Evaluation of facial esthetics in long-faced white Brazilian middle school students

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Objective: This study aimed to determine orthodontists' and layperson's perceptions about facial esthetics in a long face pattern sample. **Methods:** The sample consisted of 64 frontal photographs of white Brazilian middle school students (9-15 years old), diagnosed as long faced through morphologic evaluation and confirmed by the facial index. A Likert-type scale was used to determine orthodontists' (22) and laypeople's (22) perceptions about facial esthetics. Chi-square and proportions tests were used for comparison between the examiners regarding the classification in each degree of esthetics, adopting a significance level of 5%. **Results:** For orthodontists and laypeople, most of the subjects were considered to have acceptable appearance: 36.4% and 40.3%, respectively. Subjects whose appearance was classified as unpleasant constituted one-third of the sample: for orthodontists, 7.8% very unpleasant and 22.9% unpleasant, and 6.7% and 22.2%, respectively, for laypeople. The facial structures most cited as responsible for unpleasantness were the lack of lip sealing followed by incisor exposition. The increase of the lower third of the face for orthodontists and eyes for laypeople were the third most cited unpleasant characteristics. **Conclusions:** For the evaluators, two-thirds of the long face sample were considered to have an acceptable, pleasant, or very pleasant appearance. Laypeople's opinions aligned with the orthodontists', that one-third of long-face patients were considered to have an unpleasant appearance. (Am J Orthod Dentofacial Orthop 2019;155:812-8)

Genetic predisposition in facial growth and the consequent limitations to the treatment of malocclusions in patients with skeletal involvement, ie, discrepancy, are recognized and well discussed in the scientific world.[1,2] Facial morphology is established early, given that the facial pattern is maintained during growth.[1]

Individuals with long face are characterized by large morphologic deviations in relation to the normal growth pattern, showing significant esthetics involvement.[3] Vertical discrepancy, a complex and multifactorial anomaly, is considered to be a challenge for orthodontists.[4-6] The main complaint of these patients is the excess of anteroposterior[6] and dental exposure during smile, caused by the excessive increase of the lower third of the face.[5] People with this deformity can not seal their lips passively, a mandatory characteristic in these patients, causing a contraction of the perioral muscles, which accentuates the contour deficiency of the chin.

The prognosis for these patients varies according to the severity of the discrepancy, location, age, and race.[6] Thus, isolated orthodontic treatment is often limited, and an orthodontic-surgical procedure, when the face is considered to be unpleasant, usually constitutes a more adequate option,[6-8] because the improvement of facial appearance should be the primary objective of orthodontic treatment. The face is considered to be the most important individual factor in the attraction aspect.[9] The proportional relationships between the different facial structures is the key to esthetics and a pleasant facial appearance.[10] The main motivation of the patient is to be recognized as beautiful (pleasant) or at least normal (acceptable), excluding unpleasant features of the face and smile.[11]

The current panorama of dental research challenges us to understand the patient's perception of their appearance. Understanding the part of the face that

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All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported.
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Submitted, December 2017; revised and accepted, June 2018.
0889-5406/$36.00

https://doi.org/10.1016/j.ajodo.2018.06.017

causes greater visual discomfort is of great value in quantifying the real need for surgical intervention to balance the bony bases and remove the genetically predisposed skeletal factor.

The present study aims to determine the perception of orthodontists and laypeople in relation to facial esthetics by means of frontal face analysis in a sample of individuals with long face. Considering that the perception and the evaluation of the facial attractiveness by professionals and patients are of extreme importance, this paper intends to establish parameters of malleability between the results from compensatory orthodontic treatment or the indication for surgical approach.

MATERIAL AND METHODS

The Research Ethics Committee of Sagrado Coração University approved this study under protocol nounber 1.079.214. Frontal facial photographs of 71 long-faced white Brazilians were selected from a sample of 5020 individuals evaluated in an epidemiologic survey to determine the prevalence of the long face pattern in the city of Bauru, São Paulo.[6] Of these, 48 were male (67.60%) and 23 female (32.40%), aged 9-15 years (mean 12 years).

As an inclusion criterion, it was determined that individuals should be white, had not undergone previous orthopedic or orthodontic treatment, and did not present clinically observed syndromes or asymmetries. The individuals with long face were diagnosed through the morphologic evaluation of the face, whose main characteristic is the increase of the lower third of the face and consequent absence of passive lip seal[6,7] (Fig 1). The diagnosis was later confirmed by calculating the facial index (n-gn/zy-zy),[11] which considers the proportion between face width and height with mean normal values of 88.5 for men and 86.2 or women. These measurements were performed with the use of Photoshop CS4 software (Fig 1). The individuals selected for the sample presented values >93.6 for boys and >90.8 for girls (Table I).

After the inclusion criteria were applied, 7 subjects were excluded because they presented facial index values below those established. The final sample consisted of 64 individuals, 42 male (65.63%) and 22 female (34.37%), with mean age 12.11 years (range 10.9-15.1 years).

The frontal facial photographs were taken by the same professional, with subjects in natural head position and relaxed lips, looking at their own eyes reflected in a mirror in front of them, according to the method proposed by Solow and Tallgren,[12] adapted for frontal facial photographs[6] (Fig 2).

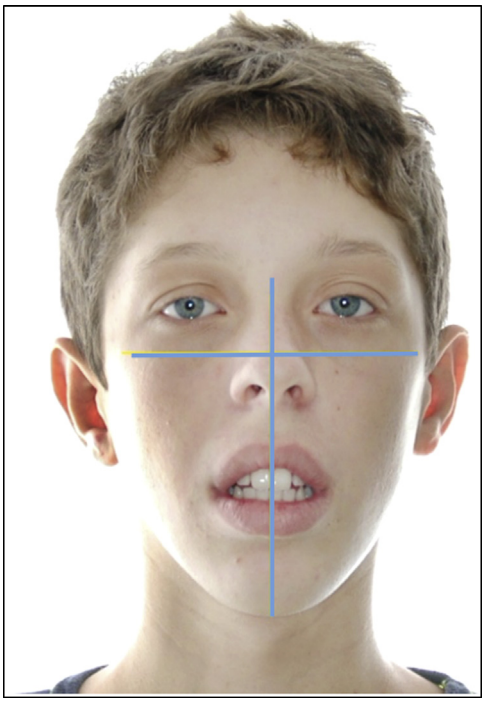

Fig 1. A patient of the sample showing the facial type and lines (face width and height) for calculating the facial index.

Table I. Facial index

Facial type	*Male*	*Female*
Mesofacial	83.4-93.6	81.6-90.8
Brachyfacial	<83.4	<81.6
Dolichofacial	>93.6	>90.8

The facial photographs of the 64 long-faced individuals were evaluated by 2 heterogeneous groups of evaluators. One group consisted of 22 laypeople (11 female and 11 male, with a mean age of 28 years 6 months); 13 (61.9%) of them had a high school degree and 9 (42.8%) a university degree. The other group consisted of 22 orthodontists (11 female and 11 male, with a mean age of 35 years 5 months. All evaluators in both groups were white.

Considering 2 groups of evaluators and adopting a significance level of 5% ($P < 0.05$) and power of 80%, to detect an effect size of 1.0, 22 evaluators were required for each group.

All photos were mixed and randomly presented, individually, with the use of Microsoft Powerpoint 2010 with a maximum interval of 30 seconds between each image. The evaluators performed a subjective evaluation facial assign grades from 1 to 5 (1 = very unpleasant;

Fig 2. Sample frontal facial photographs of long-faced individuals.

2 = unpleasant; 3 = acceptable; 4 = pleasant; 5 = very pleasant). The 5-point Likert-type scale was used to evaluate the esthetics status of the individuals in the sample. This scale is widely used and accepted in the literature as an evaluation method.[13,14] The evaluators could not go back and evaluate previous images, aiming to reduce predisposition and comparison in the evaluation process.

In addition, evaluators had to indicate the facial characteristics responsible for the scores assigned as 1 or 2.[15-18] Each image could receive only 1 grade. The evaluators were asked to identify the responsible structure even when the faces were considered to be acceptable, to eliminate any induction in the assignment of the highest marks because they do not need justifications.

Statistical analysis

Data were described by means of tables with the use of absolute (n) and relative (%) frequency. To check the agreement within each category of examiner, the Kendall coefficient of concordance was used. Ten photographs were randomly selected and the examiners (10 from each group) were asked to repeat the esthetics classification, with at least 1 week interval between the 2 evaluations.

Chi-square and proportions tests were used for the comparison between the 2 categories of examiners regarding the classification in each degree of facial esthetics. In all tests, a significance level of 5% ($P < 0.05$) was adopted. All statistical procedures were carried out with the use of Statistica version 12 software (Statsoft, Tulsa, Okla).

RESULTS

The results show that there was a statistically significant agreement among the examiners when dividing them according to sex within each category ($P < 0.001$), which makes the method reproducible (Table II). The coefficient of concordance ($r = 0.84$; $P = 0.002$) obtained is considered very good, showing that the evaluators applied the same pattern when they evaluated the sample. This finding was statistically significant, which makes the evaluation method reliable (Table III).

The comparison between evaluators showed a statistically significant difference when the individuals were considered to be acceptable and very pleasant (Table IV). Laypeople were more critical regarding patients considered very pleasant, considering 1.3% of the sample thus versus 2.5% by orthodontists. However, with the acceptable individuals, the opposite happened: Orthodontists were more critical, considering 36.4% as acceptable versus 40.3% by laypeople. For the other classifications, there was no statistically significant difference.

Table II. Kendall coefficient of agreement (*W*) among examiners within each category

Category	*W*	*P*
Male orthodontists	0.55	<0.001*
Female orthodontists	0.56	<0.001*
Lay men	0.50	<0.001*
Lay female	0.32	<0.001*

*Statistically significant agreement ($P < 0.05$).

Table III. Coefficient of concordance (*r*) among examiners within each category

Category	*r*	*P*
Orthodontists	0.84	0.002*
Laypeople	0.84	0.002*

*Statistically significant agreement ($P < 0.05$).

Table IV. Comparison between nongender categories

Category	Very unpleasant	Unpleasant	Acceptable	Pleasant	Very pleasant
Orthodontists	7.8%	22.9%	36.4%	30.4%	2.5%
Laypeople	6.7%	22.2%	40.3%	29.5%	1.3%
P	0.245	0.652	0.033*	0.622	0.018*

*Statistically significant disagreement ($P < 0.05$).

When comparing the classification of patients, considering only the sex of the evaluators, statistically significant differences were found in the individuals considered pleasant, unpleasant, and very unpleasant. Men classified 6.2% of the sample as very unpleasant, 20% as unpleasant, and 34.4% as pleasant. Women classified 8.3% of the sample as very unpleasant, 25% as unpleasant and 25.5% as pleasant (Table IV).

Table V presents how many times each structure was pointed as the main factor responsible for evaluations of ≤2. For orthodontists, the absence of lip seal was the main factor responsible for the unpleasantness (57.79%), followed by increased incisor exposure (14.62%) and increased facial lower third (10.79%). For laypeople, the absence of lip seal was also the most indicated cause, appearing in 36.2% of the justifications, followed by exposure of incisors (28.07%) and eyes (12.31%).

Table V. Structures classified as the most unpleasant

	Orthodontists		Laypeople	
Structure	*n*	%	*n*	%
Absence of lip sealing	241	57.79	147	36.20
Incisors exposure	61	14.62	114	28.07
Eyes	14	3.35	50	12.31
Increased lower third	45	10.79	4	0.98
Asymmetry	19	4.55	5	1.23
Increased face height	9	2.15	11	2.70
Nose	1	0.23	19	4.67
Chin	5	1.19	19	4.67
Ears	3	0.71	18	4.43
Face assembly	3	0.71	17	4.18
Absence of zygomatic projection	12	2.87	–	–
Jaw	4	0.95	–	–
Pimples	–	–	1	0.24
Skin	–	–	1	0.24
Total	417	100	406	100

DISCUSSION

In the vertical patterns, facial evaluation in norma frontalis is an indispensable tool in the diagnosis process, because in this view the facial discrepancy affects individual's appearance the most.[1,6] There is no consensus in the literature regarding facial attractiveness in individuals with the long face pattern. Some articles suggest a tendency to classify these individuals as less attractive,[6,19-23] but not all studies show significant differences.[24] Long-faced individuals are the ones that most seek orthognathic surgery to correct skeletal discrepancy.[23]

The improvement in facial esthetics and smile should be primary objectives of the treatment, which should be done in an individualized way, paying attention to the patient's complaints and expectations.[10] Recognizing the structures responsible for unpleasantness in distinct growth patterns can lead us to more contemporary, consistent, and satisfactory treatments.[1,24] Facial attractiveness should be seen as a set of characteristics, where the perception of a beautiful face is affected by many nonmetric factors, eg, face color, hair, facial expression, and cultural aspects of the evaluators.[25,26]

To quantify facial attractiveness, different methods have been used, such as visual analog scale[20,21] and eye tracking technology.[27] Eye tracking is reliable in showing which features viewers view most frequently (fixation density) and how much time they spend viewing those features (fixation duration).[27] In the present study, the 5-point Likert-type scale was used to evaluate a standardized unmanipulated sample composed of 64 white individuals with long face to assess the degree of facial esthetics and structures that most bothered the evaluator. According to a tendency found in the literature, the evaluators were separated into 2 categories: orthodontists and laypeople.[16-20,28] Thus, the group of evaluators selected for the present study consisted of orthodontists and laypeople of both genders, adding up to 44 individuals. The group was selected heterogeneously, so that the concept of beauty was individual, reflecting the professional background and the social environment.

Differences between the opinions of laypeople and orthodontists for dental and facial esthetics were observed in other studies.[28,29] Professionals tend to be more sensitive in their judgment than laypeople owing to their education and knowledge of the inherent

limitations.[15] Lay evaluators tend to focus on other facial features, such as chin shape, nose shape and size, and hair color, which may influence the perception of attractiveness.[30] Although with low prevalence, other structures as dark circles, facial pimples, and nose were also indicated by the evaluators. In a study regarding facial attractiveness performed with eye tracking method, it was found that the evaluators viewed certain areas of the face more than others. The eyes dominated the first look and the area of longest fixation, and the mouth was the second most observed area. Thus the mouth is not the most important area for laypeople while gauging appearance.[27]

Acceptable faces were more prevalent for both categories of evaluators (Table IV), which corroborated the results by Reis et al,[16] who evaluated a sample of 100 individuals with passive lip seal. In the present study, although most individuals were classified as acceptable, the percentage was considerably lower compared with the Reis et al study,[16] in which the laypeople considered 40.3% of the sample as acceptable versus 36.4% in the orthodontists' opinion, with a statistically significant difference. This difference in results could be explained by the inclusion criterion used by Reis et al: All 100 individuals in their sample were balanced with passive lip seal. The authors further suggested that passive lip seal was an important feature in the higher scores. When sealing is present, individuals are 90% more likely to be recognized as acceptable or pleasant, which makes lip sealing an important feature to be achieved in treatment.

An opposite trend was noted in the "very pleasant" rating. Although the percentage of individuals in this classification was very low, laypeople were more critical (1.3%) compared with orthodontists (2.5%), showing a statistically significant difference (Table IV). These results suggest that orthodontists are more indulgent toward individuals who are classified as "acceptable," "pleasant," and "very pleasant," and less judgmental with those classified as "unpleasant" and "very unpleasant."

In this context, in a sample of patients treated for cleft lip and palate, most individuals were classified as acceptable by both professionals and laypeople,[17,18] which may suggest that professionals understand the limitations of their treatments.

In the present study, when the individuals classified as "unpleasant" and "very unpleasant" are united, the percentage for professionals was 30.7% although for laypeople was 28.9%. These percentages are much higher than those found by Reis et al,[16] in which 8% of individuals were classified as unpleasant. It seems reasonable to admit such a evident index of disagreeability when considering that the sample was composed of individuals with a single growth pattern characterized by skeletal discrepancy.

Lower facial height influences frontal facial attractiveness and influences the perception of need for treatment by laypeople.[21] The proportions between lower anterior facial height and total anterior facial height were altered in a study by Johnston et al (2005)[20] where they were evaluated by laypeople, and the authors observed that images with reduced proportions were more attractive. In a study by Chew et al,[22] the authors observed that an increased lower facial proportion was considered more uninteresting, but the correlation was weak and did not reach a significant level, which corroborated the results obtained by Maple et al,[30] who reported that there was no difference between the images of lower facial height manipulated for more and for less.

The evaluators were asked to identify the main structure responsible for facial unpleasantness in the individuals in the sample (Table V). The absence of lip seal was cited as the most uncomfortable characteristic for orthodontists (57.9%) in patients classified as "unpleasant" and "very unpleasant," followed by incisor exposure (14.62%) and increased lower third (10.79%). The increased lower third, one of the justifications for the "unpleasant" concept, shows that the long-faced individuals already express an increase in the growth of this structure since childhood, an alteration already observed in previous studies.[5,31]

The results of this study showed that the absence of lip seal (36.2%) was the characteristic most cited by laypeople as well, followed by exposure of the incisors (28.07%) and eyes (12.31%). The absence of lip seal, a pathognomonic characteristic in these patients, is a reflection of the increase of the lower third of the face, which is the justification for the concept of unpleasantness expressed by laypeople.

The option of not using a stripe in the eyes of the individuals is justified by the concept of facial esthetics as a set of characteristics. This is especially important in patients with this growth pattern, because their eyes appear as justification of unpleasantness in a high percentage by laypeople, maybe because of the deficiency in zygomatic expression, a common characteristic of these patients that frequently increases sclera exposure.

In vertical facial patterns, as discussed earlier, frontal impact is a primary factor. Most complaints include excessive dental exposure, absence of lip seal, and an increase of the lower third of the face,[3,7] complaints that corroborate the structures responsible for the "unpleasant" score in the opinion of orthodontists and laypeople. Individuals who present exacerbated clinical

signs of the growth discrepancy are candidates for a surgical procedure,[6,8] considering that the compensatory treatment is not able to change the esthetics deficit. This was corroborated by Proffit and White,[8] who reaffirmed the need for surgical intervention in individuals with severe skeletal discrepancy, considering that orthodontic treatment alone should be avoided owing to the impossibility of success at the end of treatment. Proffit et al[23] reported the desire for orthognathic surgery as a treatment option in 34% of their long-faced patients. This surgical approach would be better indicated only for one-third of our sample considered to be "unpleasant" and "very unpleasant" by laypeople and orthodontists. In the other two-thirds, the evaluation of the dental discrepancy would determine the possibility of compensatory (minimalist) treatment.

CONCLUSIONS

1. The majority of subjects (two-thirds) of this sample of white Brazilian middle-schoolers had their facial appearance considered to be acceptable or pleasant by the evaluators.
2. Nearly one-third of the sample was classified as having an "unpleasant" or "very unpleasant" facial appearance by laypeople and orthodontists.
3. The only statistical differences between the groups of evaluators' rates were for those considered acceptable and very pleasant.
4. Lip seal absence and incisor exposure were the features most responsible for the unpleasantness for both groups of evaluators.

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