

Smile microesthetics as perceived by dental professionals and laypersons

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ABSTRACT

Objectives: To evaluate and compare the perception of different dental professionals and laypersons toward altered gingival characteristics (microesthetics) and to identify those characteristics that are most negatively and positively rated.

Materials and Methods: A smiling photograph of a female dental student was selected and digitally manipulated to create changes in different microesthetic parameters. These altered images were rated by the following five groups: 120 orthodontists, 45 periodontists, 49 prosthodontists, 130 general dentists, and 172 laypersons. Smile esthetics scores were calculated, and comparisons between groups were performed using the univariate general linear model.

Results: The presence of black triangles between the upper incisors was the most negatively rated, and the ideal smile was the most positively rated. Significant differences were detected in the rating scores among the different study groups ($P < .05$). Orthodontists, prosthodontists, and general dentists scored the presence of a black triangle in the smile as the least attractive, whereas periodontists and laypersons perceived the inflamed gingiva and pigmented gingiva as the least attractive, respectively. Dental specialists tended to give the altered smile images lower scores than the laypersons.

Conclusions: The ideal smile and that with black triangles between the upper incisors were rated as the most and the least attractive smiles, respectively. Orthodontists, prosthodontists, and general dentists scored the presence of black triangles in the smile as the least attractive, whereas periodontists and laypersons perceived the inflamed gingiva and pigmented gingiva as the least attractive smiles, respectively. Dental specialists tended to give the altered smile images lower scores than the laypersons. (*Angle Orthod.* 0000;00:000–000.)

KEY WORDS: Microesthetics; Perception

INTRODUCTION

Smile esthetics can be divided into macroesthetics (the relationships of teeth to each other, to soft tissues, and to facial characteristics), miniesthetics (the correlation of lips, teeth, and gingiva), and microesthetics (fine structures of dental and gingival esthetics).¹ These factors determine the final attractiveness of the orthodontically finished smile. The esthetics of the smile has an important influence on the perception of an individual's appearance and personality.^{2,3}

Smile esthetics demand a balance between factors related to both teeth and the gingiva. Positioning of teeth in the confines of the gingival architecture has a tremendous impact on smile esthetics. Gingival factors include shape, contour, level, and symmetry of the gingival margins and zeniths, the color and health of the gingiva, and position of the interdental papilla, among others.^{4,5}

The assessment of perceived smile esthetics is of utmost importance as it helps in the planning of treatment and determines what is most likely to be

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Figure 1. Control smile photograph.

considered as good appearance.⁶ An interdisciplinary approach is usually required to improve gingival esthetics, which involves cooperation between an orthodontist, periodontist, and prosthodontist. Many studies have investigated the perceptions of laypersons and dental professions to altered dental characteristics; however, only a few have investigated the impact of altered gingival factors on smile attractiveness.⁵

Batra and colleagues⁵ investigated the perceptions of laypersons toward gingival characteristics and concluded that laypersons had considerably negative perceptions of asymmetric gingival alterations and of optical color changes caused by the presence of black triangles, inflammation, and pigmentation of the gingiva. Also, Sriphadungporn and Chamnannidiadha⁷ reported that the larger the black triangle, the lower the images were rated. In both studies,^{5,7} only laypersons' perceptions to altered smile esthetics were investigated.

Many microesthetic problems are treated by a multidisciplinary approach. Therefore, it would be necessary to know which characteristics are accepted and preferred both by dental specialists, who provide the treatment, and by laypersons, who represent the patients. This would be helpful for treatment planning because the goals of dental specialists should be in harmony with those of the patients to perform the most appropriate treatment.

The aims of this study were the following:

- Evaluate and compare the perception of different dental professionals and laypersons toward altered gingival characteristics (microesthetics).
- Identify the microesthetic characteristics that were most negatively and positively rated by different dental professionals and laypersons.
- Determine the importance of the studied dental and gingival microesthetic factors on smile attractiveness ratings.

MATERIALS AND METHODS

This cross-sectional study was reviewed and approved by the Institutional Review Board Committee at

Jordan University of Science and Technology. The survey was conducted during a period of 2 months.

Sample size was calculated using the G*power 3.1.9 program. Assuming a small effect size difference (0.25) between groups and based on a study conducted by Abu Alhaja and colleagues,⁸ who reported a mean attractiveness score of 2.22 ± 0.94 and 2.18 ± 0.81 by laypersons and orthodontists, respectively, the power analysis yielded a total sample size estimate of 220 participants (45/group) at a conventional α level (0.05) and desired power ($1 - \beta$) of 0.85.

A female dental student was chosen who had a smile with characteristics close to the standard norms. Informed consent was obtained from the candidate to digitally manipulate her smile and to use it in this study. A colored frontal close-up smile photograph was obtained using a digital camera (Nikon Coolpix 5000; Nikon, Melville, N.Y.) in the frontal pose (Figure 1). The control smile photograph was obtained using a standardized procedure by positioning the subject 5 feet from the camera with the head in the natural position.⁹ The image was then condensed so that each millimeter measured on the digital image was equivalent to 1 millimeter measured clinically on the patient using the maxillary central incisor as the reference. The original photograph (control smile) was then digitally manipulated using image processing software (Adobe Systems, San Jose, Calif) to produce a series of images with the nose and chin removed from the images to reduce the number of confounders.

The control smile image was altered to produce the following modifications: (1) discrepancies in the position of the free gingival margin of upper anterior teeth (Figure 2a–e), (2) variations in the color and health of the gingiva (Figure 3a–d), (3) presence of black triangles between the anterior teeth (Figure 4a,b), (4) discrepancy in the position of the zenith (Figure 5), and (5) variations in the cant of the occlusal plane (Figure 6a,b).

A total of 16 digital photographs were used in this study. An online survey was developed using Google Forms and distributed via social media applications (WhatsApp and Facebook Messenger) to all dental contacts obtained from various professional groups. Laypersons were selected from Facebook friends who had at least their first university degree that was not related to dentistry.

The questionnaire consisted of three parts. The first part included demographic data of the participant to determine sex, age, dental specialty, and years of experience for dental professions and level of education for laypersons. The second part consisted of altered photographs that were randomly displayed where the rater was asked to rank the attractiveness of the smile shown in each photograph using a scale of

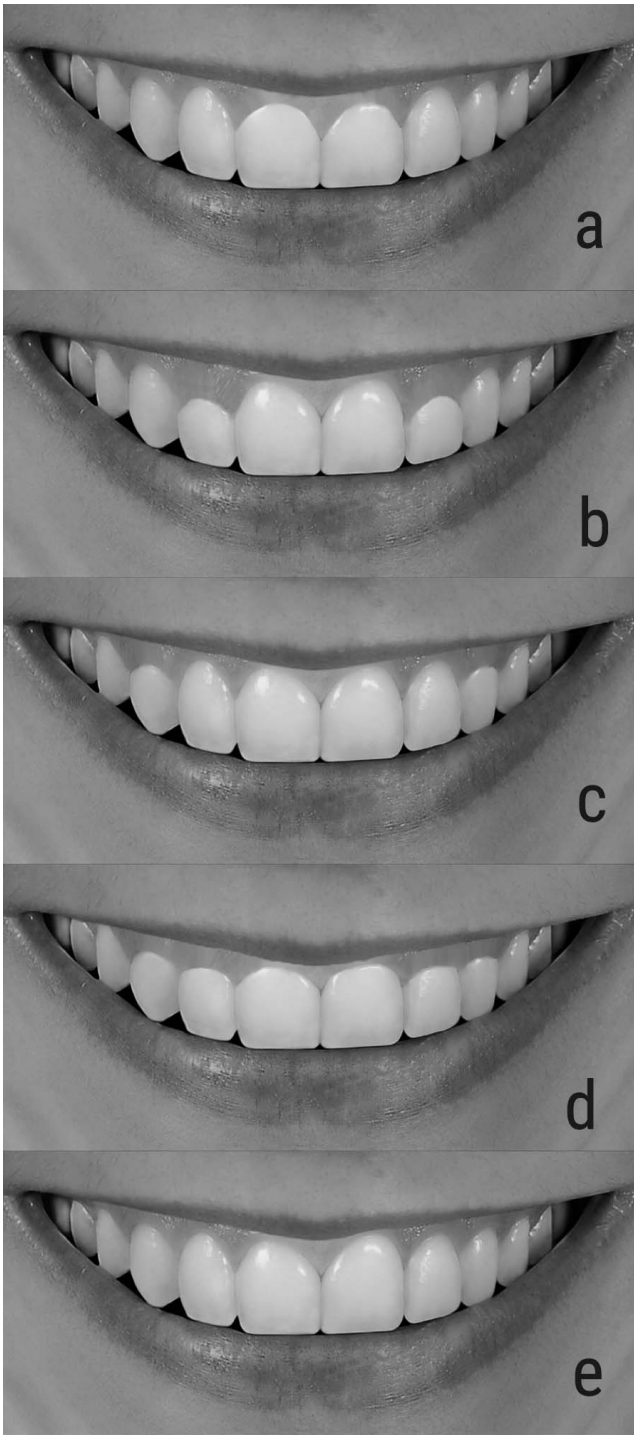


Figure 2. Discrepancies in the position of the free gingival margin of upper anterior teeth. (a) Gingival margin of the central incisors is 1.5 mm below that of the lateral incisors. (b) Gingival margin of the lateral incisors is 1.5 mm below its normal position. (c) Gingival margin of the canines is 1.5 mm below its normal position. (d) Gingival margins of the upper central incisors and canines are 1.5 mm below their normal positions (their crowns are 1.5 mm shorter than the control photograph). (e) Asymmetric gingival margins between upper right and left central incisors (0.5 mm).

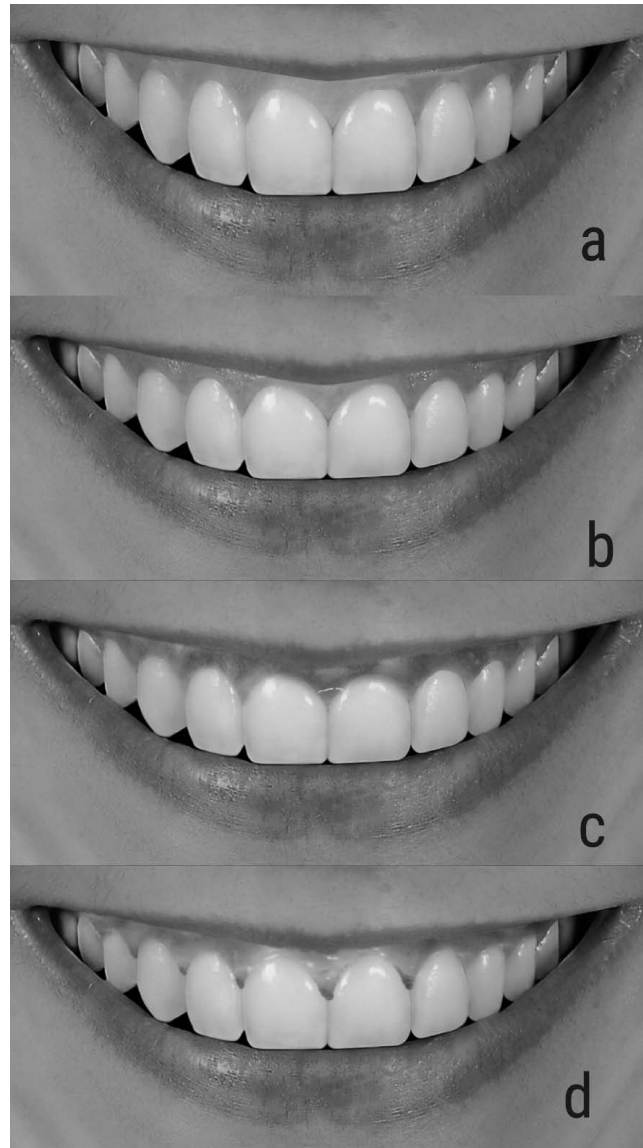


Figure 3. Variations in the color and health of the gingiva: (a) normal gingival color, (b) slightly red gingival color, (c) racial pigmentation, (d) inflamed gingiva and interdental papillae.

0 to 10 (where 0 indicated an extremely unattractive smile and 10 indicated an extremely attractive smile). The photographs were presented in a random sequence without giving participants to compare the differences among the photographs directly. The third part included six questions related to certain aspects of smile esthetics, which the rater was asked to answer. Each rater was given brief information about the aim of the study without disclosing the specific characteristics that were altered.

The online survey was sent to 701 participants (183 orthodontists, 87 periodontists, 74 prosthodontists, 157 general dentists, and 200 laypersons). Of those, 516 participants responded (orthodontists, $n = 120$; peri-

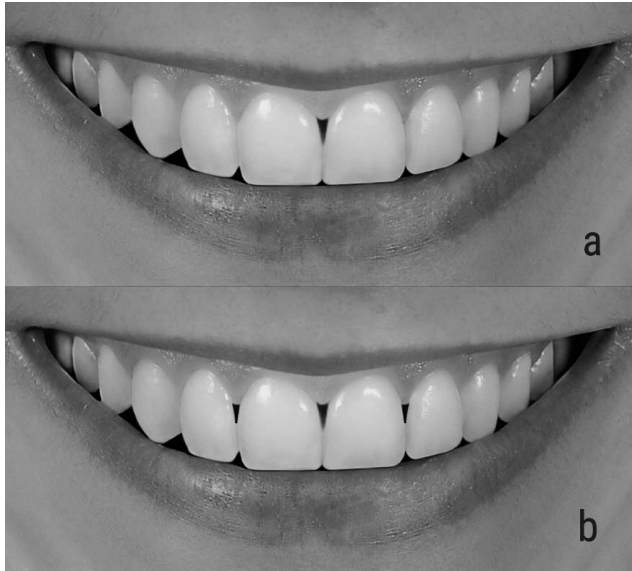


Figure 4. Presence of black triangles between the anterior teeth: (a) 2-mm black triangle between the central incisors and (b) 2-mm black triangle between the central incisors and 1-mm black triangle between central and lateral incisors on both sides.

odontists, $n = 45$; prosthodontists, $n = 49$; general dentists, $n = 130$; and laypersons, $n = 172$). Distribution of participants regarding sex, age range, dental profession, and years of experience is shown in Table 1.

Statistical Analysis

Data analysis was accomplished using the Statistical Package for Social Science (version 22.0; IBM Corp., Armonk, N.Y.). The mean scores and standard deviations (SD) of each group were calculated. Comparison among groups was performed using the univariate general linear model, which was selected to test the effect of independent factors on smile attractiveness as well as the interactions among these factors.

Method Error

Two copies of the control smile were added to the 14 altered photographs to check for reproducibility of the results. The reliability of the questionnaire was evaluated using Cronbach's α . Cronbach's α was 0.94, indicating good internal consistency. A total of 10 randomly selected participants were asked to complete the questionnaire twice with a 2-week interval. Reliability testing was carried out for all questions using correlation coefficient tests. The correlation coefficients were high and ranged from 0.87 to 0.98.



Figure 5. Gingival zenith is located 1-mm mesial to the midline of central incisors.

RESULTS

The means, SDs, medians, and F values for the attractiveness scores of the different smile images as rated by different study groups are shown in Table 2. All participants rated the control smile photograph as the most attractive. The presence of black triangles between the upper incisors was the most negatively rated by the study sample, followed by the inflamed gingiva characteristic and racial pigmentation.

Low gingival line of lateral incisors, short clinical crowns of anterior teeth, racial pigmentation, and inflamed gingiva were rated similarly as the second least attractive smile. Low gingival level on the canines and slightly red gingiva were rated similarly and were considered acceptable, followed by a mesially located zenith and cant of the occlusal plane.

As noted from the F values, significant differences were detected in the rating scores among different study groups. Differences between means, standard errors (SEs), and significance for the rating scores

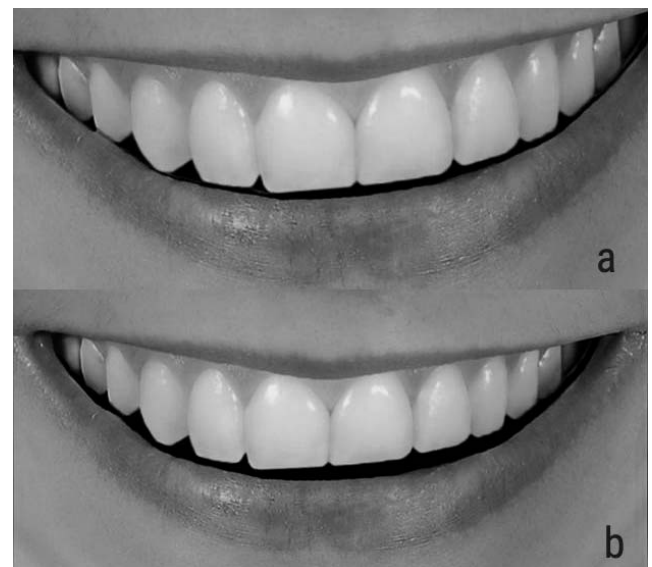


Figure 6. Variations in cant of the occlusal plane: (a) 5-degree occlusal plane cant (mild) and (b) 10-degree occlusal plane cant (severe).

Table 1. Sociodemographic Characterization of the Study Groups

	Orthodontists	Periodontists	Prosthodontists	General Dentists	Laypersons	Total
Sex						
Females	57	21	22	109	116	325
Males	63	24	27	21	56	191
Age range						
20–29 y	35	22	17	104	112	290
30–39 y	48	17	19	6	41	131
40–49 y	26	6	6	2	6	46
>50 y	11	0	7	18	13	49
Years of dental experience						
<5 y	45	21	11	97		174
5–10 y	22	15	17	7		61
11–20 y	41	7	12	3		63
>20 y	12	2	9	23		46
Total	120	45	49	130	172	516

among study groups are shown in Table 3. Orthodontists, prosthodontists, and general dentists scored the presence of black triangles in the smile as the least attractive, whereas periodontists and laypersons perceived inflamed gingiva and pigmented gingiva as the least attractive, respectively.

Dental specialists perceived the altered smile images differently with respect to gingival level and color, cant of the occlusal plane, and zenith location ($P < .05$). All images were given lower attractiveness scores by general dentists compared with the other groups.

Regression analyses to predict the variables that affected the rating scores of the altered smile images are shown in Table 4. A correlation existed between

dental specialty and attractiveness scores. Dental specialists tended to give the altered smile images lower scores than the laypersons.

The means and SDs for questions related to the impact of the studied variables on the attractiveness rating of the smile from the rater perspective are shown in Table 5; higher scores indicate higher impact. The factors were rated in decreasing order of importance as follows: gingival health, level of gingival margins of anterior teeth, normal occlusal cant, presence of black triangles, color of the gingiva, and gingival contour of anterior teeth (position of the zenith). Statistically significant differences were detected among study groups ($P < .05$).

Table 2. Mean, SD, Median, F Value, and Significance for the Rating of Altered Smiles by the Dental Professionals and Laypersons

	Mean (SD)/Median						F Value
	Orthodontists	Periodontists	Prosthodontists	General Dentists	Laypersons	All Groups	
Ideal smile	7.23 (1.67)/8	7.18 (1.98)/8	7.38 (1.48)/7	6.38 (2.02)/7	7.17 (2.31)/7	7.01 (2.04)/7	5.16**
Gingival level and height of anterior teeth crowns (age, sex, dental experience, and the importance of gingival level as covariates)							
Low gingival level on both centrals	4.56 (1.91)/4	5.07 (1.87)/5	4.60 (1.82)/5	3.82 (1.99)/4	5.63 (2.60)/6	4.76 (2.27)/5	12.15***
Low gingival level on both laterals	3.60 (1.84)/4	4.92 (1.98)/5	4.40 (2.11)/5	3.31 (2.04)/3	4.35 (2.45)/4	3.95 (2.20)/4	8.44***
Low gingival level on both canines	5.56 (1.94)/6	5.79 (2.17)/6	6.08 (1.76)/6	5.21 (2.22)/5	6.37 (2.26)/7	5.80 (2.17)/6	5.57***
Short clinical crowns, all incisors and canines	3.79 (1.90)/4	5.28 (2.19)/5	4.21 (1.80)/5	3.60 (1.82)/4	5.12 (2.51)/5	4.32 (2.23)/4	14.15***
Asymmetric gingival level, central incisor	6.61 (1.81)/7	6.69 (2.16)/7	6.73 (1.41)/7	5.781(2.22)/6	6.76 (2.35)/7	6.45 (2.14)/7	3.27*
Gingival health and color (age, sex, dental experience, and the importance of gingival health as covariates)							
Normal	6.76 (1.61)/7	7.34 (1.87)/7	6.63 (1.41)/6	6.10 (2.09)/6	6.85 (2.44)/7	6.66 (2.08)/7	3.70**
Slightly red	6.13 (2.05)/6	5.30 (1.69)/5	5.92 (1.99)/6	5.31 (2.39)/5	6.33 (2.37)/6	5.90 (2.26)/6	4.82***
Racial pigmentation	4.25 (2.09)/5	4.51 (1.79)/5	4.35 (1.84)/5	3.15 (2.05)/3	3.70 (2.72)/6	3.82 (0.10)/4	4.43**
Inflamed gingiva	3.66 (2.09)/4	3.30 (1.62)/3	3.54 (2.18)/4	2.95 (1.95)/2	4.45 (0.19)/4	3.70 (2.29)/4	10.06***
Black triangle (age, sex, dental experience, and the importance of having dental papilla between teeth as covariates)							
Between the two centrals	4.27 (2.09)/5	4.96 (2.29)/6	4.18 (1.87)/5	3.88 (2.11)/3	4.85 (2.46)/5	4.42 (2.28)/4	4.59***
Between centrals and laterals	2.63 (2.04)/3	3.65 (2.45)/4	3.05 (1.82)/4	2.53 (1.80)/2	3.89 (2.68)/4	3.16 (2.32)/3	9.66***
Incisor gingival contour–zenith (age, sex, dental experience and the importance of having incisor gingival contour as covariates)							
Mesially located	4.33 (1.95)/5	4.81 (1.83)/5	4.36 (1.79)/5	3.96 (1.95)/4	5.36 (2.47)/5	4.62 (2.19)/5	9.36***
Cant of occlusal plane (age, sex, dental experience, and the importance of having normal occlusal plane as covariates)							
Mild occlusal cant	3.86 (2.37)/4	5.31 (2.12)/6	4.37 (2.02)/5	4.30 (2.33)/4	5.62 (2.42)/6	4.73 (2.41)/5	12.20***
Severe occlusal cant	4.10 (2.07)/4	5.45 (1.95)/6	4.02 (1.94)/4	3.82 (2.04)/4	5.51 (2.48)/5	4.61 (2.31)/5	15.50***

* $P < .05$; ** $P < .01$; *** $P < .001$.

Table 3. Mean for the Rating Scores Between the Different Profession Subgroups

	Mean Difference (SE)		
	Orthodontists and Periodontists,	Orthodontists and Prosthodontists	Orthodontists and General Dentists
Ideal smile			.013*
Gingival level and heigh of teeth crowns			
Low gingival level on both centrals			
Low gingival level on both centrals	.001***		
Low gingival level on both laterals			
Low gingival level on both canines	.000***		
Low gingival level on all incisors and canines, short clinical crowns			
Gingival health and color			
Normal			
Slightly red			
Racial pigmentation			.008**
Inflamed gingivae			
Black triangle			
Between the twocentrals			
Between centrals + laterals			
Incisor gingival contour–zenith			
Mesially located			
Cant of occlusal plane			
Mild occlusal cant	.004**		
Severe occlusal cant	.005**		

* $P < .05$; ** $P < .01$; *** $P < .001$.

DISCUSSION

Increased awareness of the esthetics of smiles among the general population influenced dental specialists to look for ways to make teeth look better. Many dento-gingival problems are treated by a multidisciplinary approach, and the patient has to consent to the chosen treatment. Therefore, it is necessary to know which characteristics are preferred, both by the different dental specialists who provide the treatment and by laypersons who represent the patients. This cross-sectional observational study was conducted to define the microesthetic parameters necessary to achieve ideal esthetic smile outcomes as perceived by orthodontists, periodontists, prosthodontists, general dentists, and laypersons. This was the first study to evaluate the perception of different dental professionals and laypersons toward altered gingival characteristics.

The photographs used in this study were altered using computer software and were limited to the mouth to reduce the effect of confounders.^{10–12} A strength of the present study was that the images of each modified smile component were presented randomly in the questionnaire. This increased the accuracy of judgments.¹³

The control smile photograph was ranked as the most attractive. Low gingival level on the canines and slightly red gingiva were rated similarly and were close to the control smile for attractiveness scores, followed by a mesially located zenith. In a previous study,⁶ it was found that a bilateral distally located zenith was

rated by laypersons as the most attractive, whereas a unilateral mesially located zenith was scored as the most unattractive. Orthodontists' perceptions were found to be similar to laypersons when the gingival zenith was symmetrical.¹⁴

Having a cant of the occlusal plane was scored next in the attractiveness scores by the study sample, in which the orthodontists gave the lowest attractiveness scores, whereas the laypersons gave the highest scores. This was in agreement with the results of previous studies^{15–17} in which an occlusal plane cant was evaluated more negatively by orthodontists than by general dentists and laypersons. These results showed that laypersons found occlusal plane canting more acceptable than orthodontists and other dental specialists.

In the current study, orthodontists, prosthodontists, and general dentists scored the presence of black triangles in the smile as the least attractive. This was in agreement with Kokich et al.,¹⁸ who found that orthodontists rated a 2-mm black triangle as noticeably less attractive than the ideal smile, whereas it took a greater deviation (3 mm) for the laypersons to rate the smile as less attractive. On the other hand, periodontists and laypersons perceived the inflamed and the pigmented gingiva as the least attractive, respectively, which supported the findings of Batra et al.,⁵ who showed that changes in the color of the gingiva caused by inflammation and pigmentation were recognized by laypersons more readily and were ranked as highly

Table 3. Extended

Mean Difference (SE)						
Orthodontists and Laypersons	Periodontists and Prosthodontists	Periodontists and General Dentists	Periodontists and Laypersons	Prosthodontists and General Dentists	Prosthodontists and Laypersons	General Dentists and Laypersons
				.027*		.014*
.000***		.002**			.012*	.000***
.017*		.000***		.022*		.005**
.005**						.001***
.000***	.040*	.000***			.021*	.001***
						.014*
		.008**				.023*
		.008**		.032*		.001***
						.002**
.000***		.050*				.000***
.001***					.045*	.000***
.000***					.014*	.000***
.000***	.017*	.000***			.001***	.000***

unesthetic compared with alterations in the zenith and contours.

Low gingival line of the lateral incisors and short clinical crowns of anterior teeth were the second least attractive features. Previous studies^{5,10,19,20} also found similar results and reported that laypersons were less discerning of a crown length discrepancy than general dentists and orthodontists. A discrepancy of 1.5 to 2 mm was undetectable by laypersons, whereas orthodontists and periodontists noticed minor changes of 1.0 and 0.5 mm.

Dental specialists gave the altered smile images lower scores than the laypersons, indicating that dental specialists were more critical of variations in gingival characteristics than laypersons. This was in agreement with previous studies,^{10,21} which concluded that laypersons were less critical than dentists and orthodontists when evaluating smiles. This finding indicates that the goals of dental practitioners may not be in harmony with the goals of patients, highlighting the importance of effective communication between dental specialists and their patients when planning treatment.

Table 4. Regression Analysis Results Showing the Predictors for the Attractiveness Rating for Each Altered Smile Image

	Predictor	R	Standardized Coefficient β
Ideal smile	Specialty**	0.241	-0.162**
Low gingival level on both centrals	Specialty*	0.179	-0.129*
Low gingival level on both laterals	Sex*	0.160	0.120*
Low gingival level on both canines	None	0.112	-
Low gingival level on all incisors and canines, short clinical crowns	None	0.239	-
Asymmetric gingival level, central incisor	Specialty*	0.192	-0.153*
Normal gingival color	Specialty***	0.224	-0.203***
Slightly red gingivae	Specialty*	0.227	-0.138*
Racial pigmentation	Specialty***	0.357	-0.265***
	Sex***		0.180***
Inflamed gingivae	Specialty*	0.441	-0.145*
	Sex*		0.117*
	Age***		0.390***
Black triangle between the two centrals	Specialty*	0.298	-0.138*
Black triangles between centrals and laterals	None	0.258	-
Mesially located zenith			
Mild occlusal cant	Age*	0.127	0.236*
Severe occlusal cant	Specialty*	0.247	-0.128*
	Sex***		0.193***

* $P < .05$; ** $P < .01$; *** $P < .001$.

Table 5. Mean, SE, *F* Value for the Importance of the Dental and Gingival Factors in the Rating of Smile Esthetics Regarding Specialty, Years of Experience, Sex, and Age

	Level of Gingival Margins of Upper Anterior Teeth	Color of the Gingiva	Gingival Health	Gingival Contour of Upper Anterior Teeth		Presence of Interdental Papilla	Normal Occlusal Plane
				<i>F</i> value ANCOVA	<i>P</i> value		
Dental professionals and laypersons	3.06 (<i>P</i> = .28)*	3.84 (<i>P</i> = .010)**	5.20 (<i>P</i> = .002)**	3.18 (<i>P</i> = .013)*	1.49 (<i>P</i> = .206)	5.84 (<i>P</i> = .001)**	
Orthodontists, mean (SE)	8.85 (1.23)	7.60 (2.06)	9.19 (1.16)	7.99 (1.70)	8.86 (1.88)	8.78 (1.30)	
Periodontists, mean (SE)	9.25 (0.86)	8.71 (1.35)	9.72 (0.70)	7.85 (1.69)	8.98 (1.47)	8.85 (1.13)	
Prosthodontists, mean (SE)	8.63 (1.20)	7.89 (1.68)	9.47 (0.83)	8.26 (1.25)	8.79 (1.17)	8.37 (1.19)	
General dentists, mean (SE)	8.71 (1.47)	8.08 (1.82)	8.90 (1.49)	7.93 (1.55)	8.11 (2.22)	8.01 (1.58)	
Laypersons, mean (SE)	8.80 (1.69)	8.73 (1.60)	8.49 (2.50)	8.48 (1.76)	8.48 (2.41)	8.79 (1.66)	
Post hoc Bonferroni for the dental specialty, <i>P</i> value		.005**					
Orthodontists vs periodontists							
Orthodontists vs laypersons							.013*
Orthodontists vs general dentists		.000***	.032*				
Orthodontists vs laypersons			.001***				
Periodontists vs laypersons			.001***				.044*
Periodontists vs general dentists	.020*						
Prosthodontists vs general dentists			.017*				
Prosthodontists vs laypersons		.024*		.042*			
General dentists vs laypersons							.001***

P* < .05, *P* < .01; ****P* < .001.

In the intergroup comparisons, the orthodontists and general dentists were generally the most critical raters. This was similar to the findings of a previous study,²² which reported that orthodontists and general dentists shared more similarities than differences when evaluating smile esthetics. On the contrary, others¹⁰ reported that orthodontists identified smaller levels of deviation than general dentists. Orthodontists are likely more critical than other dental specialists because they routinely perform detailed smile analysis as part of their diagnostic and treatment-planning decisions.

In this study, age, sex, and years of experience did not affect the rating of smile attractiveness, whereas the profession of the raters had an effect. These findings were similar to those of previous studies^{10-12,23} in which professional evaluators' years of experience and layperson evaluators' age and sex did not influence esthetic perceptions. On the other hand, Sripadungporn and Chamnannididha⁷ reported that a black triangle ranging from 1 to 2.5 mm between the maxillary central incisors was scored differently between two investigated age groups; the older group was more tolerant of a larger black triangle size.

The findings of the current study imply that certain gingival characteristics have more esthetic impact on patients than others and may differ from the dental specialist's ideal standard. Due to the variation in smile esthetic ratings by each person, communication between dental specialists and patients is crucial for decision making and treatment planning to avoid unnecessary treatment whether orthodontic, prosthetic, or surgical.

CONCLUSIONS

- The control smile was the most positively rated smile.
- Orthodontists, prosthodontists, and general dentists scored the smile with the presence of black triangles between the incisors as the most negatively rated smile.
- Periodontists and laypersons rated the inflamed gingiva and pigmented gingiva as the most negatively rated smiles, respectively.
- Dental specialists rated the altered smile images lower than laypersons.
- The ratings of the altered smile photographs were affected by the gingival health, level of gingival margins of anterior teeth, presence of an occlusal cant, presence of a black triangle, the color of the gingiva, and the position of the gingival zenith.

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