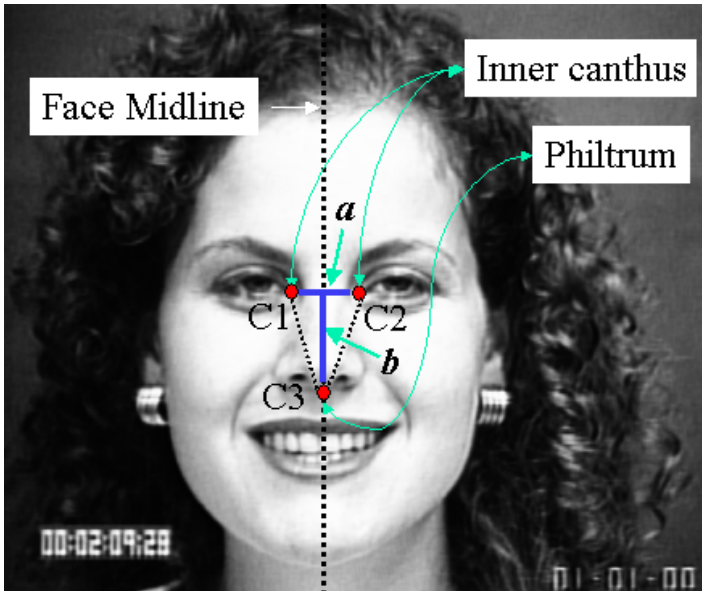
MORPHOMETRIC ANALYSIS OF FACIAL ASYMMETRY

[1]Meskini Dalila, [1]Filiptsova O.V., [1]Filippova M.A.,
[2]Kotenko V.V., [1]Burlaka I.S., [1]Sivalnyova D.O.
[1]The National University of Pharmacy, Kharkov, Ukraine
[2]V.N. Karazin Kharkov National University

Studying bilateral asymmetry in vertebrate organisms is carried out for a long time and involves various types and characteristics: dental and behavioral traits in humans, rats and mice; skull peculiarities in rats, cats, rhesus monkeys and humans, skeletal elements in mice and birds, sexual ornamentals in birds etc. One of the first classifications of symmetry and asymmetry was given in 1962 by Van Valen. He demonstrated three types of asymmetry to be: directional asymmetry, fluctuating asymmetry and antisymmetry. All asymmetries can be measured as a size difference between the left and the right sides of the body. Fluctuating asymmetry is often referred as minor variations of morphological landmarks from a perfect symmetry. Examples can include any signs of bilateral animals and plants. Directional asymmetry reflects a characteristic deviation which is constant within a species and can be seen as a greater development of the body in one side comparatively to the other (for example, dominant left and right position of the heart/liver in humans). Antisymmetry is expressed with a bimodal distribution curve R-L differences around zero. Examples of an antisymmetry in the nature can be observed in the development of signaling claws in a male crab. Both left and right claws can be signaling with an equal chance, and it is impossible to predict it.

An interest to the study of fluctuating asymmetry is high because it can reflect the instability of ontogenesis. Yet not all possible causes are known. Facial asymmetry is a kind of fluctuating asymmetry (see Figure).



The aim of the current research was to obtain morphometric characteristics of facial asymmetry in a sample of Ukrainian people.

85 people (24 males and 61 females) were enrolled. All participants were photographed or provided their high resolution photos. From a face midline to left and to right the following indexes of facial morphometry were measured: the distance to the inner corner of the eyes, the distance to the outer corner of the eyes, the distance to the wings of the nose and the distance to the corner of the lips.

Due to the fact that the absolute size of various images was different in some participant photos, all measurements were adjusted to a uniform scale by using ratios of a measurement difference between the same distances of the right (D_r) and the left (D_l) side to the measurement of the right side. So, relative indexes of asymmetry were further used. The results obtained have shown that all distributions were related to standard normal distribution (Table).

Table

Results of a distribution checking by Kolmogorov–Smirnov (D-value) and Shapiro–Wilk (W-value) tests

Names of relative asymmetry measurements	D-value and p	W-value and p
($D_r$inner corner of the eyes – $D_l$inner corner of the eyes)/ $D_r$inner corner of the eyes	0.095, $p<0.05$	0.963, $p>0.05$
($D_r$outer corner of the eyes – $D_l$outer corner of the eyes)/ $D_r$outer corner of the eyes	0.05, $p>0.05$	0.967, $p>0.05$
($D_r$wings of the nose – $D_l$wings of the nose)/ $D_r$wings of the nose	0.075, $p>0.05$	0.987, $p>0.05$
($D_r$corner of the lips – $D_l$corner of the lips)/ $D_r$corner of the lips	0.075, $p>0.05$	0.987, $p>0.05$

Note. The statistical significance is stated comparatively to alternative hypothesis.

Levene's test had shown the equality of variances, and ANOVA has shown the equality of mean values for all morphometric traits calculated for males and females. The Pearson correlation coefficients demonstrated that a relationship between different morphometric indexes was only direct both in males (r from 0.53 to 0.81) and females (r from 0.35 to 0.86).

So, the results demonstrated that some facial asymmetry is present in both males and females, but no sex differences were found between males and females in morphometric indexes of a face asymmetry. A facial asymmetry is a typical quantitative trait with a normal (Gaussian) distribution. The tendency to one-side asymmetry (right or left) of all measures was found in both males and females.