Original Article

Perceptions of laypersons and orthodontists regarding the buccal corridor in long- and short-face individuals

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ABSTRACT

Objective: To determine the perception of orthodontists and laypersons regarding the size of the dark spaces in the buccal corridors and how that affects smile esthetics in individuals with long and short faces.

Materials and Methods: Images of eight smiling individuals were modified to create five sizes of dark spaces in the buccal corridors (2%, 10%, 15%, 22%, and 28%) and were submitted to a group of laypersons and a group of orthodontists.

Results: Laypersons were more critical in their evaluation than orthodontists. Laypersons could not distinguish the gradation of dark spaces in the buccal corridor unless it was very plain. Orthodontists perceived this gradation beginning at 15%. Female evaluators were more critical than male evaluators in both groups.

Conclusions: The presence or absence of dark spaces in the buccal corridors has little influence over smile esthetics. While this aspect must be considered in the orthodontic diagnosis, there is no justification for expanding the buccal corridor to eliminate dark spaces unless they are very evident. (*Angle Orthod.* 2011;81:86–90.)

KEY WORDS: Buccal corridor; Esthetics

INTRODUCTION

Most patients seek orthodontic treatment for esthetic purposes. The identification of the problem is not always a simple task, however, as the view of the orthodontist may be different from that of a layperson. Facial and smile analysis contributes toward this evaluation, but there is no consensus in the literature on the buccal corridor. There are few studies on its real influence over the esthetics of a smile and no consensus on how to measure or assess the buccal corridor.

The buccal corridor can be defined as the proportion between the distance between the upper canines and the distance between the corners of the lips in a smile. The buccal corridor has no influence over the smile.[1] Moore and colleagues[2] used the Frush and Fisher[3] definition, which states that the buccal corridor is the distance from the most visible posterior teeth in the smile to the inner commissures of the lips. Using front-view photographs of faces with different degrees of buccal corridor, Moore and colleagues concluded that laypersons are able to identify variations in the buccal corridor, which influences how they judge the esthetics of a smile. Ackermann[4] suggested that studies on this subject should divide samples into dolichofacial (long face) and brachyfacial (short face) examples, for facial type may influence the macroesthetics of a smile.

The aim of the present study was to determine the esthetic perception of laypersons and orthodontists regarding the buccal corridor in dolichofacial and brachyfacial individuals.

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Figure 1. Set of five different full smiles in a subject with a short face.

MATERIALS AND METHODS

The present study was carried out in the cities of Maringá (Paraná-Brazil) and Blumenau (Santa Catarina-Brazil) and received approval from the Ethics Committee of the Universidade Estadual de Maringá (Paraná, Brazil). Eight individuals were selected (four with a long face and four with a short face) based on a subjective analysis of the face.[5] All individuals were submitted to previous orthodontic treatment and had complete dentitions with no rotations in the anterior region. These individuals signed terms of informed consent, authorizing their images to be used and modified for the purposes of the present study.

Frontal photographs were taken using a digital camera (Sony H01, Tokyo, Japan), with little variation in distance. Adobe Photoshop 7.0 (Adobe Systems, San Jose, Calif) was used to correct slight imperfections or asymmetries that could influence the assessment of attractiveness. The measurement of the buccal corridor was calculated as the percentage of the width between the inner lip commissures. This percentage was the ratio between the measurement of the visible maxillary dentition (A) and width of the inner lip commissures (B), multiplied by 100. For example, for a corridor calculated at 20%, there would be a visible dentition of 80%, with each side of the corridor accounting for 10%. Five images were produced for each subject, creating a series of five different smiles: narrow (28% buccal corridor), medium-narrow (22% buccal corridor), medium (15% buccal corridor), medium-wide (10% buccal corridor), and wide (2% buccal corridor) (Figures 1 and 2). A video was created using Windows Movie Maker (Microsoft, Redmond, Wash) uniting the 40 images (5 images $\times$ 8 individuals). The images were randomly organized and numbered from 1 to 40. Presentation time was 15 seconds for each photo. The evaluators could not go back to see previous images.

A visual analogue scale (VAS) with 100 mm was used for the assessment of attractiveness. Numbered blocks were connected with the scale printed on white paper. The term ''unattractive'' was printed on the left side of the scale and ''attractive'' was printed on the right (Figure 3).

The evaluation of the images was performed by two groups. Group A comprised 41 orthodontists (15 women and 26 men). Group B comprised 42 laypersons (22 women and 20 men). All the evaluators were told to judge the attractiveness of the smiles by VAS annotation.

A pilot study had been performed with 10 orthodontists to calculate judgment sample size. Considering 10 mm to be a minimal difference among VAS means, a mean standard deviation error of 13 mm, a bilateral alpha of 0.05, and a 0.85 power analysis, an appropriate sample size was estimated to be 37. The calculations were performed using BioEstat software (version 5.0, Mamirauá Maintainable Development Institute, Belém, Pará, Brazil).

Data were recorded on a table on Microsoft Office Excel 2003 (Microsoft) and submitted to statistical analysis using the Wilcoxon, Mann-Whitney, Kruskal-Wallis, and analysis of variance tests. The level of significance was set at 5%.

RESULTS

The Wilcoxon test revealed intra-evaluator agreement on the two occasions (Table 1). The laypersons and orthodontists of both genders differed in their judgment regarding both types of face for the 2% and

Figure 2. Set of five different full smiles in a subject with a long face.

Figure 3. Visual analogue scale.

10% buccal corridors and regarding the short-face type with a 15% buccal corridor. The Kruskal-Wallis test revealed statistically significant differences between groups regarding the assessments of both the long- and short-face patterns ($P < .0002$; Table 2).

When laypersons judged the buccal corridor of the long-face pattern, there were no statistically significant differences between the following pairs of groups: 2% and 10%, 2% and 15%, and 2% and 22%. This reveals that the laypersons were unable to differentiate the degrees of buccal corridor in persons with a long face, except when the corridor was 28%. When the orthodontists judged the buccal corridor of the long-face pattern, there was no statistically significant difference for the 2% and 10% pair only, whereas there were statistically significant differences for all other variations. The orthodontists preferred 2% and 10% buccal corridors on persons with a long face.

When laypersons judged the buccal corridor of the short-face pattern, there were no statistically significant differences between the following pairs of groups: 2% and 10%, 2% and 22%, and 10% and 22%. When the orthodontists judged the buccal corridor of the short-face pattern, there was no statistically significant difference the 2% and 10% pair only, whereas there were statistically significant differences for all other variations. The orthodontists preferred 2% and 10% buccal corridors on persons with a short face.

In the laypersons' analysis of the short-face pattern, there were statistically significant differences between genders regarding the 22% and 28% buccal corridors (Table 3). Male and female orthodontists evaluated the buccal corridor in the short-face pattern in a homogeneous fashion (Table 3). In the laypersons'analysis of the long-face pattern, there were statistically significant differences between genders regarding the 15% and 28% buccal corridors (Table 3). In the orthodontists' analysis of the long-face pattern, there was a statistically significant difference between genders regarding the 22% buccal corridor only (Table 3).

Table 1. Means and Standard Deviations of Grades Given by Laypersons and Orthodontists (Opinions) on Two Separate Occasions (Wilcoxon's Test)

Group	Moment	Mean Grade	Standard Deviation	*P* Value
Laypersons	Before	34.86	19.18	.210
	After	35.93	19.13	
Orthodontists	Before	47.66	28.35	.954
	After	48.39	26.91	

Table 2. Means and Standard Deviations of Grades Given by Laypersons and Orthodontists and *P* Values (Mann-Whitney Test)

Buccal Corridor Size	Facial Type	Group	Mean	Standard Deviation	*P* Value
2%	Short	Laypersons	48.88	23.09	<.00002
		Orthodontists	64.08	21.74	
	Long	Laypersons	47.78	21.78	.00008
		Orthodontists	56.96	23.28	
10%	Short	Laypersons	44.08	22.42	<.00002
		Orthodontists	56.06	22.77	
	Long	Laypersons	47.08	22.13	.00001
		Orthodontists	57.09	21.19	
15%	Short	Laypersons	40.17	25.35	.007
		Orthodontists	47.33	20.22	
	Long	Laypersons	41.74	19.76	.825
		Orthodontists	42.24	19.83	
22%	Short	Laypersons	32.89	21.24	.472
		Orthodontists	33.85	19.05	
	Long	Laypersons	34.75	21.22	.138
		Orthodontists	30.62	18.28	
28%	Short	Laypersons	18.62	15.62	.606
		Orthodontists	16.69	13.03	
	Long	Laypersons	15.84	14.92	.324
		Orthodontists	13.71	12.69	

Variations in the buccal corridor of the long-face pattern were judged statistically similarly to the short-face pattern between the groups of evaluators. Considering the assessments of the laypersons, there was a statistically significant difference for the 28% buccal corridor only, and the short-face pattern received better scores (Table 4). In the analysis of

Table 3. Mean Grades of Female and Male Evaluators for Long-Face and Short-Face Patterns and *P* Values (Mann-Whitney Test)

Buccal Corridor Size	Facial Type	Group	Female	Male	*P* Value
2%	Short	Laypersons	46.54	51.46	.181
		Orthodontists	62.88	64.76	.697
	Long	Laypersons	45.99	49.75	.338
		Orthodontists	56.85	57.02	.914
10%	Short	Laypersons	42.71	45.59	.455
		Orthodontists	55.88	57.32	.404
	Long	Laypersons	44.78	49.61	.220
		Orthodontists	56.17	57.62	.743
15%	Short	Laypersons	37.65	40.07	.131
		Orthodontists	44.12	49.17	.151
	Long	Laypersons	38.80	44.97	.032
		Orthodontists	39.64	43.75	.238
22%	Short	Laypersons	29.69	36.40	.026
		Orthodontists	31.00	35.50	.195
	Long	Laypersons	33.07	36.61	.239
		Orthodontists	26.74	32.86	.0303
28%	Short	Laypersons	13.35	24.41	.000007
		Orthodontists	16.71	16.68	.875
	Long	Laypersons	11.80	20.27	.00002
		Orthodontists	12.67	14.31	.303

Table 4. Mean Grades of Laypersons of Both Genders for Long-Face and Short-Face Patterns and *P* Values (Mann-Whitney Test)

Buccal Corridor Size	Short Face	Long Face	*P* Value
2%	48.88	47.78	.484
10%	44.08	47.08	.387
15%	40.17	41.74	.506
22%	32.89	34.75	.537
28%	18.62	15.84	.0351

Table 5. Mean Grades of Orthodontists of Both Genders for Long-Face and Short-Face Patterns and *P* Values (Mann-Whitney Test)

Buccal Corridor Size	Short Face	Long Face	*P* Value
2%	64.08	56.96	.051
10%	56.06	57.09	.856
15%	47.33	42.24	.0161
22%	33.85	30.62	.110
28%	16.69	13.71	.007

the orthodontists, there were statistically significant differences between the long- and short-face patterns for the 2%, 15%, and 28% buccal corridors, and the short- face pattern received better scores (Table 5). Figure 4 illustrates overall comparisons.

DISCUSSION

The present study questions the real influence of the buccal corridor on the esthetics of the smile. In most studies investigating this subject, only images of the mouth region were used.[1,6–12] Moore and colleagues[2] carried out the only study using photos of the entire face. However, the studies involving smiles should consider facial type, qualifying at least long-face and short-face patterns.[4] Valiathan[13] questions whether laypersons assess the buccal corridor differently when they see a person's whole face rather that just the smile and mouth region. Maulik and Nanda[12] shot video with ambient light and no influence from a flash, stating that this factor may influence the size of the buccal corridor.

The VAS is widely used in studies for assessing the esthetics of the smile.[8–11,14–17] The agreement with this method is satisfactory forlaypersons and orthodontists alike, which was corroborated in the present study.[9]

A number of authors have used Adobe Photoshop to manipulate images,[2,9–11,16,17] and this program proved a useful, valid method for image manipulation in the present study as well. Exposure time of the photos in the video during the assessments was compatible to that used by other authors.[2,15] Also, as in previous studies, the video was used to avoid comparisons between images, as the evaluator was not able return to previously assessed images.

To our knowledge, this is the first time variations in the size of the buccal corridor were assessed considering facial pattern. The orthodontists gave higher scores than the laypersons, which is in agreement with the findings described by Phillips and colleagues[15] in relation to facial attractiveness. However, as there were no statistical differences between the 2% and 10% corridors, the laypersons may have evaluated facial characteristics other than the buccal corridor, although they were asked to evaluate the smile attractiveness. In contrast to the results of the present study, Roden-Johnson and colleagues[10] found the scores of orthodontists to be lower than those of laypersons and dentists, as did Kokich and colleagues,[17] regarding symmetry and asymmetry.

Women were more critical and gave lower scores than men in both groups, which corroborates the findings described by Parekh and colleagues.[9] Moreover, the scores in the present study were similar to the results described by Moore and colleagues.[2] Despite the methodologic differences, the 2% buccal corridor was considered the best for both long-face and short-face types by both laypersons and orthodontists, followed by 10%, 15%, and 22%, whereas the 28% buccal corridor was considered the least attractive. However, these differences were not always statistically significant in the present study.

The use of a video, in which it was not possible to go back and compare images, demonstrated that the laypersons were unable to identify the different degrees of buccal corridor unless it was very obvious, which corroborates other findings.[1,9–11] Conversely, laypersons are able to perceive variations in the buccal corridor, when they can make comparisons between pairs of photographs with different buccal corridor sizes, as stated by Moore.[2] In the present study, the orthodontists perceived the differences in the buccal corridor better than the laypersons, with statistically significant differences beginning at the 15% corridor.

Orthopedic or surgical expansion of the maxilla with the aim only of reducing the dark spaces of the buccal corridor should be considered with caution, as this characteristic of the smile has little influence over the esthetic evaluation of laypersons except when very obvious. Further studies using videography in the evaluation of the influence of the buccal corridor over facial esthetics should be carried out.

CONCLUSIONS

- The laypersons were unable to differentiate degrees of the buccal corridor in the long-face pattern except when it was 28%.
- For both the long-face and short-face patterns, the orthodontists considered 2% and 10% buccal corridors similarly.
- Female evaluators generally gave lower scores than male evaluators.

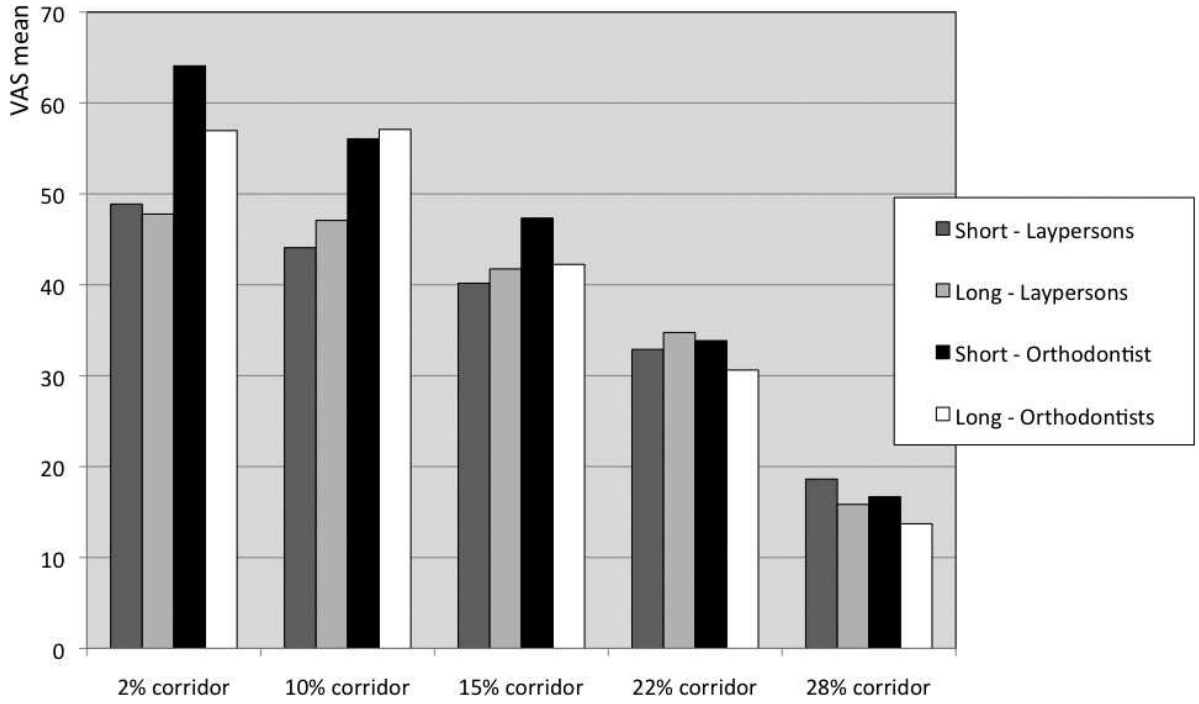

Figure 4. Graphic illustration of VAS means among groups. There is a clear representation of unattractiveness as buccal corridor becomes greater; however, differences were not always statistically significant (as shown in results).

- For the laypersons, the only statistically significant differences in scores between the long-face and short-face patterns occurred when the buccal corridor was 28%, with the short-face pattern receiving better scores.
- For the orthodontists, there were statistically significant differences in scores between the long-face and short-face patterns when the buccal corridor was 10% and 22%, with the short face pattern receiving better scores.

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