ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at:www.ijdsir.com
Volume – 8, Issue – 5, September – 2025, Page No. : 239 - 248

Comparison of Esthetic Preferences between General Dentists and Lay Persons towards Digitally Altered Smile Aesthetics

[1]Brahmasri Amulya Sharma, Postgraduate student, Government Dental College and Hospital, Afzalgunj, Hyderabad

[2]Chandulal Jadav, HOD, Government Dental College and Hospital, Afzalgunj, Hyderabad

[3]Venkata Ramana Irukulla, Associate Professor, Government Dental College and Hospital, Afzalgunj, Hyderabad

[4]Katte Sheethal Chandana, Postgraduate student, Government Dental College and Hospital, Afzalgunj, Hyderabad

[5]Tamizhselvan G, Postgraduate Student, Government Dental College and Hospital, Afzalgunj, Hyderabad

[6]Niharika Pachava, Postgraduate Student, Government Dental College and Hospital, Afzalgunj, Hyderabad

Corresponding Author: Brahmasri Amulya Sharma, Postgraduate student, Government Dental College and Hospital, Afzalgunj, Hyderabad.

Citation of this Article: Brahmasri Amulya Sharma, Chandulal Jadav, Venkata Ramana Irukulla, Katte Sheethal Chandana, Tamizhselvan G, Niharika Pachava, “Comparison of Esthetic Preferences between General Dentists and Lay Persons towards Digitally Altered Smile Aesthetics”, IJDSIR- September – 2025, Volume – 8, Issue – 5, P. No. 239 – 248.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Introduction

A smile is a vital element of nonverbal communication and plays a key role in shaping an individual’s self-esteem.[1] Creating a harmonious and attractive smile presents an ongoing challenge for dental practitioners. Over the years, various guidelines have been established to help clinicians achieve aesthetically pleasing outcomes. However, the perception of what constitutes an ‘attractive smile’ is highly subjective, often varying across different cultures, populations, and even from person to person.[2]

Dental professionals play a crucial role in identifying the acceptable limits of deviation in the aesthetic parameters that contribute to a pleasant smile.[3] with the growing emphasis on smile enhancement, patient expectations regarding dental aesthetics have risen significantly. While dentists typically evaluate smiles using objective criteria—such as buccal corridor spaces (BCS), midline alignment, presence of diastemas, tooth shape and color harmony, and the proportion between lips and gingiva—patients’ perceptions are often shaped by more subjective influences. These may include cultural background, socioeconomic status, age, and societal opinions.[4]

Given these differences, it is essential for clinicians to recognize and incorporate patients’ aesthetic preferences when planning treatment to ensure optimal satisfaction.[5]

Numerous studies have explored how dental professionals and laypersons differ in their evaluation of smile esthetics.[6] For instance, Kokich et al.[7] examined how orthodontists, general dentists, and laypeople in the United States perceived both symmetrical and asymmetrical variations in teeth and gingival features. Similar research has been carried out in Middle Eastern countries such as Dubai,[8] Jordan,[9] and Saudi Arabia.[10]

Despite these efforts, significant gaps remain in the literature—particularly in understanding the degree of discrepancy between patient and provider perceptions, the role of buccal corridor spaces, and the influence of social and environmental factors on smile esthetics.

Dentofacial aesthetics play a fundamental part in modern dental practice, as seen by people's rising requests for more cosmetic and aesthetic reasons.[11] For most persons, improving facial and smile attractiveness is the main motivating factor for receiving orthodontic treatment .[12]

As the mouth is the center of communication in the face, the smile plays an important role in facial expression and appearance. According to neurological control, there are two types of smiles: involuntary (spontaneous), which is associated with emotion and voluntary (posed), which is not usually associated with emotions.[11] The orthodontist's concern is related to the posed smile.

In orthodontics, facial and smile aesthetics are largely considered during the diagnosis and also the treatment planning.[12] The re-emergence of the soft tissue paradigm in clinical orthodontics has made smile analysis a key element in diagnosis and treatment planning (Ackerman and Ackerman 2002).[13] Because facial aesthetics are such an important component of the diagnosis and treatment-planning process, the orthodontist must be aware of what society considers optimal facial attractiveness.

The smile aesthetics can be divided into macro aesthetics (the relationship of teeth to each other, to soft tissues and facial characteristics), mini aesthetics (the correlation of lips, teeth and gingiva) and micro aesthetics (fine structures of dental and gingival esthetics).[14] The subject of smiles is important for orthodontists because most laypeople use smiles to judge the treatment's success.[15]

The perception of facial and dental aesthetics has often been assessed using the Visual Analog Scale (VAS), a simple and reliable evaluation tool. Additional methods for analyzing dental aesthetics include photographs, videos, 3D stereo photogrammetry, and eye-tracking technologies.[11]

The objective of this study was to evaluate and compare the influence of digitally altered smile features—specifically buccal corridor space, midline diastema, gingival display, and midline shift—on facial esthetic perception, as judged by general dentists and laypersons.

Material and methodology

This study was done in the Department of Orthodontics and Dentofacial Orthopaedics in Government Dental College and Hospital, Afzalgunj, Hyderabad.

Using A colored smile photograph was obtained using a digital camera (Canon D1500) in the frontal pose.

This ideal smile photograph was then manipulated for the purpose of study by using image processing software (Adobe photoshop 7, San Jose, California, USA).

The altered images were examined by 100 General Dentists and 100 Lay persons. The General Dentists group was selected among the practitioners practising in Hyderabad. The lay group was selected among the local people residing in Hyderabad using a convenient sampling technique.

The inclusion criteria were meticulously defined to ensure standardized evaluation and reliable results. A female with normal Class I occlusion, as per Andrews' six keys, was selected for the frontal photograph. She had ideal dental alignment, with no rotations, spacing, or crowding, tight interdental contacts, a level Curve of Spee, and no history of orthodontic treatment to ensure natural dentition. Two evaluator groups were identified: general dentists (B.D.S. degree holders) aged 25–60, actively in clinical practice, and laypeople aged 21–60 with no formal dental education. Exclusion criteria eliminated general dentists under 25 or over 60, laypersons under 21 or over 60, and individuals who were mentally challenged or visually impaired, as these factors could affect accurate smile esthetic evaluation.

A photograph of a female individual, age 19 years old, with smile characteristics close to standard norms was selected for this study. The subject was positioned 5 ft. from the camera (Canon D 1500) in natural head position. (Natural head position (NHP) is a standardized and reproducible position, of the head in an upright posture, the eyes focused on a point in the distance at eye level, which implies that the visual axis is horizontal). The photograph was limited to focus on mouth to reduce distractions.

This ideal smile photograph was then manipulated for the purpose of study using image processing software (Adobe photoshop 7) to produce a series of 15 images. The features of the smile photograph were altered in millimetre increments upto 5 millimetres. An informed consent was obtained from the individual to manipulate her smile and use in this study.

The smile photograph was manipulated to produce changes in buccal corridor space, midline diastema, midline shift and gingival display.

Buccal corridor space (BCS)

The size of the BCS was altered bilaterally with one photograph having narrow BCS and another photograph having wide BCS.

Midline diastema (MD)

This was achieved digitally by adding space between maxillary central incisors from 1mm to 5mm.

Midline shift (MS)

The upper midline was moved to the left from 1mm of midline shift to 5mm of midline shift.

Gingival Exposure(GE)

The amount of gingival exposure was increased from 1mm of Gingival exposure to 5mm of gingival exposure.

A questionnaire along with the smile photographs were given to the judges. The questionnaire includes information regarding age, gender, education and the occupation. A 10- point visual analogue scale (VAS) was used under each photograph to rate the attractiveness of the smile for judges.

The left end of the scale was labelled as “very unattractive” and was represented by number zero. The right end of the scale was labelled “very attractive” and was represented by number 10.

Figure 1:

a) b)

Figure 1: Photographs showing alteration to the buccal corridor space. (a) represents narrow buccal corridor space; (b) represents wide buccal corridor space

Figure 2:

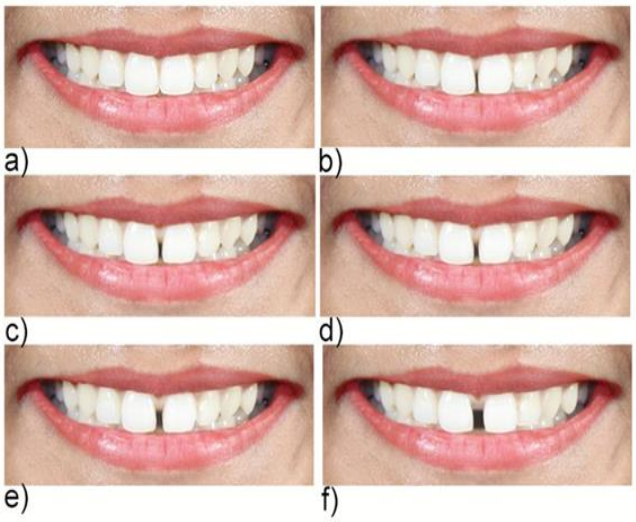

Figure 2: Photographs showing alteration of a midline diastema. The alterations were done by an increment of 1 mm. (a) No alteration; (b) 1 mm midline diastema; (c) 2 mm diastema; (d) 3 mm diastema; (e) 4 mm diastema and (f) 5 mm diastema

Figure 3:

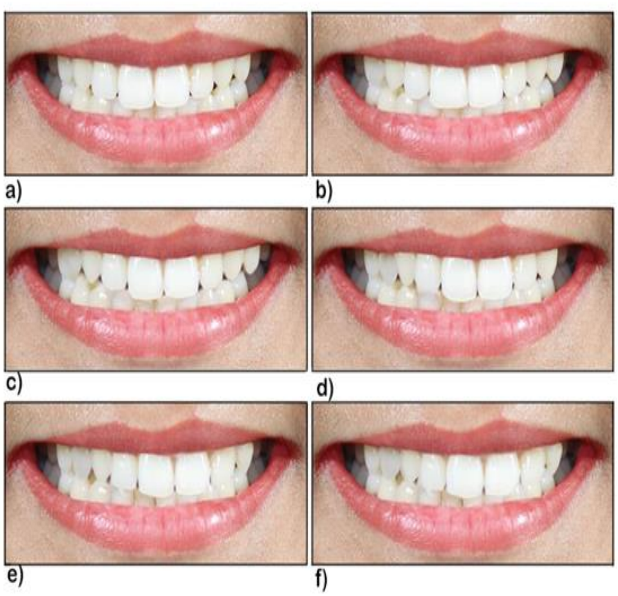

Figure 3: Photographs showing alterations to midline shift. The alterations were done with 1 mm increment. (a) No alteration; (b) 1 mm midline deviation to the left; (c) 2 mm deviation; (d) 3 mm deviation, (e) 4 mm deviation, and (f) 5 mm deviation

Figure 4

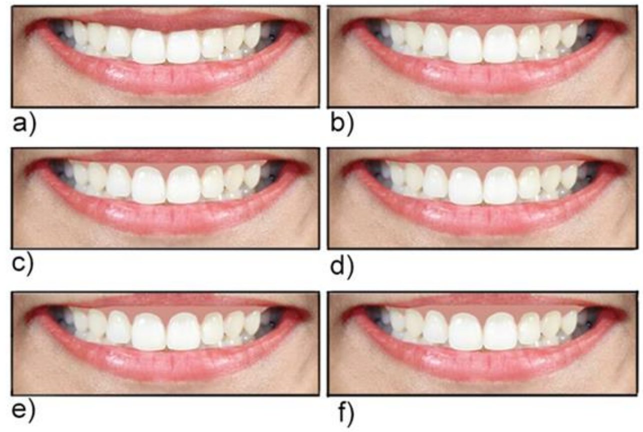

Figure 4: Photographs showing alteration of the gingival show. Alterations were based on the relation of the upper lip with the gingival margin of the maxillary incisors. (a) No alteration; (b) 1 mm increase in gingival show; (c) 2 mm; (d) 3 mm; (e) 4 mm and (f) 5 mm

Results

The present study was conducted to assess and compare the esthetic acceptance of General Dentists and Lay people regarding digitally manipulated smile photographs. The altered smile photographs were judged by 100 General Dentists and 100 Laypeople.

Table 1 depicts the comparison of mean ratings given by the General Dentists and Lay persons for ideal smile image using student's t test. Mean ratings given by General Dentists is 7.76 +1.65 and by Lay people is 9.33 + 0.94. Statistically significant difference found between two groups with $p < 0.05$.

Table1: Comparison of Mean and SD of ratings given for an ideal image between the 2 study groups (Student's t test)

Variable	General Dentists		Lay persons		P value
	Mean	SD	Mean	SD	
Ideal smile	7.76	1.65	9.33	0.94	<0.001*

*p<0.05 is considered as statistically significant Table 2 depicts the comparison of mean ratings given by the General Dentists and Lay persons for altered Buccal corridor space images using student's t test. The mean values depict that General Dentists gave less ratings compared to Laypersons for both Narrow and wide Buccal corridor space images. Statistically significant difference found between two groups with p<0.05.

Table 2: Comparison of Mean and SD of ratings given for altered Buccal corridor space images between the 2 study groups (Student's t test)

Variable	General Dentists		Lay people		P value
	Mean	SD	Mean	SD	
Buccal corridor space (narrow)	7.49	1.57	8.90	1.00	<0.001*
Buccal corridor space (wide)	6.87	1.77	8.69	0.93	<0.001*

*p<0.05 is considered as statistically significant

Table 3 depicts the comparison of mean ratings given by the General Dentists and Laypeople for altered Midline Diastema images using student's t test. The General Dentists gave less ratings compared to Lay persons. Both General Dentists and Lay persons gave lowest rating for 5mm Midline Diastema. Statistically significant difference was found between two groups with p < 0.05.

Table 3: Comparison of Mean and SD of ratings given for altered Midline Diastema images between the 2 study groups (Student's t test)

Variable	General Dentists		Lay persons		P value
	Mean	SD	Mean	SD	
Midline Diastema (1mm)	5.19	2.01	7.33	1.40	<0.001*
Midline Diastema (2mm)	4.57	1.88	6.63	1.61	<0.001*
Midline Diastema (3mm)	3.93	1.92	5.28	1.92	<0.001*
Midline Diastema (4mm)	3.19	1.84	4.81	2.14	<0.001*
Midline Diastema (5mm)	2.36	1.69	4.17	2.62	<0.001*

*p<0.05 is considered as statistically significant

Table 4 depicts the comparison of mean ratings given by the General Dentists and Laypeople for altered Gingival exposure images using student's t test. The mean ratings given by General Dentists are less compared to Lay persons with no significant difference between the two groups when the gingival exposure was 1mm and 2mm. Statistically significant difference was found between two groups when the gingival exposure was 3mm, 4mm and 5mm with p < 0.05.

Table 4: Comparison of Mean and SD of ratings given for altered Gingival Exposure images between the 2 study groups (Student's t test)

Variable	General Dentists		Lay persons		P value
	Mean	SD	Mean	SD	
Gingival exposure (1mm)	7.62	1.73	7.94	1.21	0.102
Gingival exposure (2mm)	7.22	1.82	7.72	1.16	0.121

Gingival exposure (3mm)	6.95	1.90	7.29	1.23	0.023 *
Gingival exposure(4mm)	5.99	2.02	6.49	1.43	0.034 *
Gingival exposure(5mm)	4.93	2.27	5.94	1.64	0.015 *

*p<0.05 is considered as statistically significant

Table 5 depicts the comparison of mean ratings given by the General Dentists and Laypeople for altered Midline shift images using student's t test. The mean ratings given by General Dentists are less compared to Lay persons. Statistically significant difference is found between two groups when the midline shift is 1mm showing that Dentists can easily identify 1mm midline shift compared with Lay persons. There is no significant difference found when the midline shift was 2mm, 3mm, 4mm and 5mm showing that Lay persons can also identify the midline shift similar to General Dentists.

Table 5: Comparison of Mean and SD of ratings given for altered Midline shift images between the 2 study groups (Student's t test)

Variable	General Dentists		Lay persons		P value
	Mean	SD	Mean	SD	
Midline shift (1mm)	6.95	1.70	7.90	1.50	0.034*
Midline shift (2mm)	5.80	1.71	5.97	1.68	0.240
Midline shift (3mm)	5.13	1.86	5.30	1.73	0.459
Midline shift (4mm)	4.23	1.92	4.30	1.85	0.768
Midline shift (5mm)	3.44	1.97	3.97	1.96	0.041

*p<0.05 is considered as statistically significant

Discussion

An attractive and well-balanced smile significantly shapes perceptions of an individual's appearance and personality. Dale Carnegie emphasized the power of a smile as a social tool linked with friendliness and intelligence. However, esthetic perceptions vary among orthodontists, general dentists, and laypersons, influenced by factors like age, sex, and income. Espeland and Stevnik[16] found young adults often prioritize anterior dental esthetics over occlusion. Ruben[17] classified smiles into cuspid (commissural), complex (full-denture), and Mona Lisa types, with complex smiles exposing more teeth and gingiva. With rising awareness, patients demand more refined outcomes, compelling clinicians to balance esthetic norms with individual preferences, factoring in deviation extent, treatment cost, invasiveness, and duration.

A systematic smile analysis includes macroesthetics (facial proportions), mini esthetics (dentition-to-face relation), and micro esthetics (tooth-to-tooth relations). In this study, smile images were digitally altered using Adobe Photoshop 7 to modify buccal corridor space, midline diastema, gingival exposure, and midline shift. These were evaluated using the Visual Analog Scale (VAS) by 100 general dentists and 100 laypersons. Although methods like Q-sort and eye-tracking offer insights, they are time-consuming and visually distracting. To reduce bias, only the mouth region was shown in images. Key dental factors affecting smile esthetics include crown dimensions, lip position, buccal corridors, occlusal canting, midline position, gingival display, and diastema.[18]

The buccal corridor—the space between the maxillary teeth and mouth corners during smiling—remains debated. In this study, both dentists and laypersons favored narrower buccal corridors, with dentists giving slightly lower ratings. Moore[19], Parekh[20], Loi[21], Martin[22], and Nimbalkar[23] reported similar findings, suggesting minimal to moderate buccal corridor space improves smile attractiveness. Oz et al.[24] advised against buccal corridors exceeding 16% of the intercommissural width to maintain esthetic harmony. Krishnan,[25] Sharma, and Kaur found no significant differences in buccal corridor evaluation between professionals and laypersons, while Hulsey and Roden-Johnson et al.[26] concluded buccal corridors had little impact. Kokich et al. observed laypersons were more lenient. Interestingly, Aldeeri et al. reported that a wider buccal corridor was preferred by the Riyadh population, highlighting the importance of considering cultural variations. However, routinely using broad archwires is not advisable, as treatment should be guided by individual arch form and alveolar bone dimensions to avoid relapse.

Midline diastema, typically perceived as unattractive—especially when wider than 2 mm—was poorly rated by both dentists and laypersons. This is consistent with findings from Rodrigues, Kokich, and Kerosuo, who noted negative perceptions for gaps beyond 1–2 mm. Ethnic differences influence these thresholds; while Indians consider gaps over 1.5 mm unesthetic, Africans may find up to 2–3 mm acceptable. Gaps under 1 mm are generally tolerated, with laypersons showing more leniency. Treatment varies with size: smaller gaps may be restored, while larger ones may require orthodontics and extended retention to prevent relapse.

Gingival display is another critical esthetic parameter. This study found that up to 2 mm of gingival exposure was rated esthetic by both groups, with ratings declining significantly beyond that—especially among dentists. Similar trends were reported by Geron, Hunt, Peck, and Dutra, citing 2 mm as the commonly accepted threshold. However, AlTaki and Kokich observed that laypersons may accept up to 4 mm. Treatment options for excessive gingival display include orthodontic intrusion, orthognathic surgery, and implant anchorage. Patient perception and expectations should guide the choice of intervention due to variability in standards.

The dental midline plays central role in smile symmetry. Alignment relative to facial landmarks like the nasion and Cupid's bow is often more important than perfect coincidence. Minor discrepancies are acceptable if contact areas remain vertical. Shaw et al. reported no gender-based perception differences, while McLeod, Johnston, Talic, Kerr, and Springer found acceptable midline deviations between 1.1 mm and 3.3 mm, with professionals more critical than laypersons. These findings emphasize the importance of individualized diagnosis and treatment, balancing functional goals with esthetic concerns.[27]

Pinho et al.[27] found orthodontists could detect a 1 mm deviation, whereas laypersons often failed to notice deviations up to 4 mm. Beyer et al. reported a mean threshold of 2.2 ± 1.5 mm, while Guo cited 2.6 mm. Kokich noted that dentists detected shifts beyond 1 mm, and Zhang found a 2.4 mm threshold in Chinese subjects. An et al. reported that dentists identified deviations at 3 mm, while Kaur concluded that shifts over 2 mm were esthetically unacceptable.[24] This study confirms that dentists recognized 1 mm deviations more frequently than laypersons, but from 2 mm onward, both groups perceived the shift similarly, giving lower ratings with increasing deviation.

Despite dentists assigning slightly lower scores overall, the differences were minimal, suggesting dental training may not dramatically alter esthetic perception—a conclusion supported by Flores-Mir, Rajeev, and Saffarpour. Shaw also emphasized that facial attractiveness influences esthetic judgments. In this study, midline diastema received the lowest scores, and there was no significant difference between groups regarding buccal corridor perception. Gingival exposure up to 2 mm was widely accepted, with scores falling beyond that.

Overall, although dentists tended to assess more critically, their perceptions were largely in agreement with those of laypersons, reinforcing the idea that esthetics is inherently subjective. As Margaret Hungerford famously stated, "beauty is in the eye of the beholder," highlighting the influence of cultural and individual differences on aesthetic judgment. There is no universally perfect smile, especially considering that media often promotes a limited and idealized standard. Genuine esthetic dentistry lies in the balance between scientific precision and artistic sensibility, with an emphasis on honoring the unique hard and soft tissue characteristics of each patient.[25]

Conclusion

This study examined how variations in buccal corridor space, midline diastema, gingival exposure, and midline shift affect smile aesthetics. It also compared the aesthetic perceptions of these features between General Dentists and Laypersons using digitally altered smile photographs.

Both groups preferred a narrow buccal corridor. The midline diastema received the lowest aesthetic scores, with General Dentists rating even a 1 mm gap as unesthetic, while Laypersons tolerated up to 2 mm. General Dentists considered up to 2 mm of gingival exposure acceptable, whereas Laypersons found up to 4 mm esthetic. Dentists detected midline shifts as small as 1 mm, while Laypersons noticed them only at 2 mm or more. These findings underscore the perceptual differences between trained professionals and the general public.

The study highlights a significant divergence in smile aesthetics perception between General Dentists and Laypersons. Factors such as age, gender, education, geography, and culture influence these views. Therefore, Orthodontists should consider patient preferences to ensure treatment outcomes meet both clinical standards and patient expectations, enhancing satisfaction and success.

References

1. Eli I, Bar-Tal Y, Kostovetzki I. At first glance: Social meanings of dental appearance. J Public Health Dent. 2001;61(3):150-4.
2. McLeod C, Fields HW, Hechter F, Wiltshire WA, Rody WJ. Esthetics and smile characteristics evaluated by laypersons. Angle Orthod. 2011;81(1):198-205.
3. Mokhtar HA, Al-Ali RM, Hassan HA, Suleiman MM. The perception of smile attractiveness among Saudi population. Clin Cosmet Investig Dent. 2015; 7:17-23.
4. Jornung J, Fardal O. Perceptions of patients' smiles: A comparison of patients' and dentists' opinions. J Am Dent Assoc. 2007;138(12):1544-53.
5. Kepic TJ, O'Leary TJ, Kafrawy AH. Total calculus removal: an attainable objective? J Periodontol. 1990;61(1):16-20.
6. Oumeish OY. The cultural and philosophical concepts of cosmetics in beauty and art through the medical history of mankind. Clin Dermatol. 2001; 19(4):375-86.
7. Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental

esthetics: Asymmetric and symmetric situations. Am J Orthod Dentofacial Orthop. 2006;130(2):141-51.

8. Al Taki A, Khaleel H, Al Moaleem MM. Perceptions of altered smile esthetics: A comparative evaluation in orthodontists, dentists, and laypersons. Int J Dent. 2016;2016:7815274.
9. Abu Alhaija ES, Al Shamsi NO, Al Khateeb S. Perceptions of Jordanian laypersons and dental professionals to altered smile aesthetics. Eur J Orthod. 2010;33(4):450-6.
10. Talic N, Alomar S, Almaidhan A. Perception of Saudi dentists and lay people to altered smile esthetics. Saudi Dent J. 2013;25(1):13-21.
11. Geevarghese A, Krishnan V, Kumar R, Thomas S, Bhatia S. Perception of general dentists and laypersons towards altered smile aesthetics. J Orthod Sci. 2019;8:14.
12. Coppola G, Perillo L, Paduano S, Simeon V, Grassia V. The effect of orthodontic treatment on smile attractiveness: a systematic review. Prog Orthod. 2023;24(4).
13. Chang AC, Fields HW, Beck M, Springer N. Smile esthetics from patients' perspectives for faces of varying attractiveness. Am J Orthod Dentofacial Orthop. 2011;140(4):476-85.
14. Musa M, Liu L, Liang H, Tian X. Effect of the ethnic, profession, gender, and social background on the perception of upper dental midline deviations in smile esthetics by Chinese and Black raters. BMC Oral Health. 2023;23(1):214.
15. Alhammadi MS, Halboub E, Al-Mashraqi AA, Alshahrani I, Al-Moraissi EA, Al-Kadasi AA. Perception of dental, smile and gingival esthetic components by dental specialists, general dental practitioners, dental assistants and laypersons: A cross-sectional study. World J Dent. 2022;13(3):231-6.
16. Espeland LV, Stenvik A. Perception of personal dental appearance in young adults: relationship between occlusion, awareness, and satisfaction. Am J Orthod Dentofacial Orthop. 1991;100(3):234-41.
17. Rubin LR, Mishriki Y, Lee G. Anatomy of the nasolabial fold: The keystone of the smiling mechanism. Plast Reconstr Surg. 1989;83(1):1-8.
18. Ackerman MB, Ackerman JL. Smile analysis and design in the digital era. J Clin Orthod. 2002;36 (4):221-36.
19. Moore T, Southard KA, Casko JS, Qian F, Southard TE. Buccal corridors and smile esthetics. Am J Orthod Dentofacial Orthop. 2005;127(2):208-13.
20. Parekh SM, Fields HW, Beck M, Rosenstiel S. Attractiveness of variations in the smile arc and buccal corridor space as judged by orthodontists and laymen. Angle Orthod. 2006;76(4):557-63.
21. Ioi H, Kang S, Shimomura T, Kim SS, Park SB, Kitahara T. Effects of buccal corridors on smile esthetics in Japanese and Korean orthodontists and orthodontic patients. Am J Orthod Dentofacial Orthop. 2012;142(4):459-65.
22. Martin AJ, Bonomo P, Lagravere MO. The impact of buccal corridors on smile attractiveness. Eur J Orthod. 2007;29(5):530-7.
23. Nimbalkar S, Vaidyanathan AK, Lee W, Kassim A. Smile attractiveness related to buccal corridor space in 3 different facial types: a perception of 3 ethnic groups of Malaysians. J Prosthet Dent. 2018;120 (2):252-6.
24. Oz AA, Oncag G, Ucar FI, Malkondu O. Smile attractiveness: Differences among the perceptions of dental professionals and laypersons. Turk J Orthod. 2017;30(2):50-5.

25. Krishnan V, Daniel ST, Lazar D, Asok A. Characterization of posed smile by using visual analog scale, smile arc, buccal corridor measures, and modified smile index. Am J Orthod Dentofacial Orthop. 2008;133(4):515-23.
26. Roden-Johnson D, Gallerano R, English J. The effects of buccal corridor spaces and arch form on smile esthetics. Am J Orthod Dentofacial Orthop. 2005;127(3):343-50.
27. Huang WJ, Creath CJ. The midline diastema: A review of its etiology and treatment. Pediatr Dent. 1995;17(3):171-9.
28. Pinho S, Ciriaco C, Faber J, Lenza MA. Impact of dental asymmetries on the perception of smile esthetics. Am J Orthod Dentofacial Orthop. 2007; 132(6):748-53.