

Original Article

Laypersons' perception of smile esthetics from different backgrounds

Fereshteh Najarzadegan¹, Faezeh Eslamipour²

¹Department of Orthodontics, School of Dentistry, New York University, School of Dentistry, New York, USA, ²Dental Research Center, Department of Oral Public Health and Orthodontics, Dental Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran

ABSTRACT

Background: Smile esthetics can be subjective. This study aims to assess the effect of culture/geographic location on judging smile esthetics by comparing the perception of smile characteristics between American laypersons (Western culture) and Iranians (Eastern).

Materials and Methods: One hundred residents from each country were recruited for this analytical cross-sectional study. A frontal picture of a posed smile with standard norms which are mentioned in the Contemporary Orthodontics textbook by William R. Proffit was selected. Adobe Photoshop 7 was used to alter midline diastema, gingival display (GD), maxillary midline-to-face discrepancy, buccal corridor (BC), and smile arc. Images were given to groups to determine the most attractive and acceptable smile. Data were analyzed by Chi-square, Mann-Whitney, and Spearman correlation coefficient in SPSS-22 ($\alpha = 0.05$).

Results: Americans were less critical in judging diastema ($P < 0.001$), GD ($P = 0.013$), and BC ($P = 0.004$) for smile attractiveness than Iranians. No difference was between the two groups in choosing the acceptability threshold and determining the most attractive smile except for BC ($P = 0.002$).

Conclusion: Overall, Americans were more tolerant of variations in smile characteristics than Iranians. Both groups agreed on most smiles. Therefore, it seems that it is reasonable to use similar standards for smile characteristics while considering the small differences.

Key Words: Computer-assisted image processing, dental esthetic, diastemas

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Address for correspondence:

Dr. Faezeh Eslamipour,
Department of Dental Public
Health and Orthodontics,
Isfahan University of Medical
Sciences, Hezar-Jerib Ave.,
Isfahan, Iran.
E-mail: eslamipour@dnt.
mui.ac.ir

INTRODUCTION

Hassebrauk claimed that the smile is the second indicator of a face's attractiveness after the eyes from people's point of view.^[1] The appearance of individuals and their attractiveness can significantly affect various aspects of personality, occupation, and social life.^[2] Consequently, the most common request of patients seeking dental treatments is to achieve an attractive smile.^[3] The importance of esthetics has increased nowadays.^[1] However, attractiveness

is extremely subjective and varies for each person. Social and cultural background, age, gender, ethnicity, and race are some factors that affect the desire for attractiveness.^[4,5] There is no clear definition of beauty; it is a complex subject as it relates to emotional, psychological, and social factors. In addition, beauty standards have been heavily influenced by the media.^[6]

In recent years, the impact of social media has rapidly changed the perception of esthetics.^[7,8] This

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necessitates that health-care providers who regularly address cosmetic concerns be aware of the ongoing change of population perception. Orthodontics involves smile design; therefore, understanding the perception of laypersons is important when addressing patients' chief complaints. Differences in the perception of facial esthetic standards also exist among different populations and must be considered for overall patient satisfaction.^[9]

Since patients are the primary consumer of orthodontic services, evaluating the features affecting smile esthetics could be helpful for dentists to predict patients' desire and provide significant posttreatment satisfaction. Besides identifying the most attractive smile from the viewpoint of laypersons, recognizing the threshold of acceptable smile characteristics is essential to avoid unnecessary treatment.^[10] An attractive smile is the result of the interaction between smile components (the teeth and the soft tissue).^[11] Kokich *et al.* measured orthodontists' and laypersons' perceptions of smile esthetics by using continuous photos of posed smiles adjusted that have some alterations on smile components.^[12] This study showed that orthodontists, general dentists, and laypersons detect specific dental esthetic discrepancies at varying levels of deviation. Some more studies were conducted on this topic in laypersons of different communities, which showed variations in results. Results of the studies in different communities will be discussed in detail in the following paragraphs.

Sadrhaghighi *et al.* illustrated that the acceptability thresholds for maxillary midline to face discrepancy (MMFD), buccal corridor (BC), and the golden ratio were different in nine cities, namely Yazd, Isfahan, Tabriz, Tehran, Doha, Rome, Sydney, Chicago, and Istanbul. They concluded that culture and race could affect the esthetic preferences related to a smile.^[13]

McLeod *et al.* compared Canadian laypersons' perceptions of smile esthetics to those of Americans to evaluate the effect of cultural differences on smile attractiveness. The Canadians were more sensitive than the American laypersons, and they had a narrower acceptability threshold for the BC, gingival display (GD), occlusal cant, MMFD, and lateral central gingival discrepancy.^[14]

Mejia Maidl *et al.* stated that Caucasians and Mexican Americans have different preferences in choosing

facial profiles. It has been shown that protrusion of both lips, especially for women's photos, was considerably more acceptable among Mexican Americans than among Caucasians.^[15]

Saffarpour *et al.* studied 10 laypersons in Iran, and they stated that a gummy smile, defined as more than 2 mm of gingival show in a full smile, was considered completely unesthetic.^[16] In spite of this, Kumar *et al.* stated that Indian people prefer greater GD, which appears more youthful.^[17]

Golshah *et al.* declared that BC and lip line position are important features affecting the smile attractiveness of Persian women. This is while maximum incisor exposure, intervermillion distance, interlabial gap, intercanine width, width of visible teeth, GD, and BC are not significant features on smile attractiveness based on Iranian laypersons' perception.^[18]

As mentioned above, different communities have different preferences for smile esthetics. Clinicians recognize some of these references as they gain clinical experience. However, it is our obligation as clinicians to scientifically investigate further in order to be updated with ongoing changes influenced by social media "trends." American culture includes multiple backgrounds due to the large number of immigrants including Iranians.^[19] Iran, on the other hand, consists of a less versatile background due to a lesser load of immigration into Iran.^[9] Because of that, this study is designed to assess and compare the perception of American and Iranian laypersons to represent two samples from the Western and the Eastern cultures about some effective characteristics of smile esthetics.

MATERIALS AND METHODS

The study was approved by the Ethics Committee of the Isfahan University of Medical Science, and the ethical code is IR.MUI.RESEARCH.REC.1397.118. This analytical cross-sectional study was conducted on laypersons randomly selected among 200 adults who were grown with residents in the age range of 18–60 years from four states of the USA, namely Kentucky, Minnesota, Texas, and Colorado, and four cities of Iran: Isfahan, Tehran, Mashhad, and Tabriz. Participants were recruited from dormitories, terminals, airports, and parks. Individuals with dental professional affiliations, orthodontic treatments, or orofacial syndromic anomalies were excluded. Participants voluntarily completed an anonymous questionnaire.

Using Adobe Photoshop 7, an image of a frontal view of a posed smile with characteristics close to standard norms which are mentioned in the Contemporary Orthodontics textbook by William R. Proffit was selected and cropped to the lower face. It was manipulated to alter midline diastema, GD, MMFD, BC, and smile arc (SA) following the protocol of Ker *et al.*^[10,20] Moreover, they were converted to black and white to eliminate the effect of skin color on the judgment.^[21] All images related to each type of malocclusion were printed on a paper and given to each evaluator. The size of each image was 13.2 cm × 6.6 cm. The participants selected the most attractive and acceptable thresholds for several independent smile characteristics [Figures 1-5].

Three questions were asked for each characteristic:

1. Do you think that the changes made to the images affected the smile attractiveness? (if your answer is yes, please answer the following questions)
2. Which image represents the most attractive smile in your opinion?
3. In which images is the smile considered acceptable?

The reliability of the method and questionnaire was assessed by using a test/retest on 15 individuals before doing the main project. Data analysis was performed using the intraclass correlation coefficient (ICC) test for multiple-choice questions and kappa for yes/no

questions. The mean value of ICC was 0.85, and the mean value of kappa was 0.75. *P* values were < 0.05 in all cases.

Demographic variable comparisons were made using Chi-square and Mann–Whitney tests. Differences in choosing the most attractive smile and the threshold of acceptability were analyzed using mean values and frequency distributions. Chi-square test was used to compare the effect of each variable between the groups. The most attractive smile and the acceptability thresholds were calculated for participants in each country using the Mann–Whitney test. Differences between the two groups were evaluated with the level of significance established at alpha 0.05 for all analyses using statistical software.

RESULTS

A total of 100 American laypersons (46 males, 54 females) and 100 Iranian laypersons (40 males, 52 females) were recruited in this study. The average age of participants was 31.44 ± 12.79 years in Iran and 29.89 ± 13.54 in the USA.

According to analyzing the first question in the questionnaire, diastema ($P < 0.001$), GD ($P = 0.013$), and BC ($P = 0.004$) had a significant effect on the smile's attractiveness among both groups [Table 1].

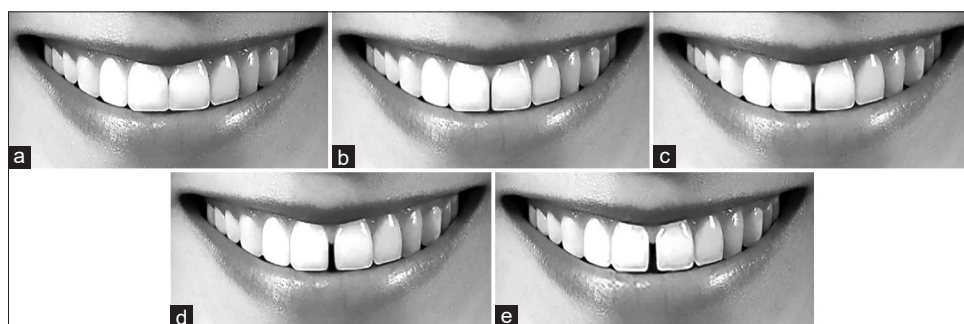


Figure 1: Midline diastema: (a) 0 mm, (b) 0.5 mm, (c) 1 mm, (d) 1.5 mm, (e) 2 mm.

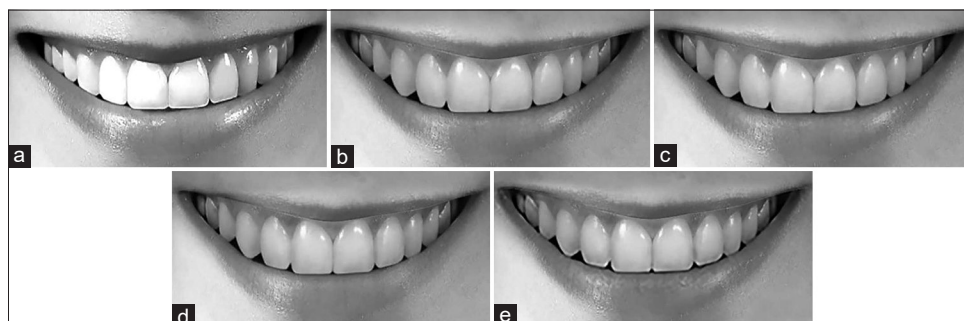


Figure 2: Gingival display: (a) 0 mm, (b) 0.5 mm, (c) 1 mm, (d) 1.5 mm, (e) 2 mm.

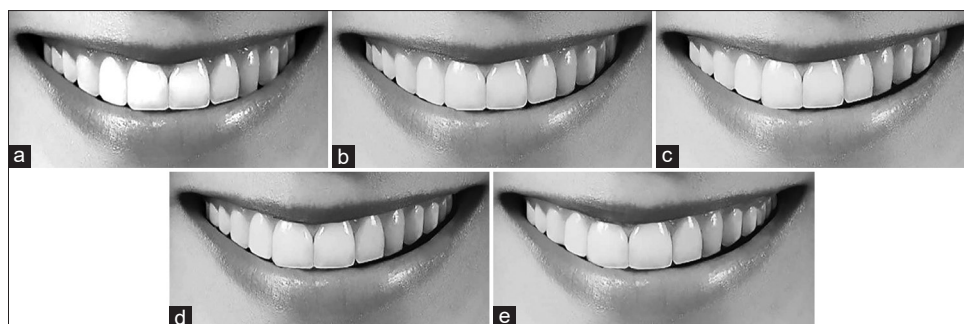


Figure 3: Maxillary midline to face discrepancy: (a) 0 mm, (b) 1 mm, (c) 2 mm, (d) 3 mm, (e) 4 mm.

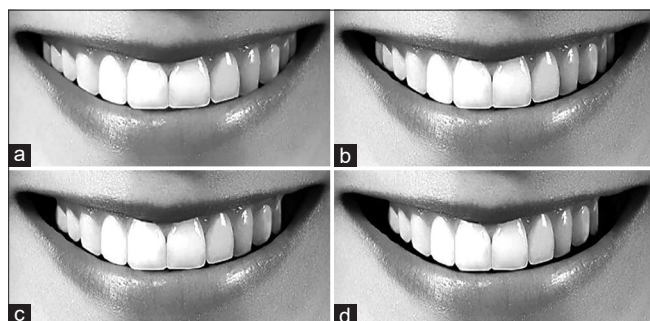


Figure 4: Buccal corridor: (a) 2 mm, (b) 4 mm, (c) 6 mm, (d) 8 mm.

The percentage frequency of the different smile characteristics rated by the study population and the corresponding P values are presented in Table 2. There was no significant difference in determining the most attractive smile and the acceptable threshold of all smile characteristics between the two groups except the most attractive smile of BC ($P = 0.002$). The percentage frequency distribution was more scattered among the American laypersons than Iranians when choosing acceptable smiles for GD and BC.

We can see some numbers after the decimal points in Table 2 because some of the participants skipped a few questions.

Gender did not have a significant effect for different smile characteristics except SA among Iranians. The effect of SA on smile's attractiveness was more sensitive among Iranian females than males.

DISCUSSION

This study focused on comparing the perception of some characteristics of smile esthetics between American and Iranian laypersons as representatives of different backgrounds.

Based on the result of this study, American laypersons were more tolerant with the effect of diastema, GD,

and BC on smiles' attractiveness. This can be due to the cross-cultural influences in the USA. In other words, American laypeople are exposed to more various people with different cultures and esthetic preferences. This can result in accepting differences more than Iranian laypeople. In the perception of all smile characteristics investigated, a significant difference was only found about the acceptability threshold of BC between the two groups.

Although diastema had an important effect on smile's attractiveness for both group perceptions, it was less tolerable among Iranians (2% vs. 19%). Collectively, the wider the diastema, the less attractive the smile. This is in agreement with the research of Nouredine *et al.*, Rodrigues *et al.*, and Machado *et al.* The present study reveals that the most attractive smile and the threshold of acceptability are, respectively, smiles with no spacing and smiles with 1 mm midline diastema in each group.^[22-24] This is in agreement with Abu Alhaja *et al.* who stated that the presence of a midline diastema of any size was unattractive and unacceptable among Jordanian laypersons which belong to Eastern Caucasian background as well.^[25] However, Kumar *et al.* stated an acceptable threshold of 1.5 mm for Indian laypersons.^[17] Parrini *et al.* concluded that the mean threshold of acceptance for midline diastema is 1.5 mm in all previous studies.^[26] Ahiaku showed that the maxillary midline diastema has experienced a renaissance in popular West African culture over the last 10 years. This study proves that although smiles with 2–4 mm diastema were chosen as the most attractive smiles by West African laypeople, they prefer 0–1 mm diastema these days.^[27] In recent years, the advocacy of uniqueness and inclusivity in beauty standards has been increasing in social media.^[6] Furthermore, few celebrities including models and singers have been known for their central diastema.^[28] These factors have perhaps influenced the laypersons.

Table 1: The percentage frequency distribution of the effectiveness of the investigated smile characteristics

Characteristics	Countries				P
	USA		Iran		
	Yes, n (%)	No, n (%)	Yes, n (%)	No, n (%)	
Diastema	81.2	18.8	98	2	<0.001*
GD	81.2	18.8	93	7	0.013*
Maxillary midline to face discrepancy	34.7	65.3	27	73	0.240
BC	55.4	44.6	75	25	0.004*
SA	83.2	16.8	92	8	0.058

*P<0.05. GD: Gingival display; BC: Buccal corridor; SA: Smile Arc

Table 2: Percentage frequency distribution of the different smile characteristics as rated by the study population and P value

Characteristics	Countries												P
	USA						Iran						
	A	B	C	D	E	Mean	A	B	C	D	E	Mean	
Diastema													
Most attractive	81.7	15.9	1.2	1.2	0	0.10	76.5	19.4	3.1	0	1	0.14	0.385
Acceptable	20.7	19.5	32.9	7.3	19.5	0.92	20.4	25.5	40.8	8.2	5.1	0.76	0.144
GD													
Most attractive	70.7	24.4	0	3.7	1.2	1.40	75.3	19.4	0	0	5.4	1.40	0.558
Acceptable	24.4	35.4	12.2	12.2	15.9	2.59	16.1	48.4	8.6	5.4	21.5	2.67	0.635
Midline discrepancy													
Most attractive	54.3	25.7	14.3	0	5.7	0.77	51.9	14.8	22.2	0	11.1	1.03	0.539
Acceptable	22.9	31.4	31.4	5.7	8.6	1.45	11.1	29.6	18.5	37	3.7	1.92	0.097
BC													
Most attractive	34.5	41.4	15.5	8.6	-	3.96	66.2	16.2	12.2	5.4	-	3.13	0.002*
Acceptable	26.3	24.6	22.8	26.3	-	4.98	20	41.3	26.7	12	-	4.61	0.371
SA													
Most attractive	92.9	6	1.2	-	-	-	96.7	0	3.3	-	-	-	0.269
Acceptable	59	27.7	13.3	-	-	-	69.6	25	5.4	-	-	-	0.095

*P<0.05. BC: Buccal corridor; GD: Gingival display; SA: Smile Arc



Figure 5: Smile arc: (a) consonant, (b) straight, (c) reverse.

From the perspective of the majority of Iranian and American laypersons, GD is an effective factor on the smile's attractiveness. Although most of the laypersons in both countries chose the smile with 0 mm GD as the most attractive smile, it was 1 mm among Jordanians and 0.5 mm among Israelis.^[25,29] The smile with 0.5 mm GD was the threshold of acceptability in both groups, but the percentage frequency distribution was scattered among the American population [Table 2]. This may be explained by the multiple backgrounds/cultures

included in the American population. Therefore, it can be concluded that variations of GD are more acceptable to the American people than Iranians. Generally, high GD was not favorable in both groups. This is in agreement with Pithon *et al.*, who stated that increased GD would decrease the smile's attractiveness among Brazilian laypersons.^[30] In spite of this, Kumar *et al.* stated that not only GD is acceptable to most Indian people, but also it causes them to seem more youthful.^[17] According to a study by McLeod *et al.*, the acceptable threshold

for GD is 3 mm among the Canadian laypersons.^[14] The results of the Van der Geld *et al.* study on The Netherlands' laypersons, Kokich *et al.* study on the laypersons of the Seattle, Washington, and Ker *et al.* study on the laypersons of Columbus, Ohio, showed the threshold of 4 mm as the acceptable one.^[10,12,31] The more recent study of Kokich *et al.* revealed that American laypersons prefer a narrower range of 3 mm GD while the acceptable range of the present study (2 mm) was less than the previous ones,^[32] so it can be concluded that passing of time has been effective on this issue, and the American laypersons prefer less GD these days. Among the previous studies conducted on various communities, the Israeli laypersons preferred less GD than other communities. This value is 0.5 mm for the most attractive smile and 1 mm for the acceptable smile among Israelis.^[29] The increased emphasis on "natural beauty trend" has been more popular in the East compared to the West part of the world. GD may be considered a uniqueness added to a person's smile from this point of view, hence the detected differences in this study.

In this study, BC was a significant factor in the attractiveness of a smile, with a higher percentage of Iranian laypersons finding it more important compared to Americans. The smile with 4 mm BC was the most attractive smile among Americans while it was 2 mm among Iranians. Both groups agree that smiling with collapsed arcs and wide BC is deemed unattractive, which is in agreement with research conducted by Roden Johnson *et al.* in Houston, Texas, Badran and Mustafa in Jordan, Martin *et al.* in Dallas, Texas, and Parekh *et al.* in Columbus, Ohio. Most of the Iranian laypersons (41.3%) selected the smile with 4 mm BC space as the threshold of acceptability.^[33-36] However, the percentage frequency for American laypersons does not show a significant distribution [Table 2]. The distribution illustrates that American laypersons are more tolerant of wide BC than Iranians. The mean threshold of acceptance for BC was 4.98 ± 2.30 among American laypersons and 4.61 ± 1.85 among Iranians. In other studies, the range of tolerance varied from 5 to 16 mm, and our result matched with this range too.^[26] McLeod *et al.* stated that BC in Canada might be a more critical treatment objective than in the USA.^[14]

In this study, MMFD up to 4 mm is not discernible for most of the people in both countries. A small percentage of subjects in both groups answered yes to the first question of the questionnaire, and the scattering percentage frequency distributions confirm

this result [Table 2]. This is in agreement with Kokich *et al.* research, which stated that MMFD up to 4 mm could not be perceptible by laypersons.^[12] Rodrigues *et al.* found no differences in the perceptions of an ideal smile and 3 mm MMFD among Brazilian laypersons, while Guo *et al.* mentioned the threshold of 2.63 mm as the acceptable smile among Chinese people.^[23,37] In our study, the frequency distributions are scattered among respondents who recognized the MMFD in both countries [Table 2]. Therefore, it can be concluded that MMFD of up to 4 mm is acceptable in both countries while the majority of both groups chose the smile without MMFD as the most attractive smile.

In the perception of the majority of both groups, SA is a significant factor in the attractiveness of a smile. The most attractive smile and the acceptability threshold were smiles with a consonant SA among both groups. The least attractive one is the reverse SA which is in agreement with Badran and Mustafa, Ker *et al.*, and Parekh *et al.*^[10,34,36] Therefore, it could be said that in both groups, SA greatly affects the attractiveness of a smile, and the consonant SA is the most attractive one and the threshold of acceptability. Gender was an effective factor in determining the impact of SA on smile attractiveness. Females were less tolerant in choosing an acceptable threshold of SA, which is in agreement with Geron and Atalia, who stated that women expect higher smile's attractiveness than men.^[29]

Rater age and gender did not significantly influence the impact of all characteristics on smile's attractiveness except SA among Iranians, so it can be concluded that men's and women's viewpoints are not significantly different in determining the attractiveness of a smile.

Considering the study's limitations, such as its focus on only two countries, qualitative analysis in perception studies may provide a deeper understanding of these differences. It may be reasonable to predict more similarities among the world's population in their perception of beauty in the near future. Abbasi *et al.* showed that the desire for esthetic dentistry is rapidly increasing, and social media serves as the primary driving force behind this transformation. In other words, the world is rapidly becoming a smaller place due to the universal access of social media.^[38] Studying the effect of social media on smile esthetics is worth a close attention from dental research.

CONCLUSION

American laypersons are more tolerant than the Iranians to the effect of some characteristics such as diastema, GD, and BC on the smile's attractiveness. In general, no significant difference was observed between the perception of American and Iranian laypersons in determining the most attractive smile and the acceptable threshold of all smile characteristics between the two groups except the most attractive smile of BC. The percentage frequency distribution was more scattered among the American laypersons than Iranians in choosing acceptable smiles for GD and BC. In other words, the variation in GD and BC was more acceptable to the American people than to Iranians. Gender did not have a considerable effect on different smile characteristics except SA.

Recommendations

More studies are needed to evaluate the effect of other characteristics, including dental size ratios, occlusal plane cant, and the effect of dental or skeletal symmetry on the smile's attractiveness.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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