



**British Journal of Medicine & Medical Research**  
4(20): 3777-3786, 2014

SCIENCEDOMAIN *international*  
[www.sciencedomain.org](http://www.sciencedomain.org)



---

# Perception of Smile Attractiveness by Laypeople—influence of Profession and Treatment Experience

Serene A. Badran<sup>1\*</sup> and Mariam Mustafa<sup>2</sup>

<sup>1</sup>*Division of Orthodontics, Faculty of Dentistry, The University of Jordan, Amman 11942, Jordan.*

<sup>2</sup>*Westcliffe Dental Practice, Blackpool, Lancashire, UK.*

## **Authors' contributions**

*Author SAB designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author MM managed the literature searches and helped draft the manuscript. All authors read and approved the final manuscript.*

**Original Research Article**

**Received 26<sup>th</sup> June 2013**  
**Accepted 9<sup>th</sup> August 2013**  
**Published 5<sup>th</sup> May 2014**

---

## **ABSTRACT**

**Aims:** To assess the influence of profession, treatment experience, age and gender on the perception of smile aesthetics with different buccal corridors and smile arcs, and to identify the threshold where buccal corridor space becomes aesthetically displeasing.

**Study Design:** A questionnaire-based descriptive study on the assessment of attractiveness ratings by laypeople.

**Place and Duration of Study:** Amman/Jordan, University of Jordan Hospital; Faculty of Dentistry, Division of Orthodontics, from 2010-2011.

**Methodology:** A coloured photograph of a female smile was digitally modified to produce six smile images with buccal corridor spaces (BCSs) ranging from 0% to 25% and three smile images with altered smile arcs (consonant, flat and reverse). These images were shown to 104 laypeople who were asked to rate the attractiveness of each smile on a scale of one to ten. Analysis of variance was used to study the effect of age, gender, profession and treatment experience on smile attractiveness rating. A one-way ANOVA post hoc Duncan test was used to establish the threshold where BCS was considered unattractive.

**Results:** The most attractive smile was the broadest and consonant smile (7.42 +/-

---

\*Corresponding author: Email: [serene.badran@gmail.com](mailto:serene.badran@gmail.com);

1.87). The image with a reverse smile arc was rated as the least attractive (2.65 +/- 1.85). Duncan's test revealed that the threshold at which BCS was considered significantly unattractive was when it reached 25%. Analysis of variance showed that young adults perceived the broadest smile as significantly more attractive than older adults ( $P = .03$ ). Profession had a significant influence on smile attractiveness ratings while gender and treatment experience did not.

**Conclusion:** Flattening the smile arc was found to have more of an unattractive bearing than small variations in BCS. Thus, it is advisable to take into consideration the smile arc during any treatment that involves the anterior maxillary area, especially prosthodontic and restorative treatments, orthognathic surgery and orthodontics.

*Keywords: Dentistry; orthodontics; aesthetics; attractiveness; buccal corridor space; smile arc; profession.*

## 1. INTRODUCTION

The paradigm shift to aesthetics in orthodontics places more emphasis on the analysis of smile in relation to the surrounding soft tissues. Many orthodontists have worked on extensive studies to investigate the different features that result in an attractive, well-balanced smile to establish guidelines which orthodontists can use during orthodontic therapy [1-3]. Smile components which have been given more attention recently include the smile arc, buccal corridor space, tooth and gingival display, midline position and midline axial inclination.

Frush and Fisher [4] defined buccal corridors as the spaces between the facial surfaces of the posterior teeth and the corners of the lips when the patient is smiling. The effect of buccal corridor has been investigated in several studies; some authors found that the people preferred broad smiles with minimal buccal corridor space [5-7] while others did not find that the presence of buccal corridor space (BCS) had a significant influence on the aesthetic evaluation of a smile [8,9]. The smile arc (SA) is defined as the relationship of the curvature of the incisal edges of maxillary anterior teeth to the curvature of the lower lip in the posed smile [10]. Studies that evaluated the effect of SA on the attractiveness of a smile came out with controversial findings; some reported that consonant smiles were judged as the most attractive [11,12] while others did not find a correlation between SA and smile aesthetics [9,13].

A review of the literature revealed that the effect of BCS and SA on smile aesthetics is still controversial. It may be because perception of smile aesthetics varies between different populations. A person's social environment and culture, as well as age and gender, may have an influence on the perception of attractiveness. Moreover, the type of education or profession can influence someone's perception of attractiveness; for example, artists and architects who are trained to look at symmetries and proportions could have a different perception about what constitutes a beautiful and harmonious smile when compared to other professions. People who had orthodontic treatment may have a different perception about smile aesthetics from their own experience.

Perceptions to variations in BCS and/or SA was evaluated in different populations [7-9,11,12,14-16]. However, the level of acceptability to variations in BCS as well as the effect of SA on smile aesthetics was not assessed in the Arab population. Moreover, the influence

of age, gender profession and treatment experience on smile attractiveness rating was not fully investigated.

The aims of this study were to assess the attractiveness rating of two aspects of smile aesthetics; BCS and SA, to establish a threshold at which the BCS becomes aesthetically displeasing as judged by laypeople and to investigate whether age, gender, profession and treatment experience influence the perception of smile aesthetics.

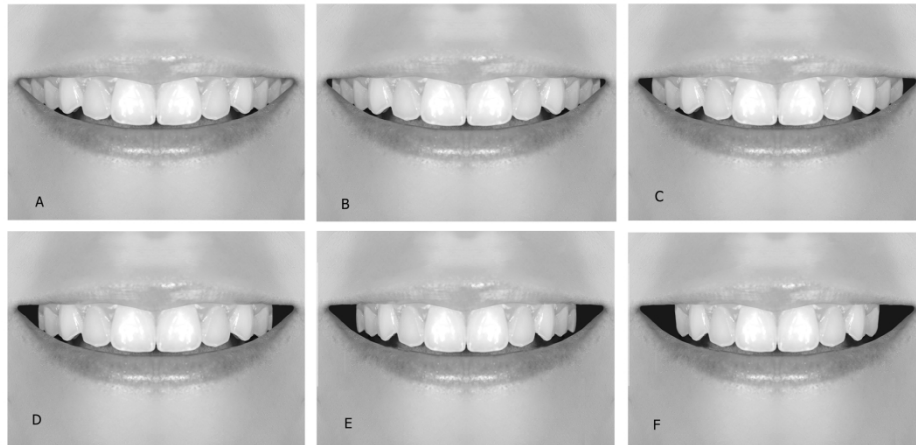
## 2. MATERIALS AND METHODS

This is a descriptive cross-sectional study of laypeople's perception of smile attractiveness. Ethical approval to conduct the study was obtained from the Faculty of Dentistry at the University of Jordan.

Sample size was calculated to achieve a power of 90%. The assumed effect size was 0.3 with an alpha significance level of 0.05. To achieve 90% power, a sample size of 88 was needed.

### 2.1 Smile Images

A coloured frontal photograph of a female smile displaying the first molar to the first molar was used. The image was transferred to a computer software (Adobe Photoshop CS2, San Jose, Calif.), and cropped to show the lips and teeth. Symmetry was achieved between the right and left sides using the same software. The original photograph was adjusted so that there was no display of any dark spaces between the molars and the inner commissures of the lips on both sides. This photograph produced an image with a broad smile (0% BCS). The BCS was then digitally modified, to add 5% increments of dark space from 0% to 25% [17]. This produced a set of six images with different amounts of BCS (Fig. 1).



**Fig. 1. The six images with altered buccal corridor space (BCS). A: 0% BCS; B: 5% BCS; C: 10% BCS; D: 15% BCS; E: 20% BCS; F: 25% BCS**

The SA was also modified to produce a set of three images with a parallel, flat and reverse smile with 0% BCS (Fig. 2). Each image was printed on a 5 x 7 inch glossy photograph paper and attached on one page of a photo album.



**Fig. 2. Images with altered smile arc. G: Ideal smile arc; H: flat smile arc; I: reverse smile arc**

## 2.2 The Questionnaire

The questionnaire consisted of information about the raters' gender, age, profession and their treatment experience (i.e.: whether they had orthodontic treatment or not).

Profession was divided into three groups: 1: Architects, graphic designers, or art-related professions; 2: Culinary arts; 3: Other professions not related to arts such as business, accounting, literature or any administrative work.

The raters were also asked to evaluate the following questions on a four-point Likert scale (1: not at all; 4: always): the importance of smile in assessing a person's beauty, whether a person's smile reflects his/her personality, and the impact of smile on self-confidence. The reliability of similar questions was reported in the literature [16].

## 2.3 The Raters

The raters comprised 104 Jordanian laypeople (53 females and 51 males) who had an average age of 28.7 years (range = 17 to 65 years). Consent to participate in the study was obtained from the raters. They were selected randomly from different places in the city of Amman; including university hospital and campus, private offices and coffee shops around the city.

The raters were shown the 9 altered smile images randomly and asked to rate the smile attractiveness on a scale of one to ten; one being least attractive and ten being most attractive. Each photo page was shown separately to the raters by a single interviewer. The raters were not allowed to compare between the images. The sequence of smile images was randomly changed every 10th rater.

## 2.4 Statistical Analyses

The data were analyzed using the Statistical Package for the Social Sciences (version 17.0; SPSS Inc., Chicago, Illinois, USA). The means and standard deviations for smile attractiveness ratings were calculated.

One-way analysis of variance was used to investigate whether age, gender, profession and treatment experience had any effect on smile attractiveness ratings.

A one-way ANOVA post hoc Duncan test was performed for detection of homogeneous subsets of buccal corridor means in order to establish the threshold at which the BCS was considered unattractive.

The level of significance was set at 0.05 and confidence intervals at 95% for all tests.

### 3. RESULTS

#### 3.1 Social Impact of Smile

The means and standard deviations for the impact of smile on social acceptance and self-perception are displayed in Table 1. Smile was considered as an important attribute to self-confidence, beauty and personality.

**Table 1. Means and standard deviations (SD) for the importance of smile attractiveness on social perception as judged by laypeople (n=104)**

Question	Mean	SD
Do you think a person's smile is important in judging someone's beauty?	3.61	0.61
Do you think a person's smile reflects his/her personality?	3.24	0.72
Do you think that a person's smile may have an effect on their self-confidence?	3.42	0.72

#### 3.2 Rating of Smile Images

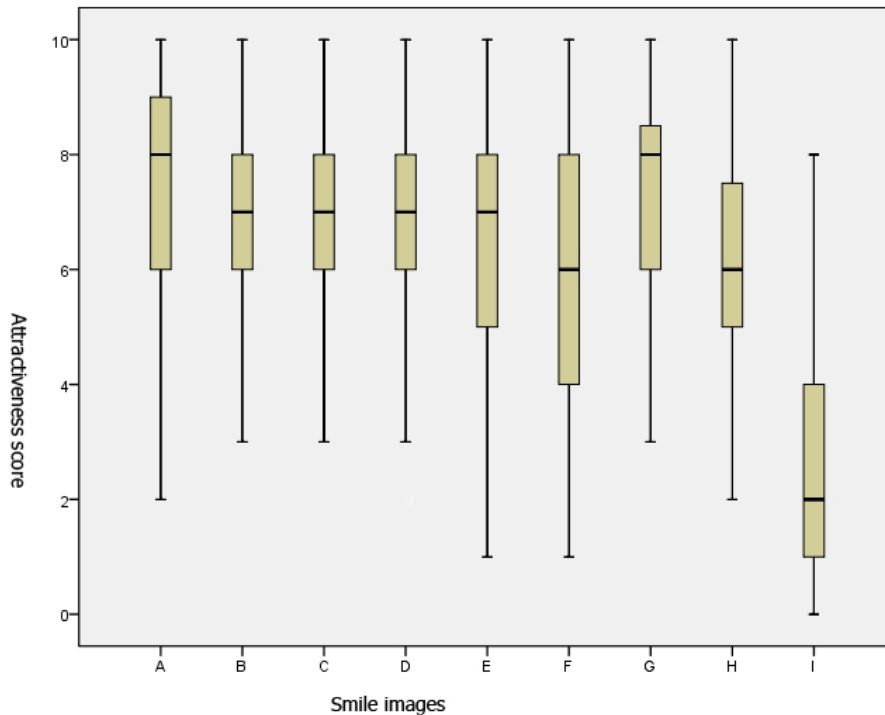
Rating of smile attractiveness was previously reported in a study comparing perception of laypeople and orthodontists to smile aesthetics [17].

The mean ratings of images by laypeople are shown in Table 2 and Fig. 3. The image that received the highest rating was the broad smile (absent BCS) with consonant SA. The one that received the lowest rating was the reverse SA image. The ratings of BCS images were statistically significant ( $P < .001$ ). Duncan's test revealed that the image with 0% BCS fell into the first subset as the most attractive image, images having 5% to 20% BCS fell into a second subset having similar attractiveness ratings, and the image with 25% BCS fell into a third subset as the least attractive image.

**Table 2. Means and standard deviations (SD) of attractiveness scores as rated by laypeople**

Image	Attractiveness Score	
	Mean	SD
0% BCS	7.42	1.87
5% BCS	6.85	1.86
10% BCS	6.64	1.70
15% BCS	6.71	1.91
20% BCS	6.67	1.98
25% BCS	5.94	2.29
Consonant SA	7.13	2.03
Flat SA	6.13	1.98
Reverse SA	2.65	1.85

BCS: Buccal corridor space; SA: Smile arc



**Fig. 3. The mean values and ranges of attractiveness scores for the nine smile images as rated by the entire sample. A: 0% BCS; B: 5% BCS; C: 10% BCS; D: 15% BCS; E: 20% BCS; F: 25% BCS; G: Ideal smile arc; H: flat smile arc; I: reverse smile arc**

### 3.3 The Effect of Age and Gender on Attractiveness Scores

The age range for the laypeople was 17-60 years. Around 33% of the laypeople were below the age of 21 years, and 33% above the age of 30 years. Age was divided into three groups in order to test for any significant effect on attractiveness ratings. The only statistically significant attractiveness score between different age groups was found for the ideal image (0% BCS with a consonant smile). The youngest group (below the age of 21 years) ranked this image as significantly more attractive as did the other age groups ( $P = .031$ ).

There were no significant differences between males and females in smile attractiveness ratings.

### 3.4 Influence of Profession and Treatment Experience on Attractiveness Rating

Out of the 104 raters interviewed, 91 (87.5%) filled out the information in the profession section of the questionnaire; 13 answers (12.5%) were missing.

There were statistical differences in rating the 10% BCS and the consonant SA images (Table 3). Group 1 (artists/graphic designers) rated the image with 10% BCS as significantly less attractive than the other two groups ( $P = .04$ ). The consonant smile image was rated as significantly more attractive by the second group (culinary arts) of raters ( $P = .01$ ).

No significant differences were found in smile attractiveness rating between those individuals who had orthodontic treatment and those who did not.

**Table 3. The effect of profession on smile attractiveness rating. Group 1: Artists and designers; Group 2: Culinary art professionals; Group 3: All others**

Image	Profession			P- value
	Group 1 (n=16) Mean (SD)	Group 2 (n=25) Mean (SD)	Group 3 (n=50) Mean (SD)	
0% BCS	7.69 (2.15)	8.00 (1.66)	7.02 (1.93)	.095
5% BCS	7.19 (1.22)	6.80 (2.20)	6.86 (1.84)	.788
10% BCS	6.19 (2.20)	7.40 (1.04)	6.48 (1.75)	.040
15% BCS	5.81 (1.47)	7.28 (1.88)	6.62 (2.01)	.057
20% BCS	6.94 (1.84)	7.16 (1.63)	6.70 (1.92)	.584
25% BCS	6.06 (1.53)	6.32 (2.63)	5.98 (2.16)	.820
Consonant SA	7.13 (1.54)	8.16 (1.34)	6.66 (2.32)	.010
Flat SA	6.13 (1.63)	6.68 (1.41)	6.04 (2.03)	.347
Reverse SA	2.31 (1.74)	2.96 (1.59)	2.78 (2.05)	.556

*BCS: Buccal corridor space; SA: Smile arc*

#### 4. DISCUSSION

The results demonstrated that small variations in BCS cannot be readily detected by laypeople; however a person's profession can have an influence on perception of smile attractiveness.

The study was limited to two aspects of smile aesthetics in order to minimize the confounding interactions that other aspects of smile aesthetics might have on the judgement of raters. Only the lips and teeth were shown in the images in order to reduce any confounding variables that might have an effect on judgement and to focus only on the smile. Although some authors argued that overall facial attractiveness was more important than dental aesthetics in evaluating the overall aesthetics [18], it is worth noting that in order to achieve the overall acceptability or attractiveness of a smile, the set of variables that affect smile aesthetics have to be studied separately in order to reduce any bias in the results. In a study conducted by Springer et al. [19] who used a full-face view, the reliability for the buccal corridor limits was poor compared to another study using a lower face or oral views [12].

It is important to note however that dental attractiveness is affected by the facial type of the individual. For example, some authors reported that a narrow smile is considered more attractive in individuals with short faces than in those with long faces [20]. The relationship between the dentition on one hand and the soft tissue, the nasal width and general facial width on the other hand is also important when evaluating smile in a full-face view. Since this would introduce many confounding variables, this study was limited to evaluating two aspects of smile aesthetics in intra-oral views only.

In this study, the raters were asked to rate the images on a scale of 1 to 10. Using this method can have an advantage over using the VAS, in that the score represents the actual feeling of the rater about attractiveness of the image [21].

The results of perceived impact of smile on social acceptance suggest that the smile plays an important role. The raters perceived the impact of smile on social acceptance and self-

confidence as important. This is in concurrence with the findings of Van der Geld et al. [22] and Abu Alhaja et al. [16].

Variations in BCS did not seem to have a significant impact on the laypeople's perception of attractiveness. Laypeople did not find a significant difference between images having 5% to 20% BCS. Only when the amount of buccal corridor display exceeded 20%, was the smile perceived as unesthetic. Other studies showed that laypeople were not that sensitive to changes in BCS [6,11].

In contrast, Moore et al. [5] found that laypeople detected changes in BCS and rated broad smiles as more attractive than narrow smiles. They, however, used paired images of different BCS from which the laypeople chose the most attractive. In our study, raters were not allowed to compare images which could explain the different findings.

The image with the broadest smile and consonant SA received the highest ratings. The same findings were corroborated by some studies [11,12] but not others [9,13]. Laypeople in our study gave low scores for the non-consonant smile images. The scores for non-consonant smile images were lower than for excessive buccal corridor images, indicating that SA has a greater impact on smile aesthetics than BCS. Accordingly, orthodontists should pay attention to the SA and should avoid any treatment mechanics that may result in flattening the smile arc.

There was no difference between the male and female raters in judging smile attractiveness. This is consistent with the findings of other authors [5,11,12].

Young adults in our study rated the image with the ideal SA and absent BCS as significantly more attractive when compared to older age groups. This can be attributed to the younger people being influenced by the western media and the photos of models displayed on most magazines that normally show a broad and consonant smile. These results were not corroborated by other studies [16,23].

Perception of smile aesthetics was not influenced by whether the rater had or did not have orthodontic treatment. Effect of treatment experience on smile aesthetics was not previously explored. However, one study which investigated facial profile attractiveness did not find that treatment experience had any significant influence on subjects' ratings [24]. The profession of laypeople influenced their perception of smile aesthetics. Those individuals who worked in the field of arts and design were more perceptive to small changes in BCS than the others. The reason for this is likely to be that artistic people tend to identify small variations in smile aesthetics because they are trained to notice such things.

The findings of this study illustrate that perception of smile aesthetics differs between subjects of different professions. Moreover, the relationship of the incisor edges of anterior teeth to the lower lip (smile arc) is an important aesthetic parameter to consider when planning dental treatment. Laypeople perceived non-consonant smile as unattractive in this study. This has important ramifications in dentistry; any dental work that does not take this variable into account, no matter how excellent, may not satisfy the patient. This is especially true in general oral rehabilitation, prosthodontics, orthodontics and orthognathic surgery that involve the anterior maxillary region. Dentist should take this into consideration and plan their treatment according to the relationship of teeth to the lips and not only to the dental occlusion.



## **5. CONCLUSION**

- A broad smile with absent BCS was found to be the most attractive smile while the reverse SA was perceived as the least attractive.
- The effect of SA on smile attractiveness seemed to outweigh the effect of BCS.
- Young adults perceived the broad and consonant smile as significantly more attractive than the older age groups.
- Profession had an influence on smile attractiveness ratings; artists were generally more perceptive to changes in BCS than subjects of other professions.

## **CONSENT**

Consent to participate in the study was obtained from the raters.

## **ETHICAL APPROVAL**

Ethical approval to conduct the study was obtained from the Faculty of Dentistry at the University of Jordan.

## **ACKNOWLEDGEMENTS**

The authors would like to thank Dr Hisham Alhelo for his help with the statistical analysis and Hala Tahboub for her help with editing the images.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

## **REFERENCES**

1. Arnett GW, Bergman RT. Facial keys to orthodontic diagnosis and treatment planning - part II. *Am J Orthod Dentofacial Orthop.* 1993;103:395–411.
2. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent.* 1999;11:311–324.
3. Sarver DM. Principles of cosmetic dentistry in orthodontics: part 1. Shape and proportionality of anterior teeth. *Am J Orthod Dentofacial Orthop.* 2004;126:749–753.
4. Frush JP, Fisher RD. The dynesthetic interpretation of the dentogenic concept. *J Prosthet Dent.* 1958;8:558–581.
5. Moore T, Southard KA, Casco JS, Qian F, Southard TE. Buccal corridors and smile esthetics. *Am J Orthod Dentofacial Orthop.* 2005;127:208–213.
6. Ritter DE, Gandini LG Jr, Pinto Ados S, Ravelli DB, Locks A. Esthetic Influence of Negative Space in the Buccal Corridor during Smiling. *Angle Orthod.* 2006;76:198–203.
7. Ioi H, Nakata S, Counts AL. Effects of buccal corridors on smile esthetics in Japanese. *Angle Orthod.* 2009;79:628–633.
8. 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;127:343-50.
9. McNamara L, McNamara JA Jr, Ackerman MB, Baccetti T. Hard- and soft-tissue contributions to the esthetics of the posed smile in growing patients seeking orthodontic treatment. *Am J Orthod Dentofacial Orthop.* 2008;133:491–499.

10. Sarver DM. The importance of incisor positioning in the esthetic smile: The smile arc. *Am J Orthod Dentofacial Orthop.* 2001;120:98-111.
11. 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;76:557–563.
12. Ker AJ, Chan R, Fields HW, Beck M, Rosenstiel S. Esthetics and smile characteristics from the layperson's perspective: a computer-based survey study. *J Am Dent Assoc.* 2008;139:1318–1327.
13. Rodrigues CD, Magnani R, Machado MS, Oliveira OB. The perception of smile attractiveness. *Angle Orthod.* 2009;79:634–639.
14. Sharma N, Rosenstiel SF, Fields HW, Beck FM. Layperson's esthetics and smile characterization between Caucasian and Indian populations. *J Dent Res.* 2010;89(special issue B):3626.
15. McLeod C, Fields HW, Hechter F, Wiltshire W; Rody W Jr, Christensen J. Esthetics and smile characteristics evaluated by laypersons. A comparison of Canadian and US data. *Angle Orthod.* 2011;81:198–205.
16. Abu Alhajja ESJ, Al-Shamsi NO, Al-Khateeb S. Perceptions of Jordanian laypersons and dental professionals to altered smile aesthetics. *Eur J Orthod.* 2011;33:450-456.
17. Badran SA, Mustafa M. A comparison between laypeople and orthodontists in evaluating the effect of buccal corridor and smile arc on smile esthetics. *Journal of World Federation of Orthodontists* (In press).
18. Shaw WC, Rees G, Dawe M, Charles CR. The influence of dentofacial appearance on the social attractiveness of young adults. *Am J Orthod.* 1985;87:21-26.
19. Springer NC, Chang C, Fields HW, Beck M, Firestone AR, Rosenstiel S, Christensen JC. Smile esthetics from the layperson's perspective. *Am J Orthod Dentofacial Orthop.* 2011;139:e91-e101.
20. Zange SE, Ramos AL, Cuoghi OA, de Mendonca MR, Rosely Suguino R. Perceptions of laypersons and orthodontists regarding the buccal corridor in long- and short-face individuals. *Angle Orthod.* 2011;81:86–90.
21. Phillips C, Tulloch C, Dann C. Rating of facial attractiveness. *Community Dent Oral Epidemiol.* 1992;20:214–220.
22. Van der Geld P, Oosterveld P, Van Heck G, Kuijpers-Jagtman AM. Smile attractiveness. Self-perception and influence on personality. *Angle Orthod.* 2007;77:759–765.
23. Martin AJ, Buschang PH, Boley JC, Taylor RW, McKinney TW. The impact of buccal corridors on smile attractiveness. *Eur J Orthod.* 2007;29:530–537.
24. Johnston DJ, Hunt O, Johnston CD, Burden DJ, M. Stevenson M, Hepper P. The influence of lower face vertical proportion on facial attractiveness. *Eur J Orthod.* 2005;27:349–354.

© 2014 Badran and Mustafa; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*  
<http://www.sciencedomain.org/review-history.php?iid=511&id=12&aid=4451>