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Perceptions of Buccal Corridor and Smile Line by Laypersons and Professionals

Fatemeh Deylami [1], Reza Ghorbanipour [2,*], Behzad Chalaki [1], Sedigheh Sheikhzadeh [3], Maryam Johari [4], Hoda Shirafkan [5]

[1] Student Research Committee, Babol University of Medical Sciences, Babol, Iran
[2] Dental Materials Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran
[3] Department of Orthodontics, School of Dentistry, Babol University of Medical Sciences, Babol, Iran
[4] Department of Oral and Maxillofacial Radiology, School of Dentistry, Babol University of Medical Sciences, Babol, Iran
[5] Department of Community Medicine, Social Determinants of Health Research Center, Health Research Institute, School of Medicine, Babol University of Medical Sciences, Babol, Iran

[*] ***Corresponding Author:*** Dental Materials Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran. Email: dr_ghorbanipour@yahoo.com

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Abstract

Background: Perceptions of smile esthetics often differ between dental professionals and laypersons, particularly regarding the buccal corridor and smile line. These differences may affect treatment planning and patient satisfaction.

Objectives: This study aimed to compare the perceptions of dental professionals and laypersons regarding the buccal corridor and smile line across different vertical facial dimensions.

Methods: This descriptive-analytical cross-sectional study was conducted in 2022 at the Faculty of Dentistry, Babol University of Medical Sciences, Babol, Iran. Seventy-two participants, including 36 dental professionals and 36 laypersons, evaluated standardized photographs of 3 male patients with short, normal, and long facial heights, classified according to the facial index. The patient inclusion criteria were similar age, completed orthodontic treatment, full dentition, and the absence of anterior tooth rotation. The exclusion criteria were a history of orthognathic or plastic surgery, cleft lip and palate, facial asymmetry, or syndromic conditions. Laypersons had previous dental treatment experience but no orthodontic treatment or professional esthetic training, whereas professionals had specialized expertise in esthetic dentistry. Buccal corridor width and smile arc were digitally modified, and attractiveness was rated using a Visual Analogue Scale (VAS). Data were analyzed using the independent-samples t-test, one-way analysis of variance, the Mann-Whitney U test, and the chi-square test, with the significance level set at 0.05.

Results: Professionals demonstrated greater sensitivity than laypersons to differences in buccal corridor width and smile arc, particularly in long-faced patients. In this subgroup, professionals assigned significantly lower attractiveness scores than laypersons for both full-face images (4.41 ± 1.78 vs 5.96 ± 1.62; $P < 0.001$) and close-up images (4.68 ± 1.83 vs 5.94 ± 1.33; $P = 0.001$). Laypersons preferred flat smile arcs, whereas professionals favored consonant smile arcs; significant intergroup differences were observed mainly in long-faced subjects ($P = 0.049$ to $P < 0.001$).

Conclusions: Dental professionals and laypersons differed significantly in their perceptions of the buccal corridor and smile line across vertical facial dimensions. Potential biases related to sample selection and image characteristics were acknowledged; therefore, the findings should be interpreted with caution. These results highlight the importance of integrating clinical expertise with patients' esthetic perceptions in orthodontic treatment planning.

Keywords: Perception, Dental Esthetics, Attitude of Health Personnel, Orthodontics, Prosthodontics, Visual Analog Scale, Smiling

1. Background

Dental appearance is widely recognized as an important determinant of facial attractiveness and is closely associated with perceptions of physical appeal and interpersonal acceptance (1). A growing body of literature emphasizes the central role of the mouth and teeth in facial esthetics, with the smile being the most prominent focal point after the eyes (2, 3). Smiling, one of the most basic and universal forms of nonverbal communication, not only enhances appearance but also substantially influences how others perceive personality traits (4). Rapid recognition of facial expressions is essential for effective interpersonal communication and contributes to social bonding and psychological well-being (5). Accordingly, an attractive facial appearance is often associated with greater self-confidence and improved social adaptability (6). The influence of a

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smile extends beyond dental esthetics and includes alignment with facial beauty standards, the interaction between the lips and teeth, and the harmonious integration of all facial components (7). Various factors, including tooth position, tooth color, gingival position and thickness, and lip display, can influence the esthetic quality of a smile (1).

In orthodontics, improving facial esthetics is considered a primary treatment objective. Because the harmony between soft-tissue and dental structures must be evaluated together, frontal analysis is preferred over profile-based assessment for evaluating smile-related features (4). Among the various components of the smile, 3 key aspects have received considerable attention in recent literature: gingival display, the smile arc, and buccal corridor width (2). An esthetically ideal smile arc typically features the incisal edges of the maxillary central incisors and canines curving parallel to the contour of the lower lip. In this configuration, the central incisors are slightly longer than the lateral incisors, and the canines support the curve at its widest point, creating what is known as a consonant arc (3, 4, 8, 9). In contrast, deviations from this curvature result in a nonconsonant, flat, or reverse arc (3). The buccal corridor, first described in the 1950s and often referred to as the negative space at the corners of the mouth, is defined as the gap between the outer surfaces of the posterior teeth and the corners of the lips during smiling. It is influenced by dental arch form, muscle function, and smile dynamics (4). Although buccal corridor dimensions are typically expressed as a percentage of total smile width, their esthetic relevance remains controversial (10).

Achieving functional occlusion alone is no longer sufficient for patient satisfaction. Increasingly, patients seek visible improvements in facial appearance and social acceptance as part of orthodontic treatment outcomes. However, certain interventions, such as premolar extractions, can reduce arch width and increase buccal corridor size, potentially compromising esthetic outcomes if not properly evaluated (4, 7).

It is also important to recognize that the perception of beauty is inherently subjective and influenced by numerous demographic variables, including ethnicity, sex, age, and socioeconomic background (11). Consequently, esthetic assessments should incorporate a range of perspectives, particularly those of both dental professionals and laypersons, to reflect the multifaceted and culturally contextual nature of beauty (12).

Several studies have reported notable differences between professionals and nonexperts in evaluating ideal smile features, such as the smile arc and the buccal corridor (13-16). However, few investigations have examined these perceptual differences across varying vertical facial dimensions.

2. Objectives

This study aimed to address this gap by evaluating and comparing the perspectives of dental professionals and laypersons regarding smile arc and buccal corridor width in individuals with different vertical facial proportions.

3. Methods

3.1. Study Design and Setting

This descriptive-analytical cross-sectional study was conducted in 2022 at the Faculty of Dentistry, Babol University of Medical Sciences, Babol, Iran. The study was approved by the Ethics Committee of Babol University of Medical Sciences (IR.MUBABOL.HRI.REC.1400,145). A total of 72 participants, including 36 dental professionals and 36 laypersons, were recruited using convenience sampling.

3.2. Participants

Dental specialists in orthodontics, restorative dentistry, and prosthodontics were categorized as professionals, whereas patients presenting for cosmetic dental treatment at the Faculty of Dentistry, Babol University of Medical Sciences, were classified as laypersons.

The sample size was calculated based on buccal corridor attractiveness scores reported by Zange et al. (10). Assuming a significance level of 0.05, 80% power, and means ± SDs of 48.88 ± 23.09 and 64.08 ± 21.74 among laypersons and orthodontists, respectively, a final sample size of 72 participants was considered adequate to detect a moderate difference in esthetic perception between the groups.

3.3. Patient Selection and Image Preparation

In this study, 3 male patients who had undergone orthodontic treatment at the Faculty of Dentistry in Babol were selected. These patients represented different facial heights (short, normal, and long) and were classified according to the facial index, calculated by dividing facial height by maximum facial width. Facial height refers to the midline distance between the soft-tissue nasion, the point of the nasofrontal suture, and the gnathion, the lowest point on the inferior border of the chin. Facial width refers to the distance

across the face between the most lateral points of the zygomatic arches, from zygion to zygion (13). Measurements were performed clinically using a vernier caliper (0 - 150 mm; R&N, China). For male subjects, a facial height index of approximately 88.5% was considered normal (17). The facial indices were 84% for the short-faced patient, 88.5% for the normal-faced patient, and 92% for the long-faced patient.

The inclusion criteria were similar age, completed orthodontic treatment, a full set of teeth, and the absence of anterior tooth rotation. The exclusion criteria were previous orthognathic or plastic surgery, cleft lip and palate, and any facial asymmetry or syndrome. After informed consent was obtained, the subjects were photographed at a radiology center using a Nikon D3500 camera (Nikon Corp., Tokyo, Japan) to obtain 2 frontal digital images: a full-face smile view and a close-up smile view. Adobe Photoshop CC 2014 (Adobe Systems Inc., San Jose, CA, USA) was used to make minor corrections to facial imperfections to avoid influencing esthetic perception. For each patient, 5 photographs depicting different buccal corridor widths (2%, 10%, 15%, 22%, and 28%) were produced, along with 3 separate images showing different smile arc configurations:

1) Consonant: The incisal edges of the central incisors and canines aligned with the upward curvature of the lower lip, with the lateral incisor edge positioned 1 - 2 mm higher.

2) Flat: The incisal edges of the central and lateral incisors, along with the canine tip, formed a straight line.

3) Reverse: The central incisor edges were positioned higher than the canine tips, with the lateral incisor edges slightly elevated, creating a reverse curvature.

3.4. Evaluator Selection and Rating Procedure

Laypersons were selected based on previous dental treatment experience, no history of orthodontic treatment, and no professional exposure to esthetic assessments. Professionals were required to be willing participants with specialized experience in esthetic dentistry. The images were printed on 250-g silk matte paper in 13 × 18 cm format and arranged randomly, with each image assigned a unique number. Participants received a detailed explanation of the study objectives and methodology and provided informed consent before the evaluation. Using a VAS ranging from 0 to 10, participants rated the attractiveness of each photograph.

3.5. Control of Confounding Factors

Potential confounding factors were primarily addressed through the study design rather than statistical adjustment. To minimize individual variability, a limited set of standardized male facial photographs was selected, with key variables such as age, sex, facial symmetry, and orthodontic treatment controlled during image selection. In addition, all photographs were taken under standardized conditions, and digital manipulation was performed consistently. The images were presented in randomized order, and all assessors used the same VAS; therefore, no statistical adjustment was deemed necessary in this experimental setting.

3.6. Statistical Analysis

Data analysis was performed using SPSS version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics included the mean and standard deviation for quantitative variables and frequency and percentage for qualitative variables. The normality of quantitative data was evaluated using the Shapiro-Wilk test. Comparisons between professionals and laypersons were performed using the independent-samples t-test and one-way analysis of variance when the data were normally distributed. The Mann-Whitney U test was used for nonnormally distributed data. Associations between categorical variables were analyzed using the chi-square test or Fisher exact test, as appropriate. The level of statistical significance was set at $P < 0.05$.

4. Results

The study population comprised 48 females (66.77%), with an overall mean age of 36.79 ± 9.57 years (range, 20 - 63 years). Analysis of buccal corridor assessments showed that, among short-faced patients, only the 2% buccal corridor change was statistically significant in full-face views. Normal-faced subjects showed no significant differences. Among long-faced patients, statistically significant differences were observed in all buccal corridor groups except for the 10% and 22% alterations. In close-up views, significant differences in the mean buccal corridor ratings were found for short-faced patients at 2% and 10%, for normal-faced patients at 10%, and for long-faced patients at 10%, 15%, 22%, and 28%.

Table 1 presents the mean and standard deviation of scores by group and facial height. Laypersons consistently assigned higher attractiveness ratings than professionals, with statistically significant differences observed for long-faced patients in both full-face and close-up views. No significant sex-based differences were

Table 1. Buccal Corridor Attractiveness Scores Across Evaluator Groups and Vertical Facial Heights (N = 36) [a]

Photo Types and Face Height	Laypersons (n = 36)	Professionals (n = 36)	P-Value
Full-face			
Short	6.35 ± 1.49	5.96 ± 1.31	0.241
Normal	5.18 ± 1.61	4.88 ± 1.78	0.457
Long	5.96 ± 1.62	4.41 ± 1.78	< 0.001
Close-up			
Short	6.37 ± 1.51	5.82 ± 1.27	0.101
Normal	5.95 ± 1.88	4.85 ± 1.72	0.085
Long	5.94 ± 1.33	4.68 ± 1.83	0.001

[a] Values are expressed as mean ± SD.

Table 2. Mean and Standard Deviation of Smile Line Scores by Group in Individuals with Different Vertical Facial Dimensions (N = 36) [a]

Variables	Laypersons	Professionals	P-Value
Full-face			
Short			
Flat	5.88 ± 1.56	5.80 ± 1.54	0.821
Reverse	5.97 ± 1.96	5.57 ± 1.53	0.346
Consonant	6.00 ± 1.62	6.19 ± 1.95	0.647
Normal			
Flat	5.80 ± 1.65	5.27 ± 2.06	0.235
Reverse	5.55 ± 1.77	4.88 ± 1.75	0.114
Consonant	5.68 ± 1.62	5.38 ± 2.15	0.515
Long			
Flat	6.27 ± 1.36	5.38 ± 2.27	0.049
Reverse	6.66 ± 1.49	4.91 ± 1.91	< 0.001
Consonant	6.05 ± 1.49	5.19 ± 2.05	0.047
Close-up			
Short			
Flat	5.97 ± 1.73	5.58 ± 1.64	0.332
Reverse	6.25 ± 1.72	5.30 ± 1.70	0.022
Consonant	6.02 ± 1.55	6.11 ± 1.98	0.843
Normal			
Flat	6.05 ± 1.70	5.19 ± 1.86	0.045
Reverse	5.72 ± 1.68	4.83 ± 1.93	0.041
Consonant	6.02 ± 1.66	5.91 ± 2.22	0.805
Long			
Flat	6.80 ± 1.47	5.27 ± 1.18	0.001
Reverse	6.72 ± 1.86	4.94 ± 1.86	< 0.001
Consonant	6.69 ± 1.60	5.30 ± 2.01	0.002

[a] Values are expressed as mean ± SD.

observed in the assessment of buccal corridor attractiveness.

Education-based analyses indicated that full-face view scores did not differ significantly; however, normal-faced subjects showed statistically significant differences in close-up views. In addition, age was not significantly correlated with buccal corridor scores across any facial types.

Regarding smile arc configurations, no statistically significant differences were observed for short- and

normal-faced subjects in full-face views. However, long-faced subjects showed significant differences across all 3 smile arc types, with laypersons typically assigning higher scores than professionals. In close-up views, only short-faced subjects showed a statistically significant difference for the reverse smile arc. Normal-faced individuals showed significant differences in flat and reverse smile arcs between the groups, whereas long-faced subjects mirrored the full-face findings, with significant differences across all configurations. Table 2 summarizes these outcomes.

5. Discussion

This study investigated perceptions of professionals and laypersons regarding the buccal corridor and smile arc across individuals with different vertical facial dimensions. The analysis showed no significant association between evaluators' sex and their assessments of the smile arc and buccal corridor width. This finding is consistent with previous studies that reported similar outcomes, although some discrepancies exist (17, 18). For example, Zange et al. observed that female evaluators were more critical of buccal corridor widths than male evaluators (10).

Regarding professional background, nonprofessionals consistently assigned higher attractiveness scores across all buccal corridor measurements than professionals. Among all participants, the 2% and 22% buccal corridors were considered the least and most attractive, respectively. Among laypersons, the highest and lowest scores for buccal corridor size were assigned to the 10% and 15% buccal corridors, respectively, whereas among professionals, they were assigned to the 22% and 2% buccal corridors, respectively. However, there were significant differences between observers' opinions for buccal corridor sizes of 2%, 10%, and 22%. These variations underscore the subjective nature of esthetic evaluations and are consistent with findings from Abu Alhaija et al., who reported differing opinions among nonprofessionals, orthodontists, and general dentists regarding buccal corridor sizes (19). Similarly, Oshagh et al. found that dental students were better able to distinguish between buccal corridor sizes than art students and laypersons (20). Conversely, Ioi et al. reported that professional expertise did not significantly affect assessments of smile attractiveness (21). Similarly, Niknam et al. reported no significant differences between professionals and laypersons regarding preferences for buccal corridor width, with a 15% buccal corridor rated as the most attractive. Their study examined an Iranian population and used a 5-point Likert scale to assess the attractiveness of an image of a female subject (22).

The divergence in perceptions between professionals and laypersons may be attributable to differences in evaluative criteria. Professionals often rely on theoretical knowledge and clinical experience, leading to more critical assessments, whereas laypersons base their judgments on overall harmony and personal preferences. This distinction is evident in the study by Roden-Johnson et al., which found no significant differences in smile attractiveness evaluations among orthodontists, general dentists, and laypersons (23). However, Parekh et al. reported that orthodontists could discern differences in buccal corridors that laypersons could not (24). Such discrepancies may stem from methodological differences, such as the use of qualitative versus quantitative assessments or the ability to compare images side by side (25).

Regarding smile arcs, this study found that parallel or consonant smile arcs received the highest attractiveness scores (7.30 ± 1.60), followed by flat (7.19 ± 1.45) and reverse smile arcs (6.88 ± 1.51). Laypersons showed a preference for flat smile arcs, whereas professionals favored parallel arcs. A significant positive correlation was observed between smile arc and buccal corridor scores. These findings are consistent with those of Hulsey, who reported higher smile scores for parallel smile arcs, and Parekh et al., who found that both orthodontic and lay groups preferred parallel smile arcs and narrower buccal corridors (7, 17). Aljanakh, and Motamedian et al. also reported higher attractiveness ratings for parallel smile arcs and smiles displaying more teeth (26-27). Similarly, Mazhari et al. demonstrated that laypersons overestimated the age of subjects with flat and reverse smile arcs and that the absence of a consonant smile line contributed to the perception of increased facial aging (15).

However, cultural and ethnic differences may influence these preferences. For example, Gracco et al. found that flat smile arcs were more widely accepted among their study participants (28). Likewise, Najarzadegan et al. reported that American laypeople were more tolerant of larger buccal corridors than Iranian laypeople (29).

Facial characteristics, including vertical facial dimensions, play a key role in the perception of smile attractiveness (1, 10, 30). Many studies have focused only on the oral region, potentially overlooking the influence of overall facial morphology (9, 17, 23, 24, 31, 32). Valiathan and Gandhi emphasized that laypersons may assess buccal corridors differently when viewing the entire face (33). In this study, images of individuals with

short, normal, and long facial heights were used to evaluate the impact of facial dimensions on smile attractiveness. The results indicated that as facial height increased, mean attractiveness scores decreased, with shorter facial heights perceived as more attractive.

5.1. Limitations

This study had several limitations. The results were based on digitally manipulated 2-dimensional photographs and may not fully approximate the dynamic, 3-dimensional smile that occurs in everyday interactions. The image set included only male subjects. Based on cultural and religious considerations in Babol, Iran, female facial images could not be used. Therefore, the results cannot be generalized to females. Future investigations of smile esthetics should be conducted in both sexes to determine whether these findings apply across sex groups.

In addition, the laypersons in the present study were selected from individuals seeking cosmetic dental treatment. This approach was used because such individuals are typically more attentive to facial esthetics than the general population. However, this selection may also limit the representativeness of the layperson sample, as it may not reflect the perceptions of the general public. Therefore, the general applicability of the present findings is limited primarily to adult male subjects and esthetically motivated laypersons in a similar cultural context. Future multicenter studies with more diverse layperson samples are needed to validate and further generalize these findings.

5.2. Conclusions

This study demonstrated statistically significant differences between dental professionals and laypersons in their perceptions of buccal corridors and smile arcs, particularly in patients with long vertical facial dimensions. Laypersons preferred a flat smile arc and showed minimal variation in perceptions of buccal corridor width, whereas professionals were more sensitive to changes and favored a consonant smile arc and specific buccal corridor measurements. These findings emphasize the need for clinicians to balance objective clinical standards with subjective patient preferences to achieve optimal esthetic outcomes.

Footnotes

AI Use Disclosure: The authors declare that no generative AI tools were used in the creation of this article.

Authors' Contribution: F. D. and R. G. contributed to the study concept and design. F. D. and M. J. contributed to data acquisition. F. D., R. G., and B. C. contributed to data analysis and interpretation. F. D. and B. C. drafted the manuscript. R. G. and S. S. critically revised the manuscript for important intellectual content. H. D. performed the statistical analysis. M. J. and S. S. provided administrative, technical, and material support. R. G. and S. S. supervised the study.

Conflict of Interests Statement: The authors do not declare any conflicts of interests for this study.

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Ethical Approval: This study is approved under the ethical approve code of IR.MUBABOL.HRI.REC.1400,145

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