Influence of Maxillary Central Incisors Dimensions, Angulations and Positions on the Perception of Smile Esthetics in Dakshina Kannada District, India

[1]Mafaz Bin Ahsan; [2]Subramanya Shetty; [3]Faizan Ahmed Khan; [4]Sandeep Shetty
[1]Post graduate student, [2]Professor, MDS, [3]Reader, MDS, Professor &[4]Head, MDS
[1,2,3,4]Department of Orthodontics and Dentofacial Orthopaedics, Yenepoya Dental College, Yenepoya (Deemed to be university) Mangalore, Karnataka, India
[1]ORCID ID – 0000-0001-7457-8700

Corresponding Author:Mafaz Bin Ahsan

Abstract

Background: A smile's attractiveness is the outcome of a complex interplay of various factors, each contributing with differing degrees of significance.Given that patient satisfaction is paramount, greater consideration of their desires should take precedence over strict adherence to standardized protocols. **Objectives:** The objective was to investigate the differences in smile attractiveness ratings among orthodontists, prosthodontists, and laypersons, focusing on the effects of bilateral alterations to the maxillary central incisors including changes in vertical position, angulation, and mesio-distal width. **Methods:** A sample of 66 participants, comprising 22 orthodontists, 22 prosthodontists, and 22 laypersons, rated the attractiveness of 13 digitally altered smile photographs of a male and a female participant.Alterations included variations in the vertical position (-1 mm, -0.5 mm, +0.5 mm, +1 mm), angulation (-4°, -2°, +2°, +4°), and mesio-distal width (-1 mm, -0.5 mm, +0.5 mm, +1 mm) of the maxillary central incisors. Ratings were collected using a Visual Analogue Scale (VAS) and analyzed statistically. **Results:** Significant differences in attractiveness ratings were observed between the three groups. Professionalsdemonstrated greater sensitivity to changes in incisor angulation and position compared to laypersons, who showed distinct preferences for certain aesthetic alterations. The study highlighted a divergence between professional and lay perceptions, emphasizing the need for orthodontic treatments to align with patient preferences. **Conclusions:** This study reveals notable differences in smile attractiveness ratings between professionals and laypersons. Orthodontists exhibited a pronounced sensitivity to variations in tooth angulations while Prosthodontists and Laypersons were particularly critical regarding mesio-distal width and vertical positioning.

Keywords: Smile; Maxillary central incisor; Orthodontics; Smile attractiveness

Kindly Note
The Pre-Print of this manuscript is available on Research Square (DOI = dx.doi.org/10.21203/rs.3.rs-4572381/v1 and License = CC BY 4.0).

Introduction

Modern orthodontic treatments aim to create a balanced, attractive smile. Numerous studies on facial features provide normative data that guide orthodontists in assessing structures and planning treatments effectively.[1] Despite the availability of these norms, there has been a significant gap in research-based literature on beauty standards. Smile aesthetics are inherently subjective, influenced by individual biases and cultural perceptions.[2]

It is well-documented that perceptions of smiles vary between orthodontic professionals and laypersons, with dentists exhibiting heightened sensitivity to dental aesthetics. Previous studies have explored smile perceptions among different demographic groups, often focusing on either male or female participants and altering the concerned tooth unilaterally.[2-20] To the best ofavailable knowledge, no study has simultaneously included both male and female participants while also examining bilateral alterations of the involved tooth as done in this study.

Furthermore, while some studies have investigated the mesiodistal width dimensions of teeth, they predominantly focused on reductions rather than increases in mesiodistal width.[3] This study addresses this gap by examining the effects of increasing the mesiodistal width bilaterally by both 0.5 mm and 1 mm as well.

Maxillary anterior teeth placement, particularly the maxillary central incisors, is crucial in determining the overall aesthetics of a smile. This placement is informed by both expert assessment and common sense. Given that older individuals typically display less of their maxillary incisors compared to younger individuals, the positioning of these teeth becomes even more significant.[21]Numerous research have looked into how differences in the maxillary central incisors alignment, size, and shape impact how people perceive smiles in general. When evaluating these teeth for aesthetics, their prominence and symmetry are crucial considerations.[22]

This study aims to evaluate the aesthetic perceptions of Orthodontists, Prosthodontists, and Laypersons using digitally manipulated images of frontal smiles. The objectives of this study are threefold:

1. To digitally alter crown width, angulation, and vertical position of the maxillary central incisors bilaterally in frontal smile photographs of both male and female participants.
2. To evaluate aesthetic variations resulting from these alterations.
3. To rate the different frontal smile photographs using a Visual Analogue Scale (VAS) across the three observer groups.

This study's findings can enhance clinical practices by furnishing evidence-based guidelines tailored for dental professionals. Employing digital manipulation

techniques, the study precisely modulates the vertical position, angulation, and mesio-distal width of the maxillary central incisors, thereby eliminating the variability inherent in physical manipulation. This precision fosters more reliable assessments.
The innovative integration of digital manipulation, multiple evaluative parameters, and a diverse pool of evaluators addresses a significant gap in the current literature. Previous studies have rarely encompassed these comprehensive aspects concurrently, underscoring the unique value of this research. Consequently, this study stands as a seminal contribution to the domain of dental aesthetics, poised to inform and refine future clinical practices.

Materials and Methods

The study commenced following approval from the Institutional Ethics Committee on June 13, 2023. Two participants, one male and one female, were selected from the institution, aged between 18 and 28 years. Eligibility criteria included Angle's Class I occlusion, a full complement of unworn and unrestored healthy upper anterior teeth, less than 2 mm gingival display, a central to lateral incisal step, coincident upper and lower dental midlines, and a gingival line of the central incisor and canine that was coincident, with the gingival line of the lateral incisor positioned below. Exclusion criteria encompassed developmental anomalies, cleft, gross facial asymmetry, dental attrition, lip irregularities, or any history of lip surgery or any history of orthodontic treatment.
Participants were provided with detailed information about the study and given adequate time to review the information sheet before providing informed consent. High-definition photographs were captured using a DSLR camera equipped with a macro lens and a Macrolite ring flash, mounted on a tripod. A 10 x 10 mm reference sticker was placed on the participant's forehead to ensure image standardization.[23] The camera was positioned 5 feet from the subject, and image capture was standardized by instructing the participant to pose a smile with maximum incisor display, a consonant smile, and a buccal corridor space of less than 2 mm.
A single frontal smiling photograph of each participant was digitally altered in Adobe Photoshop 2020. The photographs were cropped to include only the smile and adjusted to eliminate lip discoloration and surrounding skin to avoid distractions during the rating process.Twelve variations were created for each participant by modifying the Maxillary Central Incisors in terms of vertical position (-1 mm, -0.5 mm, +0.5 mm, +1 mm),angulation[24] (-4°, -2°, +2°, +4°)and mesio-distal width (-1 mm, -0.5 mm, +0.5 mm, +1 mm) as represented exaggeratedly in Figure 1-3.

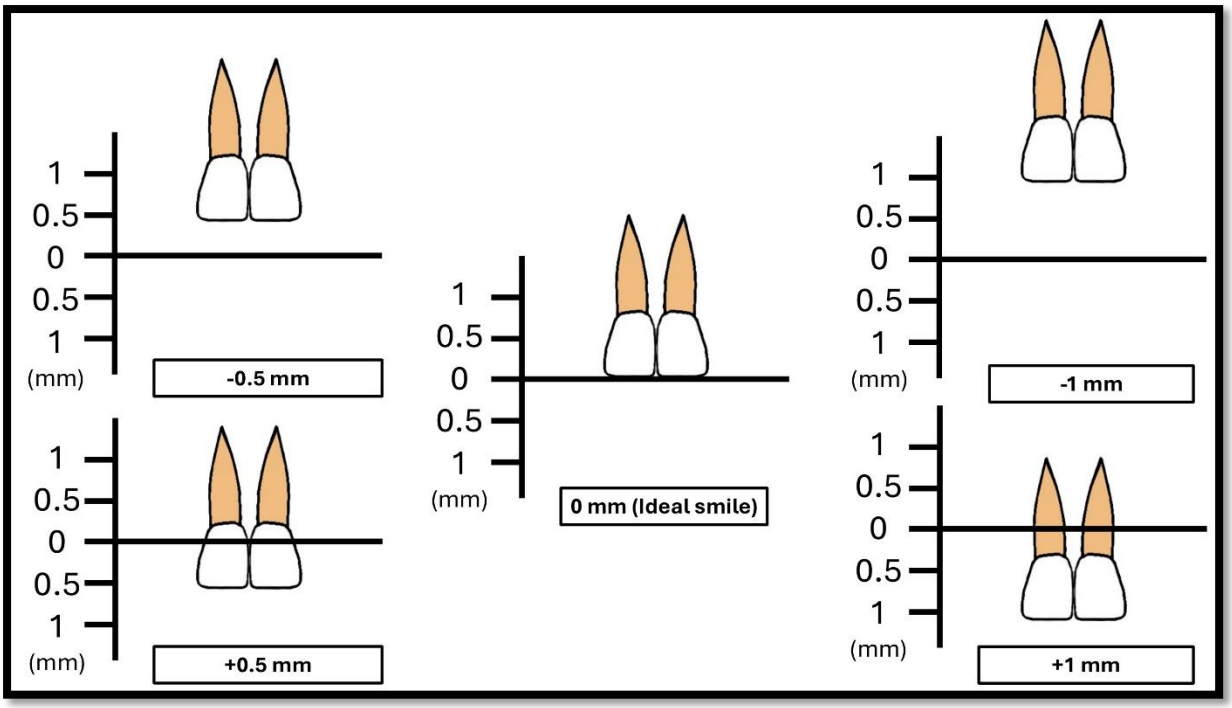

Figure 1. Representation of vertical position digital alterations of the Maxillary Central Incisors bilaterally

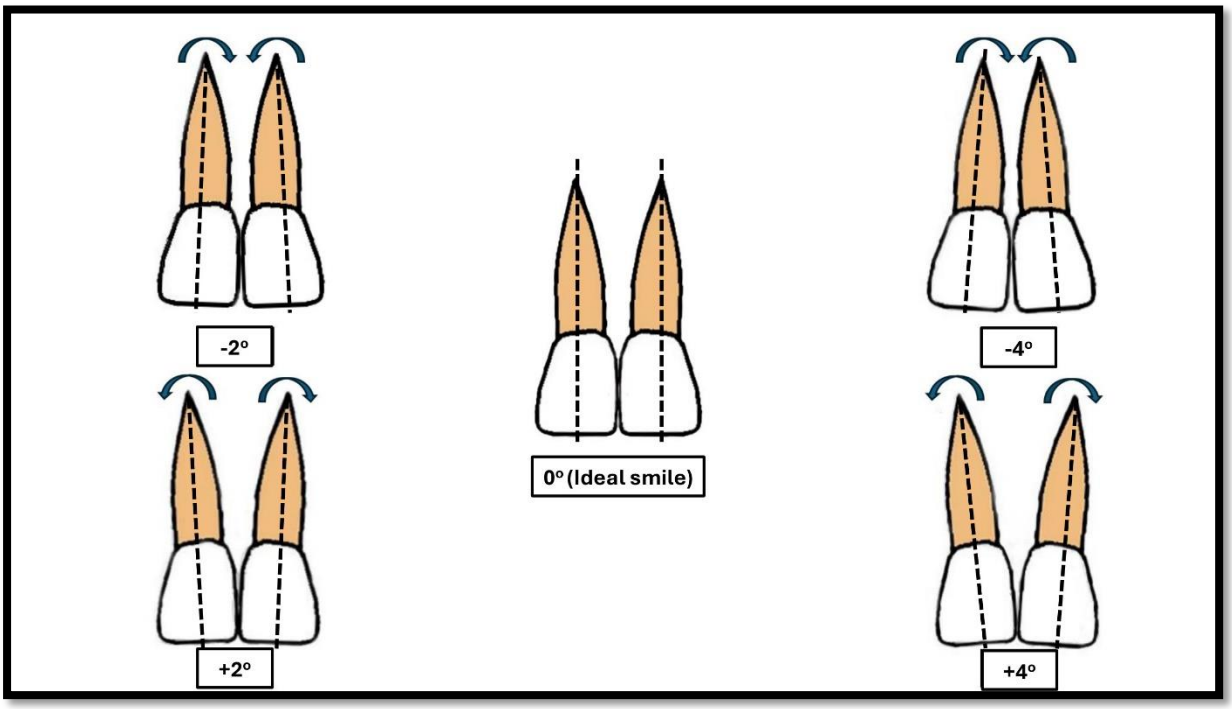

Figure 2. Representation of angulation digital alterations of the Maxillary Central Incisors bilaterally

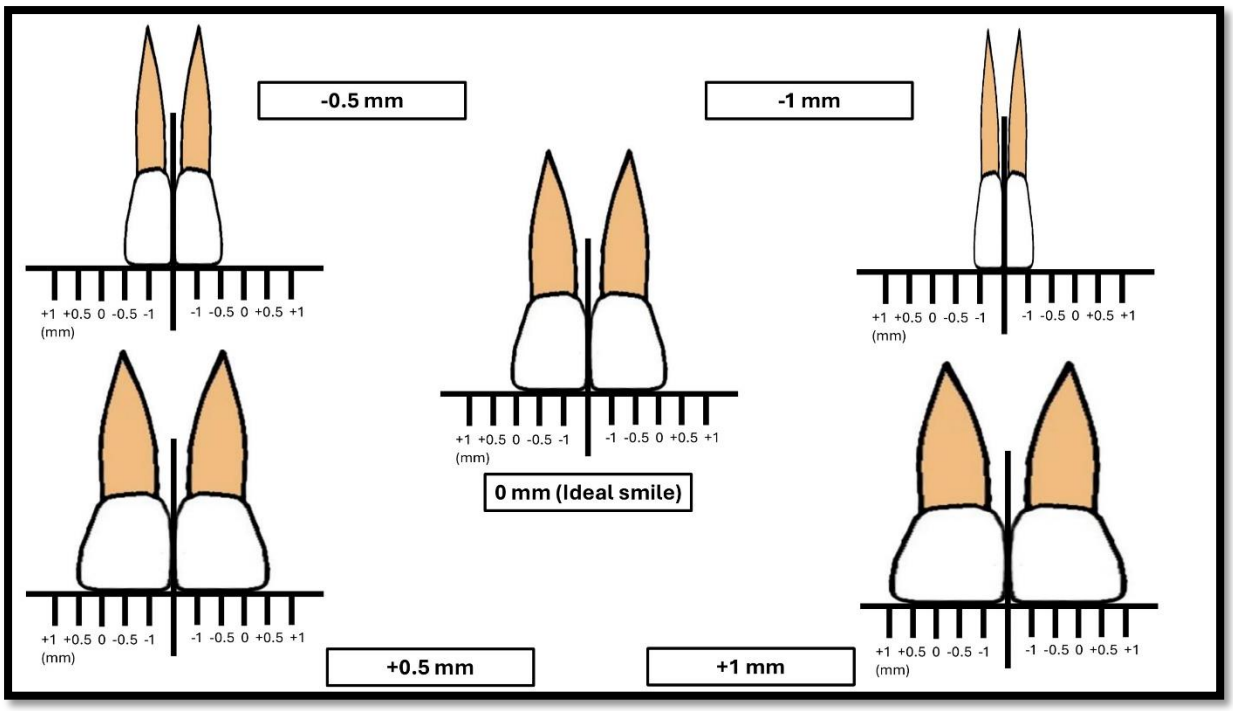

Figure 3. Representation of mesio-distal width digital alterations of the Maxillary Central Incisors bilaterally

The 26 resulting photographs, including the ideal smile images, were validated twice within a 3-month interval by a panel of 10 experts, consisting of 7 Orthodontists and 3 Prosthodontists, each with over 10 years of clinical experience. The validation involved a Google Forms questionnaire with multiple-choice responses (Yes, No, Maybe) to confirm the accuracy of the variations in the Maxillary Central Incisor parameters. The experts, who were not part of the sample size for smile rating to avoid bias, confirmed the variations.

After validation, a smile attractiveness rating from 1 (Unattractive) to 10 (Attractive) was conducted using a Visual Analogue Scale (VAS) via a Google Forms questionnaire. Each photograph was presented individually, with the VAS scale on each form section. The questionnaire, which displayed all 26 photographs in a random sequence, was completed by 66 participants categorized into three groups: orthodontists, prosthodontists, and laypersons, with 22 participants in each group. Laypersons were defined as individuals aged 18-60 years without any academic or professional association with dental sciences, while orthodontists and prosthodontists included both recent graduates and experienced clinicians up to 60 years of age. The questionnaire did not include any identifying details of the photographed participants. Participants were briefed about the study and given sufficient time to review the participant information sheet and provide informed consent. The VAS ratings were analyzed statistically.

The various alterations were specific to the Maxillary Central Incisor bilaterally for the Female and Male smile photographs. Smile Photographs (P1 to P26) shown in Figure4-

10appeared in the Google form in a random sequence. That same random sequence was shown to each participant. Table 1 shows the description/ alteration of each photograph.

Table 1. Smile Photographs in the order of appearance in the Google questionnaire form used to rate the smiles using the Visual Analogue Scale

Photograph	Description
P1	Female Ideal Smile
P2	Male Ideal Smile
P3	Female Smile with Digitally altered angulation of Maxillary Central Incisor by +2° bilaterally
P4	Male Smile with Digitally altered angulation of Maxillary Central Incisor by +2° bilaterally
P5	Female Smile with Digitally altered angulation of Maxillary Central Incisor by +4° bilaterally
P6	Male Smile with Digitally altered angulation of Maxillary Central Incisor by +4° bilaterally
P7	Female Smile with Digitally altered angulation of Maxillary Central Incisor by -2° bilaterally
P8	Male Smile with Digitally altered angulation of Maxillary Central Incisor by -2° bilaterally
P9	Female Smile with Digitally altered angulation of Maxillary Central Incisor by -4° bilaterally
P10	Male Smile with Digitally altered angulation of Maxillary Central Incisor by -4° bilaterally
P11	Female Smile with Digitally altered vertical position of Maxillary Central Incisor by +0.5 mm bilaterally
P12	Male Smile with Digitally altered vertical position of Maxillary Central Incisor by +0.5 mm bilaterally
P13	Female Smile with Digitally altered vertical position of Maxillary Central Incisor by +1 mm bilaterally
P14	Male Smile with Digitally altered vertical position of Maxillary Central Incisor by +1 mm bilaterally
P15	Female Smile with Digitally altered vertical position of Maxillary Central Incisor by -0.5 mm bilaterally
P16	Male Smile with Digitally altered vertical position of Maxillary Central Incisor by -0.5 mm bilaterally
P17	Female Smile with Digitally altered vertical position of Maxillary Central Incisor by -1 mm bilaterally
P18	Male Smile with Digitally altered vertical position of Maxillary Central

	Incisor by -1 mm bilaterally
P19	Female Smile with Digitally altered mesio distal width of Maxillary Central Incisor by +0.5 mm bilaterally
P20	Male Smile with Digitally altered mesio distal width of Maxillary Central Incisor by +0.5 mm bilaterally
P21	Female Smile with Digitally altered mesio distal width of Maxillary Central Incisor by +1 mm bilaterally
P22	Male Smile with Digitally altered mesio distal width of Maxillary Central Incisor by +1 mm bilaterally
P23	Female Smile with Smile with Digitally altered mesio distal width of Maxillary Central Incisor by -0.5 mm bilaterally
P24	Male Smile with Digitally altered mesio distal width of Maxillary Central Incisor by -0.5 mm bilaterally
P25	Female Smile with Digitally altered mesio distal width of Maxillary Central Incisor by -1 mm bilaterally
P26	Male Smile with Digitally altered mesio distal width of Maxillary Central Incisor by -1 mm bilaterally

P = Photograph

Figure 4. Ideal Smile

Figure 5. Female Angulation

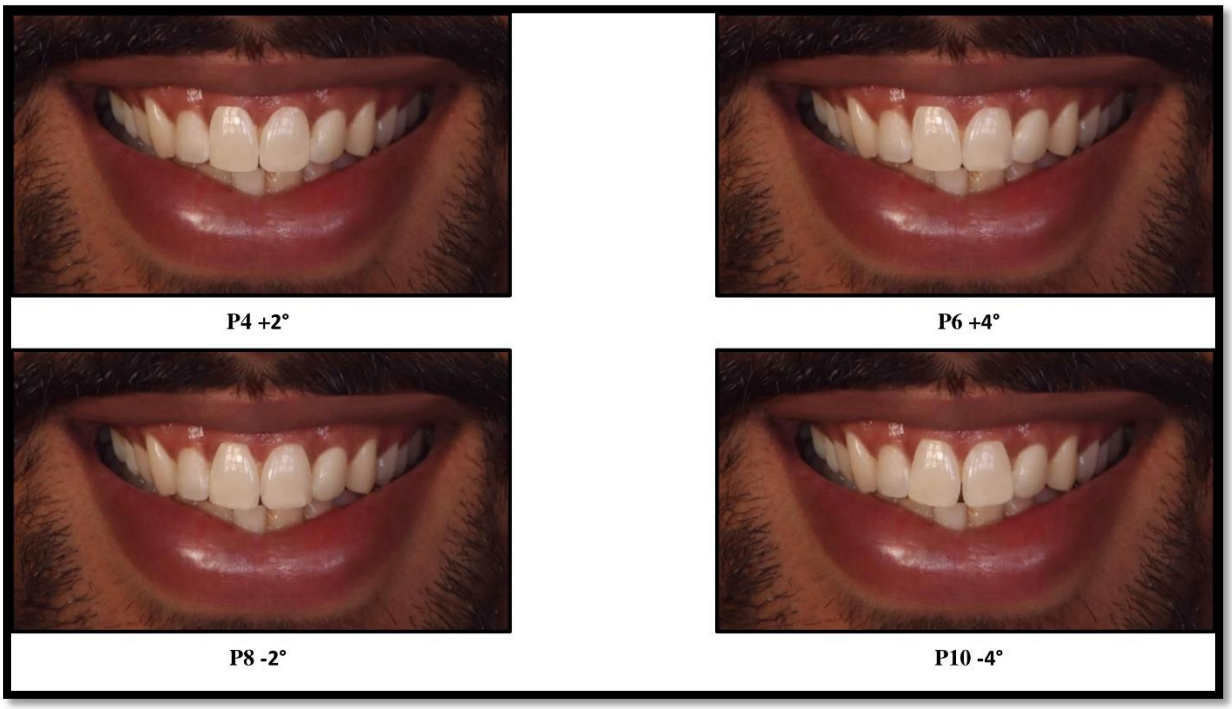

Figure 6. Male Angulation

Figure 7. Female Vertical Position

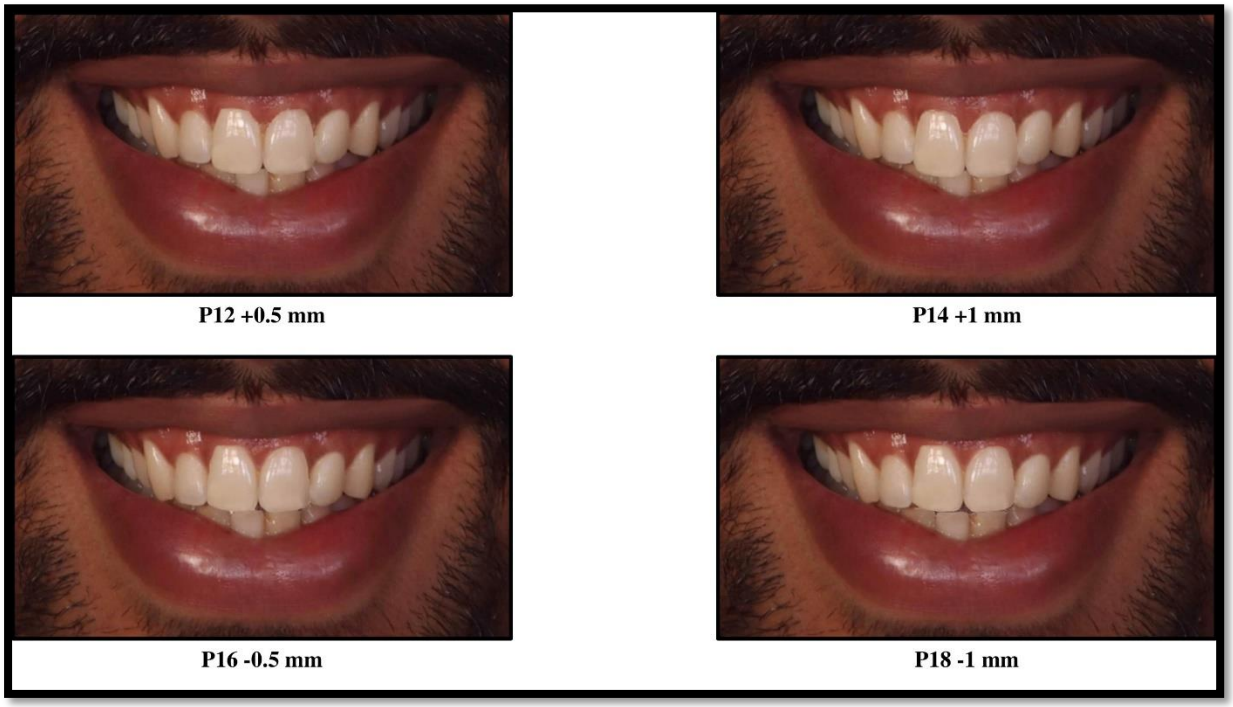

Figure 8. Male Vertical Position

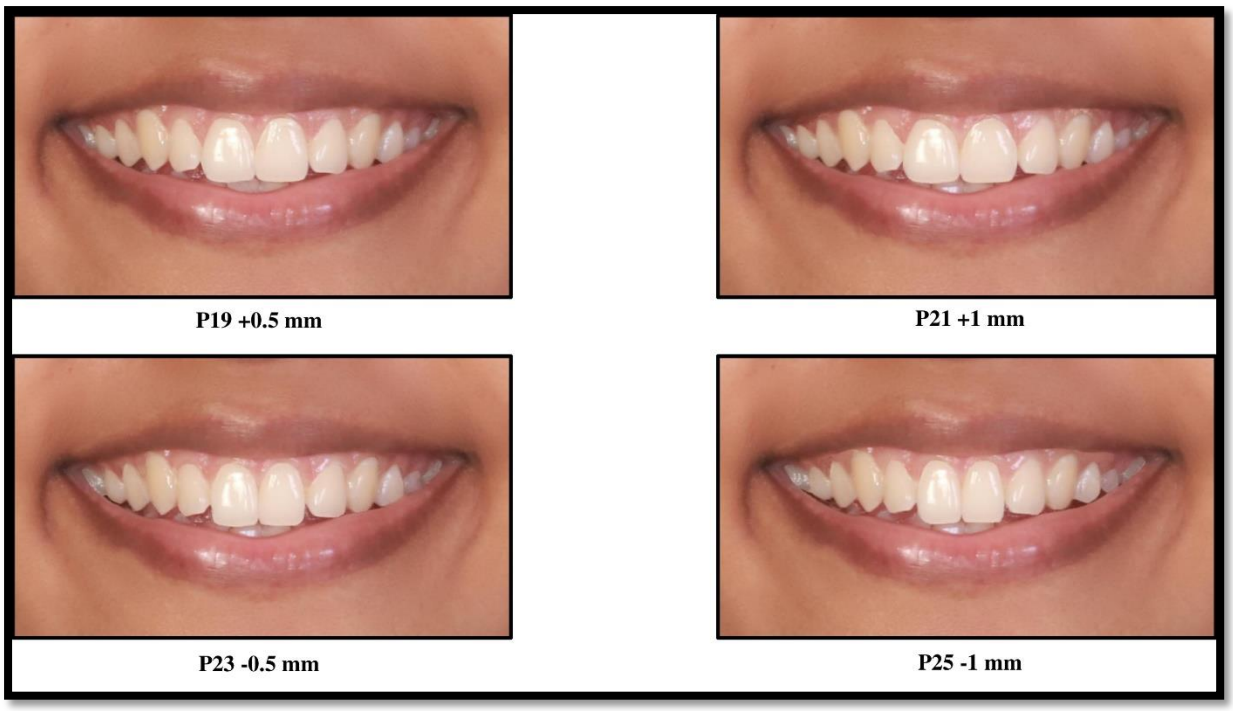

Figure 9. Female Mesio Distal Width

Figure 10. Male Mesio Distal Width

Statistical Analysis

The Sample Size for the study was estimated by one way ANOVA using G* power. The anticipated effect size was 0.4. To detect anticipated effect with 80% power, 5% level of significance, 22 subjects were included in each group.Statistical analyses were carried out using SPSS 27 version. The perception scores of three study groups were compared through a Kruskal Wallis test, selected due to the ordinal nature of the data. Multiple

comparison with Bonferroni correction was conducted for the photographs which showed statistically significant differences in perception ratings.

Results

All photos except photograph 17 showed statistically significant different perception scores among the three groups (Table 2). Among the other 25 photographs that showed statistically significant differences in perception ratings, none revealed any statistically significant disparity between Orthodontists and Prosthodontists. Fifteen of the 25 photographs displayed statistically significant differences in perception scores between Orthodontists and Laypersons. Additionally, all 25 photographs a statistically significant differences in the perception scores of Prosthodontists and Laypersons. The maximum difference in median perception scores (-3.5) was reported between the Prosthodontists and Laypersons for photographs 25 and 26. The minimum difference in median perception scores (0) was reported between Prosthodontists and Orthodontists for photographs 1, 3, 5, 7, 9, 12, 15, 16, 18 and 20 (Table 3). The order of attractiveness of the photographs including 5 best and 5 worst according to the ratings of the 3 Observer groups can be seen in Table 4.

Table 2. Assessment of Mean and Median of the Questionnaire Visual Analogue Scale Smile Attractiveness rating responses

Photograph	Profession	Mean	Median	SD	IQR	Test statistics	p value
Photograph 1	Orthodontist	6.36	6	1.59	2.75	8.57	0.01377
	Prosthodontist	5.82	6	1.62	2		
	layperson	7.5	7.5	1.97	2.75		
Photograph 2	Orthodontist	5.18	5	2.13	2	11.33	0.00347
	Prosthodontist	5.55	6	1.71	2.75		
	layperson	7.14	7	1.93	2		
Photograph 3	Orthodontist	5.86	6	2.01	2.75	14.98	0.00056
	Prosthodontist	5.59	6	1.47	1.75		
	layperson	7.59	7.5	1.5	1.75		
Photograph 4	Orthodontist	5.05	5	2.1	2	9.93	0.00699
	Prosthodontist	5.05	5.5	1.79	3.5		
	layperson	7	7	2.27	3.75		
Photograph 5	Orthodontist	6.05	6	1.94	2	6.88	0.03202
	Prosthodontist	5.5	6	1.63	2.75		
	layperson	7.05	7	1.94	2		
Photograph 6	Orthodontist	5.32	5	1.86	2	8.51	0.01417
	Prosthodontist	5.18	6	1.99	2.75		

	layperson	7.09	7.5	2.39	4		
Photograph 7	Orthodontist	6.32	6	1.81	2.75	13.66	0.00108
	Prosthodontist	5.77	6	1.41	2		
	layperson	7.68	8	1.76	1.75		
Photograph 8	Orthodontist	5.64	5	1.79	1.75	11.27	0.00357
	Prosthodontist	4.95	5	1.84	2.75		
	layperson	7.05	7.5	2.3	2		
Photograph 9	Orthodontist	5.95	6	1.94	2	15.16	0.00051
	Prosthodontist	5.55	6	1.68	2.5		
	layperson	7.68	7	1.55	1.75		
Photograph 10	Orthodontist	4.73	4.5	2.03	2.75	12.33	0.0021
	Prosthodontist	4.36	5	1.68	3		
	layperson	6.86	7	2.38	3.75		
Photograph 11	Orthodontist	5.55	5.5	2.22	2.75	18	0.00012
	Prosthodontist	5.09	5	1.66	2		
	layperson	7.64	8	1.73	2.5		
Photograph 12	Orthodontist	5.82	5	2.13	2.75	12.71	0.00174
	Prosthodontist	4.86	5	2.19	2.75		
	layperson	7.23	7	1.82	2		
Photograph 13	Orthodontist	5.27	5	2.29	3.5	9.22	0.00995
	Prosthodontist	4.45	4.5	2.11	3.75		
	layperson	6.73	7	2.31	3		
Photograph 14	Orthodontist	5.77	5	2.16	3.75	7.1	0.02867
	Prosthodontist	5.27	5.5	2.03	2.75		
	layperson	7.09	7	2.11	3.75		
Photograph 15	Orthodontist	6.23	6	2.22	3	15.85	0.00036
	Prosthodontist	5.64	6	1.68	2		
	layperson	8	8	1.54	2.75		
Photograph 16	Orthodontist	5.64	5	2.11	2.75	13.34	0.00127
	Prosthodontist	4.68	5	1.64	1.75		
	layperson	7	7	1.9	2		
Photograph 17	Orthodontist	6.09	6	2.35	3	3.01	0.22232
	Prosthodontist	6	6	1.8	2		
	layperson	7.05	7	2.06	2.75		
Photograph 18	Orthodontist	5.14	5	1.78	2	13.82	0.001
	Prosthodontist	4.64	5	1.4	1.75		
	layperson	6.86	7	1.98	3		
Photograph 19	Orthodontist	6.27	6	1.83	2.5	8.71	0.01283
	Prosthodontist	5.64	5.5	1.29	2		
	layperson	7.36	7	1.94	3		

Photograph 20	Orthodontist	5.82	5	1.79	2.5	11.04	0.004
	Prosthodontist	4.73	5	1.67	2		
	layperson	6.82	7	1.94	2.75		
Photograph 21	Orthodontist	6.27	6	2.05	2	13.6	0.00111
	Prosthodontist	5.36	5.5	1.4	2		
	layperson	7.5	7.5	1.71	2.5		
Photograph 22	Orthodontist	5.5	5	1.92	2	10.11	0.00639
	Prosthodontist	4.55	4.5	1.53	2.75		
	layperson	6.5	7	2.02	2.75		
Photograph 23	Orthodontist	5.86	6	1.93	2	9.91	0.00706
	Prosthodontist	5.27	5.5	1.61	2.75		
	layperson	7.27	8	2.12	3.75		
Photograph 24	Orthodontist	5.5	5	1.77	3	15.64	0.0004
	Prosthodontist	4.64	4.5	1.68	2		
	layperson	7.14	7	1.96	2.75		
Photograph 25	Orthodontist	5.23	5.5	2.2	2.75	20.96	0.00003
	Prosthodontist	4.77	4.5	1.69	2		
	layperson	7.64	8	1.71	2		
Photograph 26	Orthodontist	5.64	5	1.62	1	18.77	0.00008
	Prosthodontist	4.41	4.5	1.44	1		
	layperson	7.09	8	2.16	2		

P = Photograph

Table 3. Assessment of Median Difference between the Orthodontist, Prosthodontist and Layperson with respect to the Questionnaire Visual Analogue Scale Smile Attractiveness rating responses

Photograph	Groups		Median Difference	Test statistics	P value
Photograph 1	Orthodontist	Prosthodontist	0	-1.47	0.55304
	Orthodontist	layperson	-1.5	2.86	0.10693
	Prosthodontist	layperson	-1.5	3.9	0.01593
Photograph 2	Orthodontist	Prosthodontist	-1	1.19	0.67521
	Orthodontist	layperson	-2	4.28	0.00704
	Prosthodontist	layperson	-1	3.77	0.02108
Photograph 3	Orthodontist	Prosthodontist	0	-0.53	0.92672
	Orthodontist	layperson	-1.5	4.08	0.01106
	Prosthodontist	layperson	-1.5	5.29	0.00053
Photograph 4	Orthodontist	Prosthodontist	-0.5	0.3	0.97509
	Orthodontist	layperson	-2	3.86	0.01757

	Prosthodontist	layperson	-1.5	3.82	0.01884
Photograph 5	Orthodontist	Prosthodontist	0	-1.33	0.61531
	Orthodontist	layperson	-1	2.33	0.22448
	Prosthodontist	layperson	-1	3.64	0.02698
Photograph 6	Orthodontist	Prosthodontist	-1	0.25	0.98272
	Orthodontist	layperson	-2.5	3.49	0.03661
	Prosthodontist	layperson	-1.5	3.63	0.02773
Photograph 7	Orthodontist	Prosthodontist	0	-1.52	0.52864
	Orthodontist	layperson	-2	3.48	0.0373
	Prosthodontist	layperson	-2	5.14	0.00082
Photograph 8	Orthodontist	Prosthodontist	0	-1.39	0.58748
	Orthodontist	layperson	-2.5	3.44	0.0396
	Prosthodontist	layperson	-2.5	4.44	0.0048
Photograph 9	Orthodontist	Prosthodontist	0	-0.81	0.83521
	Orthodontist	layperson	-1	4.16	0.00921
	Prosthodontist	layperson	-1	5.24	0.00062
Photograph 10	Orthodontist	Prosthodontist	-0.5	-0.46	0.94442
	Orthodontist	layperson	-2.5	3.97	0.01374
	Prosthodontist	layperson	-2	4.55	0.00375
Photograph 11	Orthodontist	Prosthodontist	0.5	-1.13	0.70514
	Orthodontist	layperson	-2.5	4.41	0.00515
	Prosthodontist	layperson	-3	5.74	0.00014
Photograph 12	Orthodontist	Prosthodontist	0	-1.97	0.34621
	Orthodontist	layperson	-2	3.32	0.04946
	Prosthodontist	layperson	-2	4.8	0.00199
Photograph 13	Orthodontist	Prosthodontist	0.5	-1.54	0.52026
	Orthodontist	layperson	-2	2.76	0.12417
	Prosthodontist	layperson	-2.5	4.18	0.00877
Photograph 14	Orthodontist	Prosthodontist	-0.5	-0.77	0.84876
	Orthodontist	layperson	-2	2.82	0.1139
	Prosthodontist	layperson	-1.5	3.55	0.03218
Photograph 15	Orthodontist	Prosthodontist	0	-1.33	0.61486
	Orthodontist	layperson	-2	3.86	0.01735
	Prosthodontist	layperson	-2	5.55	0.00026
Photograph 16	Orthodontist	Prosthodontist	0	-2.12	0.29219
	Orthodontist	layperson	-2	3.02	0.0826
	Prosthodontist	layperson	-2	5.11	0.00089
Photograph 18	Orthodontist	Prosthodontist	0	-1.05	0.73669
	Orthodontist	layperson	-2	3.93	0.01525
	Prosthodontist	layperson	-2	4.95	0.00136

Photograph 19	Orthodontist	Prosthodontist	0.5	-2.13	0.28749
	Orthodontist	layperson	-1	2.23	0.25738
	Prosthodontist	layperson	-1.5	4.06	0.01132
Photograph 20	Orthodontist	Prosthodontist	0	-2.51	0.17867
	Orthodontist	layperson	-2	2.32	0.23024
	Prosthodontist	layperson	-2	4.61	0.00321
Photograph 21	Orthodontist	Prosthodontist	0.5	-2.02	0.32463
	Orthodontist	layperson	-1.5	2.96	0.09118
	Prosthodontist	layperson	-2	5.26	0.00058
Photograph 22	Orthodontist	Prosthodontist	0.5	-2	0.33478
	Orthodontist	layperson	-2	2.53	0.1736
	Prosthodontist	layperson	-2.5	4.44	0.00486
Photograph 23	Orthodontist	Prosthodontist	0.5	-1.2	0.67387
	Orthodontist	layperson	-2	3.06	0.07797
	Prosthodontist	layperson	-2.5	4.32	0.00637
Photograph 24	Orthodontist	Prosthodontist	0.5	-1.82	0.40313
	Orthodontist	layperson	-2	3.88	0.01679
	Prosthodontist	layperson	-2.5	5.3	0.00052
Photograph 25	Orthodontist	Prosthodontist	1	-1.04	0.74137
	Orthodontist	layperson	-2.5	4.83	0.00187
	Prosthodontist	layperson	-3.5	6.18	0.00004
Photograph 26	Orthodontist	Prosthodontist	0.5	-3.25	0.0564
	Orthodontist	layperson	-3	3.7	0.02397
	Prosthodontist	layperson	-3.5	5.67	0.00018

P = Photograph

Table 4.Attractive and Unattractive smile photographs according to Orthodontists, Prosthodontists and Laypersons: (Best 5 in bold and Worst 5 in italics)

Orthodontist				
Photograph	**Mean**	**SD**	**Median**	**IQR**
P1	6.36	1.59	6	2.75
P7	6.32	1.81	6	2.75
P19	6.27	1.83	6	2.5
P21	6.27	2.05	6	2
P15	6.23	2.22	6	3
P25	5.23	2.2	5.5	2.75

P2	5.18	2.13	5	2
P18	5.14	1.78	5	2
P4	5.05	2.1	5	2
P10	4.73	2.03	4.5	2.75
Prosthodontist				
Photograph	**Mean**	**SD**	**Median**	**IQR**
P17	6	1.8	6	2
P1	5.82	1.62	6	2
P7	5.77	1.41	6	2
P15	5.64	1.68	6	2
P19	5.64	1.29	5.5	2
P24	4.64	1.68	4.5	2
P22	4.55	1.53	4.5	2.75
P13	4.45	2.11	4.5	3.75
P26	4.41	1.44	4.5	1
P10	4.36	1.68	5	3
Layperson				
Photograph	**Mean**	**SD**	**Median**	**IQR**
P15	8	1.54	8	2.75
P7	7.68	1.76	8	1.75
P9	7.68	1.55	7	1.75
P11	7.64	1.73	8	2.5
P25	7.64	1.71	8	2
P10	6.86	2.38	7	3.75
P18	6.86	1.98	7	3
P20	6.82	1.94	7	2.75
P13	6.73	2.31	7	3
P22	6.5	2.02	7	2.75

P = Photograph

Discussion

Numerous studies have highlighted the impact of tooth shape, dental asymmetries, age variables, gingival presentation, buccal corridor width, and arch width on smile aesthetics. These findings suggest that achieving functional occlusion alone is insufficient for ensuring desirable outcomes from orthodontic treatments.[25] However, since aesthetics is a subjective concept that varies among individuals and cultures, established clinical standards can be somewhat ambiguous.

In this study, the maxillary central incisors were digitally altered bilaterally in the smiles. These incisors were chosen due to their critical role in the aesthetic zone,

defining the "Dominance of Central Incisors," and receiving particular attention in aesthetic evaluations.[26]

Yang et al conducted a study in Chengdu, China to compare the perception of mesio distal angular changes of the maxillary central incisors in young adults. Both orthodontists and laypersons rated smiles as less attractive when the mesiodistal angulation of the maxillary central incisors increased.[24]

In this study, Orthodontists rated the Female Ideal Smile as the most attractive, while the Male Smile with a digitally altered angulation of the maxillary central incisor by -4° bilaterally was deemed the least attractive. Orthodontists exhibited a pronounced sensitivity to variations in tooth angulations, as indicated by their ratings of the second least attractive smile (Male Smile with -2° angulation) and the least attractive smile (male smile with -4° angulation). Conversely, the second most attractive smile was the female smile with a digitally altered angulation of -2°. Notably, orthodontists rated female smiles more favorably overall.

According to the study conducted by Menezes et al. in Bahia, Brazil on the vertical positioning of maxillary central incisors, the most aesthetically pleasing smiles exhibited two key features: (a) the gingival margins of the central incisors were either aligned with or positioned 0.5 mm below the gingival margins of the canines, and (b) there was an incisal step of 1.0 to 1.5 mm between the central and lateral incisors. Conversely, the least favorable smiles were characterized by (a) central incisor gingival margins located 1.0 mm above or 1.5 mm below the gingival margins of the canines, and (b) either no incisal step between the central and lateral incisors or a pronounced step of 2.5 mm.[10]

In their study exploring the Saudi population's perception of smiles, Labban N et al. adjusted the dimensions of the central incisors by elongating their length by 0.5 mm in both male and female subjects. Additionally, the width of the central incisors was subtly modified to create an enhanced prominence compared to the adjacent lateral incisors. Interestingly, nearly half of the participants expressed a preference for these more prominent central incisors, highlighting a notable aesthetic inclination within the population.[27]

In this study, Prosthodontists also rated the female smile with a digitally altered vertical position of the maxillary central incisor by -1 mm as the most attractive, aligning with the orthodontists' assessment of the least attractive smile being the male smile with -4° angulation. Prosthodontists were particularly critical regarding mesio-distal width and vertical positioning, as 7 of the top 5 most attractive and the bottom 5 least attractive smiles were altered based on these parameters. They displayed a moderate preference for both genders, with a slight inclination towards the female smile.

Laypersons' ratings revealed that the female smile with a digitally altered vertical position of the maxillary central incisor by -0.5 mm was the most attractive, while the male smile with a digitally altered mesio-distal width of +1 mm was considered the

least attractive. Similar to prosthodontists, laypersons were also critical of mesio-distal width and vertical positioning. A notable maximum difference in median perception scores (-3.5) was observed between prosthodontists and laypersons for the female smile with -1 mm mesio-distal width and the male smile with -1 mm mesio-distal width. Laypersons preferred the female smiles significantly more compared to the male smiles.

The study's findings possess the potential to significantly inform evidence-based clinical guidelines for orthodontic and prosthodontic treatments. By elucidating the aesthetic preferences of both professionals and laypersons, dental practitioners can more adeptly tailor their treatment plans to align with patient expectations, thereby enhancing overall satisfaction. Recognizing the divergence in aesthetic preferences between dental professionals and laypersons is crucial for adopting a more patient-centered approach. By incorporating the subjective perceptions of patients, dental professionals can ensure that treatment outcomes resonate with patients' aesthetic desires, leading to improved satisfaction.

This study compellingly demonstrates a clear divergence between professional and lay perceptions of smile attractiveness. It begs the question: As dental professionals, do we have an obligation to promote more dental procedures if a smile is both socially acceptable and operationally sound? However, the study's limitations must be acknowledged, including the lack of statistical analysis concerning the age and gender of the questionnaire respondents. Preferences may indeed vary between genders, and males and females might value different aspects of aesthetics. To enhance overall satisfaction, it is essential to adjust treatment strategies to account for these variances.

Moreover, while the study employed a Visual Analogue Scale (VAS) for aesthetic ratings—an effective tool—it could be further supplemented with qualitative methods such as interviews or focus groups. These methods would provide deeper insights into the underlying reasons behind aesthetic preferences, enriching the understanding and applicability of the study's findings. Although gender differences were evident due to facial hair, the gender of the participants in the photographs was not disclosed. It remains uncertain whether the gender of the participants responding to the questionnaire, the photographed individuals, or a combination of both influenced the evaluations.

Future research should consider incorporating demographic parameters such as the age and gender of respondents. Additionally, regional variations in smile perception within a country, as well as international comparisons, could provide a broader understanding of aesthetic preferences. The study focused solely on 2D images from the nose tip to the chin, while the full face plays a crucial role in smile aesthetics. Integrating 3D technology could offer more comprehensive insights into smile attractiveness.

Conclusions

- Orthodontists exhibited a pronounced sensitivity to variations in tooth angulations. They rated Female smiles more favorably overall
- Prosthodontists were particularly critical regarding mesio-distal width and vertical positioning and displayed a moderate preference for both genders, with a slight inclination towards the female smile.
- Laypersons were critical of mesio-distal width and vertical positioning and preferred the female smiles significantly more compared to the male smiles.
- This study elucidates profound differences in smile attractiveness ratings among orthodontists, prosthodontists, and laypersons, with dental professionals displaying heightened sensitivity to variations in the angulation and positioning of the maxillary central incisors.
- Conversely, laypersons demonstrated distinct aesthetic preferences, frequently favoring modifications that professionals assessed less favorably.
- Dental practitioners should place a high priority on matching patients' functional requirements and aesthetic preferences with treatments, making sure that operations are only suggested when they improve overall satisfaction.
- Promoting needless procedures just for cosmetic purposes when a smile is already operationally sound and socially acceptable presents ethical issues and ought to be avoided unless the patient requests it.

References

1. Patankar K, Khatri J. (2021) Int J Appl Dent Sci Smile esthetics in orthodontic: A review article.;7(4):223-227.
2. Machado AW, McComb RW, Moon W, Gandini LG Jr. (2013) J EsthetRestor Dent. Influence of the vertical position of maxillary central incisors on the perception of smile esthetics among orthodontists and laypersons.;25(6):392-401.
3. Thomas M, Reddy R, Reddy BJ. (2011) Indian J Dent Res Perception differences of altered dental esthetics by dental professionals and laypersons.;22:242-7
4. Brough E, Donaldson AN, Naini FB. (2010) Am J Orthod Dentofacial Orthop. Canine substitution for missing maxillary lateral incisors: the influence of canine morphology, size, and shade on perceptions of smile attractiveness.;138(6):705.e1-9; discussion 705-7.
5. Kumar S, Gandhi S, Valiathan A. (2012) Indian J Dent Res Perception of smile esthetics among Indian dental professionals and laypersons.;23:295.
6. Cracel-Nogueira F, Pinho T. (2013)Int Orthod. Assessment of the perception of smile esthetics by laypersons, dental students and dental practitioners.;11(4):432-44. English, French.
7. Correa BD, Vieira Bittencourt MA, Machado AW. (2014) Am J Orthod Dentofacial Orthop. Influence of maxillary canine gingival margin asymmetries on the perception of smile esthetics among orthodontists and laypersons.;145(1):55-63

8. Guzmán MM, Vera SME, Flores LA. (2015) Rev Mex Ortodon. Perception of smile aesthetics by dental specialists and patients.;3(1):13-21.
9. Xu H, Han X, Wang Y, Shu R, Jing Y, Tian Y, Andrews WA, Andrews LF, Bai D. (2015) . Am J Orthod Dentofacial Orthop. Effect of buccolingual inclinations of maxillary canines and premolars on perceived smile attractiveness;147(2):182-9.
10. Menezes EBC, Bittencourt MAV, Machado AW. (2017) Dental Press J Orthod. Do different vertical positions of maxillary central incisors influence smile esthetics perception?;22(2):95-105.
11. Paiva TT, Machado RM, Motta AT, Mattos CT. (2018) Am J Orthod Dentofacial Orthop.Influence of canine vertical position on smile esthetic perceptions by orthodontists and laypersons.;153(3):371-376
12. Simões D, Meyge de Brito G, Teixeira Cangussu MC, Machado AW. (2019) ? Am J Orthod Dentofacial Orthop. Does the vertical position of maxillary central incisors in men influence smile esthetics perception;156(4):485-492
13. Lemos TCB, Vasconcelos JB, Santos BMD, Machado AW. (2019) Dental Press J Orthod. Influence of maxillary canine torque variations on the perception of smile esthetics among orthodontists and laypersons.;24
14. Khalaf K, Seraj Z, Hussein H. (2020) Int J Dent.Perception of Smile Aesthetics of Patients with Anterior Malocclusions and Lips Influence: A Comparison of Dental Professionals', Dental Students,' and Laypersons' Opinions.
15. Martinez Florez D, Rinchuse D, Zullo T. (2020) J EsthetRestorDent.Influence of maxillary lateral incisor width ratio on perception of smile esthetics among orthodontists and laypersons.;1–6.
16. Althagafi N. (2021)Clin CosmetInvestig Dent. Esthetic Smile Perception Among Dental Students at Different Educational Levels.;13:163-172.
17. Patel, TrushakumariBhavanbhai; Mathur, Somilkumar; Upadhyay, Snehal R.; Shah, Takshil Devendra. (2021) The Journal of Indian Prosthodontic Society, A proportional appraisal of smile perception by laypersons, dental professionals, and a smile designing software: An in vivo study.; 21(4):p 391-396.
18. Felemban NH, Manjunatha BS (2022) Int J Oral Dent Health Assessment of the Perception of Aesthetics and Smile Attractiveness among Dental and Health Students; 8:140.
19. Yuen J., Saw Z., Ashari A., Lau M., Mustapha N., Kuppusamy E., Rajaran J. (2023). Australasian Orthodontic Journal.Aesthetic perception of gingival display on smiling among laypeople seeking dental treatment;39(2): 136-144.
20. Mannaa AI. (2023). Cureus,Knowledge and Attitude Toward Esthetic Dentistry and Smile Perception;15(9):e46043.
21. Vig RG, Brundo GC. (1978) J Prosthet Dent. The kinetics of anterior tooth display.;39(5):502-4.
22. Azzopardi, J., & Kaur, K. (2017) Journal of Prosthodontics,The role of maxillary central incisors in smile aesthetics: A review. 26(7), 580-586.

23. Husain A, Makhija PG, Ummer AA, Kuijpers-Jagtman AM, Kuijpers MAR. (2017)Am J Orthod Dentofacial Orthop.Three-camera setup to record simultaneously standardized high-definition video for smile analysis.;152(5):711-716.
24. Yang S, Guo Y, Yang X, Zhang F, Wang J, Qiu J, Li J. (2015) Am J Orthod Dentofacial Orthop.Effect of mesiodistal angulation of the maxillary central incisors on esthetic perceptions of the smile in the frontal view.;148(3):396-404.
25. Tuzgiray YB, Kaya B. (2013) Turkish J Orthod. Factors affecting smile esthetics;26:58–64
26. Machado AW. (2014) Dental Press J Orthod.10 commandments of smile esthetics.;19(4):136-57.
27. Labban N, Alrabiah M, Alamri W, Fakeeha G, Almutairi O, Alotaibi H. (2019) Biosc.Biotech.Res.Comm,Influence of Maxillary Incisor Variables on Smile Attractiveness Perception of Saudi Population.;12(4).