Influence of facial pattern in smile attractiveness regarding gingival exposure assessed by dentists and laypersons

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Introduction: The present study aimed to assess the influence of facial pattern in smile attractiveness on different levels of gingival exposure evaluated by dental specialists and laypersons. **Methods:** Frontal photographs of 2 white Brazilian women, one with a long face and the other with a balanced face, were acquired and subsequently modified to simulate gingival exposure from 0 to 6 mm. Four groups of evaluators of both sexes (mean age 34 y), including laypersons (n = 24) and dental specialists (n = 72; 24 orthodontists, 24 periodontists, and 24 maxillofacial surgeons), used a Likert-type scale to evaluate the attractiveness of the smiles of these subjects with different levels of gingival exposure. Kruskal-Wallis and Friedman tests were used to compare the perceptions of the dental specialists and laypersons. Spearman rank correlation coefficient was used to associate the age of the examiners with their rating outcomes. Statistical significance was set at $P < 0.05$. **Results:** Statistically significant differences were observed for the following levels of exposure for the long-faced subject: 0 mm, 4 mm, 5 mm, and 6 mm. Laypersons were less critical than dental specialists. In the balanced-face subject, statistically significant differences were observed between laypersons and dental specialists for gingival exposure levels of 4 mm, 5 mm, and 6 mm. Laypersons perceived gingival exposure to a lesser extent for the balanced-face subject than for the long-face subject. The balanced face was better rated than the long face by dental specialists and laypersons for all levels of gingival exposure. **Conclusions:** Facial patterns influenced the smile attractiveness evaluation. The facial characteristics of a balanced facial pattern attenuated the perception of gingival exposure. (Am J Orthod Dentofacial Orthop 2019;155:224-33)

Laypersons are being influenced by and seek to conform to the esthetic standards established by actresses and models presented by entertainment media. Recently, an increase in searches for surgical and esthetic treatments has been observed, even in dentistry[1]; notably, individuals with unattractive teeth tend to be unconcerned with their overall health.[2] The perceptions of esthetics vary considerably according to individual and social experiences.[3] The concept of an ideal smile is based on tooth morphology and color and the proportional relationships among teeth, lips, and gingiva.[4] Esthetics, from a patient's point of view, seems to play a major role in justifying orthodontic treatment, both during childhood and adulthood.[5]

Subjective facial analysis is the evaluation and judgment of the esthetics of an individual. Classification of esthetics into pleasant, acceptable, and unpleasant[6] requires a calibration of perception between the dentist and patient. If the perception is not calibrated, they may have conflicting opinions about the treatment and expectations.[7] Facial morphology is analyzed in clinical practice through photographs. This approach is valid and effective in the assessment of facial attractiveness and smile traits.[8]

In the assessment of esthetics, displaying the entire face simulates routine social interaction and may attenuate the smile features. In contrast, these features (unpleasant or acceptable) become more evident when

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the analysis is restricted to photographs of the mouth.[7,9] Facial appearance is an important factor in the perception of facial aesthetics, and the attractiveness of the face affects the perspective of the smile characteristics. In this context, facial appearance must be considered in the orthodontic treatment plan.[9]

Long face (or long face syndrome) is characterized by excessive vertical growth.[10] The morphologic aspects of this type of face may lead to different perceptions of smile esthetics compared with short-face individuals.[11] Gingival exposure is one of the characteristics of long-face individuals. This characteristic may also be related to other features, such as an enlarged labial gap, increased overbite and overjet, short upper lip, and height of the clinical crowns of the incisors.[12] Intrinsic (congenital and hereditary) and extrinsic (eg, orthodontic treatment, dental plaque, and medication) factors may also affect the gingiva (eg, hyperplasia), thus influencing the smile.[4]

Several studies[1,3,4,13] have reported differences between the perception of gingival exposure by dental specialists and laypersons. However, most of those studies restricted their analyses to the mouth, and only a few studies investigated the influence of facial pattern on smile attractiveness. The facial pattern plays a decisive role in smile esthetics.[14] Specifically, smile alterations were perceived differently in subjects with vertical facial discrepancies.[11]

The present study aimed to assess the influence of the facial pattern on the perception of gingival exposure and the differences between the perception of smile attractiveness, at difference levels of gingival exposures, by dental specialists and laypersons. Furthermore, the maximum level of gingival exposure considered to be esthetically acceptable was investigated in relation to different facial patterns.

MATERIAL AND METHODS

The present study was approved by the Committee of Ethics in Research of Sagrado Coração University, Bauru, Brazil under the protocol number 104093/2015 (CAAE: 50059015.7.0000.5502).

Initially, 2 women, one with a long face and the other with a balanced face, were selected based on subjective facial analysis.[10] The eligibility criteria for participation included the following: 1) previous orthodontic treatment; 2) no dental loss, agenesis, or extractions; 3) no dental prosthesis; 4) no dental implants; 5) and no lip asymmetry (maximum 25% difference between lips).

Frontal facial photographs of the 2 subjects were acquired with the use of a digital camera (Nikon D3200; Tokyo, Japan; 100-mm macro lens, and a ring flash). The images were of the subjects smiling, with a low variation in the distance between the camera and the subject.[11] These photographs were imported into Adobe Photoshop 6.0 version 13 software package (Adobe Systems, San Jose, Calif) for the correction of small asymmetries that could influence the assessment of facial esthetics. The same software package was used to modify the level of gingival exposure (gradually by 1 mm, from 0 to 6 mm)[3] in both models (Figs 1 and 2).

The photographs were analyzed by 4 groups of examiners: laypersons (n = 24; 16 women, mean age 33.5 y, and 8 men, mean age 46.5 y), orthodontists (n = 24; 17 women, mean age 31.5 y, and 7 men, mean age 36.6 y), periodontists (n = 24; 15 women, mean age 35.5 y, and 9 men, mean age 45.5 y), and maxillofacial surgeons (n = 24; 5 women, mean age 32 y, and 19 men, mean age 41 y). To assess the minimum number of examiners required in each group, a sample calculation was performed considering the 4 groups, a significance level of 5% ($P < 0.05$), and a sample power of 80% to detect an effect of 1.0. According to this calculation, 24 examiners were required in each group (n = 96).

Each examiner received little information on the study design. They were requested to judge the smile attractiveness in both types of faces (long and balanced). First, the examiners were shown a set of 7 photographs of the long-faced subject. Subsequently, they were shown photographs of the balanced-faced subject. The sets of images were printed on photographic paper and randomized on the level of gingival exposure when presented to the examiners. Each image was marked from A to G (Figs 3 and 4). The amount of simulated gingival exposure was not revealed to the evaluators to enable them to rate the gingival exposure in a scoring file. The examiners had 15 seconds to rate each image. Each image was presented only once during this first assessment.[11] For rating the esthetics, a Likert-type scaling system[15] was applied. According to this system, esthetics were rated on a scale from 1 to 5: 1, highly unpleasant; 2, unpleasant; 3, acceptable; 4, pleasant; 5, highly pleasant.

Data analysis

Thirty days after the first assessment, all 14 images were reanalyzed by 30% (n = 7) of the examiners in each group. This procedure was performed to quantify the reproducibility of the method. Weighted kappa was applied and resulted in moderate agreement[16] (0.46-0.56; Table I).

The data were reported descriptively with the use of tables and graphs as median and standard error of the scores. Considering that the values expressed scores

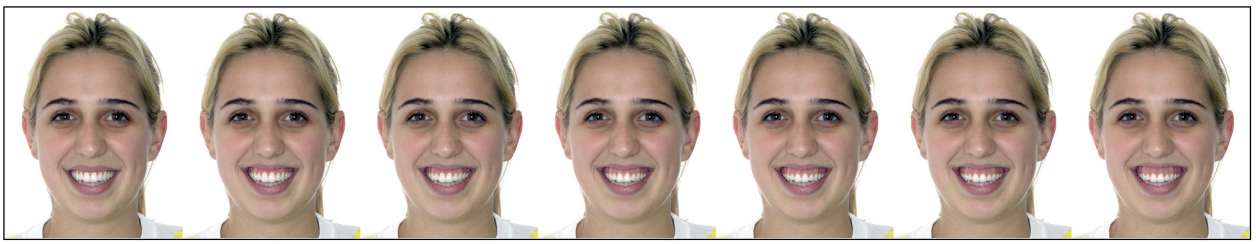

Fig 1. Long-face subject showing a gradual increase (1 mm) in the level of gingival exposure (from 0 to 6 mm, left to right).

Fig 2. Balanced-face subject showing a gradual increase (1 mm) in the level of gingival exposure (from 0 to 6 mm, left to right).

that did not undergo normality testing (Kolmogorov-Smirnov), nonparametric statistics were applied. The Kruskal-Wallis test was used for comparisons between the 2 categories of examiners (dental specialists and laypersons), whereas the Friedman test was used for comparisons within categories. Spearman rank correlation coefficient was used to associate the age of the examiners with their rating outcomes. All statistical tests were performed with the use of the Statistica 5 software package (Statsoft, Tulsa, Okla).

RESULTS

The male (55.2%) and female (44.8%) examiners were aged from 18 to 75 years (mean age 34 ± 9.6 y).

Table II summarizes the scores obtained from each group of examiners in relation to the analysis of the long face. Statistically significant differences within ($P < 0.001$) and between ($P < 0.05$) categories were observed for gingival exposures of 0 mm, 4 mm, 5 mm, and 6 mm. No significant differences were observed among the laypersons ($P > 0.05$). Among examiners, the highest scores were assigned by the periodontists when the gingival exposure was null (0 mm). Statistically significant differences were observed when these scores were compared with those assigned by laypersons. Similarly, periodontists also differed statistically from orthodontists and maxillofacial surgeons. Statistical differences between dental specialists and laypersons were observed for gingival exposures of 4 mm, 5 mm, and 6 mm. In this context, the highest scores were assigned by laypersons, suggesting that this group was more tolerant toward esthetics and that the exposure was less evident for laypersons.

Significant differences were observed when the level of gingival exposure was analyzed individually within each group. The higher the level of gingival exposure, the lower the esthetic score rated by the examiners. The trend of the reduction in the scores rated by the examiners following the increase in gingival exposure persisted between the different groups of dental specialists. Among the laypersons, no significant differences were observed between the levels of gingival exposure. Moreover, the vertical discrepancy between the faces of the 2 models was apparently not evident during the analysis performed by the laypersons. Null gingival exposure (0 mm) was considered to be pleasant to periodontists. Furthermore, the 3 mm exposure was the maximum acceptable value (score 3.0), and 4 mm became unpleasant (score 2.0). For laypersons, acceptable esthetics was reported from 0 mm to 6 mm of gingival exposure, thus demonstrating their flexibility on the perception of gingival exposure during the analysis of facial esthetics (Fig 5).

Differences between the groups of examiners and levels of exposure considering the balanced face are

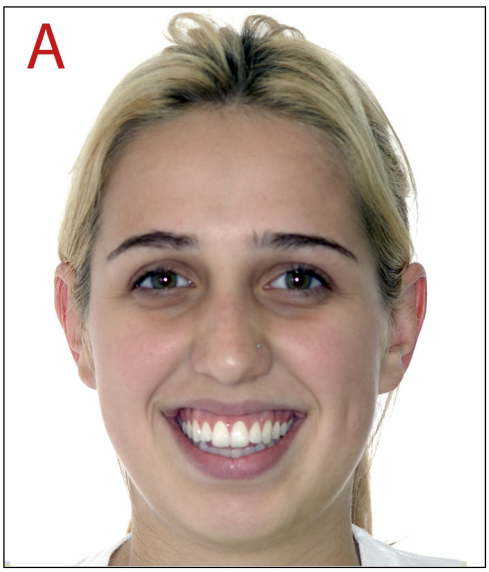

Fig 3. Long-face subject with 2 mm of simulated gingival exposure.

Fig 4. Balanced-face subject with 2 mm of simulated gingival exposure.

summarized in Table III. Statistically significant differences were observed between the groups of examiners for gingival exposures of 4 mm, 5 mm, and 6 mm ($P < 0.05$). For dental specialists and laypersons, null gingival exposure (0 mm) was pleasant (score 4.0) in the balanced face. The maximum level of acceptable gingival exposure was 5 mm (score 3.0) for dental specialists, and only 6 mm was considered to be unpleasant. Laypersons were more tolerant of gingival exposure (score 4.0) with less strict perception of the esthetics in the balanced face (Fig 6).

Table I. Kappa values considering the different groups of examiners for long and balanced face

Examiners	*Long face*	*Balanced face*
Orthodontists	0.55	0.52
Maxillofacial surgeons	0.53	0.56
Periodontists	0.56	0.52
Laypersons	0.46	0.49

The differences in the comparison between scores rated by the examiners of the long and balanced faces are summarized in Table IV. The balanced face was better rated considering all the categories of examiners and all the different levels of gingival exposure. Apparently, the balanced face contributed to attenuating the decrease in esthetics promoted by gingival exposure.

No differences statistically significant were found in the comparisons based on sex, facial pattern, and level of gingival exposure between dental specialists and laypersons (Tables V and VI).

Table VII summarizes the outcomes from the association between the age of the examiners and their rating on the different face patterns and levels of gingival exposure. A weak negative correlation was observed between the scores and the age of laypersons. In general, older examiners tended to give lower scores. No correlation was found in relation to the other groups of examiners.

DISCUSSION

Several characteristics may contribute to establishing an esthetic or unbalanced smile,[15] among which gingival exposure is one of the most important.[15] Based on previous studies, the perceptions of smile esthetics in relation to gingival exposure diverge considerably among orthodontists, general clinicians, and laypersons.[1,3,4,13] Similarly, dental specialists and laypersons also diverge in the perception of vertical maxillary excess.[15] However, little is known about the perception of periodontists on gingival exposure compared with other specialists and laypersons. Consensus among specialists is essential to standardize the treatment plan and therapeutic approach for gingival exposure. Complementing the study of Flores-Mir et al,[7] the outcomes found in the present study revealed that limits considered to be acceptable for gingival exposure are higher when the entire face is presented to the examiner

Table II. Median and standard error of the scores considering the different groups of examiners and levels of gingival exposure (GE) in the long-face subject

	Orthodontists		*Maxillofacial surgeons*		*Periodontists*		*Laypersons*		
GE	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*	P *value (among evaluators)*
0 mm	3.0^{Aa}	0.2	3.0^{Aa}	0.2	4.0^{Ba}	0.1	3.0^{A}	0.2	0.003*
1 mm	3.0^{ab}	0.2	3.0^{ab}	0.2	3.0^{ab}	0.2	3.0	0.2	0.702
2 mm	3.0^{ab}	0.2	3.0^{ab}	0.1	3.0^{abcd}	0.1	3.0	0.2	0.675
3 mm	3.0^{ab}	0.2	3.0^{ab}	0.2	3.0^{abc}	0.1	3.0	0.2	0.207
4 mm	2.0^{Acd}	0.2	2.0^{Ac}	0.1	2.0^{Acd}	0.1	3.0^{B}	0.2	0.030*
5 mm	2.0^{Acd}	0.2	2.0^{Ac}	0.1	2.0^{Acd}	0.2	3.0^{B}	0.2	0.004*
6 mm	1.0^{Ae}	0.2	1.0^{Ae}	0.2	1.0^{Ae}	0.2	3.0^{B}	0.2	0.004*
P value (GE)	<0.001†		<0.001†		<0.001†		0.056		

Kruskal-Wallis test between examiners, Friedman test within categories; $P < 0.05$. Within each row, medians followed by the same capital letter are not significantly different; within each column, medians followed by the same lowercase letter are not significantly different.
*Statistically significant difference among the groups of evaluators; †Statistically significant differences among the levels of gingival exposure.

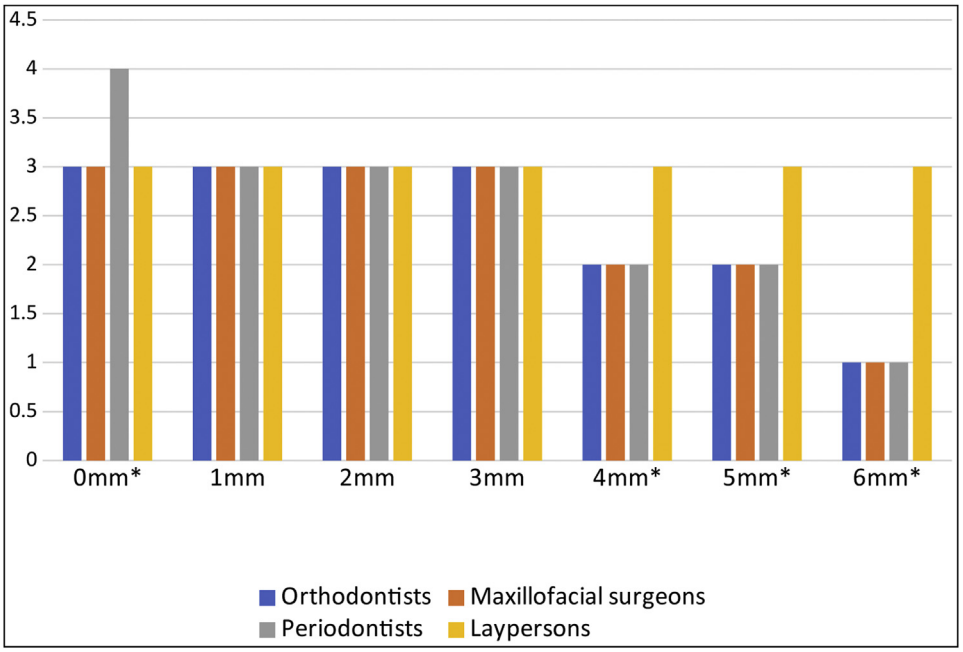

Fig 5. Mean scores rated by each group of examiners considering the different levels of gingival exposure in the subject with a long face.

(instead of the smile exclusively). Increased care must be given to the diagnosis and treatment of patients with vertical discrepancies. Confirming the literature,[11,14] higher scores were attributed to a balanced face, showing that the perception of gingival exposure may be exacerbated in patients with long faces.

The present study was designed to simulate the routine social judgment made on gingival exposure by dental specialists and laypersons. Social acceptance is one of the main goals of esthetic procedures in dentistry. To simulate social judgment and assess the first impression on esthetics, the images were presented to the examiners for a short period of time (15 seconds). In accordance with Jørnung and Fardal,[17] the laypersons were more tolerant regarding esthetics than dental specialists. Despite the similar outcomes, the laypersons studied by those authors[17] analyzed their own smiles by retrieving only memories and experiences, although the dental specialists analyzed the same smiles in more detail with the use of photographs.

When analyzing the effect of gingival exposure on smile esthetics in the long face, we observed a trend of

Table III. Median and standard error of the scores considering the different groups of examiners and levels of gingival exposure (GE) in the balanced

	Orthodontists		*Maxillofacial surgeons*		*Periodontists*		*Laypersons*		
GE	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*	P *value (among evaluators)*
0 mm	4.0^{a}	0.2	4.0^{a}	0.2	4.0^{a}	0.2	4.0^{ab}	0.1	0.173
1 mm	4.0^{a}	0.1	4.0^{a}	0.2	4.0^{a}	0.1	4.0^{ab}	0.1	0.195
2 mm	4.0	0.2	4.0	0.2	4.0	0.1	4.0	0.2	0.122
3 mm	4.0^{a}	0.2	3.0^{ab}	0.1	3.5^{a}	0.1	4.0^{ab}	0.2	0.123
4 mm	3.0^{Ab}	0.1	3.0^{Abc}	0.2	3.0^{Ab}	0.1	4.0^{Bab}	0.2	<0.001*
5 mm	3.0^{Ab}	0.1	3.0^{Abc}	0.2	3.0^{Ab}	0.1	4.0^{Bab}	0.2	0.001*
6 mm	2.0^{Ac}	0.1	2.0^{Ac}	0.2	2.0^{Ac}	0.1	4.0^{Bb}	0.3	<0.001*
P value (GE)	<0.001†		<0.001†		<0.001†		0.007†		

Kruskal-Wallis test between examiners, Friedman test within categories; $P < 0.05$. Within each row, medians followed by the same capital letter are not significantly different; within each column, medians followed by the same lowercase letter are not significantly different.
*Statistically significant difference among the groups of evaluators; †Statistically significant differences among the levels of gingival exposure.

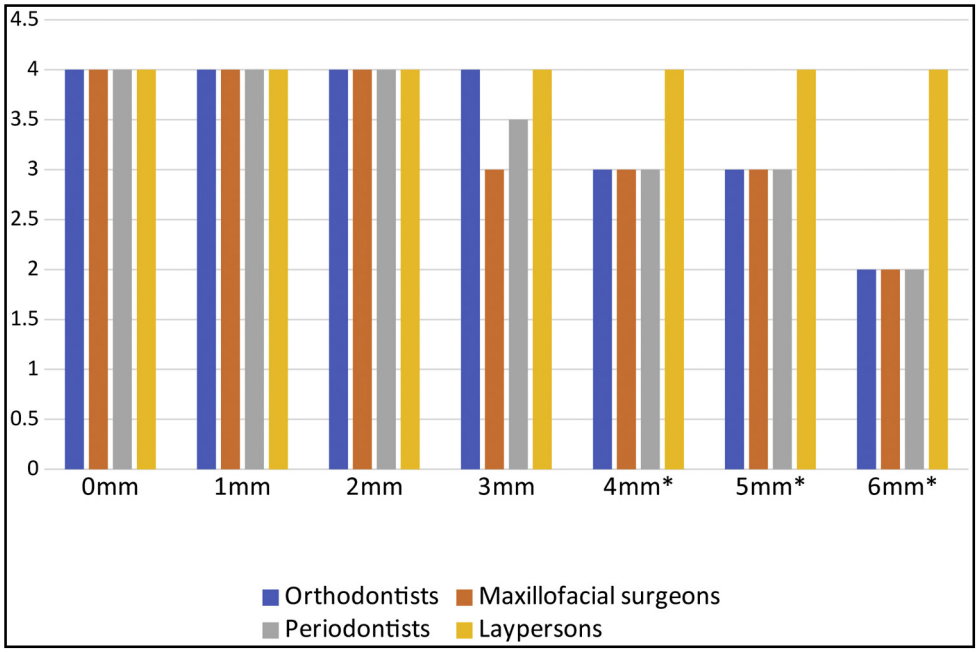

Fig 6. Mean scores rated by each group of examiners considering the different levels of gingival exposure in the subject with a balanced face.

decreased scores of smile attractiveness following increased levels of exposure. Accordingly, Alhaija et al[3] observed that null gingival exposure (0 mm) is more attractive than excessive gingival exposure. In the present study, better grades for 0 mm were provided by periodontists compared with the laypersons, which is in line with the study by Jørnung and Fardal[17] that investigated the perception of smile esthetics with the use of photographs of the mouth only. In the same context, Lauria et al[15] also investigated the mouth exclusively and revealed that the laypersons criticized smile esthetics more than the maxillofacial surgeons did. The authors justified their results by the potential influence of dental crowding in the perception of laypersons. The present study demonstrated opposite results for the maxillofacial surgeons, which could be explained by the eligibility criteria that included orthodontically treated subjects.

In the long face, 3 mm gingival exposure was considered to be acceptable by dental specialists, which is consistent with previous studies.[1,3,13,18,19] On the other hand, our findings are inconsistent with those

Table IV. Median and standard error of the scores considering the different groups of examiners and levels of gingival exposure (GE) between the long and the balanced face

		Orthodontists		*Maxillofacial surgeons*		*Periodontists*		*Laypersons*	
GE	*Face*	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*	*Median*	*SE*
0 mm	Long	3.0*	0.2	3.0*	0.2	4.0	0.1	3.0*	0.2
	Balanced	4.0	0.2	4.0	0.2	4.0	0.2	4.0	0.1
1 mm	Long	3.0*	0.2	3.0*	0.2	3.0*	0.2	3.0*	0.2
	Balanced	4.0	0.1	4.0	0.2	4.0	0.1	4.0	0.1
2 mm	Long	3.0*	0.2	3.0*	0.1	3.0*	0.1	3.0*	0.2
	Balanced	4.0	0.2	4.0	0.2	4.0	0.1	4.0	0.2
3 mm	Long	3.0*	0.2	3.0*	0.2	3.0*	0.1	3.0*	0.2
	Balanced	4.0	0.2	3.0	0.1	3.5	0.1	4.0	0.2
4 mm	Long	2.0*	0.2	2.0*	0.1	2.0*	0.1	3.0*	0.2
	Balanced	3.0	0.1	3.0	0.2	3.0	0.1	4.0	0.2
5 mm	Long	2.0*	0.2	2.0*	0.1	2.0*	0.2	3.0*	0.2
	Balanced	3.0	0.1	3.0	0.2	3.0	0.1	4.0	0.2
6 mm	Long	1.0*	0.2	1.0*	0.2	1.0*	0.2	3.0*	0.2
	Balanced	2.0	0.1	2.0	0.2	2.0	0.1	4.0	0.3

Kruskal-Wallis test between evaluators, Friedman test within categories; $P < 0.05$.
*Statistically significant differences between long and balanced faces.

Table V. Comparison between genders, facial pattern, and amount of gingival exposure (GE) among laypersons

		Female		*Male*		
Face	*GE*	*Median*	*SE*	*Median*	*SE*	P *value*
Long	0 mm	3.4	1.3	3.1	0.6	0.757
	1 mm	3.0	1.0	3.5	0.8	0.349
	2 mm	3.0	1.2	3.3	0.7	0.455
	3 mm	2.9	0.9	3.1	0.8	0.065
	4 mm	2.6	1.3	3.4	0.7	0.901
	5 mm	2.6	1.0	3.1	0.8	0.114
	6 mm	2.4	1.3	3.1	0.6	0.901
Balanced	0 mm	4.2	0.7	4.3	0.9	0.852
	1 mm	4.2	0.8	4.3	0.5	0.455
	2 mm	4.2	0.8	4.4	0.7	0.418
	3 mm	3.9	0.8	3.8	1.3	0.852
	4 mm	3.4	1.3	4.3	0.9	0.418
	5 mm	3.5	1.4	3.9	0.8	0.147
	6 mm	3.3	1.7	4.0	0.8	0.494

Kruskal-Wallis test between evaluators, Friedman test within categories; $P < 0.05$.

Table VI. Comparison between genders, facial pattern and amount of gingival exposure (GE) among dental specialists

		Female		*Male*		
Face	*GE*	*Median*	*SE*	*Median*	*SE*	P *value*
Long	0 mm	3.6	1.3	3.7	0.6	0.653
	1 mm	3.2	1.0	2.7	0.8	0.214
	2 mm	2.9	1.2	2.7	0.7	0.610
	3 mm	2.9	0.9	2.6	0.8	0.610
	4 mm	2.3	1.3	2.2	0.7	0.106
	5 mm	2.2	1.0	1.7	0.8	0.153
	6 mm	1.6	1.3	1.6	0.6	0.172
Balanced	0 mm	4.0	0.7	36	0.9	0.787
	1 mm	3.9	0.8	4.0	0.5	0.976
	2 mm	3.7	0.8	3.7	0.7	0.610
	3 mm	3.6	0.8	3.4	1.3	0.976
	4 mm	2.3	1.3	2.5	0.9	0.120
	5 mm	2.6	1.4	2.3	0.8	0.653
	6 mm	1.7	1.7	1.7	0.8	0.490

Kruskal-Wallis test between evaluators, Friedman test within categories; $P < 0.05$.

reported by Oshagh et al,[20] who also designed simulations with long-faced models and found that dental specialists tolerated gingival exposure of 1 mm. Geron and Atalia[18] demonstrated that gingival exposure of 1 mm becomes unpleasant for laypersons, although Alhaija et al[3] indicated that laypersons tolerate up to 2 mm of exposure. Accordingly, Kokich et al[13] observed that gingival exposures above 2 mm are unpleasant for laypersons. More recently, Kokich et al[1] and Ker[21] observed that laypersons may accept gingival exposures up to 3 mm. All of these studies restricted the analysis of smile esthetics to using photographs of the mouth region only. However, the scientific literature points toward a major criticism by the examiners when judging the mouth region exclusively.[7] Similarly, laypersons were more flexible in judging smile esthetics when presented with images of the entire face. When considering the analysis of smile esthetics in subjects with long and short facial patterns, Oshagh et al[20] observed a tolerance of gingival exposure of 1.5 mm by laypersons. In contrast

Table VII. Correlation between age of evaluators and score considering the different groups, levels of gingival exposure (GE) and faces

		Orthodontists		*Maxillofacial surgeons*		*Periodontists*		*Layperson*	
Face	*GE*	*r*	P	*r*	P	*r*	P	*r*	P
Long	0 mm	−0.17	0.432	0.33	0.114	−0.07	0.743	−0.27	0.200
	1 mm	−0.25	0.243	−0.07	0.730	0.03	0.882	−0.29	0.168
	2 mm	−0.34	0.106	−0.17	0.440	0.05	0.830	−0.32	0.132
	3 mm	−0.10	0.629	−0.02	0.911	0.21	0.333	−0.42	0.044*
	4 mm	−0.06	0.766	−0.04	0.859	−0.01	0.951	−0.18	0.410
	5 mm	−0.05	0.828	0.17	0.436	0.12	0.582	−0.27	0.195
	6 mm	−0.23	0.289	0.12	0.562	0.26	0.211	−0.07	0.742
Balanced	0 mm	−0.12	0.592	−0.17	0.430	−0.18	0.402	−0.20	0.343
	1 mm	−0.05	0.827	0.21	0.331	−0.22	0.300	−0.03	0.875
	2 mm	0.18	0.408	0.28	0.182	0.08	0.699	0.01	0.976
	3 mm	0.06	0.792	−0.05	0.829	−0.12	0.574	−0.02	0.920
	4 mm	−0.05	0.807	0.18	0.403	0.08	0.711	0.00	0.992
	5 mm	0.18	0.391	0.10	0.637	−0.28	0.192	0.17	0.414
	6 mm	0.16	0.464	0.29	0.164	−0.22	0.302	0.20	0.340

Spearman rank correlation coefficient and test significance at $P < 0.05$.
*Statistically significant correlation.

to previous outcomes from studies designed to analyze the entire face,[9,22,23] the increasing gingival exposure simulated in the present study did not reach unpleasant levels for laypersons. This suggests that the other facial structures from images of the entire face reduced the criticism for accepting the increasing gingival exposure. This outcome highlights the importance of planning the treatment individually for each patient. Thus, dental specialists must inform their patients about the relationship between gingival exposure and excessive maxillary height. Whereas on one hand, dentists must not impose their opinion on any patient, on the other hand the opinion of each patient must be respected individually, especially considering their willingness to correct or accept the clinical condition of their smile. Advising is important to help patients in their choices, but their esthetic preferences must remain respected. As shown in the present study, preferences are subjective. From a therapeutic scope, surgical approaches for the correction of the excessive maxillary height must be discussed with the patient in consideration of its inherent risks and benefits.

The analysis of the balanced facial pattern followed the same trend, indicating decreasing scores with increasing gingival exposure. This trend remained constant within the different groups of examiners, but in minor proportion compared with the scores of the long face. Based on the results, 2 mm of gingival exposure was considered to be pleasant among dental specialists, which is in contrast to previous findings,[1,3,13,18,19] where 2 mm of gingival exposure was considered to be acceptable only. However, these previous studies used images of the mouth region exclusively. In addition, the dental specialists considered the gingival exposure of 5 mm to be acceptable in the balanced face. Compared with previous findings,[1,3,13,18-20] the dental specialists of the present study were more tolerant regarding smile esthetics. These outcomes may be related to the use of facial photographs for the assessment of esthetics and confirm the study by Springer et al,[9] which suggested that the attractiveness of other facial structures may attenuate an unbalanced smile.

Special attention must be given to the scores rated by the laypersons, which were higher for all the levels of gingival exposure compared with those of the dental specialists. These scores were also higher than previous studies using photographs of the mouth region only[1,3,13,18] and the entire face.[9,20-22] Gingival exposure from 0 mm to 6 mm was apparently not evident to laypersons when analyzing the balanced face. The balanced facial pattern contributed to a better judgment of smile esthetics, masking the simulated gingival exposures.

Considering the outcomes according to the ages of the dental specialists, no statistically significant difference was observed. Similar findings were observed in the study by Lauria et al,[15] which highlighted a slight negative correlation with age in the group of laypersons, with statistical significance for gingival exposure of 3 mm. Weighted kappa values would suggest that the assessment of gingival esthetics was likely to be subjective with moderate agreement at different time

lines. This could mean that an individual's preference of gingival esthetics might change over time. Further investigation and research on the perception of gingival esthetics acceptability with time are required. Moreover, older laypersons preferred less gingival exposure, based on the results of the present study.

More specifically, older examiners tended to give lower scores to higher levels of gingival exposure, which is in line with a study by Pithon et al.[24] According to that report, examiners aged 35-44 years preferred the upper lip covering the extension of the upper incisors. In the present study, the mean age of the examiners was 34 years. Indeed, previous reports indicated that young persons preferred more gingival exposure compared with older persons, thus following the natural process of human aging.[24]

Our results also indicated that the scores given for the balanced face were higher than those for the long face, with statistically significant differences in all levels of gingival exposure. These observations confirm once more that facial harmony may overcome minor smile alterations in the opinion of laypersons[9] and dental specialists.[23] These results highlighted a question that persists to date[17] as to whether the scientific knowledge of dental specialists is able to reveal smile details that are imperceptible for laypersons. In the present study, laypersons were more tolerant regarding smile esthetics than the dental specialists. Vargo et al[25] stated that patients decide to undergo esthetic treatment based on the opinion of other laypersons. This phenomenon expresses the complex relationship that determines the search for esthetics in the daily practice. The outcomes of the present study have an important clinical significance. When smile attractiveness is assessed, the proportion and harmony of the facial structures count more than quantified data. Restricting the analysis of attractiveness to the occlusion is a major mistake in the clinical routine, although establishing a proper occlusion is desirable in every treatment plan. However, the opinion of the patient and esthetic complaints are important to reach optimal clinical outcomes. The combination of function and esthetics tends to fulfill the patient's expectations and leads to less frustration after the orthodontic treatment. Dental specialists should discuss and agree on a common goal for achieving the gingival esthetics specific for each patient during interdisciplinary treatment planning, because the present study found variations among dental specialists' preferences for gingival esthetics.

Furthermore, the facial pattern must be considered when diagnosing and treating gingival exposure. In the present study, the dental specialists and laypersons rated the gingival exposure differently in the different facial patterns, thus indicating that facial esthetics must be considered for the diagnosis and treatment of gingival smiles. On the other hand, the laypersons that judged smile aesthetics in the present study represent only part of the population. The extrapolation of these results to the general population should be carried out with caution, because these aesthetic concepts are influenced by cultural, ethnic, and contemporary aspects.

One of the limitations of the present study is the assessment of smile esthetics only in female subjects. Indeed, esthetics may be interpreted differently in men. Therefore, more studies should be performed in different countries to explore the influence of culture on esthetics.[26] Consequently, these studies would allow the comparison and validation of the present outcomes as well as contribute to the diagnosis and treatment of gingival smiles.

CONCLUSIONS

1. Facial pattern influences the assessment of smile aesthetics.
2. For dental specialists, the maximum gingival exposure considered to be "acceptable" in the long-face subject was 3 mm. Laypersons were more tolerant, accepting gingival exposure of up to 6 mm. In the balanced-face subject, dental specialists tolerated up to 5 mm of gingival exposure (rated as "acceptable"). The facial pattern must be taken into consideration during the diagnosis and treatment of gingival exposure in clinical practice.
3. The harmony of a balanced face attenuates the perception of gingival exposure; thus, increased gingival exposure may be largely imperceptible for laypersons.

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