ONLINE ONLY

Changes in esthetic standards since 1940

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Introduction: The goals of this study were to investigate differences between the most popular female and male faces, past and present, and to determine whether they had changed over time and, if so, to what extent. **Methods:** Internet film databases were searched for photographs of men and women who were considered attractive between 1940 and 2008. Images meeting defined inclusion criteria were compared. Measurements were taken on a minimum of 20 images per sex per decade. Intersex facial differences were grouped by decades, and we examined whether these differences remained stable or whether and how they changed over time. **Results:** The women had fuller and more protrusive lip profiles than did the men, particularly during the first decade of the 21st century. Significant sex-specific developments were noted over time with respect to chin lengths, frontonasal angles, and total face angles. The men had decreases in chin size and length, but a small opposite trend was observed in the women's faces. During the observation period, female and male faces considered highly attractive became slightly more similar in terms of chin position and size. **Conclusions:** Notions of facial attractiveness might be influenced by developments in society. (Am J Orthod Dentofacial Orthop 2010;137:450.e1-450.e9)

There is agreement in the dental literature that people are born with a shared notion of an "ideal" face.[1-7] Beautiful female faces are symmetrical and have a child-like quality, but at the same time they look mature and expressive.[3,8-10] Attractive male faces are also symmetrical, but there is controversy about what features make a man's face extremely attractive. Women's judgments are greatly influenced by menstruation cycles and circumstances of their lives.[2,9,11]

We know today that the perception of an "ideal" face changes over time and is influenced by current fashions.[12,13] Auger and Turley[12] and Nguyen and Turley[14] analyzed fashion magazines published in the 20th century and found that both female and male profiles changed significantly over time. More recent issues of the magazines included male and female faces with considerably fuller and more protrusive lip profiles.

Just as the roles of women and men in society have changed, the notions of ideal beauty have also changed for both sexes.[15,16] Today, women and men have increasingly similar roles, and, particularly in professional society, the equality of the sexes continues to evolve.[15,17] This raises the question whether these changing roles are reflected in the perceived attractiveness of faces.

The purpose of this study was to identify any intersex differences between faces considered beautiful and attractive 70 years ago. Another objective was to analyze whether these differences still exist today or whether they have changed, and, if so, what are these changes.

MATERIAL AND METHODS

Internet film databases were searched for photographs of men and women considered attractive between 1940 and 2008 (Table I). This approach was selected because databases of this type specialize in depicting high-profile people universally admired for their attractiveness. A total of 400 images were selected (200 of men, 200 of women). The images met the following inclusion criteria: (1) white people of both sexes at estimated ages between 16 and 40 years, (2) only 1 line of the philtrum visible, (3) no shadow on or beneath the profile, (4) lips closed and at rest, and (5) lateral view showing the entire head from glabella to menton.

These profile photographs were downloaded from the Internet and grouped by decades. At least 20 images were available per sex per decade. To facilitate comparison, all images were oriented parallel to the Frankfort plane by using Computer Forum software (Computer Forum GmbH, Elmshorn, Germany). Moreover, the images were standardized for size to a distance of 35 mm between soft-tissue nasion and subnasale.[18]

These facial landmarks were identified for the linear, angular, and proportional measurements (Fig 1).[19,20]

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The authors report no commercial, financial, or proprietary interest in the products or companies described in this article.
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Submitted, March 2009; revised and accepted, October 2009.
0889-5406/$36.00

doi:10.1016/j.ajodo.2009.10.029

Table I. Addresses for photos from each decade

Decade	*Period*	*Source*
1940	1940-49	eu.movieposter.com
		us.imdb.com
		www.briansdriveintheater.com
		www.imdb.com
		www.impawards.com
		www.moviegoods.com
1950	1950-59	imp.photobucket.com
		pwp.netcabo.pt
		us.imdb.com
		www.allposters.de
		www.briansdriveintheater.com
		www.btinternet.com
		www.impawards.com
		www.moviegoods.com
		www.netropolisusa.biz
1960	1960-69	us.imdb.com
		www.allposters.de
		www.briansdriveintheater.com
		www.impawards.com
		www.moviegoods.com
		www.robertkleingallery.com
1970	1970-79	us.imdb.com
		www.briansdriveintheater.com
		www.impawards.com
		www.moviegoods.com
		www.trailerfan.com
1980	1980-89	us.imdb.com
		www.impawards.com
		www.moviegoods.com
		www.terencebud.com
1990	1990-99	us.imdb.com
		www.allposters.de
		www.impawards.com
		www.moviegoods.com
		www.segafan.com
2000	2000-08	movies.indiainfo.com
		pds.exblog.jp
		starophile.free.fr
		us.imdb.com
		www.allposters.de
		www.impawards.com
		www.lightmedia.hu
		www.moviegoods.com

1. Glabella (GL), the most prominent central point between the eyebrows (corresponds to the bony glabella).
2. Nasion (N), the midpoint of nasal root and nasofrontal suture, always located above the line connecting both inner canthi (corresponds to the bony nasion).
3. Pronasale (Prn), the most anterior point of the nose tip as seen laterally.
4. Subnasale (SN), the midpoint of the columellar base angle, located where the lower margin of the nasal septum meets the upper segment of the upper lip. It is not identical to either the bony point of the anterior nasal spine or A-point.
5. Superior labial sulcus (SLS), the deepest midpoint of the upper lip, normally located midway between SN and Ls.
6. Labrale superius (Ls), the midpoint of the upper lip vermilion.
7. Stomion (Sto), the intersection between the vertical facial midline and a horizontal drawn through the closed lips with the teeth in natural occlusion.
8. Labrale inferius (Li), the midpoint of the lower lip vermilion.
9. Inferior labial sulcus (ILS), the midpoint of the supramental fold, at the transition from the lower lip margin to the upper margin of the chin.
10. Pogonion (Pog), the most anterior midpoint of the chin, located on the soft tissue directly above the bony pogonion.
11. Menton (Me), the lowest midpoint of the mandibular lower margin (corresponds to the bony menton).
12. Cheilion (Ch), the lateral corner of the mouth.
13. Exocanthion (Ex), the outer canthus.

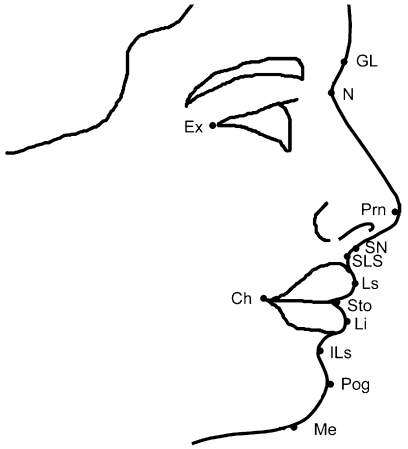

Fig 1. Landmarks according to Farkas[19] and Hajeer et al.[20]

The angular measurements were the following (Fig 2).

1. Frontonasal angle (FNA), the angle between the GL-N and N-Prn lines.
2. Nasolabial angle (NLA), the angle between the SN-Ls line and the SN to columella tangent.
3. Total face angle (TFA), the angle between the GL-SN and SN-Pog lines.
4. Nose tip angle (NTA), the angle between the N-Prn line and the SN to columella tangent.

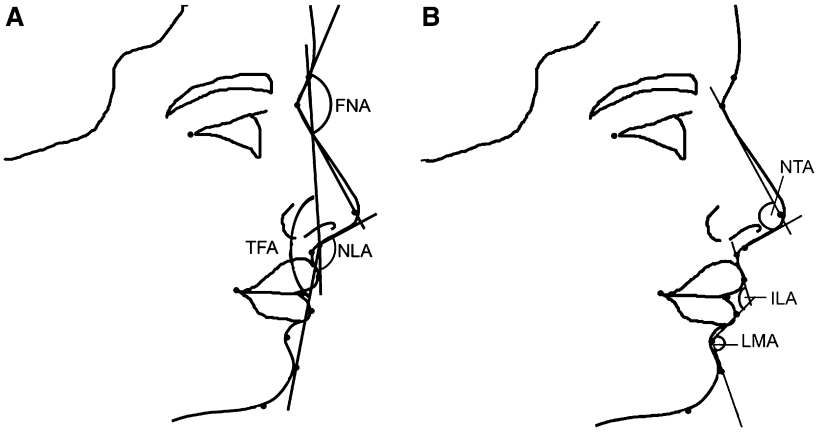

Fig 2. A, Angular measurements: frontonasal angle (FNA), nasolabial angle (NLA), total face angle (TFA). **B,** Angular measurements: nose tip angle (NTA), interlabial angle (ILA), labiomental angle (LMA).

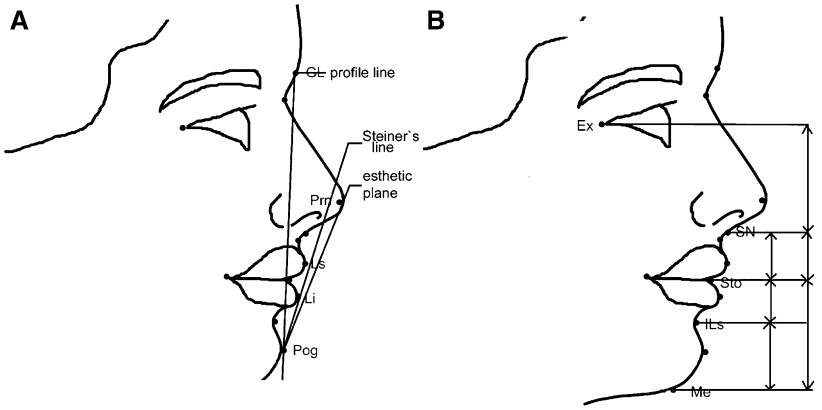

Fig 3. A, Linear measurements: distance from labrale superius (Ls) and labrale inferius (Li) to profile line, Steiner's line, and esthetic plane. **B,** Linear measurements: length of upper lip (SN-Sto), length of lower lip (Sto-ILS), chin length (ILS-Me), height of upper face (Ex-SN), height of middle face (SN-Sto), height of lower face (Sto-Me).

5. Interlabial angle (ILA), the angle between the SLS-Ls and the Li-ILS lines.
6. Labiomental angle (LMA), the angle between the Li-ILS and the ILS-Pog lines.

The linear measurements were the following (Fig 3).

7. Distance from Ls to GL-Pog.
8. Distance from Li to GL-Pog.
9. Distance from Ls to Steiner's line (columella-Pog).
10. Distance from Li to Steiner's line (columella-Pog).
11. Distance from Ls to Prn-Pog.
12. Distance from Li to Prn-Pog.
13. Length of lower lip (Sto-ILS).
14. Length of chin (ILS-Me).
15. Height of upper face (Ex-SN).
16. Height of middle face (SN-Sto).
17. Height of lower face (Sto-Me).

Surface area measurements were the following (Fig 4).

18. Lip area (Ch-Ls-Li).
19. Profile area (Ch-Pog-Prn).

The proportional measurement was the folloing (Fig 4).

20. Ratio of profile area to lip area, Ch-Pog-Prn: Ch-Ls-Li.

Statistical analysis

For each of the 20 parameters, we performed an analysis of variance (ANOVA) with the factors sex and decade, with the interaction of these factors. For each of the 7 decades, we compared the sexes with

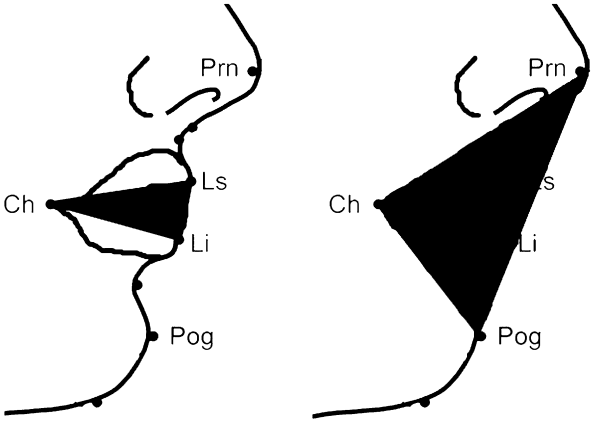

Fig 4. Surface area measurements: lip area (Ch-Ls-Li), profile volume (Ch-Pog-Prn).

post-hoc *t* tests, resulting in 161 *P* values. Because of multiple testing, we adjusted the level of significance according to the method of Bonferroni-Holm. All results are presented as mean values with their 95% CI.

To describe trends in the variables over time, we fitted straight lines for men and women separately. We tested whether the slopes differed from zero, and whether they differed between the sexes.

RESULTS

The results of the statistical analysis for describing the intersex trends in the variables over time are given in Table II. The FNA ($P = 0.0156$), the NLA ($P = 0.0050$), and the Ch-Pog-Orn:Ch-Ls-Li ($P = 0.0225$) of women changed significantly with time. Among the variables of men, the FNA ($P < 0.0001$), the LMA ($P = 0.0074$), and the distances from Ls to GL-Pog ($P = 0.0245$) and Sto-ILS ($P = 0.0492$) changed significantly with time.

In Table III, the results for differences in the development slopes between the sexes are shown. Only for changes of the variables ILS-Me, TFA, and FNA, during the study period, was a significant difference between men and women detectable.

Six parameters were found with statistically significant intersex differences, after adjusting for multiple tests (Table IV).

From the 1940s to the 1960s, attractive men had significantly higher values for Ch-Pog-Prn:Ch-Ls-Li than did attractive women (difference in the 1940s, 1.17; difference in the 1950s, 1.1; difference in the 1960s, 0.95). Higher values indicate smaller lip area (Ch-Ls-Li) relative to their profiles. The difference was no longer significant in the 1970s (difference, 0.63) and 1980s (difference, 0.56), although there was still a trend for men to have higher values; ie, Ch-Ls-Li was smaller than for women. In the 1990s and 2000s, the smaller Ch-Ls-Li of men, relative to their profile, were once again statistically significant: men had significantly higher values than did women during this time (difference in the 1990s, 1.07; difference in the 2000s, 1.24).

Among women, Ch-Ls-Li:Ch-Pog-Prn increased significantly ($P = 0.02$) from 1940 to 2008. Values decreased over time (from 3.89 to 3.40), although with slight oscillations. Among men, Ch-Ls-Li:Ch-Pog-Prn also increased over the same period. This decrease (from 5.06 to 4.64), however, fell short of statistical significance.

Among men, Ch-Ls-Li remained relatively constant (from 67 to 61 mm^2), with only minor variation between decades. Lip areas among women increased from 1940 to 2007, but the increase was not statistically significant (from 79 to 89 mm^2). Finally, male and female faces differed significantly in the 2000s, with women's lips considerably fuller than those of men (difference, 28 mm^2).

ILA was used to evaluate lip protrusion. The smaller the ILA, the greater the lip protrusion. Lip protrusion was more pronounced in women, and ILA decreased slightly over the years from 127° to 120°, whereas there was only a minor variation in men over this period (from 130° to 131°). In the 1970s, women's lips were characterized by significantly greater protrusion than those of men (because the angles measured were significantly smaller; difference, 19°).

The values for Sto-Me were slightly higher for men than for women. However, only the images from the 1960s had a statistically significant difference (3 mm). The height of the lower face changed with slight oscillations in both men and women over the years (women, 31-32 mm; men, 32-32 mm).

The distance between the upper lip and the esthetic plane (Ls-esthetic) did not change significantly in either sex over time (women, –3.2 to –2.9 mm; men, –4.1 to –3.2 mm).

Overall, the upper lip was closer to the esthetic plane (and, hence, more protrusive) in women than in men. A statistically significant difference was obtained based on the images from the 1990s (difference, 1.2 mm), since men considered especially attractive had more retrusive upper lips compared with men in other decades.

Values for NTA were generally smaller for men than women (ie, men had slightly larger noses than women). In the 1970s, this difference (9°) became large enough to reach statistical significance.

Three parameters showed statistically significant intersex differences over time (Figs 5-7).

Figure 5 illustrates FNA, which changed significantly in both men ($P = 0.0001$) and women ($P = 0.0156$) over time. Significant sex-specific differences in FNA were not found for any 1 decade.

Table II. Intrasex developments over time

Variable	*Minimum*	*Maximum*	*Mean*	*SD*	*Slope*	P *value*
Women						
FNA (°)	116.5	164.1	140.6	7.2	0.0646	0.0156*
NTA (°)	60	103.8	82.6	7.8	−0.0196	0.5006
NLA (°)	83.9	136.4	105.6	10.3	−0.1066	0.0050†
ILA (°)	77.5	166.6	122.1	16.3	−0.0955	0.1150
TFA (°)	160.5	179.4	169.2	4.4	0.0260	0.1147
LMA (°)	73.2	166.1	126.9	14.6	0.0763	0.1615
Ls profile line (mm)	0.9	8.5	5.0	1.6	0.0005	0.9358
Li profile line (mm)	−1	6.3	2.8	1.3	−0.0019	0.6923
Ls Steiner's line (mm)	−4.6	0	−1.5	1.1	−0.0045	0.2500
Li Steiner's line (mm)	−3.4	2.7	−0.0	1.3	0.0010	0.8428
Ls esthetic plane (mm)	−6.2	0.6	−2.9	1.3	0.0004	0.9372
Li esthetic plane (mm)	−4.1	2.3	−0.7	1.4	0.0039	0.4382
Sto-ILS (mm)	7.6	16.9	11.3	1.6	0.0080	0.1683
ILS-Me (mm)	15.4	29.8	20.4	2.5	0.0104	0.2617
Ex-SN (mm)	28.1	50.3	38.0	4.6	0.0068	0.6907
SN-Sto (mm)	10.8	22.9	15.8	1.9	−0.0064	0.3622
Sto-Me (mm)	26	43.2	31.4	3.1	0.0162	0.1548
Ch-Ls-Li (mm)	36.6	164.4	81.1	25.6	0.1724	0.0699
Ch-Pog-Prn (mm)	136.7	553.5	287.5	76.8	0.0465	0.8713
Ch-Pog-Prn:Ch-Ls-Li	205.8	580.1	366.3	73.5	-0.6220	0.0225*
Men						
FNA (°)	113.7	161.9	140.5	9.5	0.2253	<0.0001‡
NTA (°)	55	103.3	77.3	8.6	−0.0054	0.8679
NLA (°)	72.9	129.7	104.0	11.2	−0.0007	0.9872
ILA (°)	72.6	163	130.0	15.6	0.0275	0.6389
TFA (°)	155.9	179.7	169.2	5.3	−0.0356	0.0705
LMA (°)	90.9	168.8	124.9	15.4	0.1534	0.0074†
Ls profile line (mm)	−1.2	9.4	4.4	1.7	0.0141	0.0245*
Li profile line (mm)	−0.9	6.6	2.7	1.5	0.0092	0.1027
Ls Steiner's line (mm)	−5.6	0	−2.0	1.1	−0.0052	0.2293
Li Steiner's line (mm)	−3.8	2.8	−0.6	1.3	0.0035	0.4826
Ls esthetic plane (mm)	−7.9	−0.3	−3.6	1.4	0.0063	0.2183
Li esthetic plane (mm)	−4.7	2.3	−1.5	1.4	0.0099	0.0642
Sto-ILS (mm)	7	16.3	11.6	1.7	0.0127	0.0492*
ILS-Me (mm)	9.3	28.8	21.1	2.9	−0.0205	0.0607
Ex-SN (mm)	25.1	53	38.5	4.6	0.0005	0.9785
SN-Sto (mm)	10.7	20.8	16.1	2.0	−0.0070	0.3492
Sto-Me (mm)	19.9	42.5	32.6	3.5	−0.0081	0.5374
Ch-Ls-Li (mm)	28.8	164.8	67.5	23.3	0.0127	0.8844
Ch-Pog-Prn (mm)	151.6	575.1	297.4	77.1	−0.3493	0.2268
Ch-Pog-Prn:Ch-Ls-Li	252.5	732.4	462.4	103.4	−0.5418	0.1620

*$P = 0.05$; †$P = 0.01$; ‡$P = 0.0001$.

Nevertheless, significantly different changes were found over time ($P = 0.0001$); FNAs increased significantly more among men than among women over the observation period.

Figure 6 illustrates TFA, which significantly changed in different ways ($P = 0.02$) in men and women, with a slight decrease among men and a slight increase in women. No significant sex-specific differences were found for any 1 decade.

Figure 7 illustrates ILS-Me, which showed no significant sex-specific differences between any decade. However, significantly different changes were found for men and women over time ($P = 0.03$): chin lengths decreased slightly in men but remained essentially unchanged in women, with minor oscillating variations.

DISCUSSION

We did not investigate genetic changes of facial appearance. To investigate genetic changes, we believed that the observation period of 70 years was too short and the number of subjects in our cohort was too small for a valid study of this question. In contrast, our findings, investigating changes of ideal facial attractiveness

Table III. Difference of slope between women and men

Variable	*Difference of slopes*	P *value*
FNA (°)	−0.161	0.0001†
NTA (°)	−0.014	0.7431
NLA (°)	−0.106	0.0616
ILA (°)	−0.123	0.1438
TFA (°)	0.062	0.0166*
LMA (°)	−0.077	0.3267
Ls profile line (mm)	−0.014	0.1127
Li profile line (mm)	−0.011	0.1341
Ls Steiner's line (mm)	0.001	0.9149
Li Steiner's line (mm)	−0.003	0.7127
Ls esthetic plane (mm)	−0.006	0.4023
Li esthetic plane (mm)	−0.006	0.4187
Sto-ILS (mm)	−0.005	0.5879
ILS-Me (mm)	0.031	0.0313*
Ex-SN (mm)	0.006	0.7934
SN-Sto (mm)	0.001	0.9508
Sto-Me (mm)	0.024	0.1622
Ch-Ls-Li (mm)	0.160	0.2154
Ch-Pog-Prn (mm)	0.396	0.3305
Ch-Pog-Prn:Ch-Ls-Li	−0.080	0.8657

*$P = 0.05$; †$P = 0.001$.

over time, confirm the results of previous studies from the orthodontic, psychosocial, and sex-associated studies of Auger and Turley,[12] Nguyen and Turley,[14] and Yehezkel and Turley.[18] Like those authors, we observed that lip areas increased, the nasolabial angle decreased, and the profile became more convex in both women and men over the past 70 years.

Only in women did the increase of the lip area and the decrease of the nasolabial angle reach significant levels. In men, on the other hand, these changes were not significant but showed a significant increase in profile convexity with the reduction of chin prominence.

Several studies analyzed similar soft-tissue parameters as we did to assess the preferences of society regarding facial attractiveness.[14,21] For the most part, our mean values agreed with the variables in other studies (Table V). For example, our FNA of 140.6° ± 7° was in line with the findings of Nguyen and Turley[14] (137.3° ± 9°) and Ferrario et al[21] (134°-146°). The NTA of 82.6° ± 8° was also within the range of 74.6° to 90.6° found by Nguyen and Turley[14] and Ferrario et al[21] as was our mean for LMA of 126.9° ± 15°. The values of Ferrario et al[21] for the NLA (122°-127°) and TFA (158°-159°) differ from our values. This small variation could be because no facial esthetics were considered in their sample selection. In contrast to Nguyen and Turley,[14] we found fewer variables and some that partially changed significantly in the observed period. That might be due to different picture sources (magazines vs Internet). Furthermore, the method of standardization with the landmarks SN and N that we used could have had small inaccuracies. However, this method was also used by other authors,[12,14,18] and Gwilliam et al[22] demonstrated that SN is reproducible to within a 1-mm standard deviation for intraoperator data. But they also stated that reproducibility of soft-tissue N was relatively poor for both inter- and intraoperator data in the y-axis. For placing N correctly in the vertical position, a good clinical knowledge of natural head position in the lateral profile is required. This was the case in our study.

Many studies have described facial features that are considered particularly attractive. The lips are the key to the lower third of the face.[23] Full and well-defined lips add aspects of youth, health, and attractiveness to a face.[23,24] With increasing age, the lips become thinner; thus, the face appears older.[25] Our society attaches great value to youthful looks and wants to prevent age from showing. Adult faces that radiate youth are judged to be particularly attractive.[26,27] This notion is reflected by fashion models with full and protrusive lips. Another manifestation is the increased popularity of plastic surgery for lip augmentation.[28,29] Goehring[30] maintained that a youthful appearance suggests fertility; thus, it is especially desirable for women. Female faces with full lips, small mandibular bones, and big eyes signal high levels of estrogen and low levels of male hormones. As soon as women's outer appearance signals reduced fruitfulness via reduced estrogen levels, they are no longer judged as attractive by men.[25,31-33]

However, an increasing preference for full and protrusive lips has also been observed in men, although this finding was not statistically significant. Male faces are also considered more attractive if they have a youthful look.[26,34] This appearance factor offers many advantages, since attractive people are generally believed to be more friendly, intelligent, interesting, and socially competent than less attractive ones.[35-37]

Our results clearly indicate that some intersex differences between faces considered beautiful and attractive already existed 70 years ago and survive to this day. These sex-specific differences are reflected in some angular, linear, and surface area measurements pertaining mainly to the lip region (Table IV).

Perceived facial attractiveness varies with fashion. Today, faces with fuller and more protrusive lip profiles are preferred. Both sexes exemplify this trend. Significantly different developments in female- and male-judged attractiveness can be observed with regard to the parameters of ILS-Me, FNA, and TFA. Men had decreases with minor oscillating variations in both TFA and ILS-Me, whereas upturns, downturns, and a small opposite trend were observed in women. This means that the profiles of male faces considered attractive

Table IV. Mean values and 95% CI of the 6 parameters with significant differences between men and women

Decade	*Subjects*	*Ch-Pog-Prn:Ch-Ls-Li*	*Ch-Ls-Li (mm²)*	*ILA (°)*	*Sto-Me (mm)*	*Ls-esthetic (mm)*	*NTA (°)*
1940	Women	3.89† (3.51-4.28)	79 (68-89)	127 (120-134)	31 (30-32)	−3.2 (–3.8-−2.6)	79 (75-82)
	Men	5.06† (4.66-5.45)	67 (56-77)	130 (123-137)	32 (31-34)	−4.1 (–4.7-−3.5)	78 (75-82)
1950	Women	3.77† (3.42-4.12)	79 (69-88)	128 (122-134)	31 (30-33)	−3 (−3.5-−2.5)	86 (83-89)
	Men	4.87† (4.50-5.24)	60 (50-70)	130 (123-136)	32 (30-33)	−3.7 (−4.2-−3.1)	78 (75-82)
1960	Women	3.56* (3.17-3.95)	74 (64-85)	120 (113-126)	30* (28-31)	−2.2 (−2.8-−1.6)	85 (81-88)
	Men	4.51* (4.19-4.84)	69 (60-78)	128 (123-134)	33* (32-35)	−3.6 (−4.0-−3.1)	78 (75-81)
1970	Women	3.82 (3.43-4.20)	77 (66-87)	114* (108-121)	32 (31-34)	−2.7 (−3.3-−2.1)	84 (81-88)
	Men	4.45 (4.08-4.81)	72 (62-82)	133* (126-139)	34 (33-36)	−3.5 (−4.1-−3)	75* (72-79)
1980	Women	3.73 (3.35-4.10)	86 (76-96)	122 (115-128)	31 (30-33)	−3 (−3.6-−2.5)	80 (77-84)
	Men	4.29 (3.95-4.63)	75 (65-84)	125 (119-131)	33 (32-34)	−3.3 (−3.8-−2.8)	76 (73-79)
1990	Women	3.59† (3.28-3.91)	81 (73-90)	123 (117-128)	32 (31-33)	−2.9* (−3.4-−2.4)	83 (80-85)
	Men	4.66† (4.35-4.98)	69 (60-77)	133 (128-139)	32 (31-33)	−4.1* (−4.6-−3.7)	76 (73-78)
2000	Women	3.40† (3.09-3.72)	89† (80-97)	120 (115-126)	32 (30-33)	−2.9 (−3.4-−2.5)	81 (79-84)
	Men	4.64† (4.32-4.97)	61† (53-70)	131 (125-136)	32 (31-33)	−3.2 (−3.6-−2.7)	80 (77-83)

*$P = 0.05$; †$P = 0.001$.

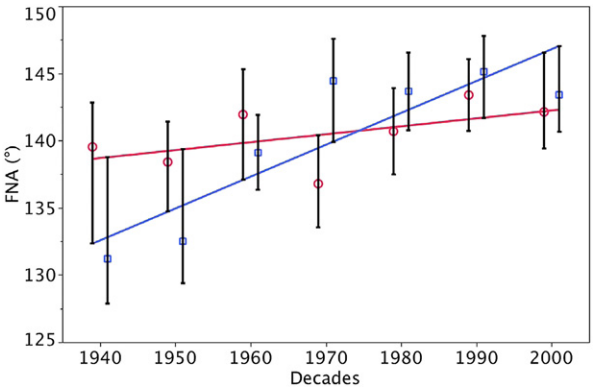

Fig 5. Frontonasal angle (FNA): decades (x-axis) are plotted against degree values (y-axis). The *blue curve* illustrates how this angle developed for men by decades from the 1940s to the 2000s. The *red curve* illustrates the same development for women.

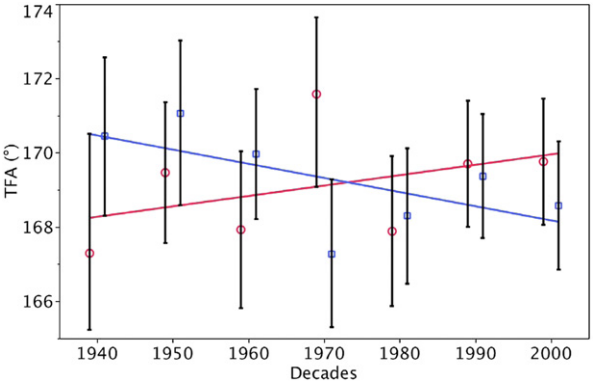

Fig 6. Total face angle (TFA): decades (x-axis) are plotted against degree values (y-axis). The *blue* and *red curves* indicate how this parameter developed from the 1940s to the 2000s (*blue,* men; *red,* women).

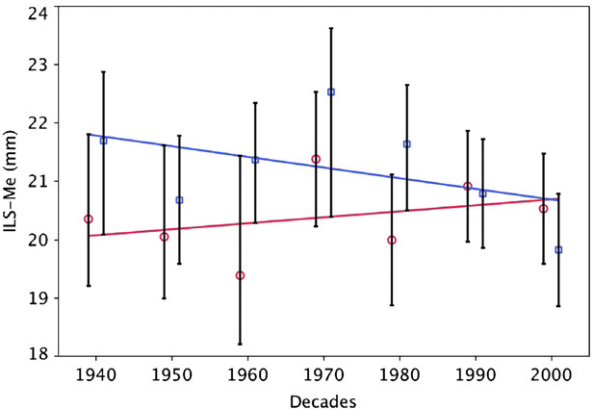

Fig 7. Chin length (ILS-Me): decades (x-axis) are plotted against millimeter values (y-axis). The *blue* and *red curves* indicate how this parameter developed from the 1940s to the 2000s (*blue*, men; *red*, women).

Table V. Mean soft-tissue measurements from this and other studies

Variable (°)	*This study*	*Nguyen and Turley*[14]	*Ferrario et al*[21]
FNA	140.6 ± 7	137.3 ± 9	134-146
NTA	82.6 ± 8	75.8 ± 7	80-86
NLA	105.6 ± 10	109.6 ± 11	122-127
TFA	169 ± 4	171.8 ± 10	158-159
LMA	126.9 ± 15	122.0 ± 10	123-132

became more convex, and the length of the chin became shorter. This allows the assumption that female and male faces considered highly attractive became increasingly similar in terms of chin position and size over the past few years.

Perrett et al[38] also observed this and pointed out that the preferences for attractiveness of both sexes in their study indicate a selection pressure on the evolution of facial shape that acts against pronounced differences between men and women. From that point of view, this is because women today prefer partners with more feminine faces. That hypothesis is supported by other authors. Little and Hancock[39] reported that average male faces are attractive, but only feminine features make them particularly attractive. According to Berry and McArthur[40] and Little and Perrett,[41] female and "immature" facial qualities allow these people to be judged as more warm, honest, and cooperative. A person with male facial features appears less cooperative.[38] According to Mueller and Mazur,[42] prominent chins are associated with a dominant character.

Although the cultural models currently tend to make both sexes more equal, and the roles of men and women are similar, especially in professional areas,[15] sex studies show the persistence of inequalities between men and women, and these differences can partially be explained by the persistence of stereotypes related to work.[43-45] Hosoda and Stone[46] postulated that, although sex stereotypes seem to have remained unchanged over the years, the value attached to stereotypic sex traits seems to be changing. Specifically, more unfavorable attributes were used to describe men than women, thereby creating a more negative masculine stereotype.

These developments have probably left their mark on dentofacial esthetics. Cornwell et al[47] and Perrett et al[38] stated that men with a pronounced male face shape (edgy chin, large nose, and relatively small eyes) had both increased perceived dominance and negative attributes (eg, coldness or dishonesty) relevant to relationships and parental care.

CONCLUSIONS

Our findings—mainly that men considered attractive show increasingly a less male face shape—indicate that the perceived attractiveness of facial profiles is probably influenced by societal developments.

Male and female faces thought to be very attractive had sex-specific differences in the lip region. They did so 70 years ago and continue to do so today. Facially attractive women are characterized by fuller and more protrusive lip profiles than facially attractive men.

With regard to chin position and size, a significant change of perceived facial attractiveness in men and women can be seen over the years. In recent years, both parameters have decreased in men considered highly attractive. A small opposite trend was observed in women thought to be attractive. In general, men's chin appearance has shown a trend toward more female traits. Developments in society have potentially played a role in influencing the perceived attractiveness of facial profiles.

REFERENCES

1. Bernstein IH, Lin TD, McClellan P. Cross- vs. within-racial judgments of attractiveness. Percept Psychophys 1982;32:495-503.
2. Cellerino A. Psychobiology of facial attractiveness. J Endocrinol Invest 2003;26:45-8.
3. Edler RJ. Background considerations to facial aesthetics. J Orthod 2001;28:159-68.
4. Iwawaki S, Eysenck HJ, Gotz KO. A new visual aesthetic sensitivity test (VAST): II. cross-cultural comparison between England and Japan. Percept Mot Skills 1979;49:859-62.
5. Langlois JH, Roggman LA, Gusselman L. Infant preferences for attractive faces: rudiments of stereotype? Dev Psychol 1987;23:363-9.
6. Tatarunaite E, Playle R, Hood K, Shaw W, Richmond S. Facial attractiveness: a longitudinal study. Am J Orthod Dentofacial Orthop 2005;127:676-82.
7. Thornhill R, Gangestad SW. Facial attractiveness. Trends Cogn Sci 1999;3:452-60.
8. Baudouin JY, Tiberghien G. Symmetry, averageness, and feature size in the facial attractiveness of women. Acta Psychol (Amst) 2004;117:313-32.
9. Honn M, Goz G. The ideal of facial beauty: a review. J Orofac Orthop 2007;68:6-16.
10. Perrett DI, May KA, Yoshikawa S. Facial shape and judgements of female attractiveness. Nature 1994;368:239-42.
11. Penton-Voak IS, Perrett DI, Castles DL, Kobayashi T, Burt DM, Murray LK, et al. Menstrual cycle alters face preference. Nature 1999;399:741-2.
12. Auger TA, Turley PK. The female soft tissue profile as presented in fashion magazines during the 1900s: a photographic analysis. Int J Adult Orthod Orthognath Surg 1999;14:7-18.
13. Pogrel MA. What are normal esthetic values? J Oral Maxillofac Surg 1991;49:963-9.
14. Nguyen DD, Turley PK. Changes in the Caucasian male facial profile as depicted in fashion magazines during the twentieth century. Am J Orthod Dentofacial Orthop 1998;114:208-17.
15. Lopez-Saez M, Morales JF, Lisbona A. Evolution of gender stereotypes in Spain: traits and roles. Span J Psychol 2008;11:609-17.
16. Risberg G. The foundation of "feminine" and "masculine." Useful theories for the training of future physicians concerning the importance of gender. Lakartidningen 2000;97:5335-40.
17. Silva EB. Gender, home and family in cultural capital theory. Br J Sociol 2005;56:83-103.
18. Yehezkel S, Turley PK. Changes in the African American female profile as depicted in fashion magazines during the 20th century. Am J Orthod Dentofacial Orthop 2004;125:407-17.
19. Farkas LG. Anthropometry of the head and face in medicine. 2nd ed. New York: Raven Press; 1994. p. 9-59.
20. Hajeer MY, Ayoub AF, Millett DT, Bock M, Siebert JP. Three-dimensional imaging in orthognathic surgery: the clinical application of a new method. Int J Adult Orthod Orthognath Surg 2002;17:318-30.
21. Ferrario VF, Sforza C, Miani A, Poggio CE, Schmitz J. Harmonic analysis and clustering of facial profiles. Int J Adult Orthod Orthognath Surg 1992;7:171-9.
22. Gwilliam JR, Cunningham SJ, Hutton T. Reproducibility of soft tissue landmarks on three-dimensional facial scans. Eur J Orthod 2006;28:408-15.

23. Maloney BP. Cosmetic surgery of the lips. Facial Plast Surg 1996; 12:265-78.
24. Byrne PJ, Hilger PA. Lip augmentation. Facial Plast Surg 2004; 20:31-8.
25. Johnston VS. Mate choice decisions: the role of facial beauty. Trends Cogn Sci 2006;10:9-13.
26. Deutsch FM, Zalenski CM, Clark CM, Clark ME. Is there a double standard of aging? J Appl Soc Psychol 1986;16:771-85.
27. Jones D. Sexual selection, physical attractiveness and facial neoteny. Curr Anthropol 1995;36:723-48.
28. Felman G. Direct upper-lip lifting: a safe procedure. Aesthetic Plast Surg 1993;17:291-5.
29. Ho LC. Augmentation cheiloplasty. Br J Plast Surg 1994;47:257-62.
30. Goehring J. Modern standards of beauty: nature or nuture? An evolutionary perspective. Available at: www.beautyworlds.com. Accessed January 20, 2008.
31. The American Academy of Facial Plastic and Reconstructive Surgery. Statistics on trends in facial plastic surgery. Alexandria, VA: AAFPRS; 2001.
32. Johnston VS, Franklin M. Is beauty in the eye of the beholder? Ethol SocioBiol 1993;14:183-99.
33. Jasienska G, Ziomkiewicz A, Ellison PT, Lipson SF, Thune I. Large breasts and narrow waists indicate high reproductive potential in women. Proc Biol Sci 2004;271:1213-7.
34. McKelvie SJ. Effects of feature variations on attributions for schematic faces. Psychol Rep 1993;73:275-88.
35. Berscheid E. An overview of the psychological effects of physical attractiveness. In: Lucker GRKMJ, editor. Psychological aspects of facial form. Ann Arbor: University of Michigan Press; 1980. p. 1-25.
36. Cunningham MR, Barbee AP, Pike CL. What do women want? Facialmetric assessment of multiple motives in the perception of male facial physical attractiveness. J Pers Soc Psychol 1990;59:61-72.
37. Lew KK. Attitudes and perceptions of adults towards orthodontic treatment in an Asian community. Community Dent Oral Epidemiol 1993;21:31-5.
38. Perrett DI, Lee KJ, Penton-Voak I, Rowland D, Yoshikawa S, Burt DM, et al. Effects of sexual dimorphism on facial attractiveness. Nature 1998;394:884-7.
39. Little AC, Hancock PJ. The role of masculinity and distinctiveness in judgments of human male facial attractiveness. Br J Psychol 2002;93:451-64.
40. Berry DS, McArthur LZ. Perceiving character in faces: the impact of age-related craniofacial changes on social perception. Psychol Bull 1986;100:3-18.
41. Little AC, Perrett DI. Using composite images to assess accuracy in personality attribution to faces. Br J Psychol 2007;98: 111-26.
42. Mueller U, Mazur A. Facial dominance of West Point cadets as a predictor of later military rank. Social Forces 1996;74: 823-50.
43. Alter RJ, Seta CE. Compensation for inconsistencies: the effects of stereotype strength on expectations of applicants' job success and satisfaction. Sex roles 2005;53:79-87.
44. Glick P, Larson S, Johnson C, Bransteter H. Evaluation of sexy women in low- and high-status jobs. Psychol Women Q 2005; 29:389-95.
45. White MJ, White GB. Implicit and explicit occupational gender stereotypes. Sex Roles 2006;55:259-66.
46. Hosoda M, Stone DL. Current gender stereotypes and their evaluative content. Percept Mot Skills 2000;90:1283-94.
47. Cornwell RE, Law Smith MJ, Boothroyd LG, Moore FR, Davis HP, Stirrat M, et al. Reproductive strategy, sexual development and attraction to facial characteristics. Philos Trans R Soc Lond B Biol Sci 2006;361:2143-54.