

Dentogingival Alterations and Their Influence on Facial and Smile Attractiveness

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ABSTRACT

Aim: This study aimed to evaluate the influence of labial and dentogingival characteristics on facial and smile attractiveness.

Materials and methods: Four different close-up photographs each of six women models with different labial and dentogingival characteristics were obtained. One of the models was considered standard. Photographs were arranged in an album were evaluated by 100 laypersons, and 30 dentists who ranked each close-up of the models from according to the degree of attractiveness from first to sixth place, with first being the model considered most attractive and justified the reasons for choosing.

Results: The standard model received the best scores for both lips (7.75) and face (5.18). Medium-sized lips were preferred ($p < 0.05$), and the smile positively or negatively interfered with aesthetic perception depending on the dentogingival alteration present. Diastema was the alteration that had the greatest negative influence.

Conclusion: Not all Dentogingival alterations interfere with aesthetic evaluation. The lips are not decisive in facial attractiveness. Attraction is assessed significantly differently by laypeople than by dentists. The smile directly influences the analysis of facial beauty.

Clinical significance: Dentogingival alterations may be imperceptible, especially when evaluating the facial joint, so its correction will not always be necessary.

Keywords: Attractiveness, Dental aesthetics, Dentogingival alterations, Diastema, Smile.

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INTRODUCTION

The smile is a facial expression that denotes joy and sympathy and can thus influence the way an individual is perceived by society in both professional and social contexts. A beautiful smile is undoubtedly a distinguishing feature.^{1,2} The patient image plays an essential role in clinical treatment decisions and the dentist's esthetic judgment.

The difficulty lies in interpreting the subjectivity of what is considered aesthetic.^{2,3} This is a constant challenge for dentists because one's self-perception is often influenced by the opinions of those close to them, or by imposed cultural factors.²⁻⁵ This reality has generated predefined preferred smiles, in which, in general, teeth are very white, in perfect alignment, and with a gingival contour that is millimetrically designed and framed by voluminous red lips.^{3,6-8} Consideration of these characteristics while disregarding age and facial factors has often led to an artificial-looking smile or even to unnecessary treatments.^{9,10}

The harmony or disharmony of a smile is determined by characteristics such as symmetry,^{3,10} gingival display,¹⁰⁻¹² outline of the lips,³ buccal corridor,^{9,10} and size and shape of the teeth.^{9,13} The overall face and its individualities are also important and should be considered since the smile is part of an aggregate.¹²⁻¹⁴ Understanding the influence of the smile on facial beauty is important because it provides a reference for discussions with the patient and for providing scientific data that can guide diagnosis and defining treatment planning in aesthetic restorative dentistry.^{9,15-17}

The objective of this study was to evaluate the influence of the lips and dentogingival characteristics on

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the smile and assess the importance of these factors for facial attractiveness. The proposed hypothesis was that the lips and dentogingival characteristics are decisive to the beauty of the smile and to facial attractiveness.

MATERIALS AND METHODS

This study was approved by the Research Ethics Committee of the University of Ceuma under protocol no. 813.239, and all participants signed a free and informed consent form. This was an observational cross-sectional study conducted in two stages.

In this cross-sectional study, was obtained dates qualitative based on a subjective analysis of layperson and dentist of facial attractiveness. In the first stage, six women volunteers (aged 19 to 25 years) with the different face and lip shapes and different dentogingival features were selected and termed models. Based on the literature, one model was considered to represent the standard: medium lips; well-aligned, white teeth well positioned relative to the midline; harmonious gingival contour; and a medium smile.^{1,12-14} Characteristics of the models (who were labeled A to F) are given in Table 1.

By using a Nikon D90 camera and a 105 mm macro lens (Nikon, Japan), four close-up photos (two of the lips and two of the face) of the models were taken: (1) lips at rest, (2) lips smiling, (3) face with makeup without a smile, and (4) face with makeup with a smile (Figs 1A and B, and 2A and B). Makeup was selected and applied by the

models themselves, who were told to make it appear natural and such that it made them feel beautiful and attractive.

The photographs were developed as 15 × 20 prints at a Kodak Picture Kiosk GS order station and arranged in a four-page album, in the sequence of close-ups given above. Each page contained close-ups of the six models, arranged in different orders to reduce the likelihood that respondents would be influenced by their choices on previous pages.

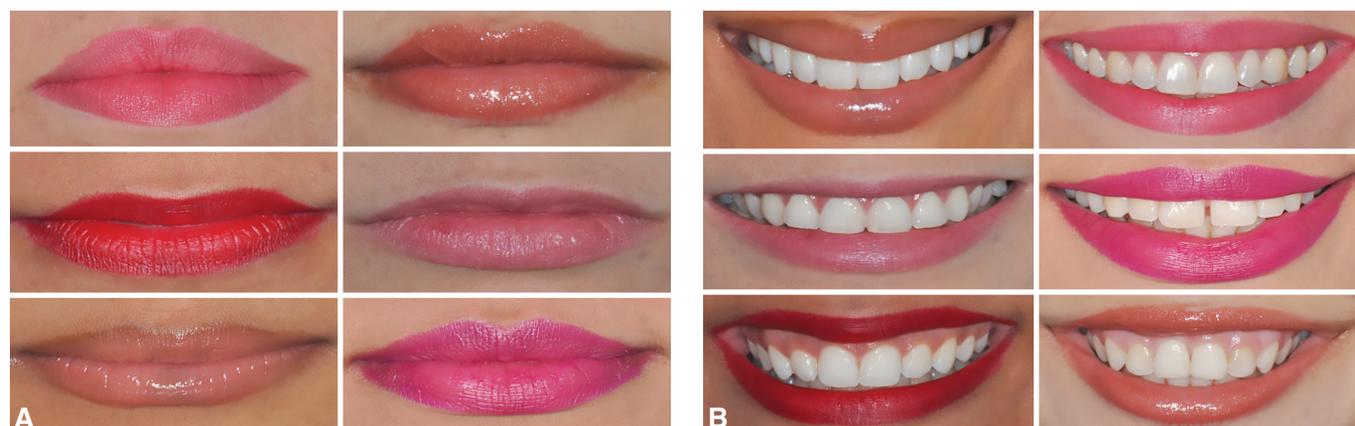
In the second stage, the album evaluated by two groups of respondents: laypersons and dentists. The group of laypersons comprised 100 randomly selected participants. The inclusion criteria were that respondents should be university students with no direct or indirect connection to dentistry, and who did not know the models in the study. The group of dentists comprised 30 experts in the fields of prosthetics, dentistry, periodontics, and orthodontics, who had been practicing for at least 5 years in their specialty and did not know the models.

Respondents were asked to rank the photographs on each page in order of attractiveness from first to sixth place, with first being the model considered most attractive. They were then asked to make a brief comment on their reasons for choosing the first and sixth place photographs. To avoid comparisons, respondents were prohibited from going back to a page that had already been evaluated. One minute per page was allotted for selection time. A single interviewer gave all instructions and comments.

Data were tabulated and submitted to descriptive and inferential analysis using the Mann–Whitney tests, which assessed whether there was a significant difference between the scores assigned to different photographs of lips and faces for the evaluated models. The Mann–Whitney test was used to evaluate the significance of differences between the total rankings assigned to models by laypersons and by dentists. The significance level was 5%. The Statistical Package for the Social Sciences (SPSS) statistical program (version 23.0, IBM, Armonk, NY, USA) was used for all statistical analyses.

Table 1: Characteristics of the models

Model	Characteristics
A	Medium lips, well-aligned, teeth and medium smile (standard model)
B	Medium lips, dental alterations (position and color) and high gingival smile
C	Thin lips, well-aligned teeth and high gingival smile
D	Thin lips, discrete misalignment and medium smile
E	Thin lips, midline deviation and low smile
F	Medium lips, and diastema between central incisors



Figs 1A and B: (A) Photo album with the close-ups of the lips at rest; (B) album with the close-ups of the lips smiling



Figs 2A and B: (A) Photo album with the close-ups of the face with makeup without a smile; (B) Photo album with the close-ups of the face with makeup with a smile

RESULTS

Tables 2 and 3 show the means of the assigned scores for each model in ascending order (most attractive to least attractive), and assessments of the photographs of the lips and faces, respectively. Comparisons between the mean scores assigned by laypersons and dentists are also given.

Overall, the lowest average scores were assigned to the standard model (A) for evaluation of both the lips and the face, among dentists and laypeople. On the contrary, the model with thin lips and discrete misalignment (D) received the highest average scores for lips and face (Tables 2 and 3).

Graph 1 shows the average scores by model and type of photography evaluated. A low average score (most attractive) is observed for the model with medium lips and straight teeth (A) in the evaluation of both the lips and the face, indicating that this composition was considered most satisfying.

In assessing whether there was a significant difference between mean scores in the evaluation of pictures of lips, attention is drawn to the effect produced by the smiles of the model with thin lips and a discrete misalignment (D) and the model with medium lips and diastema (F). In the first, the smile promoted an increased level of satisfaction with the pictures; in the second, it had the opposite effect (Graph 2).

When comparing the photos of the faces, there was no significant difference in the effect of the smile only in the standard model (Graph 3). While the smile contributed to a better assessment of models C, D, and E, the opposite occurred in models B and F.

Another aspect observed was the effect of diastema on the degree of perceived attractiveness. Diastema contributed significantly to a decrease in perceived attractiveness (higher scores) when the model was smiling. This finding was evident in evaluating photos of both the lips (Graph 2) and the faces (Graph 3).

Table 2: Average of the assigned scores for each model in ascending order (most attractive to least attractive), and assessments of the photographs of the lips

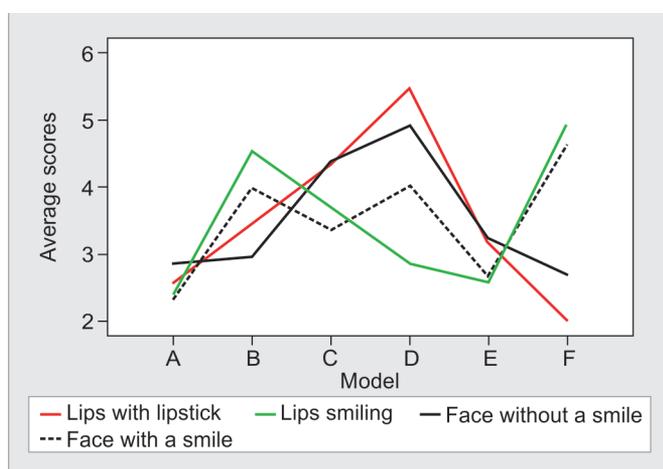
Model	Groups	Lips with lipstick Median (mean + SD)	Lips with lipstick and smiling Median (mean + SD)
A	Laypersons	(2) 2.54 ± 1.32	(2) 2.63 ± 1.39
	Dentists	(2) 2.63 ± 1.29	(1) 1.60 ± 0.89*
E	Laypersons	(3) 3.08 ± 1.28	(2) 2.40 ± 1.48*
	Dentists	(4) 3.47 ± 1.43	(3) 3.17 ± 1.26*
F	Laypersons	(2) 2.19 ± 1.41	(6) 4.89 ± 1.48*
	Dentists	(1) 1.40 ± 0.62	(5) 5.10 ± 0.92*
C	Laypersons	(4) 4.17 ± 1.30	(4) 3.76 ± 1.40*
	Dentists	(5) 4.87 ± 1.19	(4) 3.47 ± 1.38*
B	Laypersons	(4) 3.56 ± 1.54	(5) 4.33 ± 1.40*
	Dentists	(3) 3.20 ± 0.88	(5.5) 5.23 ± 0.97*
D	Laypersons	(6) 5.49 ± 0.93	(3) 2.99 ± 1.55*
	Dentists	(6) 5.47 ± 0.77	(2) 2.47 ± 1.10*

* = statistic significant differences between groups (p < 0.05).

Table 3: Average of the assigned scores for each model, and assessments of the photographs face

Model	Groups	Face without a smile (mean + SD)	Face smiling (mean + SD)
A	Laypersons	2.85 (± 1.61)	2.53 (± 1.51)*
	Dentists	2.87 (± 1.69)	2.53 (± 1.51)*
E	Laypersons	1.63 (± 1.09)*	2.61 (± 1.44)
	Dentists	3.25 (± 1.41)	2.87 (± 1.40)
B	Laypersons	3.20 (± 1.18)	2.61 (± 1.44)
	Dentists	2.87 (± 1.40)	5.10 (± 0.96)*
F	Laypersons	2.88 (± 1.45)	2.07 (± 1.09)*
	Dentists	3.23 (± 1.50)	3.61 (± 1.58)*
C	Laypersons	5.10 (± 0.96)*	4.50 (± 1.35)
	Dentists	2.88 (± 1.66)*	3.00 (± 1.25)*
D	Laypersons	2.07 (± 1.09)*	4.70 (± 1.50)
	Dentists	4.37 (± 1.45)	4.03 (± 1.52)

* = statistically significant differences between groups (p < 0.05).



Graph 1: Average scores by model and type of photography evaluated (line graph)

DISCUSSION

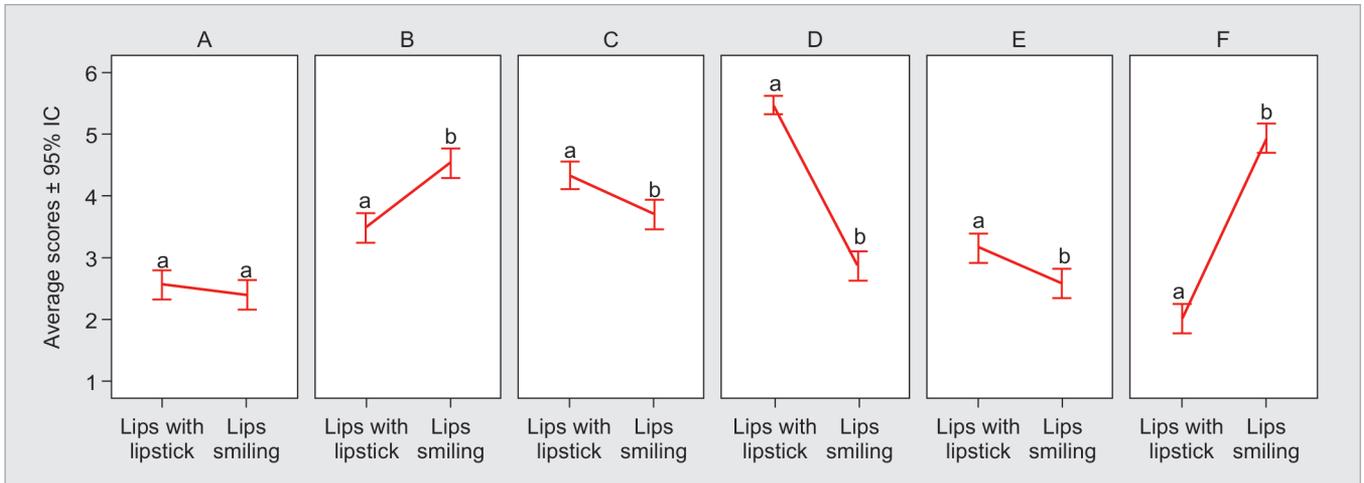
The hypothesis constructed in this study was partially rejected, since dentogingival characteristics defined the degree of attractiveness of the smile and the face but not of the lips. This finding was quite explicit in the results obtained and is supported by the literature.^{1-3,9,11}

The analysis of photographs of the lips revealed a preference for medium lips with a well-defined outline and evident Cupid’s bow, with a healthy appearance and the upper lip proportional to the bottom. This shows that fuller lips are preferred by the majority, as has been demonstrated in previous studies.^{3,9}

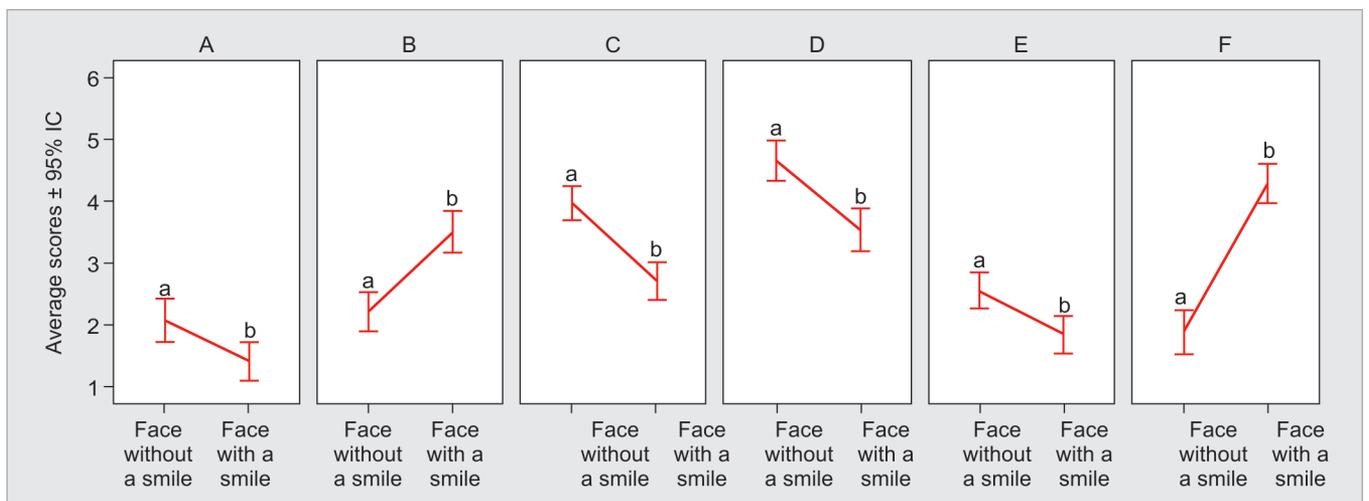
When a photo of the smile (exposing teeth and gums) was evaluated, lips earned a secondary priority, with the dentogingival combination taking predominance in the analysis.^{12,16}

The smile improved assessments of models with thin lips (C, D and E). Although they had dentogingival characteristics outside the established pattern, the effect of these was subdued by the fact that they had white well-aligned teeth (C and E) or a discrete misalignment (D).

Those with medium lips (B and F) fared worse in the smile assessment, with the exception of the standard model (A), whose facial harmony as a whole had a positive influence and, because of this, was still assessed positively in the picture with a smile. There



Graph 2: Average scores (bar graph error, confidence interval 95%) of the assigned to photographs of the lips for each model. Comparison the photos in the same model using the Kruskal-Wallis test and Dunn post hoc. "Different words = statistically significant differences ($p < 0.05$)



Graph 3: Average scores (error graph confidence interval 95%) of the assigned to photographs of the face for each model. Comparison the photos in the same model using the Mann-Whitney. Different words = statistically significant differences ($p < 0.05$)

were significant changes in the assessment of the other two. Diastema between the central incisors (model F) is highlighted since this alteration had the most significant negative influence on aesthetic perception, followed by the dental alterations (size and color) present in model B, which were very noticeable because of the model's wide smile. This is a feature that contributes to reducing the attractiveness of the smile.³

In an analysis of photos of the entire face, lips acquired tertiary importance. The harmony of the whole defined justifications for the respondents' choices. Because the observed area was larger, a greater difficulty in choosing was perceived, and subjectivity was more evident in the analysis. The presence of a smile in the photo interfered with evaluation of the face, causing several respondents to give a different score to the photo. This finding confirms the importance of the smile and the structures it frames.^{1,3,13,14} Richards et al.¹² concluded that the eyes and mouth are the facial structures that hold most of the respondent's

attention, and therefore that dental alterations often draw attention.

When comparing groups of respondents, there was greater homogeneity in the choices made by dentists, where the standard deviation in most cases was lower. Nevertheless, it is clear that when changes are very noticeable, as in the case of diastema (model F) and changes in position and color of the teeth (model B), the agreement between evaluators was strong.

When considering the dentogingival characteristics of the models in this study, it was observed that the dental deviation of 3 mm from the midline in model E was generally not detected, even by dentists. Other study found no differences in the perceptions of an ideal smile and a midline deviation of 3 mm, highlighting the variability in perceptions.¹⁸ Studies have shown that of all aesthetic parameters, changes in the dental midline are the least noticed, and are more perceptible only when the axial angle of the incisors is incorrect, which was not the case in this model.^{3,12,17}

The Diastema present between the central incisors of model F was the characteristic that carried the most negative weight in the evaluation of photos of smiling lips and smiling faces (Graphs 2 and 3). This is because it is located in the most visible area of the smile, as has been found in previous studies.^{3,5,16} Patients, the most attractive smile had no spacing, whereas the greater and the more mesially located was the diastema, the more unattractive the smile.¹⁹ The width of the midline diastema has a significant impact on smile esthetics, even when associated with lateral spaces.

The gingival smile is considered harmonious when it displays only a small strip of gum (up to 3 mm).^{14,12} In this study, models B and C had different assessments; the first received a poorer review when smiling, whereas the second did not. This occurred because model C has white straight teeth and good gum contouring, which emphasized the face; model B, however, has more voluminous gums and dental alterations affecting the position and color of the teeth, which was decisive in the evaluation. The gingival contour of teeth and upper lip has been considered essential for esthetics, asymmetries of up to 1.5 mm in the free gingival margin of the maxillary central incisors seemed to be acceptable and not perceived by the laypersons.

Model D was rated poorly when assessed about her lips and face. The smile helped improve the evaluation, since alterations in positioning were discrete and therefore often not perceived. In this case, the format of the lips and then the face defined her assessment.

The standard model (A), who had a harmonious overall appearance, was always rated well, with virtually no differences between the evaluations of laypeople and dentists. Such differences only occurred when the smile was considered, which shows how the smile can interfere with aesthetic perception.^{3,9,12}

This study conducted an aesthetic evaluation using photos, which is different from what naturally occurs owing to the exclusion of the dynamism of the face. In addition, this study evaluated only female photographs; future studies can evaluate these aspects.

CONCLUSION

From the methodology employed and within the limitations of the study, it can be concluded that the lips have a secondary role in determining facial beauty and attractiveness of smile; dentogingival characteristics are decisive in determining the aesthetics of the smile and face; and the smile influences aesthetic perception of the face by both laypersons and dentists.

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