

Original Research

Optimal Gingival Display on Smiling Based on Different Facial Vertical Patterns in Durg Population

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ABSTRACT:

Aim: This study aimed to determine the optimal gingival display on smiling on the basis of different facial vertical patterns in Iranians from the perspective of laypeople, maxillofacial surgeons, and orthodontists. **Material and Methods:** Photographs were obtained from short-faced, normal-faced, and long-faced males and females (1 male and 1 female from each group) aged 18-30 years. The original photographs were then modified to have 6, 4, 2, 0, 2, 4, and 6 mm gingival display. Three groups of raters (n = 40), including laypeople, orthodontists, and maxillofacial surgeons, were requested to score each photograph regarding smile attractiveness using a 5-point Likert scale. Data were analyzed using analysis of variance and the Bononferroni test. **Results:** Regarding the photographs of the normal-faced female model, all 3 rater groups gave the highest score to a 2 mm gingival display. In the normal-faced male model, all 3 rater groups gave the highest and lowest scores to 0 and 6 mm gingival display, respectively. In the long-faced female model, all 3 rater groups gave the same score to 0, 4, and 6 mm gingival display. In the long-faced male model, the 3 rater groups gave the same score to 0, 2, 4, and 6 mm gingival display. In the short-faced female model, all 3 rater groups gave the highest score to 0 mm gingival display. In the short-faced male model, the 3 rater groups gave the same score to all values of gingival display except 4 mm. **Conclusions:** The laypeople, maxillofacial surgeons, and orthodontists all gave the highest score to the photograph of a short-faced female model with 2mm gingival display

Keywords: Smile, Orthodontics, gingival display

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INTRODUCTION

Facial attractiveness and smile attractiveness appear strongly connected to each other. A beautiful smile requires a balance between the different soft-tissue and hard-tissue parameters of the face¹.

Smile plays an important role in facial expression and appearance. Smile attractiveness is suggested to influence personality development and social interaction. Facial attractiveness correlated with extraversion and self-confidence/self-esteem. In most domains, attractiveness was found to be equally important for men and women².

Achieving the ideal smile requires that the clinician combine the scientific esthetic principles with artistic creativity to match the individual personality³.

There is no definite index or gold standard for facial profile attractiveness because esthetics is highly affected by race and culture, and its related concepts are influenced by many factors such as ethnicity, nationality, sex, age, education, and profession⁴.

Peck and Peck classified smiles as stages I and II, and Ackerman et al designated the stage I smile as the posed smile and stage II as the unposed (spontaneous) smile. The posed smile is voluntary and need not be elicited or accompanied by emotion. A posed smile is static in the sense that it can be sustained. An unposed smile is involuntary and is induced by joy or mirth. It is dynamic in the sense that it bursts forth but is not sustained. An unposed smile is natural in that it expresses authentic human emotion⁵.

Considering the significance of smile esthetics in orthodontic treatment, this study aimed to determine the optimal gingival display on smiling on the basis of different facial vertical patterns in Chhattisgarh population from the perspective of laypeople, maxillofacial surgeons, and orthodontists and the dental professionals.

MATERIAL AND METHOD

In this study, total 90 subjects from 18-30 years with hypodivergent (30), normodivergent (30), and hyperdivergent (30) males and females (15 male and 15 female from each group), has been selected.

Facial types have been determined according to the FMA, the Jarabak index, and the middle facial one-third to lower facial one-third ratio on the basis of the results of lateral cephalometric analysis (FMA- 15; Jarabak index -75; and G-Sn/SnMe -55/45 for the short-faced subjects and FMA 35, Jarabak index - 55 and G-Sn/Sn-Me - 45/55 for the long-faced subjects.

Inclusion Criteria: Well aligned teeth, Age 18 – 30 years, Class I skeletal base with soft tissue harmony;

Exclusion Criteria: Midline diastema, Facial asymmetry, Caries when smiling, Pathologic lesions

in maxillofacial regions, No history of orthodontic treatment or facial surgery

After selecting suitable candidates, written informed consent has been obtained before photography.

The procedure is divided into 3 steps

1. Taken photographs
2. Superimposition of photographs
3. Measurement of gingival display

Taken photographs: Frontal view intraoral photographs and frontal view extraoral photographs with a posed smile has been taken by digital camera(canonEOS300D). The photographs has been taken with natural head position from 150 cm from subject.

Adobe Photoshop CC software program has been use to modify each original photograph to create 7 photographs with 6, 4, 2, 0, -2, -4, and -6 mm gingival display.

Superimposition of photographs: After that, superimposition of intraoral photograph on extraoral photograph on lip frame and then different gingival displays has been created by moving the intraoral photograph upward and downward with the help of adobe photoshop software. (Fig 1)



Before superimposition



After superimposition

Fig 1: Photographs before and after superimposition

Measurement of gingival display: For the measurement of the gingival display, the photographs have been calibrated with the help of Adobe CC photoshop software.

For this purpose, the length was measured using ruler from the lower border of upper teeth to the gingival contour of central incisor region and in the canine region. (Fig 2)

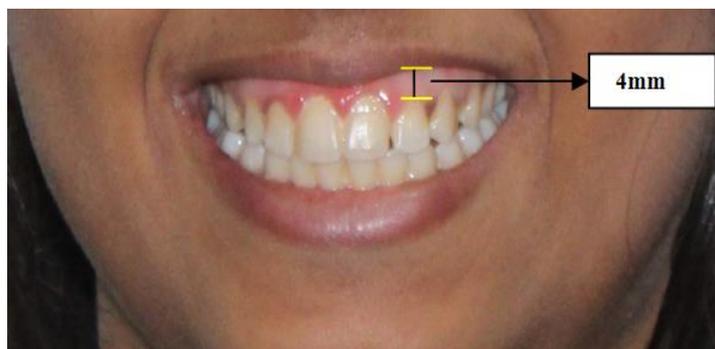


Fig 2: Measurement of gingival display

Total 630 photographs with different gingival displays has been created and randomly placed in a photograph album (seven photographs on one page), and administered among 3 groups of raters including 30 lay people, 30 oral and maxillofacial surgeons, and 30 orthodontists.

The raters has been provided with a checklist and has been asked to rate the attractiveness of each smile image separately using a 5-point visual analogue scale (VAS).

Statistical Analysis: Data analysis was done by using ANOVA test for comparing values for intrarater reliability of raters.

Bononferroni test was used to compare the gingival display values on the basis of different skeletal patterns.

RESULT

Regarding the photographs of the normal-faced female model, all 3 rater groups gave the highest score to a 2 gingival display. In the normal-faced male model, all 3 rater groups gave the highest and lowest scores to 0 and 6 mm gingival display, respectively. In the long-faced female model, all 3 rater groups gave the same score to 0, 4, and 6 gingival display. In the long-faced male model, the 3 rater groups gave the same score to 0, 2, 4, and 6 gingival display. In the short-faced female model, all 3 rater groups gave the highest score to 0 gingival display. In the short-faced male model, the 3 rater groups gave the same score to all values of gingival display except 4 mm.

Table 1: mean score of photograph allocated by the examiner for group 1 subjects in males and females

Symmetry	Gender	Gingival display	Ortho		Layperson		Oral surgeon		f-value	p-value
			Mean	SD	Mean	SD	Mean	SD		
Hypodivergent	Males	6	2.3	0.48	2.5	0.52	2.30	.48	2.89	0.04 (s)
		4	3.20	0.42	2.60	0.51	3.0	0.00	3.36	0.01 (s)
		2	3.70	0.82	2.60	0.51	3.70	0.83	4.12	0.02 (s)
		0	3.3000	.48305	2.8000	.63246	3.4000	.69921	4.28	0.01 (s)
		-2	3.8000	.63246	3.0000	.47140	3.0000	.47140	2.98	0.03 (s)
		-4	2.8000	.63246	2.8000	.42164	2.5000	.52705	3.14	0.047 (s)
		-6	2.2000	.63246	2.2000	.42164	2.0000	.00000	2.99	0.05 (s)
	Females	6	2.1	0.31	2.70	0.48	2.10	0.56	3.45	0.01 (s)
		4	3.60	0.51	3.0	0.00	3.20	0.42	6.01	0.03 (s)
		2	4.20	0.63	3.20	0.42	3.90	0.73	2.35	0.06 (n.s)
		0	2.8000	.78881	2.8000	.42164	2.8000	.78881	4.01	0.02 (s)
		-2	3.3000	.67495	2.8000	.42164	3.5000	.70711	5.01	0.01 (s)
		-4	2.9000	.31623	2.6000	.51640	2.3000	.48305	2.36	0.05 (s)
		-6	1.8000	.42164	2.4000	.51640	2.1000	.56765	3.65	0.04 (s)

Table 2: Mean score of photograph allocated by the examiner for group 2 subjects that is normodivergent

Symmetry	Gender	Gingival display	Ortho		Layperson		Oral surgeon		f-value	p-value
			Mean	SD	Mean	SD	Mean	SD		
Normodivergent	Males	6	2.0	0.47	2.9	0.56	2.2	0.42	4.17	0.05 (s)
		4	3.00	0.000	3.0	0.66	2.80	0.41	2.36	0.01 (s)
		2	3.90	0.565	3.50	0.52	3.60	0.51	6.21	0.03 (s)
		0	3.3	0.48	2.9000	.31623	3.4000	.51640	4.98	0.058 (n.s)
		-2	3.8000	.42164	3.3000	.48305	3.6000	.51640	9.45	0.01 (s)
		-4	2.9000	.31623	3.0000	.00000	2.9000	.31623	1.02	0.02 (s)
		-6	2.2000	.42164	2.5000	.52705	2.0000	.00000	2.47	0.01 (s)
	Females	6	2.1	0.31	2.9	0.31	2.1	0.31	3.45	0.001 (s)
		4	3.20	0.42	3.20	0.41	3.0	.00	1.03	0.06 (n.s)
		2	4.10	0.31	3.00	0.0	3.60	0.69	2.60	0.05 (s)
		0	3.0000	.00000	2.6000	.51640	3.0000	.00000	2.87	0.01 (s)
		-2	3.7000	.48305	2.9000	.56765	3.5000	.52705	6.21	0.03 (s)
		-4	3.2000	.42164	2.8000	.42164	2.5000	.52705	5.24	0.01 (s)
		-6	2.0000	.47140	2.7000	.67495	2.0000	.00000	3.33	0.04 (s)

Table 3: mean score of photograph allocated by the examiner to the group 3 subjects that is hyperdivergent

Symmetry	Gender	Gingival display	Ortho		Layperson		Oral surgeon		f-value	p-value
Hyper-divergent	Males	6	2.5	.52	3.1	.31	2.5	0.52	6.32	0.05 (s)
		4	3.4000	.51640	3.2000	.42164	3.2000	.42164	2.33	0.01 (s)
		2	3.8000	.78881	3.4000	.51640	3.2000	.42164	3.41	0.03 (s)
		0	3.5000	0.52705	3.2000	.42164	3.3000	.48305	4.23	0.06 (n.s)
		-2	3.5000	0.52705	3.4000	.51640	3.3000	.48305	6.55	0.02 (s)
		-4	3.2000	.42164	3.0000	.47140	2.8000	.42164	2.35	0.02 (s)
	-6	2.1000	.56765	2.7000	.48305	2.0000	.00000	2.91	0.03 (s)	
	Females	6	2.3000	0.48305	3.1000	0.56765	2.6000	.51640	3.41	0.01 (s)
		4	3.4000	0.84327	3.2000	0.42164	3.8000	.42164	4.23	0.02 (s)
		2	3.4000	0.51640	3.0000	0.66667	3.5000	.52705	3.02	0.01 (s)
		0	3.4000	0.51640	3.1000	0.73786	3.4000	.51640	6.01	0.02 (s)
		-2	3.7000	0.67495	2.9000	0.31623	3.8000	.42164	2.55	0.03 (s)
-4		3.2000	0.42164	3.3000	0.48305	3.3000	.67495	1.36	0.06 (n.s)	
-6	2.2000	.63246	3.0000	.66667	2.4000	.51640	1.80	0.02 (s)		

DISCUSSION

According to table no 1: Regarding short face subjects, it appears that smaller gingival display (0-2mm) in short faced females getting higher ratings from all three raters which is same as previous study conducted by Sriphadungporn and Chamnannidiadha⁶ and Najafi et al⁷.

Greater gingival display in short face males was more attractive according to the study conducted by Sriphadungporn and Chamnannidiadha⁶ and Najafi et al⁷ which is different from our study.

Our study found that gingival display of 2 mm in males and females getting more ratings which is different from the study conducted by Geron and Atalia found that gingival display more than 1 mm was unattractive⁸.

Kokich et al reported that 2-4 mm gingival display found more attractive by general practitioner which supports our study readings⁹.

Magolis conducted a study in which he finds that orthodontist prefer 1-2 mm gingival display which is same as our study¹⁰.

According to table no 2: In the previous study conducted by Imani et al, 2 mm gingival display in females acquires highest ratings which is similar to our study, but in males 0 mm gingival display acquires maximum ratings which is different from our study¹

De Lima et al evaluated the effect of facial patterns on smile attractiveness and different levels of gingival display from the perspective of dentist and lay person. Lay persons gave same score to different gingival display which is different from our study. Dentists gave a higher score to 2,3 and 4mm gingival display which is close to our findings¹¹

According to table 3: Oshagh et al, who also designed simulations with long-faced models and

found that dental specialists tolerated gingival exposure of 1mm which is close to our study¹²

In the long face, 3 mm gingival exposure was considered to be acceptable by dental specialists, which is consistent with previous studies¹³

Alhajia et al observed that gingival exposure of 0mm is more attractive than excessive gingival exposure which is very close to our study readings⁸

CONCLUSION

General Findings

- A 2 mm gingival display was consistently rated as the most attractive across most facial types and rater groups (laypersons, orthodontists, and oral surgeons).
- Extreme gingival displays (+6 mm and -6 mm) were generally rated as least attractive, especially in hyperdivergent and normodivergent subjects.

By Facial Pattern

Hypodivergent (Short Face)

- Laypersons and orthodontists gave the highest ratings to +2 mm, while oral surgeons favored -6 mm.
- For females, 0–2 mm gingival display was preferred by all rater groups.
- These findings were partly consistent and partly different from previous studies.

Normodivergent (Average Face)

- 2 mm gingival display received the highest mean scores from all rater groups for both males and females.
- Agreement among raters was low overall, with few exceptions (e.g., +4 mm in males).
- Laypersons and dentists generally showed a preference for moderate gingival exposure (2–4 mm), aligning somewhat with past research.

Hyperdivergent (Long Face)

- Gingival display of 0 to 2 mm was considered most attractive, while +6 mm and -6 mm were least preferred.
- Females received better ratings for minimal gingival display (0 to -2 mm).
- The ratings from professionals aligned well with previous literature that favored minimal gingival display in long-faced individuals.

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