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Geography of the Nose: A Morphometric Study

Leslie G. Farkas, John C. Kolar, and Ian R. Munro

Toronto, Ontario, Canada

Abstract. The noses of 34 attractive young North American Caucasian women were analyzed quantitatively, based on 19 nasal measurements (6 single and 7 paired linear measurements, 3 angles, and 3 inclinations) and 15 craniofacial measurements (10 linear measurements and 5 inclinations) taken directly from the face of the women. The relationship between the nasal measurements was studied in 16 proportion indices and the relationship between the nasal and the other craniofacial measurements in 13 interareal indices. The findings were also compared with those in 21 women with below-average faces. Two types of facial harmony disruption were identified: *disharmony*, a normal index with a visually apparent failure of proportionality, and *disproportion*, an index value outside of the normal range. The percentage of disharmonies and disproportions was significantly higher in the group of 21 women with below-average faces. The study revealed a wide variety of "ideal" noses. Only a small portion of the measurements (12%) and proportion indices (7%) were at the mean value. At least two-thirds of the interareal proportion indices were located in the mean ±1 standard deviation portion of the normal range. Only about one-fifth of the interareal indices were disharmonious and 2.8% disproportionate. The disproportions were more areal in the attractive faces and more interareal in the below-average faces. The greatest disproportion in the attractive face was the moderately short columella in relation to the tip protrusion and in the below-average face the long nasal bridge related to the upper-lip height. Disproportions were associated with combinations of normal and abnormal measurements, or with two normal measurements of unequal quality, which resulted in a slightly smaller disfigurement. Analysis of ethnic and racial differences showed the soft nose as the main feature of the most characteristic differences. The study revealed that the key to restoration of facial harmony is the renewal of the uniformity of proportion index qualities by elimination disharmonies and/or disproportionate relationships.

Key words: Nose in attractive face — Anthropometry — Nasal proportions — Ethnic–racial differences

The nose, with its central position in the face, outlined by the sharp contours of the forehead, cheeks, and jaws, is widely believed to influence decisively the observer's visual impression of the face [54, 62, 67, 73, 89, 97]. The fine borderline between the irregularities of nose size and shape that remain unrecognizable and those that greatly influence our judgment is unknown [10].

The prerequisites of the "ideal nose," mostly subjective, have been discussed in many publications [11, 25, 61, 89, 90, 110]. Some linear parameters have been expressed in terms of the neoclassical canons [9, 12, 88] or of the golden proportion [43, 102, 104]. Sections of the facial profile and the nasofrontal and nasolabial angles were discussed in a number of aesthetically and orthodontically oriented papers [6, 14, 21, 25, 40, 46, 47, 57, 66, 79, 80, 83, 106–108, 112, 113, 115, 117]. However, studies based on objective analysis of the nose and face that encompasses the linear and angular measurements of the nose and their relationships to the measurements of the craniofacial complex are still lacking.

The purpose of this study was to determine the quantitative parameters of the "ideal" nose, to express the quality of nasofacial harmony in quantitative terms, and to show the significant differences

Address reprint requests to Leslie G. Farkas, M.D., Facial Measurement Laboratory, The Hospital for Sick Children, 555 University Avenue, Toronto, Ontario, Canada M5G 1X8

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Fig. 1. Landmarks of the head and face: tr = trichion, g = glabella, n = nasion, prn = pronasale, sn = subnasale, sto = stomion, gn = gnathion (menton), en = endocanthion, or = orbitale inferius, al = alare, sbal = subalare, ch = cheilion, ex = exocanthion (figure modified and reprinted with permission [29])

between the "ideal" nose and the nose in the below-average face [36].

Study Group

Data for the nose and face were derived from measurements in 34 attractive and 21 below-average faces selected from among 200 healthy young North American Caucasian women [38]. Ethnically, 44.1% (15 of 34) of the attractive women were Anglo-Saxon, 26.5% (9 of 34) Germanic, 11.8% (4 of 34) Latin, and 8.8% (3 of 34) Slav or of miscellaneous origin. The entire study group (N = 200) served as the control group for the nasal measurements. Ethnic differences between the noses were analyzed in Anglo-Saxon, Latin, Germanic, and Slavic subgroups of the entire study sample [59].

Racial differences in some aspects of the nose were studied in another group of 243 randomly selected young adult North Americans (108 men and 135 women). This group included 156 Caucasians, 55 Orientals, and 32 blacks: 50% of the Caucasians were Anglo-Saxons, 18.6% (29) Germanic, 10.2% (16) Latin, and 12.2% (19) from various other ethnic groups; 9.0% (14) were of undeterminable ethnic origin [31]. To ascertain the frequency of nostril asymmetries, 156 healthy Caucasians were used as a control group [32].

Uniformity in Terminology

The amount of literature on plastic surgery on and cosmetic problems of the nose is enormous. To benefit from this research "it is essential that a uniform terminology be employed to designate the various portions of the nose" [16]. This is also true for the nomenclature of the measurements. To avoid misunderstandings and confusion we used our updated terminology for the surface landmarks and measurements employed in standard anthropometry.

Anthropometry

Landmarks

Glabella (*g*) (Fig. 1) is a cephalic surface point at the most prominent midline point between the eyebrows, not visible on lateral views. When the area between the brows is flat, the upper edge of the eyebrows defines the position of the glabella. Despite some reports [86] the landmark is never below the level of the brows. Variations in the configuration of the area surrounding the glabella markedly influence the inclination of the profile line, which originates in this point [78]. The glabella is the border of the second and third portions of the four-section facial profile canon [34].

Nasion (*n*) (Fig. 1) is the most important bony profile landmark, hardly visible on lateral views, even when marked on the skin before photographing [29]. The landmark is located at the midline in the nasofrontal suture; to the observer's fingernail it feels like a slight ridge. The nasion is always higher than the level of the eye fissures [55] or the nasofrontal groove [84]. Lessard and Daniel [65] estimated the distance between the nasofrontal suture and the line connecting the inner canthi as 10.7 mm on adult autopsy material. They also found that the nasofrontal groove was 5.8 mm above the intercanthal line. In the entire control group of young adult women in the attractiveness study, the distance between the nasion and the intercanthal line was between 6 and 14 mm. In 67.7% of the group it was 10 mm (unpublished observations).

If the nasion point cannot be identified by palpa-

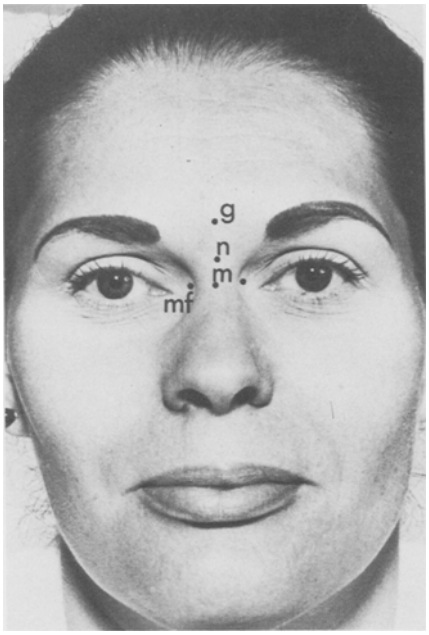

Fig. 2. Landmarks of the nasal root area: g = glabella, n = nasion, m = median or sellion, mf = maxillofrontale

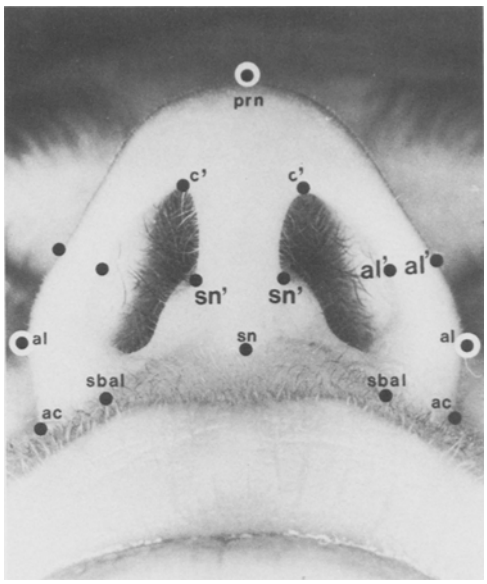

Fig. 3. Landmarks of the soft nose: prn = pronasale, al = alare, al′–al′ = points for measuring the thickness of the ala, ac = alar curvature point, c′ = highest point of the columella, sbal = subalare, sn = subnasale, sn′–sn′ = points for measuring the columella width (figure modified and reprinted with permission [30])

tion (after injuries, osteotomies, or inlays to the bridge of the nose), a point in the midline of the root at the level of the line connecting the highest points of the superior palpebral sulci may be substituted [1]. However, in facial malformations involving the orbits, this method has proved to be unreliable (unpublished observations).

Sellion (*s*) [84] (Fig. 2) is the deepest point of the nasofrontal angle. In some anthropometric studies it is marked as *m*, *m′* (median) [30, 50], or *n′* (subnasion) [37]. It is always lower than the nasion. The height of the nose has been measured mistakenly from the sellion [84], which is an important landmark when measuring the depth of the nasal root. On "Greek profiles" with a straight root crest or flattened nasofrontal angle, the sellion is on the level of the eye fissures.

Maxillofrontale (*mf*) [30] (Fig. 2) is our recently introduced nasal root landmark that indicates the terminal points of the nasal root width measurement (mf–mf). The landmark is in the lower third of the nasal root slopes, higher than the level of the endocanthions, where the maxillofrontal and nasofrontal sutures meet. Joseph's [57] "upper width of the nose" (*obere Nasenbreite*) is what we call the nasal root width measurement.

Alare (*al*) (Fig. 1) is the classical anthropometric landmark of the nasal wings (alae) at the most lateral point of the outer surface.

Pronasale (*prn*) (Fig. 1) is the most protruded point of the tip of the nose with the head in rest position. It is located in the midaxis of the *apex nasi*. On a nose that is bifid or has medial crura of asymmetric size or position, the most protruding point is para-axial. When measuring the nasal tip protrusion in such cases, both the shortest and the longest measurements are reported.

Top point of the columella (*c or c′*) [30] (Fig. 3) is at the level of the nostril tips. If the nostril sizes differ the columellar top points are asymmetric. Cottle [18] measured the width of the *apex nasi* at the level of the nostril tips.

Subnasale (*sn*) (Fig. 1), located in the midpoint of the columella base at the columella–labial junction [112], is another classical nasal landmark. It is very difficult to identify on lateral photographs [29] because of the height of the philtrum crest or irregularities of the maxillary surface. A long nasal bridge can cover the entire columella from the frontal view. Some orthodontists [14] locate the subnasale on the deepest point of the columella–upper-lip junction.

Subalare (*sbal*) [49] was introduced to mark the point where the nasal alar bases disappear into the skin of the upper lip (Fig. 3). This point helps determine the nostril floor width (sbal–sn) and the lateral height of the upper lip (sbal–ls′, r and l). The four main alar base configurations are full-curved, straight-thin and long, straight-thin and short, and curved-short. There are racial and ethnic alar base differences [31]. Combinations of various shapes may cause asymmetries of the alar base levels. We

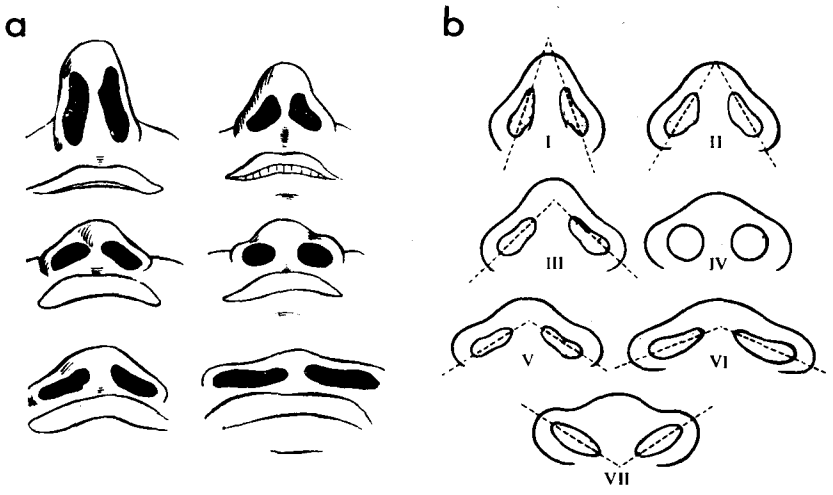

Fig. 4. Nostril types. **(a)** The six nostril types of Topinard [109]. **(b)** The seven nostril types of Farkas et al. [31] based on inclination of the nostril axis from the horizontal

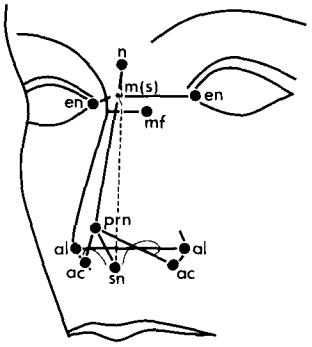

Fig. 5. A three-dimensional schematic drawing of the nasal framework outlined by the main linear measurements (modified, after Joseph [57]). Nose height (n–sn, dotted line), nasal bridge length (n–prn), nasal root depth (sagittal) shown by the fine line originating in m(s), nasal root width (horizontal), mf–mf [the right landmark is not visible], nasal root slope length (lateral, m–en), soft nose tip protrusion (sagittal, sn–prn), soft nose width (horizontal, al–al), ala length (lateral, ac–prn)

found such pseudodislocations in 14 of 156 healthy young adults (9%) [32].

Alar curvature point (*ac*) [30] is the most lateral point on the curved base line (alar groove) of each ala (Fig. 3). Cottle [18] determined the sagittal projection of the nasal tip from this point.

Terminal points of the nostril axis are the highest and the lowest spots of each nostril. Classification of the nostril types is based on inclination of the longitudinal axis of the nostrils [31] (Fig. 4). Landmarks showing the *width of the columella* (sn′–sn′) are in its midportion on the right and the left crests (Fig. 3) [30]. Landmarks showing the *thickness of the ala* (al′–al′) [30] are in the midportion of each ala (Fig. 3).

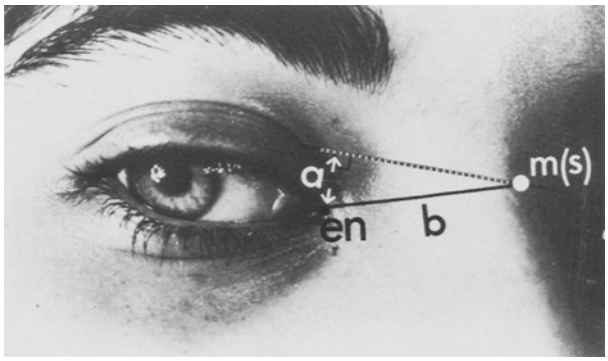

Fig. 6. Nasal root measurements: a = root depth, b = root slope, length, en = endocanthion, m(s) = sellion

Measurements

Eighteen nasal (Table 1 and Figs. 5–8) and 15 craniofacial (Table 2 and Fig. 9) measurements were taken directly from the surface of the face of each subject by one investigator (LGF). The measurement technique has been described elsewhere [30]. In addition, the *nasal tip angle* of Joseph [57], recently reintroduced by us, was obtained between the line following the general direction of the columella and the surface of the nasal bridge. In our study the angle was determined indirectly, by subtracting the inclination of the bridge from that of the columella.

Proportion Indices

Sixteen nasal indices defining the relationships between 11 nasal measurements (*areal nasal indices*) were calculated (Fig. 10 and Table 3). The position of the nose on the face was established by 13 *intera-*

Table 1. Nasal measurements in 34 women with above-average faces in comparison with controls

Type and measurement name (symbol)	Measurements in above-average faces				Measurements in subjects identical with control means	
	mm		degrees			
	Mean	S.D.	Mean	S.D.	*N*	%
Vertical (Fig. 5)						
Nose height (n–sn)	50.8	2.6				
Nasal bridge length (n–prn)	44.6	3.0			2	5.9
Horizontal						
Nose width (al–al) (Fig. 5)	31.1	1.8				
Ala length (ac–prn, 1)[a] (Fig. 5)	31.0	1.8				
Ala length surf (ac–prn surf, 1)	35.9	2.2				
Ala thickness (al′–al′, 1)	5.3	0.6			18	52.9
Nasal root width (mf–mf) (Fig. 5)	18.9	1.8				
Nasal root slope length (en–m, 1) (Fig. 6)	22.5	1.1			16	47.1
Columella width (sn′–sn′)	6.6	0.6			19	55.9
Nostril floor width (sbal–sn, 1)	10.9	1.5			11	32.4
Sagittal						
Nasal root depth (en–m′ sag, 1) (Fig. 6)	14.7	1.6			6	17.6
Nasal tip protrusion (sn–prn) (Fig. 5)	19.3	1.3			2	5.9
Columella length (c′–sn, 1) (Fig. 7)	11.2	1.8				
Inclinations (Fig. 8)						
Nasal bridge			30.8	3.9	8	23.5
Columella[a]			103.9	8.5	1	3.0
Angles (Fig. 8)						
Nasofrontal			133.9	6.5		
Nasolabial			102.1	8.2		
Nasal tip angle			73.1	8.0		

[a] Only 33 subjects were measured

Table 2. Selected craniofacial measurements in 34 women with above-average faces in comparison with controls (Fig. 9)

Type and measurement name (symbol)	Measurements in above-average faces				Measurements in subjects identical with control means	
	mm		degrees			
	Mean	S.D.	Mean	S.D.	*N*	%
Vertical						
1. Extended forehead height (tr–n)	61.9	5.4			3	8.8
2. Total face height (tr–gn)	171.9	8.4			3	8.8
3. Face height (n–gn)	111.4	4.6				
4. Upper-face height (n–sto)	69.1	2.5				
5. Lower-face height (sn–gn)	64.9	3.9			2	5.9
6. Mandible height (sto–gn)	43.6	3.1				
7. Upper-lip height (sn–sto)	20.0	1.6			9	26.5
Horizontal						
8. Face width (zy–zy)	128.8	4.3			2	5.9
9. Intercanthal width (en–en)	31.9	1.7			2	5.9
10. Mouth width (ch–ch)	50.9	3.5			4	11.8
Inclinations						
11. Forehead			−6.0	5.1	3	8.8
12. General profile line			−3.0	2.7	6	17.6
13. Upper-face line			2.7	3.0	4	11.8
14. Lower-face line			−12.4	3.4	1	2.9
15. Upper lip			1.8	6.3	8	23.5

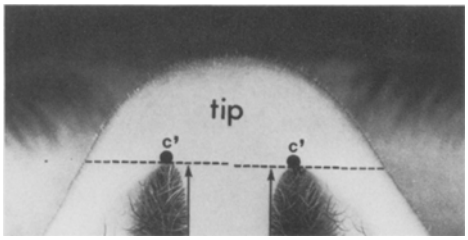

Fig. 7. Nasal tip area and the columella. The horizontal line that determines the upper limit of the columella is the base line of the nasal apex [18]. The width of the tip is measured along the horizontal. Each columella length is measured (figure modified and reprinted with permission [30])

real nasal indices in which nasal measurements were related to other craniofacial measurements (Fig. 11 and Table 4).

Canons

Six neoclassical facial canons involving nasal measurements were analyzed (Fig. 12): (1) three-section facial profile canon, (2) nasoaural canon, (3) orbitonasal canon, (4) nasofacial canon, (5) naso-oral canon, and (6) nasoaural inclination canon [34].

Relationships Between Inclinations and Angles

The relationships between the inclinations of the nasal bridge and the columella, forehead, and face, and between the nasofrontal and nasolabial angles (Table 5) were determined by calculating the differences between the inclinations/angles (Figs. 8 and 9) [33].

Asymmetry and Disfigurement

Asymmetry: The average differences between seven paired nasal measurements (Table 6) were compared with those in 51 normal young women [30].

Nasal disfigurement: The frequency and mean extent of deviations of the nasal bridge and columella, and the differences between the inclinations of the right and the left nostril axes were ascertained (Table 7) and compared with those in healthy controls [30].

Areas of the External Nose

Some areas of the nose are identified under different names in anatomy and anthropometry and by different authors. In addition, some names are used by different authors to refer to very different measurements.

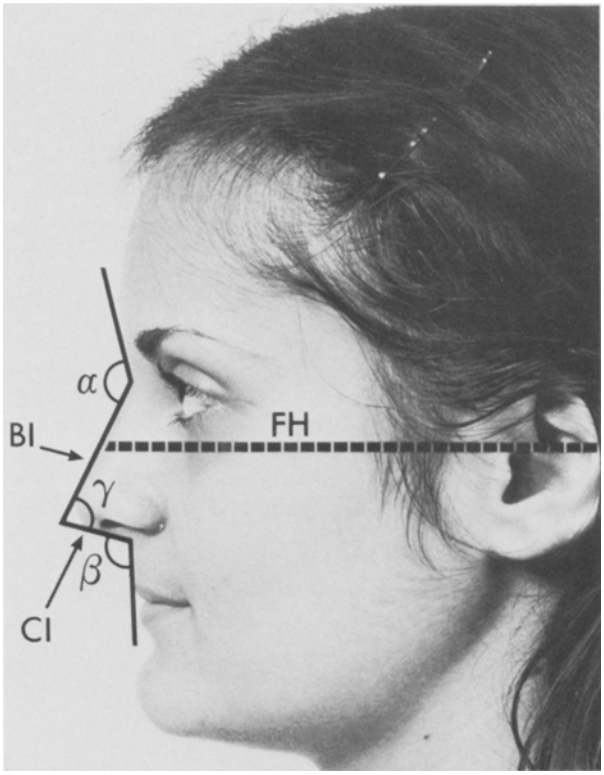

Fig. 8. Inclinations and angles of the nose: BI = nasal bridge inclination (measured from vertical), CI = columella inclination (measured from vertical), α = nasofrontal angle, β = nasolabial angle, γ = nasal tip angle [57], FH = Frankfurt horizontal

The external nose has a fixed cephalic and a mobile caudal portion. The bony pyramid and the cephalic portion of the upper lateral cartilages belong to the fixed nasal structures [16]. The mobile caudal cartilaginous structures are called the lobule [18] or soft nose [31]. According to Converse [16], confusion has resulted from the use of the term "lobule," which may indicate the tip [87] or the entire flexible cartilaginous portion [18] of the external nose.

The main anthropometric areas of the external nose are the *root* (*radix nasi*), the *bridge* (*dorsum nasi*), and the *soft nose* (Fig. 13). The basic anthropometric nasal framework is given by three proportion indices using five nasal measurements: the nasal root depth–width index (en–m′ sag × 100/mf–mf), the nasal index (al–al × 100/n–sn), and the nasal tip protrusion–width index (sn–prn × 100/al–al).

Root (*radix*): The root of the nose, located between the orbits, is the least protruding and narrowest portion of the nose. It is outlined proximally by the nasion [19] and distally by a line connecting the

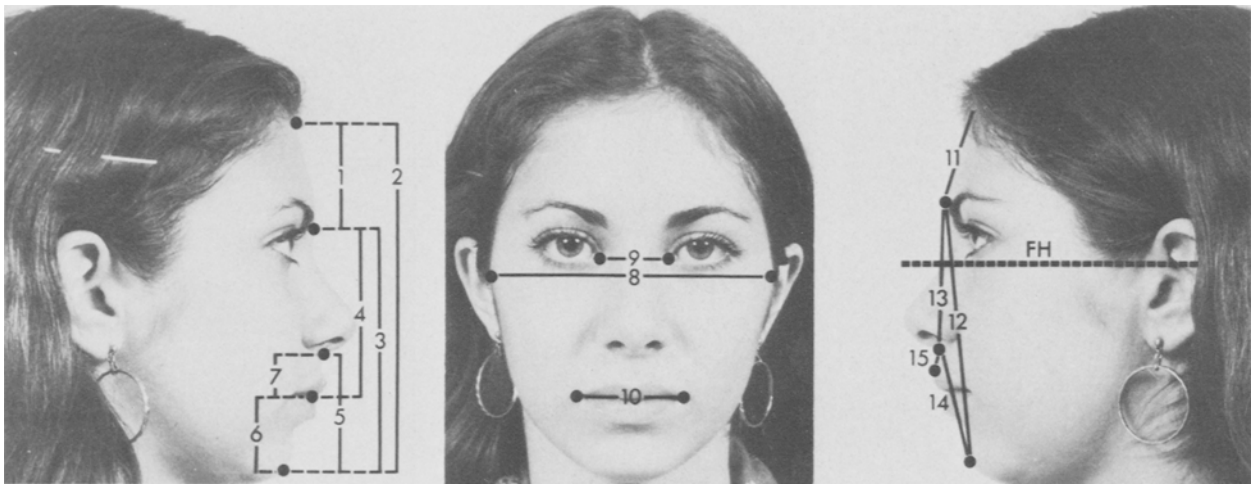

Fig. 9. Craniofacial measurements (for names of measurements see Table 2). Vertical profile (Nos. 1–7), horizontal (Nos. 8–10), facial inclinations (Nos. 11–15), FH = Frankfurt horizontal

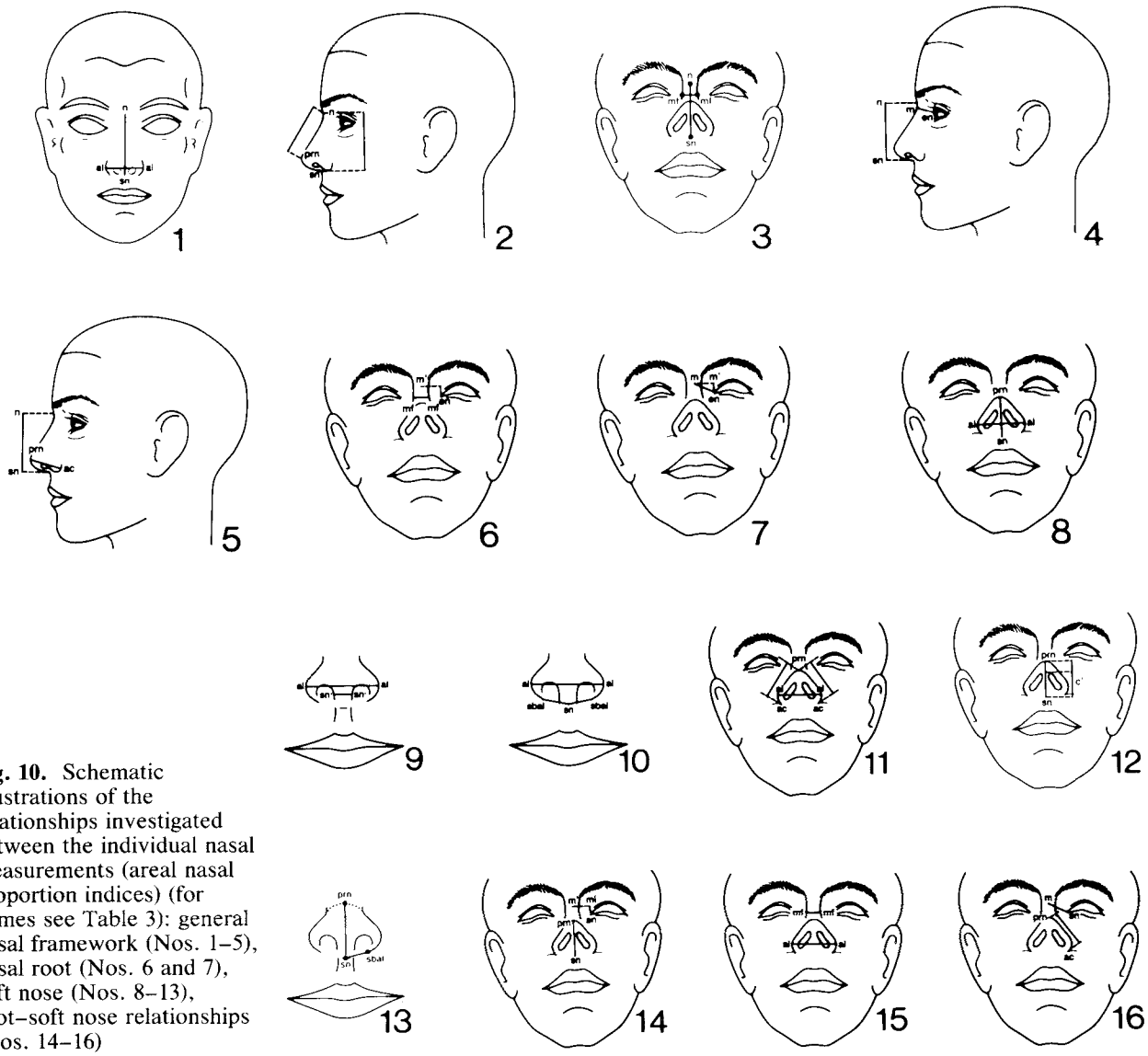

Fig. 10. Schematic illustrations of the relationships investigated between the individual nasal measurements (areal nasal proportion indices) (for names see Table 3): general nasal framework (Nos. 1–5), nasal root (Nos. 6 and 7), soft nose (Nos. 8–13), root–soft nose relationships (Nos. 14–16)

Table 3. Areal nasal indices in 34 above-average women's faces (Fig. 10)

Portion of nose and index	Index formula	Above-average faces		Measurements in subjects identical with control means	
		Mean	S.D.	*N*	%
General					
1. Nasal index (nose width/nose height)	$\frac{\text{al–al} \times 100}{\text{n–sn}}$	61.4	5.1	3	8.8
2. Nasal bridge index (nasal bridge length/nose height)	$\frac{\text{n–prn} \times 100}{\text{n–sn}}$	87.8	3.1	7	20.6
3. Nasal root width–nose height index	$\frac{\text{mf–mf} \times 100}{\text{n–sn}}$	37.2	3.7	0	0
4. Nasal root depth–nose height index	$\frac{\text{en–m' sag, l} \times 100}{\text{n–sn}}$	29.1	3.6	2	5.9
5. Ala length–nose height index[a]	$\frac{\text{ac–prn, l} \times 100}{\text{n–sn}}$	61.2	4.1	3	9.1
Root					
6. Nasal root depth–width index	$\frac{\text{en–m' sag, l} \times 100}{\text{mf–mf}}$	78.5	11.1	2	5.9
7. Nasal root depth–length index	$\frac{\text{en–m' sag, l} \times 100}{\text{en–m, l}}$	65.4	6.1	3	8.8
Soft nose					
8. Nasal tip protrusion–width index	$\frac{\text{sn–prn} \times 100}{\text{al–al}}$	62.2	5.5	2	5.9
9. Columella–nose width index	$\frac{\text{sn'–sn'} \times 100}{\text{al–al}}$	21.4	2.5	7	20.6
10. Nostril-nose width index	$\frac{\text{sbal–sn, r\&l} \times 100}{\text{al–al}}$	70.5	10.1	1	2.9
11. Nose width-ala lengths index*	$\frac{\text{al–al} \times 100}{\text{ac–prn, r\&l}}$	50.3	3.5	3	9.1
12. Columella length-nasal tip protrusion index	$\frac{\text{c'–sn, l} \times 100}{\text{sn–prn}}$	58.2	7.8	4	11.8
13. Nostril floor width–nasal tip protrusion index	$\frac{\text{sbal–sn, l} \times 100}{\text{sn–prn}}$	56.5	8.6	2	5.9
Root–soft nose relationship					
14. Nasal root depth–tip protrusion index	$\frac{\text{en–m' sag, l} \times 100}{\text{sn–prn}}$	76.6	10.0	2	5.9
15. Nasal root–nose width index	$\frac{\text{mf–mf} \times 100}{\text{al–al}}$	60.8	6.0	2	5.9
16. Nasal root–ala length index[a]	$\frac{\text{en–m, l} \times 100}{\text{ac–prn, l}}$	72.9	3.9	2	6.1

[a] Only 33 subjects were measured

edge of the lower eyelids. The root *depth* (projection, protrusion, or upper profile height) is measured sagittally between the sellion and the endocanthion level [30, 57, 114] (Fig. 6), the *width* (mf–mf) at the level of crossing of the nasofrontal and maxillofrontal sutures, and each *lateral slope* (m–en, right and left) from the vertical midline of the root to the appropriate endocanthion (Figs. 5, 6 and 13).

Nasofrontal angle (Fig. 8): This is measured between the proximal nasal bridge contour and the anterior surface of the forehead below the glabella [30]. A close relationship exists between the nasofrontal angle and the root measurements [58]. Some authors [61] refer to the nasofrontal angle as that between the slope of the forehead and the line following the nasal bridge contour.

Nasal bridge (*dorsum nasi*): The terms nasal bridge and *dorsum nasi* are used interchangeably in both the anthropometric and the surgical literature [7, 16, 30, 76, 84]. This structure is located between the root and the soft nose and is formed by fixed

Table 4. Interareal nasal indices in 34 above-average women's faces (Fig. 11)

Portion of nose and index	Index formula	Above-average faces		Measurements in subjects identical with control means	
		Mean	S.D.	*N*	%
Nose and head					
1. Nose–forehead height index	$\frac{\text{n–sn} \times 100}{\text{tr–n}}$	82.5	7.0	0	0
Nose and face					
2. Nose–total face height index	$\frac{\text{n–sn} \times 100}{\text{tr–gn}}$	29.6	1.5	9	26.5
3. Nose–face height index	$\frac{\text{n–sn} \times 100}{\text{n–gn}}$	45.6	2.1	2	5.9
4. Nose–lower face height index	$\frac{\text{n–sn} \times 100}{\text{sn–gn}}$	78.5	5.5	2	5.9
5. Nose–lower-third-face height index	$\frac{\text{n–sn} \times 100}{\text{sto–gn}}$	117.0	8.9	0	0
6. Nasal bridge length–lower face height index	$\frac{\text{n–prn} \times 100}{\text{sn–gn}}$	69.6	5.5	0	0
7. Nose–face width index	$\frac{\text{al–al} \times 100}{\text{zy–zy}}$	24.2	1.4	5	14.7
Nose and orbits					
8. Nasal root–intercanthal width index	$\frac{\text{mf–mf} \times 100}{\text{en–en}}$	59.1	3.9	1	2.9
9. Nasal root index	$\frac{\text{en–en} \times 100}{\text{en–m, r\&l}}$	71.2	3.3	0	0
10. Nasal root depth–intercanthal width index	$\frac{\text{en–m' sag, l} \times 100}{\text{en–en}}$	46.2	5.4	1	2.9
11. Nose–intercanthal width index	$\frac{\text{al–al} \times 100}{\text{en–en}}$	97.7	7.5	0	0
Nose and orolabial area					
12. Upper-lip height–nasal bridge length index	$\frac{\text{sn–sto} \times 100}{\text{n–prn}}$	45.0	4.3	3	8.8
13. Nose–mouth width index	$\frac{\text{al–al} \times 100}{\text{ch–ch}}$	61.5	5.8	1	2.9

Table 5. Differences between facial inclinations and between nasofrontal and nasolabial angles in 34 above-average faces

Measurements compared	Differences (in degrees)			
	Mean	S.D.	Minimum	Maximum
Inclinations				
Nasal bridge—general profile line	34.0	4.0	22.0	41.0
Nasal bridge—upper-face line	28.0	2.6	22.0	33.0
Nasal bridge—forehead	154.8	4.8	142.0	164.0
Nasal bridge—columella	72.8	8.2	61.0	89.0
Angles				
Nasofrontal–nasolabial	31.8	10.6	15.0	53.0

structures [16]. There are two standard anthropometric measurements in this area: the length of the bridge (n–prn) and the inclination of the bridge.

Length of the bridge is the projective distance between the nasion at the root and the pronasale on the tip of the nose. This measurement is referred to as the length of the nose (Länge der Nase of Martin) in old anthropologic textbooks [71] and also by

Table 6. Asymmetries in paired measurements of the nose in 34 above-average faces and controls

Paired measurement	Asymmetries				
	Subjects			Controls [30]	
	Frequency		Extent (mm)	Frequency (%)	Extent (mm)
	N	%			
Nasal root slope length (en–m)[a]	3	8.8	2.0	3.9	3.5
Nasal root depth (en–m′ sag)	0	0	0	2.7	1.0
Nostril floor width (sbal–sn)[b]	4	11.8	1.0	15.7	1.6
Ala thickness (al′–al′)	0	0	0	0	0
Ala length (ac-prn)	0	0	0	3.9	1.7
Ala length surf (ac–prn surf)	0	0	0		no norms
Columella length (sn–c′)[c]	5	14.7	1.0	7.8	1.0

[a] Lower on the right in two and on the left in one
[b] Lower on the left in four
[c] Lower on the left in five

Table 7. Other deformities of the nose in 34 above-average faces

Deformity	Subjects			Controls [30]	
	Frequency		Mean extent	Frequency (%)	Mean extent
	N	%			
Nasal bridge deviation	4[a]	11.8	2.8	25.5	3.4
Columella deviation	4[b]	11.8	4.5	13.7	4.4
Difference between the nares inclinations[c]	3	8.8	8.3	29.2[33]	—

[a] To right = 2, to left = 2
[b] To right = 1, to left = 3
[c] Right smaller in one by 5°, left smaller in two by 5° and 15°

some surgeons [41, 97]. Both Martin [71] and Joseph [57] also used the term "bridge length" (Nasenrücklänge) for this measurement. In our terminology, the length (or height) of the nose indicates the projective distance between the nasion and the subnasale landmarks, as used by Hrdlička [e.g., 55], French anthropologists ("Hauteur ou longueur du nez") [71], and Joseph (Nasenlänge [57]). In the nasal index, the height (or length) of the nose (n–sn) is related to the nose width (al–al), not the bridge length. The second most important index of the nose is the nasal bridge index, by which the bridge length (n–prn) is related to the nose height (n–sn) (Fig. 5).

Inclination of the nasal bridge [30] (Fig. 8) is also known as the aesthetic profile [57], the slope of the bridge of the nose [40], the projection of the nose [89], or the dorsal projection [11]. We determine the inclination of the bridge from the vertical with the head oriented in the Frankfurt horizontal [30]. Some authors express the inclination as the angle between the *dorsum nasi* and the anterior facial plane ("general profile line" in our nomenclature), that is, the line touching the glabella and the pogonion [117], which is also called the frontomental line [57] (Fig. 9). The same measurement is also known as frontal-nasal angle [6, 106], the nasofrontal angle [21], the facial nasal angle [41], the nasal projection [61], or the Profilwinkel or Nasofazialer Winkel [6].

Soft nose: The soft nose is the semimobile caudal portion of the nasal pyramid. It consists of the tip (*apex nasi*), nasal wings (*alae nasi*), and columella. The fourth structure, the membranous *septum nasi* [18], which has no anthropometric significance, is not discussed here.

Tip of the nose: This is formed by the junction of the two nasal wings [16]. Anthropometrically the tip of the soft nose is outlined by the horizontal line connecting the tips of the nostrils [18] (Fig. 7). The same line divides the tip portion from the columella [28]. The main surface landmark of the nasal tip is the pronasale, at the most protruding point of the

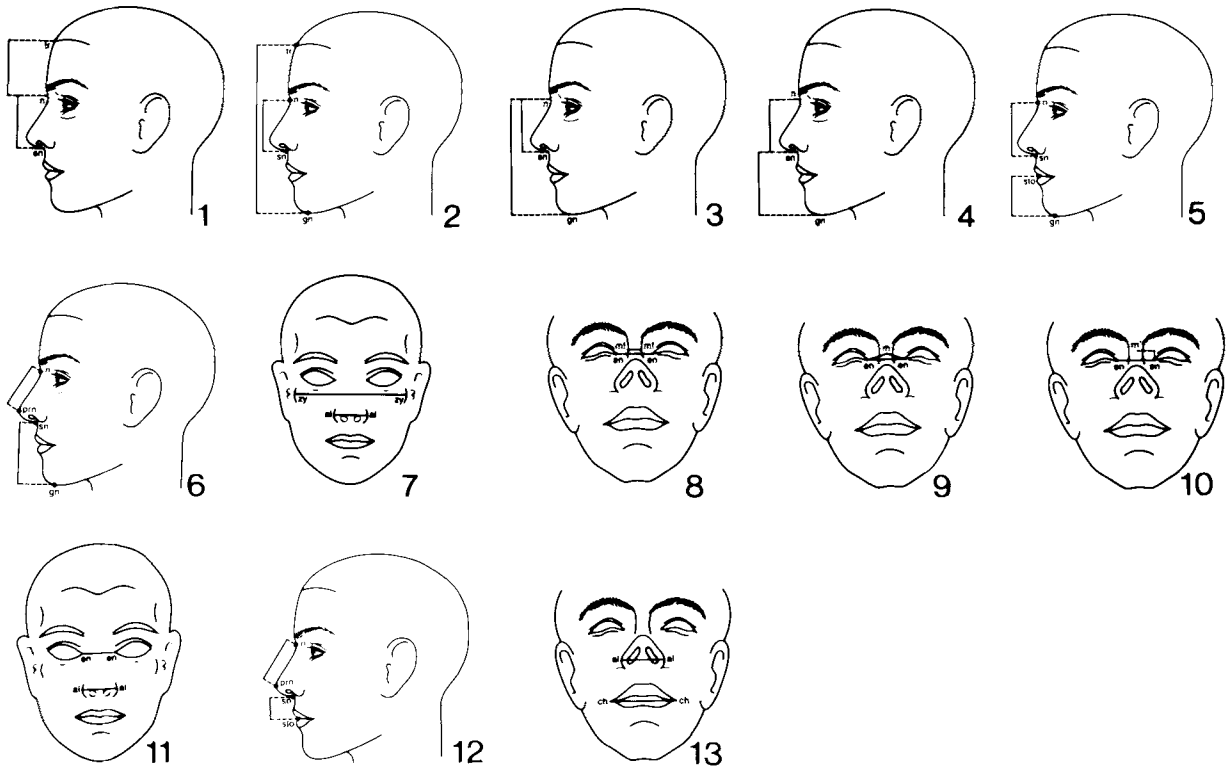

Fig. 11. Schematic illustrations of the relationships between nasal and craniofacial measurements (interareal nasal proportion indices) (for names see Table 4): nose and head (No. 1), nose and face (Nos. 2–7), nose and orbits (Nos. 8–11), nose and orolabial area (Nos. 12 and 13)

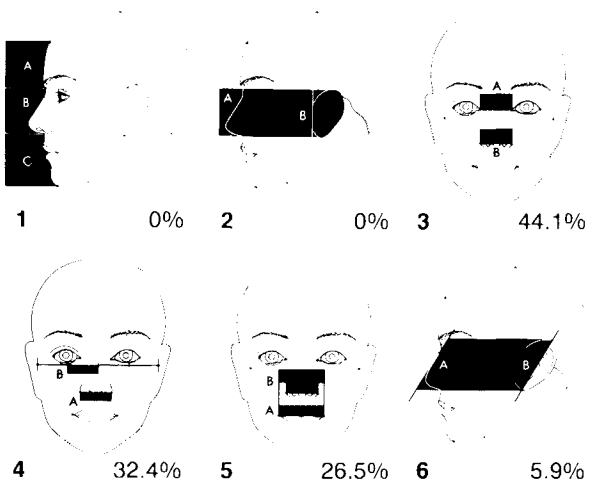

Fig. 12. Neoclassical canons involving nasal measurements: the relationship between nose height and the (1) forehead and lower face, (2) ear height, and (3–5) nose width; and (6) the relationship between nasal bridge and ear inclinations. The percentages indicate the frequency of the canon in the attractive women

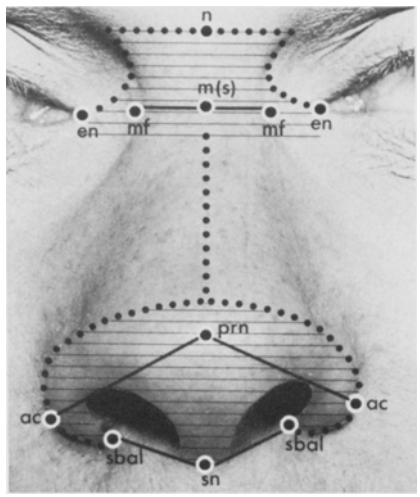

Fig. 13. The main anthropometric areas of the nose: root, soft nose, and connecting bridge. mf–mf = root width, sbal–sn = nasal floor width. The landmarks used in this figure were marked on the nose *before* photography

apex. There are two methods of measuring the *nasal tip protrusion* (Joseph's untere Profilhöhe [57]). In one, the sagittal distance is determined between the alar groove (at the junction of the ala with the cheek) and the level of the pronasale [18, 71, 84]; in the other, a technically easier method, the projec-

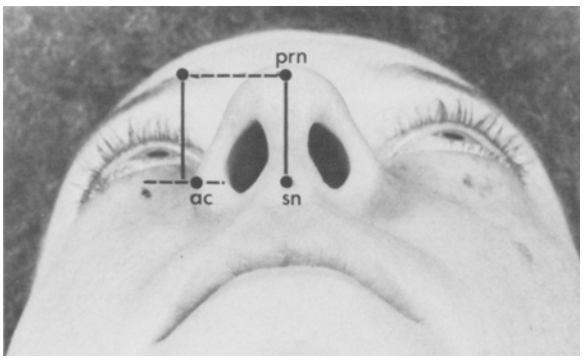

Fig. 14. Two methods of measuring nasal tip protrusion. From the subnasale point [14] and from the ala insertion [18, 71]

tive distance between the pronasale and subnasale is measured [30, 45, 57, 71, 114]. Some anthropologists refer to this measurement as the depth of the nose [22, 71] (Fig. 14).

In evaluating the quality of the nasal tip, the measurement of the nasal tip width [18] can be very useful. It is determined along the horizontal line drawn through the tip points of the nostrils (Fig. 7). We did not use this measurement.

Nasal alae: The surface and projective lengths of the nasal wings are measured between the alar groove at the nose–cheek junction and the pronasale of the nasal tip. The thickness of each ala (al′–al′) is measured in the midportion of the wings (Fig. 3) [30].

Columella: The columella extends from the tip portion of the nose to the lip and separates the external nares [16]. The upper borderline is at the level of the tips of the nostrils [28]. According to Millard [75], "the columella is the center prop that supports the nasal tip."

In the 1800s, the columella was already regarded as a special morphological entity [74]. Because of its surgical importance [2, 11, 13, 23, 26, 42, 52, 64, 70, 75, 92, 93, 100, 101, 103, 111], a separate measurement of its size is justified. The *columella length* (c′–sn) (Fig. 7) is measured along the right and the left crests, between the level of the subnasale and the horizontal line touching the tips of the nostrils [28, 30]. In many malformations of the nose, the columella lengths are unequal due to size and position asymmetries of the apical cartilage [28]. In a recent study we found columellar asymmetry in 31 of 118 (26.3%) healthy young adults [32]. The other columella measurement is the width (sn′–sn′), taken in the midportion of the columella (Fig. 3) [30].

Columella inclination is the angle formed between the surface of the columella and the vertical on a head oriented in Frankfurt horizontal (Fig. 8). In our study the columella inclination was obtained indirectly from the nasolabial angle and the upper-lip inclination. If the upper lip is receding, the negative inclination is subtracted from the nasolabial angle; if the inclination of the lip is positive (in protruding lips), the inclination is added to the angle. Some authors use the term "nasal tip rotation" instead of columella inclination, using the same method of measurement (from the vertical) that we use [11].

There are other variations of the columella inclination measurement: in the columella–lip angle, the angle between the columellar line and a line touching the glabella and the upper lip is measured [21]; the inclination of the nasal septum is determined from the Frankfurt horizontal (for the columella the term nasal septum was used) [115]; the nasolabial angle is the angle between the vertical and the longitudinal line through the nares (in many cases, it is an average value only, due to irregularities of the columellar surface) [5, 106].

Nasal tip angle: The nasal tip angle (Joseph's septodorsal angle [Septodorsalwinkel] [57]) is formed by the lines following the general direction of the columella and the nasal bridge. According to Joseph, the ideal nose has a 90° angle; a large angle indicates a short nasal bridge, and a smaller one a long nasal bridge (Fig. 8).

Nasolabial angle: The nasolabial angle, also called the septolabial angle [57], the columella–labial angle [16, 111] or the labial–columellar angle [2], is a standard anthropometric value measured between the surfaces of the columella and of the upper-lip skin [30] (Fig. 8). Converse [16] warns that the subnasale is not the fulcrum of the nasolabial angle. The columella–labial junction is where the base of the columella joins the upper lip [113]. Some authors [61] measure the nasolabial angle between the line following the long axis of the nostrils and the vertical, which actually gives the columella inclination.

The columella and the *nostrils* (or external nares), separated by the columella, are the base of the nasal pyramid [16]. The size and the shape of the nostrils depend on the size and the shape of the surrounding structures: tip, ala, nasal floor, and columella. In this area two measurements were introduced: the nasal floor width (sbal–sn, right and left) [30] and the inclination of the longitudinal medial axis of the right and the left nostril (the longest axis of the nostrils [68]). The nostril inclination provided an objective basis on which to determine ethnic and racial differences in the nose [31, 59] (Fig. 4).

Of a group of 156 healthy young Caucasian adults, nostril type asymmetry was found in 20%, caused mostly (96.8%) by columella deviation [32].

Nasal skin thickness: The thickness of the nasal skin [8, 48] appears to be associated with the quality

of the skin and the subcutaneous layer. Nevertheless, some nasal measurements (e.g., surface length [ac–prn surf], ala thickness [al′–al′], and columella width [sn′–sn′]) may indicate it quantitatively. In the nasal root, the contrast between the visual impression of the wide root and the measurement of a much narrower root also suggests the thickness of the nasal skin. On autopsy material the soft tissue coverage of the root area consists of skin and muscles from 3.5 to 9.2 mm thick [19].

Evaluation of the Findings

Normal Measurements or Indices

The width of the normal range, for both measurements and indices, is encompassed by the mean and 2 standard deviations (S.D.) below and above the mean (mean ± 2 S.D.). The absolute width of the normal range indicates the degree of variation possible in normal measurements or indices.

Variations in absolute terms (millimeters or degrees) are given by the relationship between the sizes of the mean and the standard deviation. A large mean with a small standard deviation indicates a small number of variations, all close to the mean value. How apparent are these variations? For example, the mean face width in attractive women is 128.8 mm with 4.3 mm S.D. The mean nasal bridge length of the same women is 44.6 mm and the S.D. 3.0 mm, the latter smaller than that for the face width. Despite this, the normal variation of the nasal bridge length (6 mm) would be more striking than the normal variation in face width (8.6 mm). The key is the normal variation ratio, which is the percentage of the mean value for the measurement or index that is represented by the standard deviation. Thus, the ratio for the face width is 3.3% and for the nasal bridge length is 6.7%. The smaller ratio indicates less striking consequences of the normal variations.

Optimal Indices, Disharmonies, and Disproportions

Index values in close vicinity to the mean (mean ± 1 S.D.) are regarded as optimal. The mean index (or measurement) represents only a small portion of the optimal indices. As a result of our detailed analysis of attractive faces, we have defined this zone as optimal. The significance of this range was also sensed by others studying facial attractiveness [14, 83, 108].

Disharmonies are visually perceptible aberrations that are statistically in the outer portion of the normal range (mean ± 1–2 S.D.). We observed these disharmonies in anthropometric studies of facial anomalies [39].

Disproportions are statistically abnormal proportions, either smaller than the minimum normal (mean − 2 S.D.) (subnormal indices) or larger than the maximum normal (mean + 2 S.D.) (supernormal indices).

Measurement Combinations in Disharmonies and Disproportions

Combinations of normal measurements widely separates within the normal range [e.g., (mean + 2 S.D.)/(mean − 1 S.D.)] or at the opposite ends of the normal range (mean + 2 S.D./mean − 2 S.D.) created visual disharmonies or even disproportions. Abnormal indices resulted if one measurement was normal and the other abnormal, or both were abnormal in opposite directions from the mean, or, as mentioned, if they were located at the opposite ends of the normal range [39].

The extent of disproportions, expressed as a percentage, was calculated from the absolute difference between the actual finding and the nearest terminal value of the normal range. The disproportion was considered mild if the difference was 0.1–2.9%, moderate if it was 3.0–9.9%, and marked if ≥10%.

Statistical Analysis

The data were analyzed with the Student's *t*-test and the method of standard error of difference (SED) [35].

The Nose in Attractive Women

Measurements

Nasal measurements (Table 1): Mean measurements were found in only nine of the 18 specific nasal features measured, most frequently in the columella width and ala thickness. In most of these measurements the normal variation ratio was between 5.1 and 9.5%, indicating small variations or a certain uniformity in the appearance of these measurements in the attractive face. The lowest ratio (4.9%) was observed in the nasal root slope length. The largest normal variations in the attractive face can be expected in columella length (16.1%), nostril floor width (13.8%), nasal bridge inclination (12.7%) (Fig. 15), ala thickness (11.3%), and nasal root depth (10.9%) (Fig. 16).

A close relationship was discovered between the

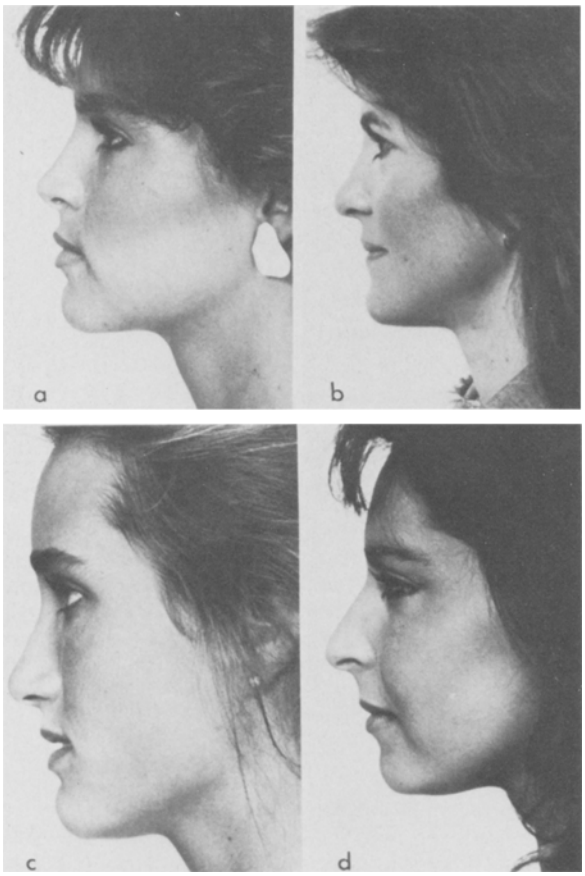

Fig. 15. Variations of the nasal bridge inclination in attractive women's faces. **(a–c)** The smallest inclination (22°). The protrusion of the nose differs visually due to different combinations of rest positions and general profile line inclinations: **(a)** has the greatest visual protrusion because the profile line is vertical and the rest position 5° *above* the FH; **(c)** has a small inclination of the bridge, apparently due to the receding general profile line (−6°), corrected only partly by a rest position 3° above the FH. **(d)** has the greatest nasal bridge inclination (37°), but visually it does not differ markedly from inclinations in **(a)** and **(b)**. The general profile line is vertical but the rest position is 2° below the Frankfurt horizontal, an example of "correction" of the nasal protrusion by changing the rest position

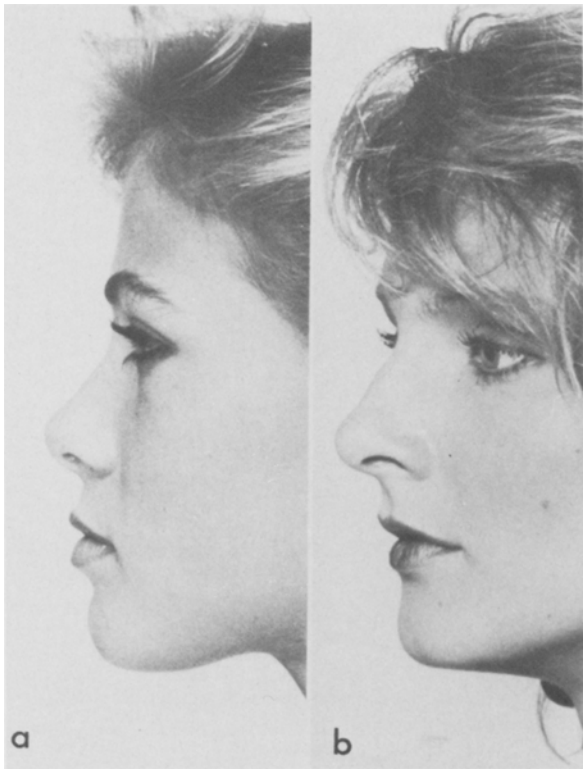

Fig. 16. Variations of the nasal root depth in attractive women. **(a)** The smallest root depth (11 mm). **(b)** The largest root depth (18 mm). Both measurements are visually disharmonious in relation to the nasal tip protrusion

inclinations of the upper lip and the columella. If the upper-lip inclination was negative (receding upper lip), the columella inclination tended to be <100°. When the upper-lip inclination was vertical (0°), the columella inclination was 100°–110°. A protruding upper lip (positive inclination) was often associated with a columella inclination <100°.

Craniofacial measurements (Table 2): There were fewer mean craniofacial (9.2%) than nasal (14.4%) measurements but at least one mean value was found in 12 of the 15 craniofacial features measured. The upper-lip height had the largest proportion (26.5%) of mean measurements.

Compared with the nasal measurements, the craniofacial measurements generally had a smaller normal variation ratio in linear measurements and a larger one in inclinations. In linear measurements the smallest ratio was in the face width (3.3%) and the largest in the forehead height (8.7%). In inclinations, the ratios were much higher, the largest (350%) being in the upper-lip inclination. These ratios indicate there are small variations in linear measurements and large variations in inclinations in the head and face of attractive women.

Indices

Areal nasal indices (Table 3): Up to seven mean values were found in 15 of 16 proportion indices defining the nose. The smallest normal variation ratio (3.5%) was in the nasal bridge index and the largest (15.2%) in the nostril floor width–nasal tip protrusion index. The nostril–nose width index (14.3%), the nasal root depth–width index (14.1%), the columella length–nasal tip protrusion index (13.4%), the nasal root depth–tip protrusion index (13.1%), and the nasal root depth–nose height index (12.4%) also had high ratios. The average ratio of

Fig. 17. Variations in the nasal root width (mf–mf) in attractive women. **(a)** The narrowest root (16 mm). The soft nose is 36 mm wide and the relationship between the two measurements is disproportionate (I = 44.4, 3.9% below the minimum normal). **(b)** The widest root (28 mm). The soft nose is 33 mm wide and the relationship between the two measurements is disproportionate (I = 72.7, 1.8% above the maximum normal)

the 16 areal nasal indices was 10.2% (Figs. 17 and 18).

Interareal nasal indices (Table 4): One to nine mean index values were present in eight of the 13 proportions, most often in the nose–total face height index (26.5%). The mean interareal indices were seen very infrequently in attractive faces.

Fig. 18. Variations in the soft nose width (al–al) in attractive women. **(a)** The narrowest soft nose (28 mm). The nose is narrow in relation to its height and the mouth width. **(b)** The widest soft nose (36 mm). The nose is wide in relation to the nasal root width (3.9% over the maximum normal), nose height (2.5% over), intercanthal distance (5.9% over), face width (5.9% over), and mouth width (9.4% over the maximum)

The smallest normal variation ratios (4.6%) were observed in the relationship of the nose and total face heights and in the nasal root index. The largest ratio (11.7%) was in the nasal root depth–intercanthal width index. The mean ratio (7.4%) indicated fewer variations in interareal than areal nasal indices (10.2%) (Fig. 19). Thus, in attractive women the relationship between the nose and the face was more stable than that between the parts of the nose.

Canons

The relationships of the measurements used in the canons are similar to the findings in the interareal nasal indices (Fig. 12).

Vertically oriented proportions: No face with three equally high profile sections (three-section facial profile canon) was found in the attractive women. The nose was always shorter than the lower-face height and the ear was always longer than the nose (mean = 8.5 mm, range = 2–15 mm).

Horizontally oriented proportions: The orbitonasal canon was found in 15 attractive women (44.1%). In 14 others (41.2%) the nose was narrower than the space between the eyes (mean difference = 2.9 mm, range = 2–5 mm). The nose was wider in the remaining five (14.7%) (mean difference = 3.4 mm, range = 2–7 mm).

The nasofacial canon was seen in 11 women (32.4%) but the nose was less than one-quarter of

Fig. 19. Variations in the height of the nose (n–sn) in attractive women. **(a)** The shortest nose (48 mm). The nose height is proportionate to the face height (n–gn = 111 mm). **(b)** The "longest" nose (56 mm). The nose is high in relation to the face height (n–gn = 117 mm)

the face width in 20 others (58.8%) (mean difference = 2.2 mm, range = 1.3–4 mm). Only three women (8.8%) had a nose wider than stated in the canon (mean difference = 2.5 mm, range = 1.2–4.7 mm).

The naso-oral canon occurred in nine women (26.5%). Most women (23, 67.6%) had a narrow nose relative to the mouth width (mean difference = 6.1 mm, range = 2–11 mm). A relatively wide nose was found in two women (5.9%) (differences = 3 and 9 mm).

Inclination: Equal inclination of the nasal bridge and the medial axis of the left ear was present in two attractive women (5.9%). In the other 32 women (94.1%) the bridge inclination was larger (mean difference = 13°, range = 4°–29°).

Relationships Between Inclinations and Angles

Clinically, facial inclinations (Table 5) are judged in the rest position of the head [30], but the quantitative assessments are done in the Frankfurt horizontal. The smallest mean difference between inclinations was found between the nasal bridge and the upper face line (28°).

On average, the nasofrontal angle (mean = 133.9°) was 31.8° larger than the nasolabial angle (mean = 102.1°) (Fig. 20). The mean nasal tip angle (73.1°, S.D. = 8.0; range = 61°–88°) found in the attractive face could not be called "ideal" according to Joseph's [58] criterion (90°), and the angles closest to this ideal (86°–89°) were found in the faces with the lowest score of attractiveness among the above-average faces (5.3 on the scale of 5.0–7.0 points). In contrast, the most attractive women (average score = 5.8) had a much smaller nasal tip angle (71.6°). While the nasal tip angle is a good indicator of the size of the nasal bridge, Joseph's criterion does not seem to be realistic. For attractive women the wide range of normal variation of nasal tip qualities did not significantly affect our judgment (Fig. 21).

An indirect relationship was observed between the degree of bridge inclination and the nasofrontal angle. In the presence of a large (35.1°) bridge inclination the mean nasofrontal angle was 130° (mean for the entire group = 133.9°). A medium bridge inclination (30°–32°) was associated with a mean nasofrontal angle of 132.5°. A small nasal bridge inclination (22°–29°) was accompanied by a relatively large (mean = 139°) nasofrontal angle (Fig. 22).

In the attractive women an interesting relationship was found between the nasal bridge inclination and the rest position of the head. In the presence of a bridge inclination above the mean, the protrusion of the nose was reduced by a rest position below the Frankfurt horizontal. If the bridge inclination was small, it was balanced by a rest position above the Frankfurt horizontal. Attractive women with a vertical general profile line (10 of 34)—regarded by some plastic surgeons as ideal [16, 21, 56, 63]—had an almost mean nasal bridge inclination (33.3°). These women held their heads in the Frankfurt horizontal (Fig. 23).

Asymmetry and Disfigurement

Asymmetry (Table 6): Four of the paired measurements were never asymmetric in the attractive women. The three that were asymmetric in a few of the women were in the normal range for extent of asymmetry.

Disfigurement (Table 7): Deviations of the nasal bridge and columella were rare and mild. Differences between the inclinations of the longitudinal axes of the nostrils [32] were found only in a small number of women.

Appearance of Nasal Proportions

Areal indices: Harmonious index values (Table 8) were seen in 385 of the individual proportions calculated for 16 areal nasal indices in the attractive women. Of these, 340 (88.3%) were optimal (within 1 S.D. above or below the mean) and 45 (11.7%)

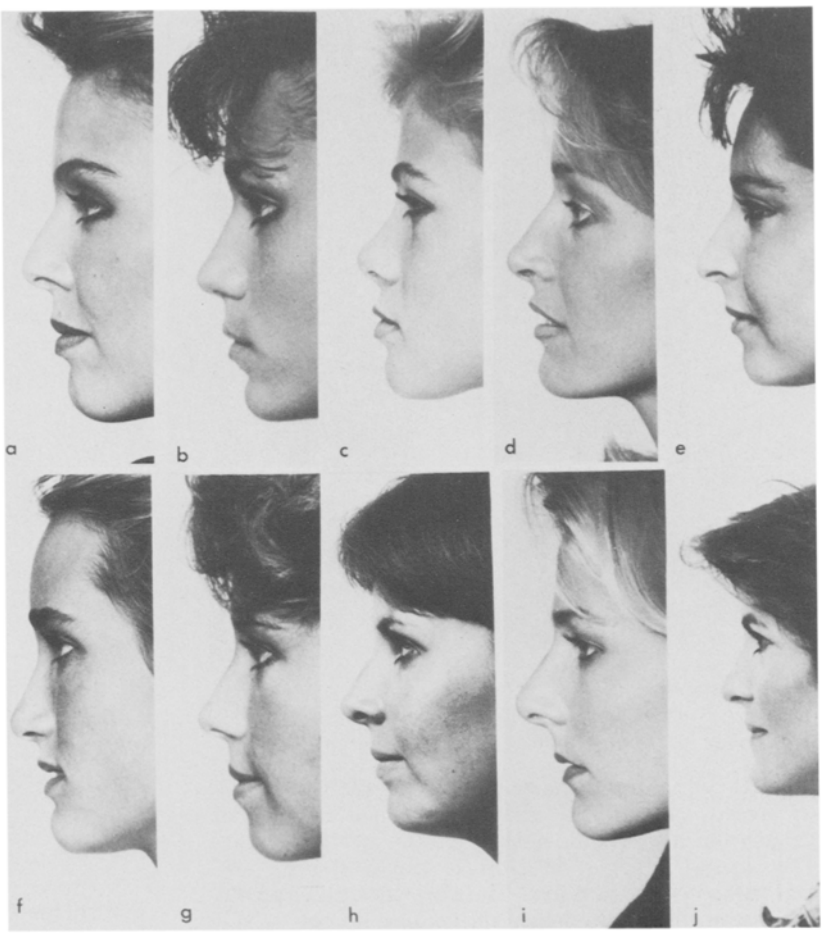

Fig. 20. Variations of nasofrontal and nasolabial angles in the faces of attractive women. **(a–e)** The mean nasofrontal angle is 132° (range = 130°–135°) and the mean nasolabial angle 99° (range = 90°–110°). **(f–j)** The mean nasofrontal angle is 141° (range = 140°–145°) and the mean nasolabial angle 104° (range = 92°–120°)

were at the mean. The index with the smallest number of optimal values (15 of 34), the columella–nose width proportion (sn′–sn′/al–al), exhibited the high number of mean values (7). The nasal bridge length–nose height index (n–prn/n–sn), which had an optimal value for only 20 of the women, also had a high number (7) of mean indices. The index with the highest number of optimal values (27, 79.4%), the nasal root width–nose height proportion (mf–mf/n–sn), had no mean indices.

Disharmonies (Table 9) were found in 24.8% (134 of 541) of those studied. Disharmonies were seen least frequently between the nasal root and soft nose measurements and in the two basic proportions of the nose: the nasal (al–al/n–sn) and the nasal bridge (n–prn/n–sn) indices. Disharmonies were more frequent in the soft nose area. The highest frequency of disharmony (35.3%), found in the nasal root depth–nose height index (en–m′ sag/n–sn), illustrated a deep or shallow nasal root in relation to the nose height.

Disproportions (Table 10) were reported in 4.1% (22 of 541) of the cases, involving 13 of the 16 indices. There were twice as many supernormal as sub-

Table 8. Frequency of harmonious areal nasal indices in 34 attractive women's faces[a]

Percentage (No.) of subjects with harmonious indices	No. of indices	Proportions
61.8–67.6 (21–23)	7	en–m′ sag, l/n–sn sn′–sn′/al–al sbal–sn, r&l/al–al ac–prn/n–sn[b] al–al/ac–prn, r&l[b] en–m′ sag, l/sn–prn c′–sn, l/sn–prn
70.6–79.4 (24–27)	9	al–al/n–sn sn–prn/al–al en–m, l/ac–prn, l[b] mf–mf/al–al en–m sag, l/en–m, l sbal–sn/sn–prn en–m′ sag/mf–mf mf–mf/n–sn n–prn/n–sn

[a] Proportions at the mean comprise 11.7% of the harmonious indices
[b] Only 33 subjects were measured

Fig. 21. Variations in nasal tip angle in the faces of attractive women. **(a)** The smallest tip angle (61°): bridge length (n–prn) = 44 mm, nose height (n–sn) = 50 mm. **(b)** The largest tip angle (88°): bridge length (n–prn) = 43 mm, nose height = 50 mm. The tip angles differ greatly but the length and the height of the nose do not

normal values. Three indices were never abnormal in the attractive face: the nasal bridge–nose height, the root depth–length, and the root–ala length proportions.

Interareal Indices

Harmonious index values (Table 11) were seen in 360 of the individual proportions calculated for the 13 interareal indices in the attractive women: 336 (93.3%) were optimal and 24 (6.7%) at the mean. The number of mean indices was significantly smaller in the interareal than in the areal nasal proportions (SED = 2.1, diff = 5.0). The smallest percentage of optimal values was seen in the nose–total face height index (n–sn/tr–gn) (19 of 28), which also had the highest number (9) of average values. The highest frequency of optimal indices (32, 94.1%) was found in the nasal root index (en–en/en–m, right and left), which had no average values.

Disharmonies (Table 12) were present in 17.2% (76 of 442) of the women. The smallest number of disharmonies (2) was found in the index with the highest frequency of optimal values (en–en/en–m, right and left). The greatest number (11) was seen in the relationship of the nose width to the mouth width (al–al/ch–ch), which had the smallest number (22) of harmonious indices. The most frequently disharmonious nose–mouth proportion was due to a relatively narrow or wide nose in relation to the mouth width.

Disproportions (Table 13) were found in 6 of the 442 indices (1.4%). Five of the indices were supernormal and one was subnormal.

Table 9. Frequency of disharmonious areal nasal indices in 34 attractive women's faces

Percentage (No.) of subjects with disharmonious indices	No. of indices	Proportions
17.6–23.5 (6–8)	8	mf–mf/n–sn en–m′ sag, l/mf–mf mf–mf/al–al n–prn/n–sn sbal–sn/sn–prn al–al/n–sn en–m′ sag, l/en–m, l en–m′ sag, l/sn–prn
26.5–30.3 (9–10)	7	sn–prn/al–al c′–sn, l/sn–prn al–al/ac–prn, r&l[a] en–m, l/ac–prn, l[a] sn′–sn′/al–al sbal–sn, r&l, al–al ac–prn, l/n–sn[a]
35.3 (12)	1	en–m′ sag/n–sn

[a] Only 33 subjects were measured

Table 10. Frequency of disproportionate areal nasal indices in 34 attractive women's faces

Percentage (No.) of subjects with disproportionate indices	No. of indices	Proportions
2.9–3.0 (1)	6	mf–mf/n–sn en–m′ sag, l/n–sn en–m′ sag, l/mf–mf sn–prn/al–al sbal–sn/sn–prn ac–prn, l/n–sn[a]
5.9–6.1 (2)	5	sbal–sn, r&l/al–al al–al/ac–prn, r&l[a] c′–sn, l/sn–prn al–al/n–sn sn′–sn′/al–al
8.8 (3)	2	en–m′ sag, l/sn–prn mf–mf/al–al

[a] Only 33 subjects were measured

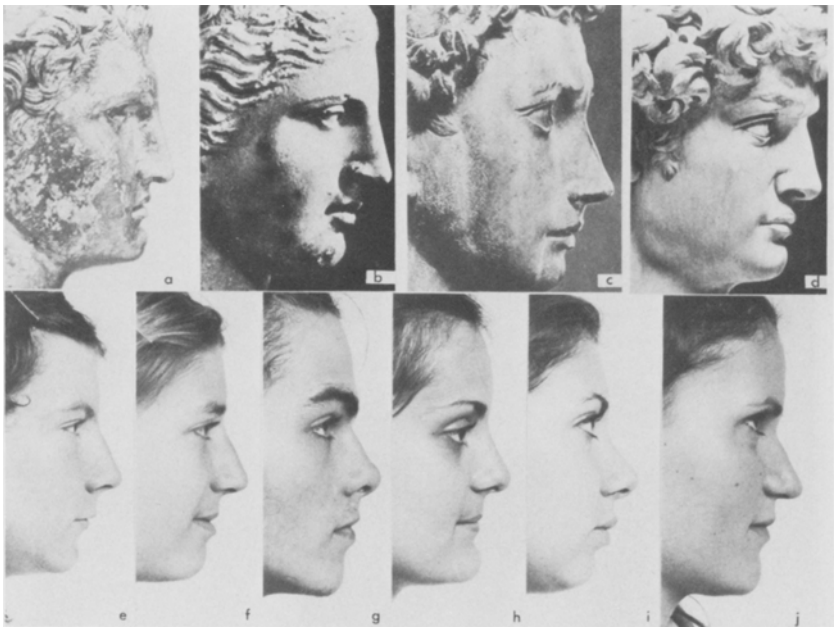

Fig. 22. Variations of nasofrontal and nasolabial angles and their influence on the aesthetics of the facial profile. **(a, b)** Almost straight nasofrontal and moderately acute nasolabial angles of antique sculptures. The nasal root is high and the nose appears long. **(c, d)** Renaissance faces with nasofrontal angles similar to our contemporary findings. **(e–g)** (males) and **(h–j)** (females): angle variations in healthy young North American Caucasians

Table 11. Frequency of harmonious interareal nasal indices in 34 attractive women's faces

Percentage (No.) of subjects with harmonious indices[a]	No. of indices	Proportions
64.7	1	al–al/ch–ch
73.5–79.4 (25–27)	5	n–sn/sto–gn n–sn/sn–gn en–m′ sag, l/en–en sn–sto/n–prn n–sn/n–gn
82.4–94.1 (28–32)	7	n–sn/tr–gn n–prn/sn–gn al–al/zy–zy mf–mf/en–en al–al/en–en n–sn/tr–n en–en/en–m, r&l

[a] Proportions at the mean comprise 6.7% of the harmonious indices

Table 12. Frequency of disharmonious interareal nasal indices in 34 attractive women's faces

Percentage (No.) of subjects with disharmonious indices	No. of indices	Proportions
5.9–11.8 (2–4)	5	en–en/en–m, r&l al–al/en–en mf–mf/en–en n–sn/tr–n al–al/zy–zy
17.6–23.5 (6–8)	7	n–sn/tr–gn n–prn/sn–gn n–sn/n–gn n–sn/sn–gn sn–sto/n–prn n–sn/sto–gn en–m′ sag, l/en–en
32.3 (11)	1	al–al/ch–ch

Differences Between Above- and Below-Average Faces

Nasal Measurements

There were three identical measurements in the above- and below-average groups: the nose and columella heights and the nasolabial angle. Four measurements differed significantly. In the attractive face the inclination of the nasal bridge was greater ($p < 0.01$), the root was higher ($p = 0.05$) and had longer slopes ($p < 0.01$), and the columella was narrower ($p = 0.01$). The remaining ten measurements were nonsignificantly different. The most characteristic differences were a shorter nasal bridge, a narrower soft nose with shorter but slightly thicker alae, a wider nostril floor, and a smaller nasal tip protrusion. In addition, the columella inclination was greater and the nasofrontal angle smaller in the attractive face.

Analysis of the nasal tip angle showed a nonsignificantly smaller angle (mean = 73.1°, S.D. = 8.0) in attractive women than in women with below-av-

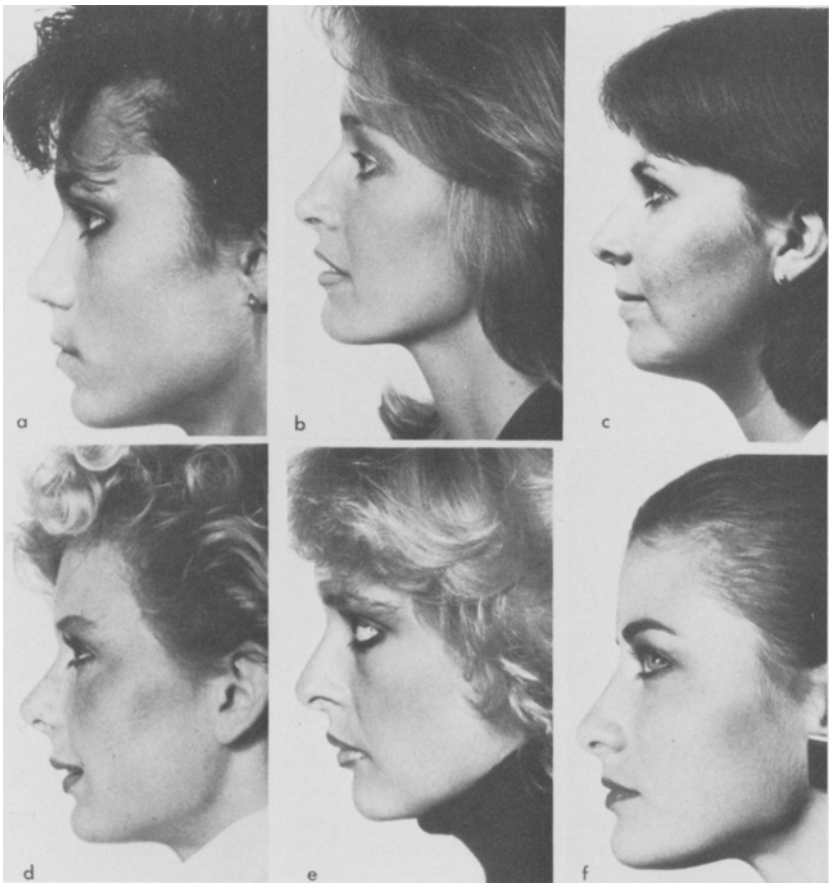

Fig. 23. Variations in the inclinations of the general profile line (GPL) (from the vertical) and the rest position (RP) of the head (from the FH) in the faces of attractive women. **(a)** GPL = −4°, RP = 0°; **(b)** GPL = −4°, RP = +10°; **(c)** GPL = −5°, RP = +5°; **(d)** GPL = −7°, RP = +3°; **(e)** GPL = 0°, RP = −10°; **(f)** GPL = 0°, RP = 0°

erage faces (mean = 74.0°, S.D. = 11.9), which in Joseph's [57] terms indicates a longer nasal bridge in the attractive women. However, Joseph's fixed criterion for the ideal nose based on the 90° nasal tip angle does not seem to be realistic, since the nasal bridge index (n–prn/n–sn) reveals a shorter nasal bridge in the attractive face (87.8) than in the below-average face (89.7).

Indices

Areal indices: Three of the 16 indices differed significantly. Compared with the below-average face, the nasal root in the attractive face was deep in relation to the nose height ($p < 0.05$) and to the nasal tip protrusion ($p < 0.02$); the nasal root slopes were longer related to the ala length ($p = 0.001$).

The 13 nonsignificantly differing indices in the attractive face revealed a wide nasal root, short bridge, narrow soft nose, and short alae in relation to the nose height. The root was high for its width and for the length of the slope. For the soft nose width, the tip protrusion was smaller with a narrower columella but the nostril floor and the nasal root were wider. The soft nose was wide in relation to the ala length. For the nasal tip protrusion, the columella was long and the nostril floor wide.

Table 13. Frequency of disproportionate interareal nasal indices in 34 attractive women's faces

Percentage (No.) of subjects with disproportionate indices	No. of indices	Proportions
2.9 (1)	6	Supernormal n–sn/sn–gn al–al/zy–zy mf–mf/en–en al–al/en–en al–al/ch–ch Subnormal n–sn/sto–gn

Interareal indices: Two of the 13 indices were identical in the above- and below-average faces: the nose–face height and the nose–face width proportions.

Six of the 11 nonsignificantly differing proportions were oriented vertically. Compared with the below-average face, the attractive face showed a relatively long nose for the forehead, total face, and

Table 14. Areal nasal proportions in above- and below-average faces[a]

Index category	Above-average (541 indices)		Below-average (336 indices)	
	N	%	*N*	%
Harmonious	385	71.2	224	66.7
Mean	45	8.3	21	6.3
Optimal	340	62.8	203	60.4
Non harmonious	156	28.8	112	33.3
Disharmonious	134	24.8	95	28.3
Disproportionate	22	4.1	17	5.1
Total	541		336	

[a] No difference is significant

Table 15. Interareal nasal proportions in above- and below-average faces

Index catetory	Group				Significance
	Above-average (442 indices)		Below-average (273 indices)		
	N	%	*N*	%	
Harmonious	360	81.4	168	61.5	SED = 3.5, diff = 19.9
Mean	24	5.4	13	4.8	Not significant
Optimal	336	76.0	155	56.8	SED = 3.8, diff = 20.2
Not harmonious	82	18.6	105	38.5	SED = 3.5, diff = 19.9
Disharmonious	76	17.2	77	28.2	SED = 3.3, diff = 11.0
Disproportionate	6	1.4	28	10.3	SED = 1.9, diff = 8.9
Total	442		273		

mandible (lower third face) heights. In relation to the lower face height, the nasal bridge and the nose itself were short. The nasal bridge was also short for the upper-lip height. The other five proportions were oriented horizontally or sagittally showing that compared with the below-average face the attractive face had a nasal root that had long slopes and was narrow but deep in relation to the intercanthal distance. Furthermore, the soft nose was narrow in relation to the intercanthal distance and mouth width (Fig. 18).

Appearance of Nasal Proportions

Areal indices (Table 14): The women with attractive faces had more harmonious areal nasal proportions and fewer disproportionate indices than the women with below-average faces, but the differences were not significant. In both groups the overwhelming majority of harmonious nasal proportions were associated with measurements within 1 S.D. of the mean, and only about 11% were actually at the mean. Most of the nonharmonious nasal indices were related to visual disharmonies (85.9% in attractive women and 84.8% in below-average faces), rather than to true disproportions (14.1–15.2%).

Interareal Indices (Table 15): Harmonious interareal nasal proportions were significantly more frequent in the attractive faces than in women with below-average faces. Mean index values were seen in only 7% of the interareal indices. The differences between attractive and below-average faces were significant for percentages of optimal, harmonious, disharmonious, disproportionate, and total nonharmonious indices. In the below-average faces more than one-quarter of the nonharmonious relationships were associated with abnormal indices (true disproportions), but in the attractive faces true disproportions were present in only 7.3%.

Origins of Disharmony and Disproportion

Disharmony (Table 16): Disharmony in both areal and interareal indices was significantly greater in

Table 16. Measurement combinations in nasal disharmonies of above- and below-average faces

	N	Disharmonies		Measurement combination			
		N	%	Normal/normal		Abnormal/normal	
				N	%	*N*	%
Above-average							
Areal	541	134	24.8	128	95.5	6	4.5
Interareal	442	76	17.2	73	96.1	3	3.9
Total	983	210	21.4[a]	201	95.7	9	4.3[b]
Below-average							
Areal	336	95	28.3	83	87.4	12	12.6
Interareal	273	77	28.2	55	71.4	22	28.6
Total	609	172	28.2[a]	138	80.2	34	19.8[b]

[a] SED = 2.2, diff = 6.8
[b] SED = 3.3, diff = 15.4

the below-average faces. In both groups most disharmonies were associated with a combination of two *normal* measurements. However, the combination of abnormal and normal measurements was almost five times as common in women with below-average faces than those with attractive faces. Disharmonies growing out of combinations of abnormal and normal measurements were seen slightly more often in the areal than the interareal indices of the above-average faces, and twice as often in interareal indices as in areal indices of the below-average faces.

Disproportion (Table 17): Disproportion in both areal and interareal indices was significantly greater in the below-average faces. In the attractive faces the abnormal nasal indices were seen slightly less frequently with a combination of two normal measurements than with one of normal and abnormal measurements. In the below-average faces the disproportions came more from combinations of normal measurements rather than from those of normal and abnormal measurements. Disproportions in the attractive face occurred more often in areal than interareal indices. In the below-average faces the opposite was seen.

The mean extent of disproportion was nonsignificantly smaller in attractive faces and mild in both groups. Disproportions related to normal measurements were milder than those produced in a combination of normal and abnormal measurements. Some disproportions in the below-average faces were marked (>10%): The worst areal disproportion was produced by the wide nostril floors in relation to the soft nose width and the worst interareal proportion by the short upper lip in relation to the nasal bridge length.

In the attractive faces the greatest areal disproportion was moderate and due to the short columella in relation to the nasal tip protrusion. The largest interareal disproportions were due to the disproportionally wide soft nose in relation to the face and intercanthal widths.

Ethnic and Racial Differences in the Nose

An important consideration in any study of the nose is the variation that can be attributed to the ethnic or racial origin of the patients. Some plastic surgeons have noted the importance of these distinctions in producing a surgical result that is appropriate for the craniofacial framework of the patient [98]. Most of the physical anthropological literature on these differences gives only subjective criteria, or a few measurements and the nasal index, to identify characteristic nose "types" [17, 20, 24, 53, 60, 96, 109]. Further analysis is rare, although one study has examined the correlations among several craniofacial measurements and proportions, including the nasal and facial indices [51]. In general, the basic shapes of the nose and face are similar; for example, a long, narrow nose would be found in a long, narrow face.

In the medical literature racial differences of the nose were also based mostly on subjective assessment [2, 3, 8, 15, 26, 52, 98, 101]; few objective data are available [27, 31, 41].

Ethnic Differences

The present study has given us the opportunity to examine in detail the ethnic differences in the nose of 200 North American women from a variety of European backgrounds. The origin of each subject was determined by interview. The subjects were classified in four broad ethnic subgroups—Anglo-Saxon (n = 91), Germanic (n = 26), Latin (n = 25), Slavic (n = 27), and a miscellaneous category (n = 31). The last group was excluded from further analysis of ethnic differences because the subjects were not clearly of Caucasian origin.

Only seven of 28 measurements and five of 35 proportions analyzed [59] showed statistically significant differences among the four groups. These results show how small the measurable differences in the nose are among these ethnic groups. The basic framework of the nose and its relationships to the rest of the head and face do not differ. The differences between individuals reflect variation

Table 17. Measurement combinations in nasal disproportions in above- and below-average faces

Index	Disproportions		Measurement combination				Extent of disproportion (%)		
	N	%	Normal/normal		Abnormal/normal		Combination		Mean (Range)
			N	%	*N*	%	Normal/normal	Normal/abnormal	
Above-average									
Areal	22/541	4.1	11	50.0	11	50.0	3.0	4.6	3.8 (0.5–9.7)
Interareal	6/442	1.4	2	33.3	4	66.7	3.3	4.5	3.9 (1.4–5.9)
Total	28/984	2.8[a]	13	46.4	15	53.6			3.9 (0.5–9.7)
Below-average									
Areal	17/336	5.1	9	52.9	8	47.1	3.5	4.6	4.1 (0.8–13.3)
Interareal	28/273	10.3	17	60.7	11	39.3	2.7	5.8	5.1 (0.2–15.1)
Total	45/609	7.4[a]	26	57.8	19	42.2			4.6 (0.2–15.1)

[a] SED = 1.2, diff = 4.6

within our species rather than systematic population differences.

The only area to exhibit statistically significant differences was the soft nose. Even here the differences were finely scaled. No single variant absolutely characteristic of any one group could be identified. Instead, each group showed a range of variation subtly overlapping that of the adjacent groups, producing overall statistical differences that are not apparent from a group-by-group examination.

In the soft nose of these women, the protrusion of the nasal tip accounted for five of the 12 observable differences (one measurement and four proportions). The tip protrusion was largest in the Germanic subgroup and smallest in the Latin. A similar pattern occurred when the protrusion was compared with nose height or width, bridge length, or alar length: The indices were smallest in the Latin subgroup, followed by the Slavic. The only differences involved the relative positions of the Anglo-Saxon and Germanic subgroups in the sequence. In the nasal tip protrusion–bridge length proportion, the Germanic mean was largest. In the other three indices, the Anglo-Saxons had the highest mean index.

Although statistical differences were not seen in columella length, they did occur in columella width and in the proportion between its width and length. The Slavic subgroup had the widest columella and differed significantly from the Germanic and Anglo-Saxon samples. Proportionally, the Slavic columella was the shortest and widest, the Germanic the longest and narrowest.

The differences in the configuration of the soft nose also produced significant differences in the inclination of the long axis of the nostrils. The inclination from the horizontal was greatest in the Anglo-Saxons followed by the Germanic, the Latin, and the Slavic subgroups.

The morphology of the soft nose affects the angles and inclinations of the nasofacial profile. The nasolabial angle was largest in the Anglo-Saxon subgroup due to a slightly, though nonsignificantly, greater inclination in the columella.

The pattern for the nasal tip angle was the same as that for the inclination of the columella. The largest angle (76.5°) was found in the Germanic and the Anglo-Saxon samples, the smallest in the Latin (70.1°). The complementary relationship occurred in the difference between the nasofrontal and nasolabial angles. There being no significant differences among the groups in the nasofrontal angle, the greater the nasolabial angle, the smaller the difference between the two. As expected, the smallest difference was in the subgroup with the largest nasolabial angles (Germanic), while the greatest difference was in the Latin group.

A detailed analysis of ethnic differences in an additional group of 125 young adult North American Caucasians of both sexes [31] revealed strong relationships between the type of nostrils (Fig. 4) and some elements of the soft nose, with certain ethnic orientations.

Type I nostrils (Fig. 24) were typical of Anglo-Saxons (66.0% of 53 type I nostrils). Type II nostrils were more common in non-Anglo-Saxons (56.1% of 66 type II nostrils) (Fig. 25). Compared with type II nostrils, in individuals with type I nostrils the nasal tip protrusion and the columella length were significantly greater ($p < 0.001$ and $p < 0.01$, respectively) and the soft nose was significantly narrower ($p < 0.001$). The columella width was almost the same in both nostril types. Type III nostrils were rare in

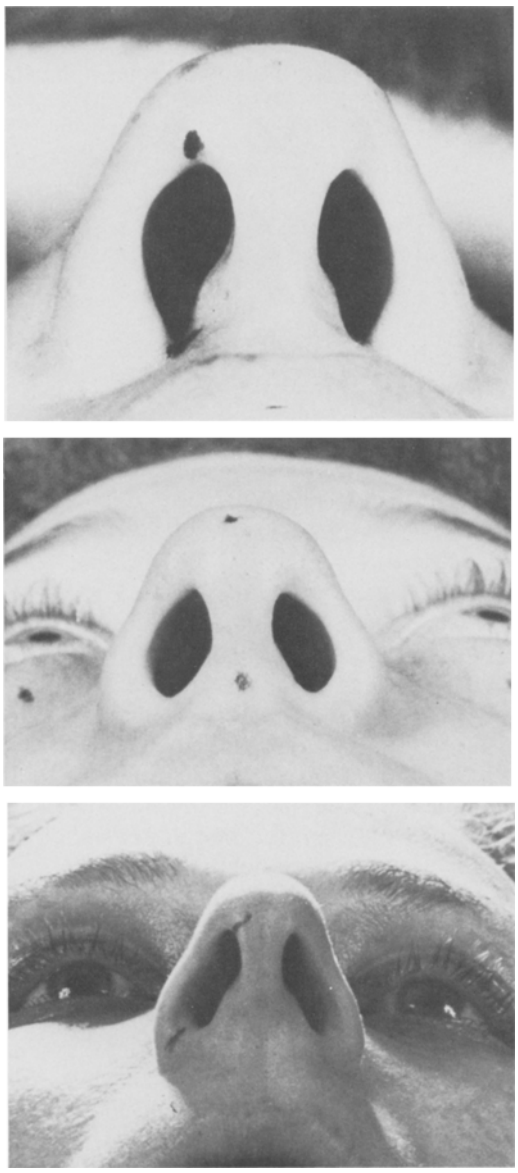

Fig. 24. Variations of type I nostrils (range of inclination = 70°–90°), characteristic for the Anglo-Saxon nose. The alar base is short and curved in the top and the bottom noses

Fig. 25. Variations of type II nostrils (range of inclinations = 55°–69°), most common in individuals of continental European origin. The alar base is more curved than in type I

Caucasians (4.8%) (Fig. 26). Compared with type II nostrils, noses with type III nostrils had a significantly shorter columella, a similar nasal tip protrusion, and a significantly wider nose and columella ($p < 0.001$ and $p < 0.05$, respectively).

The nostril type had a definite influence on the quality of the alar base. Thus, in most noses with type I nostrils (76.6%), the alar base was short and curved. In one-fifth of type I nostrils (21.3%) it was full and curved. In noses with type II nostrils the full and curved base was significantly more frequent (44.7%, SED = 9.3, diff = 23.4), while the percentage of short-curved alar bases significantly decreased (46.8%, SED = 9.5, diff = 29.8).

Racial Differences

Rogers [99] distinguishes three basic racial nose types: the Caucasoid (white), Mongoloid (Oriental), and Negroid (black or African) nose. In the medical literature most of the information about the non-Caucasian nose is descriptive. The literature is more likely to be concerned with the Negroid [2, 15,

Fig. 26. Variations of type III nostrils (range of inclinations = 40°–54°) typical for south European nationalities. The alar base is full and curved. Type III nostrils were most frequent in our sample of Asians, with a short and curved alar base in half of the cases

26, 52, 72, 98, 101] than the Asian or Oriental nose [7, 50, 95]. The Negroid type is related to the nose of blacks and individuals of mixed African–Asian and/or Caucasian origin (e.g., the Latin American or Mestizo nose of Coiffman [15], the Brazilian Negroid nose of Avelar [2], the Caribbean "Chata" nose of Sanchez [101]). Thus, it reflects the qualities of those living in North, Central, and South America more than those in Africa. Like Caucasians, blacks and Orientals show many qualitative and quantitative differences in their noses.

Qualitative Signs of Non-Caucasian Noses

In the medical literature, compared with the Caucasoid nose the characteristics of the Negroid nose are described as follows:

1. Nose length (n–sn): generally short [98]
2. Soft nose: large, flat [98, 101]
3. Dorsum: wide, depressed [2, 15, 26, 101]
4. Nasal tip: wide, bulbous [2, 15]
5. Alae: flared, wide-based, thick [15, 26, 98, 101]
6. Columella: short and wide [2, 15, 52, 101]
7. Nostrils: enlarged [2, 15, 52]
8. Nostril shape: round and horizontally ovoid [26, 101]
9. Nostril floor: increased [3]
10. Nasofrontal angle: obtuse [15]
11. Nasolabial angle: acute [2]

According to Rogers [98], the Oriental nose differs from the Negroid nose as follows:

1. Nasal root width: smaller
2. Nasal root depth: shallower
3. Nasal bridge contour: concave
4. Nasal bridge inclination: smaller
5. Dorsum: narrower
6. Nasal tip: not bulbous
7. Tip protrusion: smaller
8. Nostril size: moderately wide
9. Alae: less flaring and thinner

Other characteristics of the Oriental nose [52] and its Egyptian variation [8] refer to the flat and wide nasal bridge, short and wide columella, flared nasal alae with wide nostrils, and acute nasolabial angle.

Quantitative Signs of Non-Caucasian Noses

Objective data about the Negroid and the Oriental noses are scanty in the medical literature. The nasal index (al–al/n–sn) of the Negroid nose (80 [27], 85 [72]) indicated a wider nose than in young adult Caucasians. If the index is taken to be 85.0, it is 7.1% larger than the maximum index in young Caucasian North American men (79.4), 14.2% larger than the greatest index in young North American women (74.4), and 18.7% larger than the maximum nasal index in the attractive North American women (71.5).

The only quantitative data for Orientals are reported by Furukawa [41] about the Japanese nose (Table 18) and Matory and Falces [72] about the Oriental/Mestizo nose.

The wider range of the nasal index in Caucasians (Table 18) indicates much more variation in the nose width–height relationship. Thus, the Caucasian nose may be narrower or wider than the narrowest or widest Japanese nose. The nasal bridge is

Table 18. Differences between the normal and/or range values in noses of young Japanese and North American adults

Index or measurement	Japanese population [41]		North American Caucasians [30, 39]	
	Mean	Range	Mean	Range
Nasal index (al–al/n–sn)				
Males			65.8 (S.D. = 6.8)	52.3–79.4
Females			64.4 (S.D. = 5.0)	54.3–74.4
Gender not identified		57°–70°		
Nasal bridge length (n–prn)				
Males	44 mm		49.0 mm (S.D. = 4.2)	
Females	42 mm		45.4 mm (S.D. = 3.9)	
Nasal bridge inclination				
Males	30°		31.6° (S.D. = 4.6)	22.4°–40.8°
Females		20°–32°	30.0° (S.D. = 5.3)	19.4°–40.6°
Attractive women			30.8° (S.D. = 3.9)	23°–38.6°

Table 19. Nostril types in young adult North American Caucasians, Asians, and blacks

Nostril type	Inclination (degrees)	Caucasians (N = 125)		Asians (N = 53)		Blacks (N = 32)	
		N	%	N	%	N	%
I	70–90	53	42.4	0	0	0	0
II	55–69	66	52.8	10	18.9	1	3.1
III	40–54	6	4.8	28	52.8	5	15.6
IV	0	0	0	3	5.7	2	6.3
V	25–39	0	0	10	18.9	1	3.1
VI	10–24	0	0	2	3.8	16	50.0
VII	(−50)–(−20)	0	0	0	0	7	21.9

longer in Caucasians than in Japanese. The mean nasal bridge inclination is slightly smaller in Japanese men than in Caucasian men and the range is wider in Caucasian than Japanese women, allowing more variations. The nasal index of the Oriental/Mestizo group (75.0) [72] is in the range of the index for Caucasian men (Table 18) and only slightly greater than the maximum index for young Caucasian women.

We recently analyzed the differences in the soft nose of Caucasian, Asian, and black North Americans [31, 32]. We found type I nostrils, which have the greatest inclination of the nostril axis, only in Caucasians (Table 19). The type II nostril was the most common Caucasian nostril type and type III was the most frequent in Asians. The round nostrils of type IV were seen in a surprisingly small number of adult non-Caucasians. The nearly horizontal nostrils (types V and VI) were more frequent in blacks (Figs. 27a and 27b) than Asians, and nostrils with reversed direction of the axis were present only in Negroid noses (Fig. 27c). Racial differences were observed even in the qualities of the alar bases. More than half of the Oriental noses had a short and curved alar base, which visually increased the length of the alae compared with the full and curved alar bases present in about one-quarter of the noses. For the blacks, the most typical alar bases were long, straight, and thin (43.8%), followed by the short, straight, and thin forms (25.0%).

Nostril Types and Soft Nose Measurements

In Asians and blacks with type IV nostrils, the nasal tip protrusion was smaller and the columella shorter than in Caucasians with type III. The nose width did not differ greatly but the columella was narrower than in Caucasians with type II nostrils.

The soft nose measurements in type V and type VI nostrils differed as follows: The columella and the nose width were significantly greater in type VI

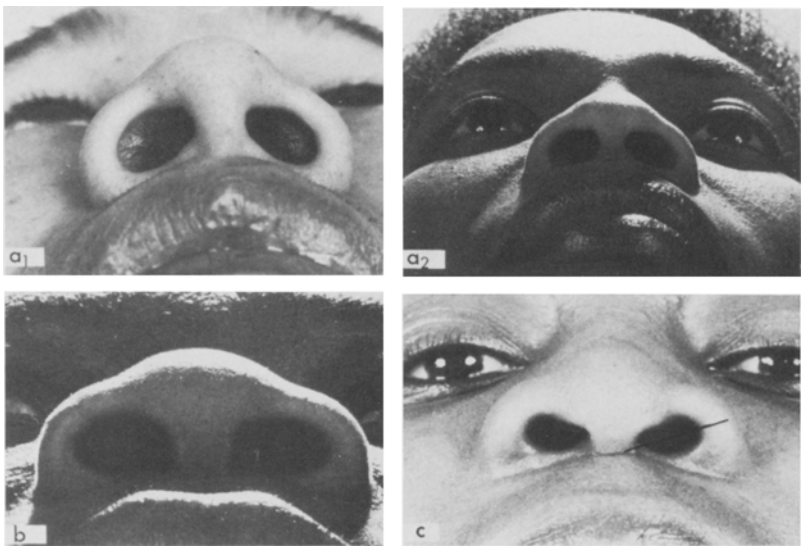

Fig. 27. Nostril types typical for the Negroid nose. **(a_1, a_2)** Variations of type V nostrils (range of inclinations = 25°–39°). **(b)** Type VI nostrils (range of inclinations = 10°–24°). **(c)** Type VII nostrils [range of inclinations = (−50°)–(−20°)]. Note the changing relationship between the length of the columella and the protrusion of the nasal tip. The nose is widest in type VI. The alar bases of these noses do not represent the most frequent forms (long, straight, thin)

noses ($p < 0.01$ and 0.001, respectively), and the columella and tip protrusion were nonsignificantly greater.

The unusual nostril type VII was associated with a nonsignificantly longer and wider columella but the same tip protrusion as the type VI nostril (Fig. 27c).

Nostril Types and Soft Nose Proportions

We tested the relationships of nasal tip protrusion to nose width (sn–prn/al–al), of columella width to nose width (sn′–sn′/al–al), and of columella length to nasal tip length (c′–sn/sn–prn). The indices confirmed the findings of the absolute measurements in the three racial types.

The *tip protrusion–nose width* index decreased markedly from the Caucasian, through the Asian, to the African nose, because of increasing nose width. The columella was about two-thirds of the Caucasoid nose width with type II nostrils, half of the Asian nose width with type III nostrils, and about one-third of the Negroid nose width with type VI nostrils. The general pattern of the Asian or the Negroid nose did not change even in the presence of nostril types seen in whites. Thus, compared with Caucasoid noses of the same types, Oriental noses with type II nostrils and both Asian and African noses with type III nostrils were wide.

The *columella–nose width* index decreased from 20.8–22.0 in Caucasians to 18.8 in Orientals and 18.1 in blacks because of the relatively large increase in the bialar width.

The *columella length–nasal tip protrusion* index in Caucasian noses was largest with type I nostrils (59.3%), less in noses with type II nostrils (58.6%), and smallest (54.1) in the presence of type III nostrils. In the Oriental nose, most frequently with type III nostrils, the index was similar to that in Caucasians with type III nostrils (54.9). The smallest index (50.8) was observed in the Negroid nose with type V nostrils.

Conclusion

As in any statistical analysis, differences were based on mean findings. The numbers of the African or the Asian samples cannot be regarded as representative, and the selection of the individuals measured was restricted to North, Central, and South America, and Hong Kong. Thus, the statistical findings are a modest illustration of differences between the races rather than absolute indicators of morphological characteristics. An exhaustive anthropometric study of the Mongoloid and the Negroid noses must comprise all major ethnic groups of these races, a task still awaiting enthusiasts.

Quantitative Analysis of the Nose in Clinical Practice

The human face provides the greatest number of morphological variations of any part of the body; thus, it is the key factor in creating individuality of appearance. To maintain a harmonious appearance the variations should not exceed certain limits [77]. The purpose of corrective or aesthetic plastic surgery is to identify and eliminate the factors disturbing facial harmony.

Facial Examination

Reliable measurements taken by photogrammetry: Landmarks marked on the face of the patient before photography will increase the accuracy of measurements. They facilitate orientation in the Frankfurt horizontal, which is required for measuring the inclinations in the facial profile line, the most important data obtained by photogrammetry. The only other reliable measurements taken from the nose are the height of the nose (n–sn), measured from a standard life-size frontal print, and the length of the columella (c′–sn), obtained from a lateral print of similar quality [29].

Information about both the Frankfurt horizontal and the rest position are needed in photogrammetry. While the metric analysis of the nasal bridge inclination (and the other sections of the facial profile) is carried out from the Frankfurt horizontal, the aesthetic judgment of the facial profile is conveyed on a head in rest position. Thus, for surgical planning of changes, for example, in the nasal bridge inclination, it is imperative to determine the difference between the rest and Frankfurt horizontal positions in the patient (Fig. 15).

Those studying the facial profile divided into three sectors by lines originating in the ear canal (tragion) [6, 106] must have information about the relative positions of the tragion landmarks. Our basic population study showed that healthy individuals of any age may have unilateral dislocation of the tragion [30]. A recent analysis found an uneven level of tragions in 19% of 200 young women. Lower ear canals were found equally on the right and the left sides. It would be improper to study the three-sector scheme of the profile on the side of the dislocated ear canal.

Anthropometry: Before measuring the nose and the face the examiner should visually evaluate the size and proportions of the nose itself to help identify problem areas. For this purpose the "graphic scale" visualizing various aspects of the nose in relation to the face, designed by Mahler and coworkers [69], appears to be useful. In areas of the main disfigurements all available measurements should be taken to reveal the actual problems objectively.

Calculation of Indices

The most frequent index quality determines the trend in proportions of the face. This information is essential for planning the surgical correction. Index values in problem areas will distinguish between disharmonies (statistically normal but visually disturbing proportions consisting of relatively unbalanced measurements) and disproportions (statistically abnormal indices). In abnormal indices the extent of the disproportion must be determined.

The surgeon will focus his attention on the most disproportionate areas. Areas that were never disproportionate in the attractive women we studied must be carefully tested in patients. In the nose, these include bridge length and nose height (n–prn/n–sn), and nasal root depth and slope length (en–m′ sag, left/en–m, left) (areal indices); and nose length and forehead height (n–sn/tr–n), nose length and face height (n–sn/n–gn), nose length and total face height (n–sn/tr–gn), nasal bridge length and upper-lip height (n–prn/sn–sto), nasal bridge length and lower half of the face height (n–prn/sn–gn), nasal root depth and intercanthal distance (en–m′ sag, left/en–en), and length of root slopes and intercanthal distance (en–m, left/en–en).

Examination of the Nasofrontal and Nasolabial Angles

The size and the configuration of the nasofrontal and the nasolabial angles depend on many factors (Fig. 20). In the *nasofrontal angle*, the factors include the shape and size of the glabellar area; the position of the eyebrows [112]; the distance between the glabella level and the deepest point of the root contour [114]; the width, depth, slope lengths, and surface contour of the nasal root, and the relation of its bottom point to the intercanthal line level [65]; and the length and inclination of the nasal bridge. Obviously, to correct this feature, the wide range of norms in all anatomical elements in its vicinity must be taken into consideration [40].

The *nasolabial angle* is affected not only by the size of the space between the columella line and the surface of the upper lip, expressed in degrees, but also by the position of the columella–labial junction in relation to the nasal tip protrusion and the upper-lip height [113]. The aesthetic appearance of the angle in the facial profile depends at least as much on the rest position of the head as on the size of the angle. One of the main factors influencing the size of the angle is the inclination of the upper lip; the length of the nasal bridge, which affects the position of the columella, is also important. At correction all these factors must be carefully analyzed.

Planning the Changes

Our study of attractive women's faces casts doubt on the use of overspecific "ideal," values [38]. For practical use, the normal range of the measurements must be given. However, the average measurement and/or index values are not "ideal," as our study proved. The key to restoration of facial

harmony is the renewal of the uniformity of proportion index qualities [116] by eliminating disharmonious and/or disproportionate relationships. Uniformity means that there is a dominating trend of index values in the face.

The desired change in a proportion is achieved by changing one of the measurements forming the proportion, simply "removing excesses or adding whenever necessary" [21]. The correct amount of change can be easily determined from the desired index value.

For surgical correction of the facial profile inclinations, especially that of the nasal bridge, the changes are calculated with the head in the Frankfurt horizontal, but the amount is adjusted to the needs of the profile with the head in the rest position (Fig. 20). Similarly, the corrections of the nasolabial and the nasofrontal angles are planned with the head in the rest position. The surgeon might rely more on his inborn or acquired aesthetic judgment than on knowledge of the mathematics.

In the literature there are repeated calls for restoration of harmony, balance, or equilibrium in the faces of patients with nose problems. We found that the main difference between the attractive and the below-average women's faces was not in the proportion qualities of the nose but in the relationships of the nasal and craniofacial measurements. This study also showed that mild disharmony in nonsensitive areas does not detract from the woman's attractiveness (Fig. 28).

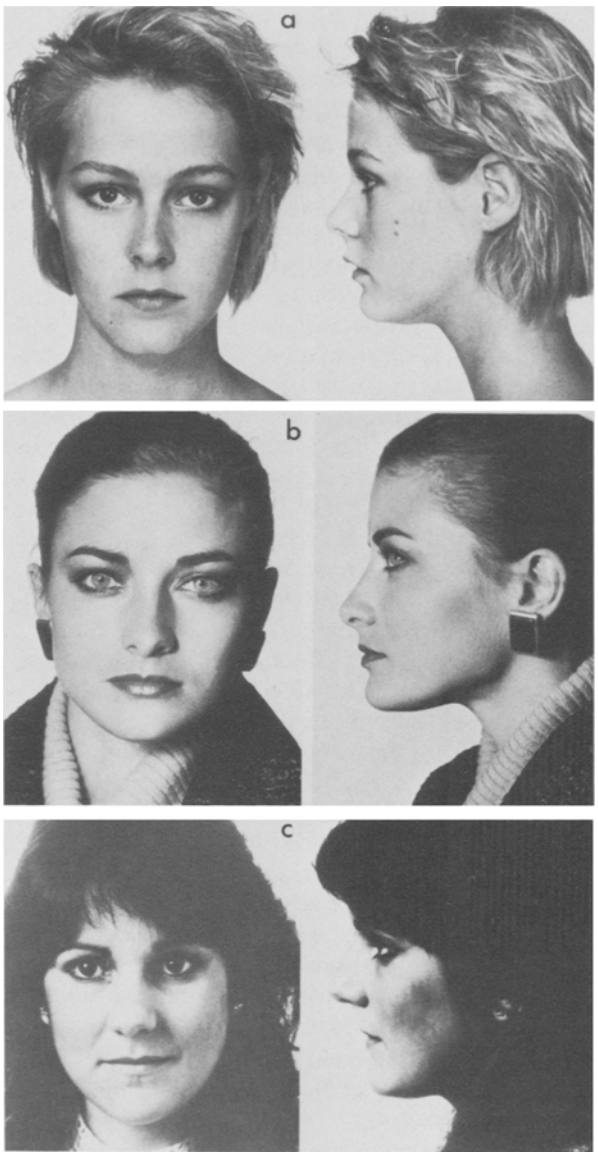

Fig. 28. Variations of nose and face qualities in attractive women. **(a)** A harmonious face; all 29 indices are in the range of mean ± 1 S.D. (attractiveness score = 5.1). **(b)** The most appealing face (attractiveness score = 6.2). Thirteen of the 29 indices were disharmonious and one index was mildly disproportionate (1.4%), due to the relatively long nose for the face. All measurements of the nose and face were in the normal ranges. **(c)** one of the least appealing faces in the attractive category (score = 5.0). Of the 29 indices, 7 are disharmonious, 7 disproportionate, and 15 harmonious. The proportion problems are caused by the relatively short nose, wide soft nose, and narrow nasal root

Discussion and Conclusions

The nose has been described, both in the distant past [62] and more recently [67, 73], as the keystone among the facial features for determining individuality. The influence of the nose on the fate of its owner is immortalized in the stories about Cleopatra's small nose and Cyrano de Bergerac's huge one. If the aim of aesthetic plastic surgery is to surpass the "average normal" [44], it is imperative to determine the above-average physiognomy objectively. Up until now we have had to be satisfied with 500-year-old facial canons and the urging words of surgeons calling for "harmony," "proportionality," or "balance" in the face [2, 4, 40, 52, 85, 97].

The neoclassical canons helped to bridge a long period in which objective data about the face were few. Opponents of these canons in medicine first appeared in the late 1940s [99]. Dissatisfaction with Leonardo's facial proportions led to formulation of a new profile-line concept by González-Ulloa, in his two pioneer articles in the early 1960s [46, 47]. However, the influence of the neoclassical teaching is still strong in plastic surgery despite continuous voices of criticism [34, 39, 105]. When searching for the neoclassical canons in attractive women's faces, we found, as in the healthy control population [34], the canons are not generally present.

The half-century long unflagging effort of orthodontists in search of objective descriptions of attractiveness must be applauded [14, 77–79, 81–83,

91, 107, 108, 118], even if it was restricted mostly to considerations of the facial profile. Thirty years ago, on the basis of his studies, the Italian orthodontist Edmondo Muzj [79] declared that "the beauty of [a man's] features . . . is not an abstraction born from the imagination of an artist," but "a concrete fact since he is constituted of mensurable characteristics demonstratively regulated by a biometric correlation among somatic characteristics." His prophetic words, that the greatest number of harmonious proportion characteristics is the key to the highest expression of health, aesthetics, and beauty of features, were confirmed by our findings in the faces of attractive women. Harmony means an optimal relationship between the proportions of all craniofacial features. It is declared also by the golden section [57, 116]. The anthropometric expression of the optimal relationship is shown by the width of the proportion variations, in our study represented by indices at the level of mean ± 1 S.D.

The averages repeatedly cited in the literature are not favored by nature: Mean nasal and craniofacial measurements were found in 12.0% and mean areal and interareal index values in 7% of the attractive faces. The attractiveness of the face was based on homogeneity of proportion index values, of which more than two-thirds were within 1 S.D. of the mean. This range still permitted certain variations, which added to the individuality of the face. The study also disclosed the key nasal indices that were never disproportionate. The visual impression is influenced by the relationship of the nose with the face more than by the proportions of the nose itself.

Almost half of the disproportions in the attractive faces and more than half in the below-average faces were produced by two measurements in the normal range. Consequently, precise measurements directly from the face of the patient are indispensable during surgical planning.

The ranges of the nasal measurements are based on findings in the faces of attractive women. The comparison of the nose in attractive and below-average faces offered additional data: It revealed significant differences in 23.5% of measurements (e.g., greater bridge inclination, deeper nasal root, longer root slopes) and only 10.3% of proportion indices. The detailed analysis detected significantly more visual disharmonies and more and greater disproportions in women with below-average faces. It was surprising to find attractive women with nasal bridge inclinations ranging between 22° and 37°, or to see inclinations of the general profile line (the line touching the glabella and the pogonion) between 0° and −11° (mean = −3.0°). The study proved that the vertical general profile line (g–pg) is not essential for the attractiveness of the face (Fig. 23). It was also interesting to learn about the relationship between the rest position and Frankfurt horizontal position of the head and the importance of adjusting surgical changes in the facial profile in accordance with the rest position.

The search for ethnic and racial differences in the soft nose proved to be the most rewarding, showing some definitive differences. The most typical expression of the soft nose differences was in its width and protrusion and the inclination of the longitudinal axis of the nostrils.

Rhinoplasty is one of the most challenging aesthetic plastic operations [101]. Quantitative evaluation of the nose and face is valuable [40, 97, 98], but not the only mode to improve the present status of surgery. The aesthetic feeling of the plastic surgeon may be inborn, but more likely it is a skill developed by repeated observations [94]. Since the changes required to reach the best aesthetic results sometimes rely on millimeters [25], the estimates should be based on precise quantitative analysis. However, the final approval of the decision is made by the aesthetic judgment of the operator.

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References

1. Ashley-Montagu MF: Location of the nasion in the living. Am J Phys Anthropol **20:**281, 1935
2. de Avelar JM: Personal contribution for the surgical treatment of negroid noses. Aesth Plast Surg **1:**81, 1976
3. de Avelar JM: The Negroid nose. VIIIth Congress of the International Society of Aesthetic Plastic Surgery, Madrid, Spain, (abstract) September 1985 p 51
4. Baroudi R, Keppke EM, da Silveira Carvalho CG: The square chin and the pointed chin: another refinement in facial aesthetics. Aesth Plast Surg **3:**129, 1979
5. Baud C: Harmonie du visage, 3rd ed. La Chaux de Fondes (Suisse): Clinique de la Tour, 1974
6. Baud CA: Geometrie der Schönheit in Harmonie der Gesichtszüge, Basel: Karger, 1982, pp 263–270
7. Beekhuis GJ: Saddle nose deformity: etiology, prevention, and treatment; augmentation rhinoplasty with polyamide. Laryngoscope **84:**2, 1974
8. Beheri GE: Rhinoplasty in Egyptians. Aesth Plast Surg **8:**145, 1984
9. Belinfante LS: Total treatment planning for esthetic problems of the face: a team approach. J Oral Surg **37:**178, 1979
10. Berndorfer A: Aesthetic surgery as organopsychic therapy. Aesth Plast Surg 3:143, 1979
11. Bernstein L: Esthetics in rhinoplasty. Otolaryngol Clin North Am **8:**705, 1975
12. Broadbent TR, Mathews VL: Artistic relationships

in surface anatomy of the face: application to reconstructive surgery. Plast Reconstr Surg **20:**1, 1957
13. Broadbent TR, Woolf RM: Anatomy of a rhinoplasty—saw technique. In Masters FW, Lewis JR Jr, eds. Symposium on Aesthetic Surgery of the Nose, Ears, and Chin. St. Louis: C.V. Mosby, 1973, Vol 6, pp 20–29
14. Burstone CJ: The integumental profile. Am J Orthod **44:**1, 1958
15. Coiffman F: External incisions on the nose. Aesth Plast Surg **1:**363, 1978
16. Converse JM: Corrective rhinoplasty. In Reconstructive Plastic Surgery, 2nd ed. Philadelphia: W.B. Saunders, 1977, Vol 2, pp 1040–1163
17. Coon CS: The Races of Europe. New York: MacMillan, 1939
18. Cottle MJ: Corrective Surgery. Nasal septum and external pyramid. Study notes and laboratory manual. Chicago: American Rhinologic Society, 1960
19. Daniel RK, Lessard M-L: Rhinoplasty: a graded aesthetic-anatomical approach. Ann Plast Surg **13:**436, 1984
20. Deniker J: The Races of Man: Outline of Anthropology and Ethnography. New York: Ayer Co., 1900
21. D'Ottaviano N, Baroudi R: Surgical and esthetic aspects of the facial profile. Int J Oral Surg **3:**243, 1974
22. Dzierżykraj-Rogalski T, Modrzewska K: Basic Anthropology for Medical Student. Warszawa: State Publishing House of Medical Literature, 1955 (in Polish)
23. Edgerton MT, Lewis CM, McKnelly LO: Lengthening of the short nasal columella by skin flaps from the nasal tip and dorsum. Plast Reconstr Surg **40:**343, 1967
24. Eickstedt E von: Rassenkunde und Rassengeschichte der Menschheit. Stuttgart, 1934
25. Fahoun K: Aesthetic aspects of nose shape evaluation. Acta Chir Plast (Prague) **23:**163, 1981
26. Falces E, Wesser D, Gorney M: Cosmetic surgery of the non-Caucasian nose. Plast Reconstr Surg **45:**317, 1970
27. Farina R, Cury E, Ackel IA: The prominent nasal tip. Aesth Plast Surg **8:**141, 1984
28. Farkas LG, Lindsay WK: The columella in cleft lip and palate anomaly. In Hueston JT, ed. Transactions of the Fifth International Congress of Plastic and Reconstructive Surgery, 22–26 February 1971. Melbourne, Australia: Butterworths, 1971, pp 373–381
29. Farkas LG, Bryson W, Klotz J: Is photogrammetry of the face reliable? Plast Reconstr Surg **66:**346, 1980
30. Farkas LG: Anthropometry of the Head and Face in Medicine. New York: Elsevier, 1981
31. Farkas LG, Hreczko TA, Deutsch CK: Objective assessment of standard nostril types—a morphometric study. Ann Plast Surg **11:**381, 1983
32. Farkas LG, Deutsch CK, Hreczko TA: Asymmetries in nostrils and the surrounding tissues of the soft nose—a morphometric study. Ann Plast Surg **12:**10, 1984
33. Farkas LG, Katic MJ, Kolar J, Munro IR: The adult facial profile: relationships between the inclinations of its segments. Dtsch Z Mund Kiefer Ges Chir **8:**182, 1984
34. Farkas LG, Hreczko TA, Kolar JC, Munro IR: Vertical and horizontal proportions of the face in young adult North American Caucasians: revision of neoclassical canons. Plast Reconstr Surg **75:**328, 1985
35. Farkas LG, Kolar JC, Munro IR: Craniofacial disproportions in Apert's syndrome: an anthropometric study. Cleft Palate J **22:**253, 1985
36. Farkas LG, Kolar JC, Munro IR: Geography of the nose in an attractive face: a morphometric study. VIIIth Congress of the International Society of Aesthetic Plastic Surgery, Madrid, Spain, September 1985, p 36 (abstract)
37. Farkas LG, Sohm P, Kolar JC, Katic MJ, Munro IR: Inclinations of the facial profile: art versus reality. Plast Reconstr Surg **75:**509, 1985
38. Farkas LG, Munro IR, Kolar JC: Linear proportions in above- and below-average women's faces. In Farkas LG, Munro IR, eds. Anthropometric Facial Proportions in Medicine. Springfield, IL: C.C. Thomas, 1986 (in press)
39. Farkas LG, Munro IR: Anthropometric Facial Proportions in Medicine. Springfield, IL: C.C. Thomas, 1986 (in press)
40. Fontana AM, Muti E: The nasofrontal angle and profile in rhinoplasty: case presentations. Aesth Plast Surg **7:**169, 1983
41. Furukawa M: Proportions of the nose and changes with age in Orientals. VIIIth Congress of the International Society of Aesthetic Plastic Surgery, Madrid, Spain, September 1985, p 38 (abstract)
42. Gelbke H: The nostril problem in unilateral harelips and its surgical management. Plast Reconstr Surg **18:**65, 1956
43. Ghyka MC: The Geometry of Art and Life. New York: Sheed & Ward, 1946
44. Gillies HD, Millard DR Jr: The principles and art of plastic surgery. Boston: Little, Brown & Co., 1957
45. Godycki M: Basic Anthropometry. Warszawa: State Publishing House, 1956 (in Polish)
46. González-Ulloa M: Quantitative principles in cosmetic surgery of the face (profileplasty). Plast Reconstr Surg **29:**186, 1962
47. González-Ulloa M: A quantum method for the appreciation of the morphology of the face. Plast Reconstr Surg **34:**241, 1964
48. González-Ulloa M: The fat nose. Aesth Plast Surg **8:**135, 1984
49. Hajniš K, Farkas LG: Proposición del examen antropólogico de fisuras de labio (labio leporino), de maxilar y de paladar. Rev Lat Am Cir Plast **8:**194, 1964
50. Hajniš K, Farkas LG: Anthropological record for congenital developmental defects of the face (especially clefts). Acta Chir Plast (Prague) **11:**261, 1969
51. Hajniš K: Das Verhältnis der Kopfhauptindexe und Dimensionen als Ausgangspunkt der Bestimmung der anthropologischen Type. Acta Fac Rerum Nat Univ Comen Anthropol **23:**107, 1976
52. Hinderer UT: Relationship between the protrusion of the nasal tip and the dorsum in rhinoplasty. Aesth Plast Surg **8:**201, 1984
53. Hooton EA: Up From the Ape (rev ed). New York: MacMillan, 1947
54. Hoyer C, Aybar L: Non Caucasian nose, extra rigidity to the lower lateral cartilage. VIIIth Congress

of the International Society of Aesthetic Plastic Surgery, Madrid, Spain, September 1985, p 66 (abstract)
55. Hrdlička A: Anthropometry. Philadelphia: Wistar Institute, 1920
56. Jackson IT, Munro IR, Salyer KE, Whitaker LA, eds.: Atlas of Craniomaxillofacial Surgery. St. Louis: C.V. Mosby, 1982
57. Joseph J: Nasenplastik und sonstige Gesichtsplastik nebst einem Anhang über Mammaplastik und einige weitere Operationen aus dem Gebiete der äusseren Körperplastik. Ein Atlas und Lehrbuch. Leipzig: Verlag von Curt Kabitzsch, 1931
58. Kolar JC, Farkas LG, Munro IR: Surface morphology in Treacher Collins syndrome: an anthropometric study. Cleft Palate J **22**:266, 1985
59. Kolar JC: Ethnic differences in facial proportions. In Farkas LG, Munro IR, eds. Anthropometric Facial Proportions in Medicine. Springfield, IL: C.C. Thomas, 1986 (in press)
60. Kroeber AL: Anthropology: Biology and Race. New York: Harcourt, Brace and World, Inc., 1963
61. Krugman ME, Lopez R, McKenzie P: Facial series of photographs as viewed by the plastic surgeon with special emphasis on the nose. J Biol Photogr Assoc **47**:201, 1979
62. Lavater JC: Essai sur la physiognomonie. La Haye: 1783, Tome I, p 262
63. Lee L, Lee K-J: A study of facial proportions and sketching of facial contours. Ear Nose Throat J **58**:150, 1979
64. LeRoy Straith C: Elongation of the nasal columella. Plast Reconstr Surg **1**:79, 1946
65. Lessard M-L, Daniel RK: Surgical anatomy of septorhinoplasty. Arch Otolaryngol **111**:25, 1985
66. Lines PA, Lines RR, Lines CA: Profilometrics and facial esthetics. Am J Orthod **73**:648, 1978
67. Macgregor FC: The place of the patient in society. Aesth Plast Surg **5**:19, 1981
68. Maes J, Li CS, Shaw DT: Alar base-wedge excisions: partial excision of the alae nasi-base of the nostrils. Aesth Plast Surg **3**:271, 1979
69. Mahler D, Moses S, Last U: A measuring scale for objective evaluation of the nasal shape. Aesth Plast Surg **7**:223, 1983
70. Marcks KM, Trevaskis AE, Payne MJ: Elongation of columella by flap transfer and z-plasty. Plast Reconstr Surg **20**:466, 1957
71. Martin R: Lehrbuch der Anthropologie in systematischer Darstellung mit besonderen Berücksichtigung der anthropologischen Methoden, 2nd ed. Jena: G. Fischer, 1928, Vol 1
72. Matory WE Jr, Falces E: Non-Caucasian rhinoplasty: a 16-year experience. Plast Reconstr Surg **77**:239, 1986
73. Micheli-Pellegrini V, Manfrida GM: Rhinoplasty and its psychological implications: applied psychology observations in aesthetic surgery. Aesth Plast Surg **3**:299, 1979
74. Mikulicz J: Zur Bildung der hatigen Nasenscheidewand. Langenbecks Arch Klin Chir **30**:113, 1884
75. Millard DR: The triad of columella deformities. Plast Reconstr Surg **31**:370, 1963
76. Millard DR Jr: Problem cases in rhinoplasty. In Masters FW, Lewis JR, eds. Symposium on Aesthetic Surgery of the Nose, Ears, and Chin. St. Louis: C.V. Mosby, 1973, Vol 6, pp 45–49
77. Muzj E: The method for orthodontic diagnosis based upon the principles of morphologic and therapeutic relativity. Angle Orthod **9**:123, 1939
78. Muzj E: An investigation of the facial profile and new diagnostic methods. Dent Rec June:164, 1949
79. Muzj E: Biometric correlations among organs of the facial profile. A possible solution to the present crisis in orthodontics. Am J Orthod **42**:827, 1956
80. Muzj E: Oro-facial anthropometrics. Hempstead, NY: Index Publishers Corporation, 1970
81. Muzj E: The human face. A casual evolution or a genetic program? Responsabilità del sapere. Rome: Centro di comparazione e sintesi, 1979
82. Muzj E: Musical and architectural proportions in the anatomy of the facial system. An anthropometric approach. Angle Orthod **52**:177, 1982
83. Neger M: A quantitative method for evaluation of the soft-tissue facial profile. Am J Orthod **45**:738, 1959
84. Olivier G: Practical Anthropology. Springfield, IL: C.C. Thomas, 1969 (translated by MA MacConaill)
85. Onizuka T, Itoh Y, Nakamura K: Procedures for repair of the cleft lip nose. Aesth Plast Surg **7**:179, 1983
86. Onizuka T, Iwanami M: Blepharoplasty in Japan. Aesth Plast Surg **8**:97, 1984
87. Parkes ML, Kamer FM: The mature nose. Laryngoscope **83**:157, 1973
88. Patterson CN: Surgery of the aging nose. In Sisson GA, Tardy ME Jr, eds. Plastic and Reconstructive Surgery of the Face and Neck. Proc 2nd Int Symp, Vol. I, Aesth Surg. New York: Grune & Stratton, 1977, p 20
89. Patterson CN, Powell DG: Facial analysis in patient evaluation for physiologic and cosmetic surgery. In Sisson GA, Tardy ME, Jr, eds. Plastic and Reconstructive Surgery of the Face and Neck, Proc 2nd Int Symp, Vol. I, Aesth Surg. New York: Grune & Stratton, 1977, p 146
90. Pech A, Cannoni M, Abdul S, Gitenet P, Zanaret M, Thomassin J-M: Les aspects pratiques de la profiloplastie. Rev Laryngol **99**:39, 1978
91. Peck H, Peck S: A concept of facial esthetics. Angle Orthod **40**:284, 1970
92. Peck GC: Surgery of the nasal tip. In Masters FW, Lewis JR, Jr, eds. Symposium on Aesthetic Surgery of the Nose, Ears, and Chin. St. Louis: C.V. Mosby, 1973, pp 36–42
93. Pešková H, Fára M: Lengthening of the columella in bilateral cleft. Acta Chir Plast **2**:18, 1960
94. Reich J: Aesthetic judgment in the surgery appearance. Aesth Plast Surg **1**:35, 1976
95. Reich J: The evolution of thought concerning the justification of aesthetic plastic surgery. Aesth Plast Surg **2**:183, 1978
96. Ripley WZ: The Races of Europe: a Sociological Study. New York: Appleton, 1899
97. Robin JL: The preplanned rhinoplasty. Aesth Plast Surg **3**:719, 1979
98. Rogers BO: The role of physical anthropology in plastic surgery today. Clin Plast Surg **1**:439, 1974
99. Safian J: A critical review of recent literature on rhinoplasty. Plast Reconstr Surg **2**:463, 1947
100. Salinger S: Reconstruction of the columella. Plast Reconstr Surg **2**:87, 1947
101. Sanchez AE: Rhinoplasty in the "Chata" nose of Caribbean. Aesth Plast Surg **4**:169, 1980

102. Seghers MJ, Longacre JJ, DeStefano GA: The golden proportion and beauty. Plast Reconstr Surg **34:**382, 1964
103. Sherlock EC: Anatomy of the nose and septum. In Masters FW, Lewis JR, Jr, eds. Symposium on Aesthetic Surgery of the Nose, Ears, and Chin. St. Louis: C.V. Mosby, 1973, Vol 6, pp 8–11
104. Sinclair PM: The divine proportion. Am J Orthod **82:**166, 1982
105. Skiles MS, Randall P: The aesthetics of ear placement: an experimental study. Plast Reconstr Surg **72:**133, 1983
106. Stoksted P, Gutierrez C: Facial morphology applied to rhinologic surgery. J Laryngol Otol **15:**693, 1981
107. Stoner MM: A photometric analysis of the facial profile. Am J Orthod **41:**453, 1955
108. Sushner NJ: A photographic study of the soft-tissue profile of the Negro population. Am J Orthod **72:**373, 1977
109. Topinard P: Eléments d'Anthropologie générale. Paris: A Delahaye et E LaCrosnier, 1885
110. Walter C: Aesthetische Chirurgie der Nase. In Gohbandt E, Gabka J, Berndorfer A, eds. Handbuch der Plastischen Chirurgie. Beitrag 34. Berlin: Walter De Gruyter & Co., 1966, Vol 2
111. Webster RC: Advances in surgery of the tip: intact rim cartilage techniques and the tip-columella-lip esthetic complex. Otolaryngol Clin North Am **8:**615, 1975
112. Webster RC: Revisional rhinoplasty. Otolaryngol Clin North Am **8:**753, 1975
113. Webster RC, Smith RC, Kazda G: Columella-labial changes in solution of rhinoplastic problems. Laryngoscope **95:**629, 1985
114. Weninger J: Leitlinien zur Beobachtung der somatischen Merkmale des Kopfes und Gesichtes am Menschen. Mitt Anthropol Ges Wien **54:**232, 1924
115. Wissner G: Alterveränderungen von Gesichts- und Ohrmerkmalen. Anthrop Anz **32:**157, 1970
116. Wright AM: Facial proportions in medical illustration. In Farkas LG, Munro IR, eds. Anthropometric Facial Proportions in Medicine. Springfield, IL: C.C. Thomas, 1986 (in press)
117. Wright WK: Surgery of the bony and cartilaginous dorsum. Otolaryngol Clin North Am **8:**575, 1975
118. Wylie WL: The assessment of anteroposterior dysplasia. Angle Orthod **17:**97, 1947