2,5 | 1,98 | 0,160 | 0,48 | 0,488 | |

| Trait | Right Side | | | Left Side | | | $\chi^2$ test | | Yates' correction | | McNemar test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | $\chi^2$ | p | $\chi^2$ | p | $\chi^2$ |
| for. pr. trans. part. C3 | 63 | - | - | 60 | - | - | | | | | |
| for. pr. trans. part. C4 | 65 | 3 | 4,6 | 66 | 2 | 3,0 | 0,22 | 0,636 | - | 0,986 | |
| for. pr. trans. part. C5 | 64 | 17 | 26,6 | 62 | 14 | 22,6 | 0,27 | 0,604 | 0,1 | 0,755 | 0,4 |
| for. pr. trans. part. C6 | 57 | 34 | 59,6 | 49 | 26 | 53,1 | 0,47 | 0,495 | 0,24 | 0,627 | 0,8 |
| for. pr. trans. part. C7 | 41 | 4 | 9,8 | 38 | 6 | 15,8 | 0,65 | 0,420 | 0,22 | 0,640 | |
| for. pr. trans. apart. C1-7 | 14 | 4 | 28,6 | 14 | 4 | 28,6 | - | 1,000 | 0,17 | 0,676 | |
| for. pr. trans. apart. C1 | 49 | 3 | 6,1 | 60 | 2 | 3,3 | 0,48 | 0,489 | 0,05 | 0,816 | |
| for. pr. trans. apart. C2 | 80 | 2 | 2,5 | 77 | 2 | 2,6 | - | 0,969 | 0,22 | 0,640 | |
| for. pr. trans. apart. C3 | 60 | - | - | 56 | - | - | | | | | |
| for. pr. trans. apart. C4 | 67 | - | - | 61 | - | - | | | | | |
| for. pr. trans. apart. C5 | 65 | - | - | 64 | - | - | | | | | |
| for. pr. trans. apart. C6 | 55 | - | - | 51 | - | - | | | | | |
| for. pr. trans. apart. C7 | 45 | - | - | 41 | 1 | 2,4 | 1,11 | 0,292 | - | 0,963 | |
| pont. os. sphenoid. | 120 | 3 | 2,5 | 119 | 5 | 4,2 | 0,53 | 0,462 | 0,14 | 0,710 | |
| proc. pter.-spinos. | 121 | 1 | 0,8 | 120 | 2 | 1,7 | 0,35 | 0,556 | - | 0,994 | |
| proc. pter.- alaris | 123 | 3 | 2,4 | 123 | 4 | 3,3 | 0,15 | 0,701 | - | 1,000 | |
| ponticuli sellae | 86 | 11 | 12,8 | 83 | 12 | 14,5 | 0,1 | 0,752 | 0,1 | 0,927 | |
| pont. clinoid medius | 95 | 9 | 9,5 | 93 | 9 | 9,7 | 0 | 0,962 | 0,04 | 0,841 | |
| pont. carot.-clinoid. | 98 | 5 | 5,1 | 88 | 1 | 1,1 | 2,34 | 0,126 | 1,24 | 0,266 | |
| pont. interclinoid. | 115 | 2 | 1,7 | 116 | 1 | 0,9 | 0,35 | 0,556 | - | 0,994 | |
| taenie interclinoid. | 107 | 1 | 0,9 | 107 | 1 | 0,9 | - | 1,000 | 0,5 | 0,477 | |
| pont. mylohyoid. | 205 | 7 | 3,4 | 195 | 6 | 3,1 | 0,04 | 0,849 | 0,01 | 0,927 | 0,1 |
| pont. atlantis | 87 | 5 | 5,7 | 93 | 3 | 3,2 | 0,67 | 0,412 | 0,21 | 0,647 | |
| pont. atlantis lat. | 96 | 1 | 1,0 | 104 | 1 | 1,0 | - | 0,955 | 0,43 | 0,513 | |
| pont. atlantis post. | 96 | 5 | 5,2 | 100 | 3 | 3,0 | 0,61 | 0,435 | 0,18 | 0,675 | |
| for. suprascap. | 106 | 4 | 3,8 | 101 | 4 | 4,0 | - | 0,944 | 0,08 | 0,771 | |
| | | | | | | | | | | | |
| spina trochlearis | 167 | 30 | 18,0 | 162 | 21 | 13,0 | 1,57 | 0,212 | 1,21 | 0,271 | **2,0** |
| tuberc. marginale | 164 | 88 | 53,7 | 157 | 85 | 54,1 | 0,01 | 0,931 | - | 0,980 | 0,4 |
| tuberc. zygomax. | 137 | 29 | 21,2 | 138 | 27 | 19,6 | 0,11 | 0,741 | 0,03 | 0,857 | |
| torus maxillaris | 217 | 2 | 0,9 | 228 | 3 | 1,3 | 0,16 | 0,693 | - | 0,956 | |
| depres. suprameat. | 207 | 87 | 42,0 | 200 | 85 | 42,5 | 0,01 | 0,923 | - | 0,997 | 2,3 |
| spina suprameat. | 210 | 93 | 44,3 | 196 | 77 | 39,3 | 1,04 | 0,308 | 0,85 | 0,358 | 4,0 |
| torus acusticus | 238 | 29 | 12,2 | 238 | 33 | 13,9 | 0,3 | 0,586 | 0,17 | 0,683 | 3,0 |
| proc. retromast. | 27 | 2 | 7,4 | 24 | 2 | 8,3 | 0,02 | 0,902 | 0,01 | 0,903 | |
| tuberc. praecond. | 171 | 6 | 3,5 | 168 | 5 | 3,0 | 0,08 | 0,782 | - | 0,976 | |
| proc. paracond. | 68 | - | - | 68 | 2 | 2,9 | 2,03 | 0,154 | 0,21 | 0,476 | |
| torus mandibul. | 274 | 3 | 1,1 | 262 | 2 | 0,8 | 0,16 | 0,690 | - | 0,960 | |
| proc. supracond. | 160 | 1 | 0,6 | 162 | 2 | 1,2 | 0,32 | 0,569 | - | 0,991 | |
| for. supracond. | 183 | - | - | 182 | - | - | | | | | |
| troch. tertius | 99 | 15 | 15,2 | 105 | 13 | 12,4 | 0,33 | 0,566 | 0,14 | 0,711 | 0,1 |

| Trait | Right Side | | | Left Side | | | χ2 test | | Yates' correction | | McNemar test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Inci-dence | % | N | Inci-dence | % | χ2 | p | χ2 | p | χ2 |
| | | | | | | | | | | | |
| linea nuchae supr. | 96 | 37 | 38,5 | 95 | 38 | 40,0 | 0,04 | 0,837 | 0 | 0,954 | |
| fossa costaclavic. | 125 | 25 | 20 | 122 | 23 | 18,9 | 0,05 | 0,820 | 0 | 0,947 | 0,25 |
| fossa pector. maj. | 163 | 12 | 7,4 | 142 | 5 | 3,5 | 2,13 | 0,145 | 1,46 | 0,227 | |
| fossa teres | 162 | 5 | 3,1 | 150 | 7 | 4,7 | 0,53 | 0,488 | 0,19 | 0,667 | |
| fossa bicipitis | 90 | 10 | 11,1 | 82 | 11 | 13,4 | 0,21 | 0,645 | 0,05 | 0,820 | |
| fossa hypotroch. | 177 | 15 | 8,5 | 183 | 14 | 7,7 | 0,08 | 0,774 | 0,01 | 0,925 | |
| crista hypotroch. | 125 | 42 | 33,6 | 122 | 43 | 35,2 | 0,07 | 0,786 | 0,02 | 0,890 | - |
| fossa gastrocn. | 79 | 4 | 5,1 | 85 | 5 | 5,9 | 0,05 | 0,818 | 0,01 | 0,910 | |
| inc.musc. vasti lat. | 61 | 7 | 11,5 | 64 | 9 | 14,1 | 0,19 | 0,665 | 0,03 | 0,869 | |
| fossa. musc. vasti lat. | 69 | - | - | 69 | - | - | | | | | |
| fossa solei | 131 | 21 | 16,0 | 122 | 22 | 18,0 | 0,18 | 0,672 | 0,07 | 0,798 | |
| crista solei | 100 | 31 | 31 | 89 | 20 | 22,5 | 1,74 | 0,187 | 1,33 | 0,248 | |

Table 7. Incidence of bilateral non-metric traits and preference of a symmetrical/asymmetrical incidence.
Explanatory notes: traits with a preference for a symmetrical incidence are in bold type, in the case of preference for an asymmetrical incidence they are in bold italics.

| | Frequency | | | | N | χ2 test | | Yates´correction | | McNemar test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 21 | 22 | 1 | | χ2 | p | χ2 | p | A/D | B/C |
| oss.sut. coronalis | | 1 | 2 | 147 | 150 | 2,97 | 0,0848 | 1,31 | 0,2529 | 148,01 | 139,32 |
| ossiculum praefrontale | | 1 | 1 | 95 | 97 | 1,98 | 0,1584 | 0,48 | 0,4863 | 95,01 | 89,25 |
| fiss. zygom. transv. | 4 | | 1 | 104 | 109 | 1,76 | 0,1846 | 0,76 | 0,382 | 95,72 | 104,08 |
| oss. sut. zygo-max. | | 1 | 2 | 111 | 114 | 2,96 | 0,853 | 1,3 | 0,2544 | 112,01 | 103,42 |
| **sut. infraorbitale** | **52** | **4** | **10** | **30** | **96** | **16,64** | **0** | **15,49** | **0,0001** | **12,49** | **59,65** |
| **sutura incisiva** | **74** | **4** | **3** | **131** | **212** | **47,27** | **0** | **45,7** | **0** | **65,03** | **190,03** |
| oss. epiptericum | 6 | 2 | 6 | 56 | 70 | 0,26 | 0,6103 | 0,05 | 0,8186 | 52,22 | 47,71 |
| sut. frontotemp. | | 3 | | 118 | 121 | 2,96 | 0,0852 | 1,3 | 0,2541 | 119,01 | 110,4 |
| proc. front. os. temp. | 2 | 3 | 2 | 85 | 92 | 1,24 | 0,2657 | 0,53 | 0,4667 | 84,27 | 76,25 |
| proc. temp. os. front. | 1 | | 1 | 87 | 89 | 1 | 0,5 | 0,477 | 84,1 | 84,1 | |
| proc. pariet. os. sphen. | 7 | 5 | 1 | 54 | 67 | 0,07 | 0,7912 | 0 | 0,9795 | 47,04 | 49,32 |
| oss. inc. pariet. | 3 | 2 | 6 | 89 | 100 | 2,16 | 0,1421 | 1,34 | 0,2467 | 89,48 | 76,68 |
| sut. squamom. | 9 | 2 | 6 | 119 | 136 | 0,06 | 0,814 | 0 | 0,9883 | 109,49 | 112,01 |
| proc. mast. bipart. | 1 | 2 | 1 | 107 | 111 | 0,98 | 0,3216 | 0,24 | 0,6265 | 106,08 | 100,43 |
| **os. sut. lambdoid.** | **66** | **20** | **11** | **42** | **139** | **9,44** | **0,0021** | **8,73** | **0,0031** | **25,29** | **67,35** |
| sut. mendosa | 2 | | | 137 | 139 | 1,98 | 0,1588 | 0,49 | 0,4842 | 131,18 | 137,01 |
| oss. asterii | 4 | 2 | | 99 | 105 | 0,65 | 0,4208 | 0,15 | 0,6958 | 91,74 | 97,23 |
| oss. sut. occipit. | 1 | 2 | 3 | 85 | 91 | 2,58 | 0,108 | 1,42 | 0,2332 | 86,1 | 75,26 |
| | | | | | | | | | | | |
| fac. condyl. bipartita | 2 | 3 | | 82 | 87 | 0,19 | 0,6593 | - | 0,9899 | 79,28 | 76,54 |
| fac. art. sup. part. (C1) | 11 | 8 | 5 | 73 | 97 | 0,15 | 0,7001 | 0,03 | 0,866 | 66,9 | 62,63 |
| fac. art. sacral. acces. (Sa) | 1 | 3 | 1 | 25 | 30 | 1,67 | 0,1969 | 0,68 | 0,4097 | 25,29 | 18,38 |

| | Frequency | | | | N | χ2 test | | Yates´correction | | McNemar test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 21 | 22 | 1 | | χ2 | p | χ2 | p | A/D | B/C |
| fac. art. sacr. acc. (Co) | 1 | 3 | 1 | 42 | 47 | 1,71 | 0,1909 | 0,72 | 0,396 | 42,19 | 34,59 |
| **fac. art. acces. cost. (Cl)** | **38** | **18** | **5** | **43** | **104** | **2,86** | **0,0908** | **2,39** | **0,1222** | **29,75** | **50,39** |
| **fac. art. acromialis** | **18** | **2** | | **1** | **21** | **9,29** | **0,0023** | **7,65** | **0,0057** | **0,1 (,7488)** | **14,09 (,002)** |
| fac. art. acromialis absens | 1 | | 2 | 18 | 21 | 0,31 | 0,5769 | - | 0,9682 | 164,41 | 14,09 |
| fac. art. proc. corac. | 4 | 2 | | 18 | 24 | 0,59 | 0,4411 | 0,11 | 0,7361 | 12,89 (,0003) | 16,96 |
| fac. art. carp. part. (Ra) | 3 | 3 | | 36 | 42 | - | 1 | 0,18 | 0,6726 | 32,09 | 32,09 |
| fac. art. trochl. part.(Ul) | 14 | 3 | 1 | 33 | 51 | 4,76 | 0,0292 | 3,7 | 0,0544 | 19,94 | 38,47 |
| inc. radial. part. (Ul) | | 1 | | 48 | 49 | 0,99 | 0,3197 | 0 | 0,9919 | 47,02 | 44,18 |
| facies Poirieri (Fe) | 5 | | 1 | 41 | 47 | 2,51 | 0,1131 | 1,35 | 0,2448 | 32,33 | 42,19 |
| facies Charlesi (Fe) | 18 | | 3 | 32 | 53 | 9,07 | 0,0026 | 7,68 | 0,0056 | 16,28 | 42,88 |
| **fac. art. cond. media (Fe)** | **21** | **1** | **1** | **28** | **51** | **13,11** | **0,0003** | **11,47** | **0,0007** | **11,68** | **43,47** |
| **facies Charlesi+fac. art. cond. media (Fe)** | **40** | | **3** | **60** | **103** | **26,93** | **0** | **25,2** | **0** | **26,88** | **92,46** |
| fac. art. tib. acc. med. (Ti) | 1 | 1 | 1 | 24 | 27 | 0,32 | 0,5441 | - | 0,9751 | 22,32 | 19,86 |
| fac. art. tib. acc. lat. (Ti) | 24 | 2 | 2 | 7 | 35 | 10,65 | 0,0011 | 9,21 | 0,0024 | 1,69 (,1930) | 23,08 |
| **fac. art. tal. ant. et med. (Ca)** | **45** | **5** | **10** | **60** | **120** | **12,12** | **0,0005** | **11,13** | **0,0008** | **33,19** | **80,12** |
| **fac. art. tal. a. et m. com. (Ca)** | **60** | **12** | **4** | **50** | **126** | **19,93** | **0** | **18,77** | **0** | **22,72** | **83,67** |
| fac. art. tal. ant. bipart. (Ca) | | | 1 | 123 | 124 | 1 | 0,3183 | - | 0,9968 | 122,01 | 119,07 |
| fac. art. tal. ant. absens (Ca) | 1 | 1 | 2 | 117 | 121 | 0,98 | 0,3213 | 0,24 | 0,6257 | 116,07 | 110,4 |
| fac. art. calc. ant. et med.(Ta) | 14 | 1 | 5 | 91 | 111 | 2,94 | 0,0865 | 2,19 | 0,1387 | 73,73 | 92,44 |
| **fac. art. calc. a. et m. com. (Ta)** | **90** | **5** | **1** | **16** | **112** | **55,26** | **0** | **53,39** | **0** | **2,18** | **93,43** |
| fac. art. calc. ant.absens (Ta) | 1 | 1 | | 111 | 113 | - | 1 | 0,5 | 0,4776 | 108,08 | 108,08 |
| fac. art. med. tal. (Ta) | 2 | 1 | | 55 | 58 | 0,32 | 0,5687 | - | 0,9882 | 50,42 | 53,15 |
| proc. troch. tali lat.(Ta) | 4 | 1 | 1 | 67 | 73 | 0,64 | 0,4235 | 0,15 | 0,7012 | 60,05 | 65,33 |
| | | | | | | | | | | | |
| for. supratroch. (Hu) | 7 | 2 | 8 | 72 | 89 | 0,48 | 0,4869 | 0,19 | 0,659 | 68,34 | 61,45 |
| **inc.fac. lunatae (Co)** | **22** | **5** | | **73** | **100** | **9,48** | **0,0021** | **8,26** | **0,0041** | **48,6** | **84,15** |
| plate formation (Fe) | 4 | 1 | 1 | 42 | 48 | 0,63 | 0,4282 | 0,14 | 0,7104 | 35,56 | 40,5 |
| | | | | | | | | | | | |
| **sulcus frontalis** | **30** | **5** | **19** | **76** | **130** | **0,55** | **0,4574** | **0,35** | **0,5528** | **61,26** | **71,59** |
| for. et inc.supratr. | | 1 | 1 | 209 | 211 | 1,99 | 0,1583 | 0,49 | 0,4826 | 209 | 203,12 |
| **for. et inc. frontalis** | **170** | **12** | **9** | **11** | **202** | **84,2** | **0** | **82,55** | **0** | **2,58 (0,108)** | **145,29** |
| foramen frontale | 22 | 18 | 15 | 149 | 204 | 1,94 | 0,1637 | 1,56 | 0,2116 | 144,96 | 121,94 |
| **incisura frontalis** | **124** | **28** | **24** | **27** | **203** | **20,87** | **0** | **20,04** | **0** | **18,61** | **88,24** |
| ***for. et inc. suprorb.*** | | ***10*** | ***7*** | ***191*** | ***208*** | ***16,36*** | ***0,0001*** | ***14,42*** | ***0,0001*** | ***206*** | ***160,44*** |
| ***foramen supraorb.*** | | ***10*** | ***5*** | ***196*** | ***211*** | ***14,5*** | ***0,0001*** | ***12,57*** | ***0,0004*** | ***209*** | ***168,25*** |
| incisura supraorb. | 1 | | | 210 | 211 | 1 | 0,3179 | - | 0,9981 | 206,04 | 209 |
| for. nasale absens | 3 | 5 | 1 | 69 | 78 | 0,95 | 0,3308 | 0,4 | 0,5289 | 67,6 | 60,01 |
| for. zygomat. absens | 2 | 4 | 5 | 136 | 147 | 4,3 | 0,0382 | 3,12 | 0,0775 | 139,17 | 120,31 |

| | Frequency | | | | N | $\chi 2$ test | | Yates´correction | | McNemar test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 21 | 22 | 1 | | $\chi 2$ | p | $\chi 2$ | p | A/D | B/C |
| **for. ethmoidale** | **65** | | | **2** | **67** | **49** | **0** | **46,78** | **0** | **0,01 (0,9306)** | **65,01** |
| can. opticus part. | | | 1 | 82 | 83 | 0,99 | 0,3188 | - | 0,9952 | 81,01 | 78,11 |
| for. infraorb. part. | 4 | 1 | 1 | 107 | 113 | 0,65 | 0,4203 | 0,15 | 0,6949 | 99,69 | 105,22 |
| depr. bipar. circum. | 1 | | | 234 | 235 | 1 | 0,3178 | - | 0,9983 | 230,04 | 233 |
| for. pariet. absens | 59 | 22 | 35 | 54 | 170 | 0,03 | 0,8726 | - | 0,9579 | 52,84 | 55,26 |
| proc. pariet. sq. temp. | 1 | | 1 | 72 | 74 | - | 1 | 0,51 | 0,4766 | 69,12 | 69,12 |
| for. squam. sup. | 1 | 1 | | 75 | 77 | - | 1 | 0,54 | 0,4767 | 72,12 | 72,12 |
| for. mastoid. intras. | 17 | 10 | 14 | 32 | 73 | 0,93 | 0,3337 | 0,62 | 0,4297 | 33,61 | 23,75 |
| for. mastoid. extras. | 24 | 13 | 11 | 27 | 75 | - | 1 | 0,03 | 0,8683 | 25,25 | 25,25 |
| for. tympan. | 10 | 6 | 4 | 160 | 180 | - | 1 | 0,05 | 0,8183 | 150,32 | 150,32 |
| **for. marginale** | **2** | **7** | **4** | **174** | **187** | **6,02** | **0,0141** | **4,72** | **0,02898** | **179,13** | **154,67** |
| for. condylare | 35 | 16 | 6 | 35 | 92 | 2,27 | 0,1319 | 1,84 | 0,1754 | 24,69 | 41,76 |
| can. condylaris | 25 | 9 | 7 | 57 | 98 | 1,64 | 0,2009 | 1,23 | 0,2682 | 42,15 | 57,55 |
| can. condyl. interm. | | 2 | 1 | 110 | 113 | 2,96 | 0,0853 | 1,3 | 0,2545 | 111,01 | 102,42 |
| ***for. hypogl. bipart.*** | ***5*** | ***18*** | ***18*** | ***129*** | ***170*** | ***21,06*** | ***0*** | ***19,56*** | ***0*** | ***153,69*** | ***85,87*** |
| for. spin. incompl. | 10 | 6 | 5 | 45 | 66 | 0,04 | 0,8394 | - | 0,9743 | 39,8 | 37,87 |
| for. ovale incompl. | 1 | 1 | 1 | 92 | 95 | 0,33 | 0,5667 | - | 0,9928 | 90,09 | 87,26 |
| for. ovale et spin. confl. | 1 | 1 | | 96 | 98 | - | 1 | 0,51 | 0,4773 | 93,09 | 93,09 |
| for. Vesalii | 9 | 3 | 5 | 89 | 106 | 0,05 | 0,8155 | - | 0,9851 | 80,14 | 82,54 |
| for. ovale part. | 2 | | | 106 | 108 | 1,98 | 0,1592 | 0,49 | 0,4856 | 100,23 | 106,01 |
| for. mentale part. | 1 | | | 252 | 253 | 1 | 0,3178 | - | 0,9984 | 248,04 | 251 |
| for. mentale absens | 1 | | | 250 | 251 | 1 | 0,3178 | - | 0,9984 | 246,04 | 249 |
| sulc. myloh. absens | 2 | | | 159 | 161 | 1,99 | 0,1586 | 0,49 | 0,4836 | 153,15 | 159,01 |
| for. mandib. access. | 4 | 5 | 2 | 115 | 126 | 0,78 | 0,3759 | 0,33 | 0,5637 | 112,62 | 104,69 |
| **for. pr. trans. part. C1-7** | **20** | **3** | **1** | **3** | **27** | **7,71** | **0,0055** | **6,38** | **0,0115** | **,77 (0,3815)** | **15,61 (0,0001)** |
| for. pr. trans. part. C1 | | 1 | | 36 | 37 | 0,99 | 0,3205 | - | 0,9893 | 35,03 | 32,24 |
| for. pr. trans. part. C2 | | | 2 | 64 | 66 | 1,96 | 0,1604 | 0,48 | 0,4894 | 64,02 | 58,37 |
| for. pr. trans. part. C4 | | | 2 | 49 | 51 | 1,96 | 0,1613 | 0,47 | 0,4923 | 49,02 | 43,47 |
| for. pr. trans. part. C5 | 9 | 6 | 4 | 32 | 51 | 0,04 | 0,8332 | - | 0,9687 | 28,02 | 26,23 |
| for. pr. trans. part. C6 | 18 | 7 | 4 | 14 | 43 | 1,27 | 0,2601 | 0,83 | 0,3623 | 9,44 (0,0021) | 17,8 |
| for. pr. trans. part. C7 | 1 | | 5 | 21 | 27 | 2,41 | 0,1205 | 1,26 | 0,2621 | 22,32 | 13,78 |
| for. pr. trans. apart. C1-7 | 3 | 1 | | 4 | 8 | 0,81 | 0,3687 | 0,11 | 0,736 | 1,45 (0,2278) | 4 (0,0455) |
| for. pr. trans. apart. C1 | 2 | 1 | | 32 | 35 | 0,32 | 0,5718 | - | 0,9807 | 27,68 | 30,25 |
| for. pr. trans. apart. C2 | 1 | | | 62 | 63 | 0,99 | 0,3192 | - | 0,9937 | 58,14 | 61,02 |
| pont. os. sphenoid. | | 2 | 2 | 90 | 94 | 3,92 | 0,0478 | 2,17 | 0,1405 | 92,01 | 80,83 |
| proc. pter.-spinos. | | 1 | 1 | 91 | 93 | 1,98 | 0,1595 | 0,48 | 0,4866 | 91,01 | 85,26 |
| proc. pter.- alaris | | 2 | 2 | 93 | 97 | 3,92 | 0,0477 | 2,18 | 0,1403 | 95,01 | 83,8 |
| ponticuli sellae | 9 | 2 | 2 | 66 | 79 | 1,78 | 0,1824 | 1,09 | 0,2961 | 54,1 | 65,98 |
| pont. clinoid medius | 6 | 3 | 2 | 79 | 90 | 0,09 | 0,7698 | - | 0,9857 | 71,76 | 74,27 |

| | Frequency | | | | N | $\chi 2$ test | | Yates´correction | | McNemar test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 21 | 22 | 1 | | $\chi 2$ | p | $\chi 2$ | p | A/D | B/C |
| pont. carot.-clinoid. | 1 | 2 | | 83 | 86 | 0,33 | 0,5671 | - | 0,992 | 81,1 | 78,28 |
| pont. interclinoid. | 1 | | | 106 | 107 | 1 | 0,3184 | - | 0,9963 | 102,08 | 105,01 |
| taenie interclinoid. | 1 | | | 99 | 100 | 1 | 0,3197 | - | 0,996 | 95,09 | 98,01 |
| ***pont. mylohyoid.*** | ***1*** | ***5*** | ***4*** | ***146*** | ***156*** | ***6,21*** | ***0,0127*** | ***4,71*** | ***0,03*** | ***151,06*** | ***129,19*** |
| pont. atlantis | 2 | 2 | | 70 | 74 | - | 1 | 0,26 | 0,6124 | 66,33 | 66,33 |
| pont. atlantis lat. | 1 | | | 82 | 83 | 0,99 | 0,3188 | - | 0,9952 | 78,11 | 81,01 |
| pont. atlantis post. | 2 | 3 | | 78 | 83 | 0,19 | 0,6595 | - | 0,9894 | 75,29 | 72,57 |
| for. suprascap. | 1 | 2 | 2 | 71 | 76 | 2,57 | 0,1091 | 1,41 | 0,2357 | 71,12 | 60,49 |
| | | | | | | | | | | | |
| spina trochlearis | 13 | 12 | 6 | 111 | 142 | 0,73 | 0,3938 | 0,44 | 0,5069 | 105,7 | 94,56 |
| **tuberc. marginale** | **56** | **6** | **4** | **44** | **110** | **25,32** | **0** | **23,91** | **0** | **16,92** | **81,68** |
| **tuberc. zygomax.** | **19** | **3** | **2** | **69** | **93** | **7,27** | **0,007** | **6,14** | **0,0132** | **47,58** | **77,23** |
| torus maxillaris | 1 | 1 | | 197 | 199 | - | 1 | 0,5 | 0,4784 | 194,04 | 194,04 |
| **depres. suprameat.** | **59** | **14** | **7** | **91** | **171** | **14,75** | **0,0001** | **13,81** | **0,0002** | **53,57** | **115,63** |
| **spina suprameat.** | **59** | **12** | **4** | **94** | **169** | **20,4** | **0** | **19,25** | **0** | **52,11** | **124,89** |
| torus acusticus | 21 | 3 | 9 | 176 | 209 | 2,28 | 0,1314 | 1,76 | 0,1843 | 152,04 | 173,83 |
| proc. retromast. | 2 | | | 5 | 7 | 1,78 | 0,1824 | 0,33 | 0,5677 | 1,78 (0,1824) | 5,14 (0,0233) |
| tuberc. praecond. | 3 | 2 | 2 | 153 | 160 | 0,14 | 0,7085 | - | 0,9935 | 149,3 | 146,46 |
| proc. paracond. | | | 1 | 51 | 52 | 0,99 | 0,3196 | - | 0,9924 | 50,02 | 47,17 |
| torus mandibul. | 2 | 1 | | 246 | 249 | 0,33 | 0,5649 | - | 0,9972 | 241,1 | 244,04 |
| proc. supracond. | 1 | | 1 | 132 | 134 | 0 | 1 | 0,5 | 0,4779 | 129,07 | 129,09 |
| troch. tertius | 8 | 5 | 4 | 64 | 81 | 0,05 | 0,8175 | - | 0,9807 | 58,25 | 56,01 |
| | | | | | | | | | | | |
| **linea nuchae supr.** | **36** | | | **55** | **91** | **30,9** | **0** | **28,88** | **0** | **22,96** | **89,01** |
| fossa costaclavic. | 13 | 9 | 7 | 78 | 107 | 0,27 | 0,6011 | 0,11 | 0,7452 | 72,07 | 65,85 |
| fossa pector. maj. | 5 | 5 | | 109 | 119 | - | 1 | 0,1 | 0,7468 | 102,98 | 102,98 |
| ***fossa teres*** | ***1*** | ***3*** | ***4*** | ***117*** | ***125*** | ***4,36*** | ***0,0367*** | ***2,99*** | ***0,0837*** | ***120,07*** | ***103,7*** |
| fossa bicipitis | 4 | | 2 | 49 | 55 | 0,63 | 0,4265 | 0,14 | 0,707 | 42,37 | 47,44 |
| fossa hypotroch. | 11 | 2 | 3 | 142 | 158 | 2,14 | 0,1433 | 1,46 | 0,2273 | 126,13 | 141,74 |
| **crista hypotroch.** | **28** | **5** | **5** | **68** | **106** | **7,27** | **0,007** | **6,35** | **0,0118** | **44,25** | **77,8** |
| fossa gastrocn. | 3 | | 2 | 66 | 71 | 0,19 | 0,6603 | - | 0,9877 | 60,66 | 63,34 |
| fossa Alleni (Fe) | 1 | | 1 | 61 | 63 | - | 1 | 0,51 | 0,476 | 58,14 | 58,14 |
| inc. musc. vasti lat. (Pa) | 4 | 1 | 4 | 29 | 38 | 0,1 | 0,7526 | - | 0,9702 | 25,93 | 23,81 |
| fossa solei | 15 | 3 | 4 | 71 | 93 | 2,61 | 0,1065 | 1,93 | 0,165 | 54,9 | 72,25 |
| crista solei | 15 | 5 | | 47 | 67 | 4,37 | 0,0366 | 3,42 | 0,0643 | 31,72 | 51,68 |

Table 9. Comparison of the population group from the sub-castle (Kostelisko) and the castle on the basis of the measure of divergence. Traits in which both groups differed significantly statistically are in bold type.

| traits | Mikulčice sub-castle | | | Mikulčice-castle | | | Measure of Divergence | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Inci-dence | % | N | incid-Ince | % | MD | p=0,05 | p=0,01 | $S^2$ MD | Left Endpoint of 95 % Confidence Interval | Right Endpoint of 95 % Confidence Interval |
| sutura metopica | 297 | 23 | 7,7 | 967 | 98 | 10,1 | 0,01122 | 0,01320 | 0,32209 | 0,00695 | -0,15216 | 0,17460 |
| oss. sut. coronalis | 151 | 4 | 2,65 | 698 | 30 | 4,3 | 0,00884 | 0,02417 | 1,70000 | 0,02474 | -0,29945 | 0,31714 |
| oss. epiptericum | 75 | 19 | 25,33 | 394 | 76 | 19,3 | 0,04366 | 0,04761 | 0,39474 | 0,00262 | -0,05660 | 0,14393 |
| sut. frontotemp. | 121 | 3 | 2,48 | 457 | 12 | 2,6 | -0,01026 | 0,03136 | 2,50000 | 0,02710 | -0,33292 | 0,31241 |
| oss. bregmatic. | 217 | 1 | 0,5 | 719 | 1 | 0,1 | 0,00047 | 0,01800 | 12,00000 | 0,02036 | -0,27921 | 0,28014 |
| oss. sut. sagittal. | 180 | 13 | 7,2 | 692 | 30 | 4,3 | 0,02540 | 0,02100 | 0,66154 | 0,00534 | -0,11786 | 0,16866 |
| oss. lambdae | 99 | 20 | 20,2 | 702 | 125 | 17,8 | -0,00172 | 0,03458 | 0,34800 | 0,00047 | -0,04419 | 0,04074 |
| oss. sut. lambdoid. abs. | 175 | 42 | 24,0 | 658 | 281 | 42,7 | **0,67669** | 0,02170 | 0,16421 | 0,01098 | 0,47131 | 0,88208 |
| | | | | | | | | | | | | |
| fac. condyl. bipartita | 87 | 5 | 5,7 | 476 | 10 | 2,1 | 0,06425 | 0,04079 | 1,80000 | 0,01016 | -0,13330 | 0,26179 |
| enlargement cap. femoris | 53 | 19 | 35,8 | 406 | 210 | 51,7 | 0,18027 | 0,06399 | 0,34436 | 0,03531 | -0,18805 | 0,54859 |
| | | | | | | | | | | | | |
| for. supraorbitale | 213 | 17 | 8,0 | 894 | 198 | 22,1 | **0,39614** | 0,01744 | 0,38324 | 0,02227 | 0,10362 | 0,68866 |
| incisura supraorbitalis | 210 | 1 | 0,5 | 870 | 400 | 46,0 | **5,59914** | 0,01773 | 6,01500 | 0,16526 | 4,80235 | 6,39594 |
| for. ethmoidale absens | 101 | 2 | 2,0 | 241 | 4 | 1,7 | -0,01268 | 0,04215 | 4,50000 | 0,03634 | -0,38632 | 0,36096 |
| for. infraorb. part. | 116 | 8 | 6,9 | 512 | 1 | 0,2 | **0,39164** | 0,03172 | 6,75000 | 0,00088 | 0,33359 | 0,44969 |
| for. hypogl. bipart. | 179 | 50 | 27,9 | 546 | 15 | 2,7 | **1,46881** | 0,02225 | 0,52000 | 0,02647 | 1,14991 | 1,78771 |
| for. ovale incompletum | 96 | 3 | 3,1 | 620 | 33 | 5,3 | 0,01357 | 0,03609 | 2,18182 | 0,03657 | -0,36125 | 0,38839 |
| | | | | | | | | | | | | |
| torus palatinus | 221 | 44 | 19,9 | 605 | 147 | 24,3 | 0,02515 | 0,01853 | 0,17718 | 0,00188 | -0,05982 | 0,11012 |
| torus acusticus | 217 | 41 | 18,9 | 882 | 33 | 3,7 | **0,58716** | 0,01723 | 0,32816 | 0,00322 | 0,47595 | 0,69836 |
| tuberc. pharyng. absens | 196 | 55 | 28,1 | 583 | 194 | 33,3 | **0,03984** | 0,02045 | 0,14002 | 0,00021 | 0,01120 | 0,06847 |
| troch. tertius | 84 | 20 | 23,8 | 668 | 194 | 29,0 | 0,03112 | 0,04021 | 0,33093 | 0,00216 | -0,05991 | 0,12215 |
| | | | | | | | | | | | | |
| fossa pector. maj. | 121 | 12 | 9,9 | 760 | 98 | 12,9 | 0,01116 | 0,02874 | 0,56122 | 0,01223 | -0,20562 | 0,22793 |
| fossa teres | 128 | 11 | 8,6 | 748 | 111 | 14,8 | 0,07965 | 0,02745 | 0,59951 | 0,01898 | -0,19039 | 0,34970 |
| fossa pector. maj. et teres | 128 | 2 | 1,6 | 755 | 40 | 5,3 | 0,08634 | 0,02741 | 3,15000 | 0,04272 | -0,31877 | 0,49146 |
| fossa hypotroch. | 160 | 18 | 11,3 | 824 | 349 | 42,4 | **1,81234** | 0,02239 | 0,35053 | 0,05577 | 1,34946 | 2,27521 |
| fossa solei | 99 | 28 | 28,3 | 733 | 129 | 17,6 | **0,17602** | 0,03440 | 0,26080 | 0,00758 | 0,00535 | 0,34670 |

Table 11. Comparison of the population groups from the sub-castle (Kostelisko) and hinterland (Josefov) using the measure of divergence (on the basis of the same traits as in the case of the castle/sub-castle comparison). The traits in which both groups differed statistically significantly are in bold type.

| traits | Mikulčice sub-castle | | | Mikulčice-castle | | | Measure of divergence | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | inci-dence | % | N | inci-dence | % | MD | p=0,05 | p=0,01 | S 2 MD | Left Endpoint of 95 % Confidence Interval I | Right Endpoint of 95 % Confidence Interval |
| sutura metopica | 297 | 23 | 7,7 | 117 | 12 | 10,3 | 0,00499 | 0,03574 | 0,07148 | 0,01920 | -0,26660 | 0,27658 |
| oss. sut. coronalis | 151 | 4 | 2,65 | 86 | 11 | 12,8 | 0,33697 | 0,05475 | 0,10950 | 0,10640 | -0,30237 | 0,97630 |
| oss. epiptericum | 75 | 19 | 25,33 | 54 | 18 | 33,3 | 0,07508 | 0,09556 | 0,19111 | 0,00827 | -0,10317 | 0,25332 |
| sut. frontotemp. | 121 | 3 | 2,48 | 51 | 1 | 2,0 | -0,02506 | 0,08362 | 0,16723 | 0,06502 | -0,52484 | 0,47471 |
| oss. bregmatic. | 217 | 1 | 0,5 | 93 | - | - | -0,00890 | 0,04608 | 0,09217 | 0,05242 | -0,45766 | 0,43987 |
| oss. sut. sagittal. | 180 | 13 | 7,2 | 103 | 10 | 9,7 | 0,00242 | 0,04579 | 0,09159 | 0,02659 | -0,31716 | 0,32201 |
| oss. lambdae | 99 | 20 | 20,2 | 87 | 13 | 14,9 | 0,02725 | 0,06479 | 0,12957 | 0,00097 | -0,03369 | 0,08818 |
| oss. sut. lambdoid. abs. | 175 | 42 | 24,0 | 89 | 44 | 49,4 | **1,93941** | 0,05085 | 0,10170 | 0,07074 | 1,41810 | 2,46073 |
| | | | | | | | | | | | | |
| fac. condyl. bipartita | 87 | 5 | 5,7 | 43 | 3 | 7,0 | -0,02913 | 0,10425 | 0,20850 | 0,06567 | -0,53139 | 0,47314 |
| enlargement cap. femoris | 53 | 19 | 35,8 | 53 | 5 | 9,4 | **1,21666** | 0,11321 | 0,22642 | 0,11440 | 0,55373 | 1,87959 |
| | | | | | | | | | | | | |
| for. et inc. suprorb. | 210 | 19 | 9,0 | 98 | 4 | 4,1 | 0,07384 | 0,04490 | 0,08980 | 0,00509 | -0,06606 | 0,21373 |
| for. ethmoidale absens | 101 | 2 | 2,0 | 39 | 2 | 5,1 | 0,02746 | 0,10663 | 0,21325 | 0,14566 | -0,72058 | 0,77550 |
| for. infraorb. absens | 115 | - | - | 80 | 2 | 2,5 | 0,10934 | 0,06359 | 0,12717 | 0,14482 | -0,63655 | 0,85524 |
| for. condylaris absens | 126 | 35 | 27,8 | 49 | 7 | 14,3 | 0,27857 | 0,08503 | 0,17007 | 0,02675 | -0,04201 | 0,59915 |
| for. hypogl. bipart. | 179 | 50 | 27,9 | 52 | 13 | 25,0 | -0,01089 | 0,07445 | 0,14890 | 0,00400 | -0,13480 | 0,11301 |
| | | | | | | | | | | | | |
| proc. marginalis absens | 161 | 44 | 27,3 | 50 | 10 | 20,0 | 0,06081 | 0,07863 | 0,15727 | 0,03860 | -0,32427 | 0,44590 |
| torus palatinus | 221 | 44 | 19,9 | 71 | 1 | 1,4 | **1,04229** | 0,05583 | 0,11166 | 0,02602 | 0,72610 | 1,35848 |
| torus acusticus | 217 | 41 | 18,9 | 75 | 3 | 4,0 | **0,54606** | 0,05382 | 0,10765 | 0,00979 | 0,35208 | 0,74004 |
| tuberc. pharyng. absens | 196 | 55 | 28,1 | 56 | 19 | 33,9 | 0,03658 | 0,06888 | 0,13776 | 0,00174 | -0,04513 | 0,11828 |
| troch. tertius | 84 | 20 | 23,8 | 39 | 4 | 10,3 | 0,30234 | 0,11264 | 0,22527 | 0,02431 | -0,00327 | 0,60796 |
| | | | | | | | | | | | | |
| linea nuchae supr. | 94 | 39 | 41,5 | 81 | 21 | 25,9 | 0,44351 | 0,06895 | 0,13790 | 0,09167 | -0,14992 | 1,03693 |
| fossa pector. maj. | 121 | 12 | 9,9 | 64 | 13 | 20,3 | 0,18771 | 0,07167 | 0,14334 | 0,05990 | -0,29200 | 0,66743 |
| fossa teres | 128 | 11 | 8,6 | 62 | 8 | 12,9 | 0,02058 | 0,07182 | 0,14365 | 0,04229 | -0,38250 | 0,42366 |
| fossa hypotroch. | 160 | 18 | 11,3 | 66 | 24 | 36,4 | **1,08741** | 0,06420 | 0,12841 | 0,11534 | 0,42176 | 1,75305 |
| fossa solei | 99 | 28 | 28,3 | 67 | 14 | 20,9 | 0,06318 | 0,07508 | 0,15016 | 0,01046 | -0,13732 | 0,26368 |

Table 13. Comparison of the population groups from the castle and hinterland (Josefov) using the measure of divergence. The traits in which both groups differed statistically significantly are in bold type.

| traits | Mikulčice sub-castle | | | Mikulčice-castle | | | Measure of Divergence | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Incidence | % | N | Incidence | % | MD | p=0,05 | p=0,01 | $S^2$ MD | Left Endpoint of 95 % Confidence Interval l | Right Endpoint of 95 % Confidence Interval l |
| sutura metopica | 967 | 98 | 10,1 | 117 | 12 | 10,3 | -0,00956 | 0,02874 | 0,05749 | 0,00806 | -0,18549 | 0,16638 |
| oss. sut. coronalis | 698 | 30 | 4,30 | 86 | 11 | 12,8 | 0,20410 | 0,03918 | 0,07836 | 0,05466 | -0,25413 | 0,66232 |
| oss. epiptericum | 394 | 76 | 19,3 | 54 | 18 | 33,3 | 0,30498 | 0,06317 | 0,12634 | 0,02791 | -0,02244 | 0,63241 |
| sut. frontotemp. | 457 | 12 | 2,63 | 51 | 1 | 2,0 | -0,01731 | 0,06539 | 0,13078 | 0,04801 | -0,44676 | 0,41215 |
| oss. bregmatic. | 719 | 1 | 0,1 | 93 | - | - | -0,01214 | 0,03643 | 0,07286 | 0,05215 | -0,45974 | 0,43545 |
| oss. sut. sagittal. | 692 | 30 | 4,3 | 103 | 10 | 9,7 | 0,08682 | 0,03346 | 0,06692 | 0,03708 | -0,29062 | 0,46426 |
| oss. lambdae | 702 | 125 | 17,8 | 87 | 13 | 14,9 | 0,00197 | 0,03876 | 0,07751 | 0,00108 | -0,06246 | 0,06639 |
| oss. sut. lambdoid. abs. | 658 | 281 | 42,7 | 89 | 44 | 49,4 | **0,31626** | 0,03827 | 0,07653 | 0,00149 | 0,24068 | 0,39185 |
| | | | | | | | | | | | | |
| fac. condyl. bipartita | 476 | 10 | 2,1 | 43 | 3 | 7,0 | 0,09996 | 0,07607 | 0,15214 | 0,11722 | -0,57110 | 0,77102 |
| | | | | | | | | | | | | |
| for. ethmoidale abs. | 241 | 4 | 1,7 | 39 | 2 | 5,1 | 0,05315 | 0,08937 | 0,17874 | 0,13458 | -0,66588 | 0,77219 |
| for. infraorb. abs. | 512 | 1 | 0,2 | 80 | 2 | 2,5 | 0,15046 | 0,04336 | 0,08672 | 0,10834 | -0,49466 | 0,79559 |
| can. condylaris abs. | 545 | 477 | 87,5 | 55 | 30 | 54,5 | **2,17631** | 0,06005 | 0,12010 | 0,16190 | 1,38767 | 2,96494 |
| for. hypogl. bipart. | 546 | 15 | 2,7 | 52 | 13 | 25,0 | **1,18235** | 0,06319 | 0,12637 | 0,20366 | 0,29783 | 2,06687 |
| | | | | | | | | | | | | |
| torus palatinus | 605 | 147 | 24,3 | 71 | 1 | 1,4 | **1,44111** | 0,04721 | 0,09442 | 0,04425 | 1,02883 | 1,85340 |
| torus acusticus | 882 | 33 | 3,7 | 75 | 3 | 4,0 | -0,01411 | 0,04340 | 0,08680 | 0,03141 | -0,36149 | 0,33328 |
| tuberc. pharyng. abs. | 583 | 194 | 33,3 | 56 | 19 | 33,9 | -0,01879 | 0,05872 | 0,11743 | 0,00453 | -0,15068 | 0,11310 |
| troch. tertius | 668 | 194 | 29,0 | 39 | 4 | 10,3 | **0,60330** | 0,08141 | 0,16283 | 0,05118 | 0,15988 | 1,04672 |
| | | | | | | | | | | | | |
| fossa pector. maj. | 760 | 98 | 12,9 | 64 | 13 | 20,3 | 0,08292 | 0,05082 | 0,10164 | 0,02341 | -0,21698 | 0,38281 |
| fossa teres | 748 | 111 | 14,8 | 62 | 8 | 12,9 | -0,00990 | 0,05240 | 0,10480 | 0,00444 | -0,14046 | 0,12066 |
| fossa hypotroch. | 824 | 349 | 42,4 | 66 | 24 | 36,4 | 0,07125 | 0,04910 | 0,09819 | 0,03752 | -0,30840 | 0,45090 |
| fossa solei | 733 | 129 | 17,6 | 67 | 14 | 20,9 | 0,00221 | 0,04887 | 0,09774 | 0,00675 | -0,15885 | 0,16326 |