

Laypersons' Perceptions of the Esthetics of Visible Anterior Occlusion

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ABSTRACT

Objective: To analyze 6 different types of visible anterior occlusion, exclusive of extraoral facial features, in terms of their esthetic appeal, as perceived by 91 randomly selected adult laypersons with different levels of education in Lima, Peru.

Methods: Photographic images of 3 examples of each occlusion type (open bite [OB], deep bite [DB], crossbite [CB], end-to-end bite [EE], crowded bite [CwB] and ideal bite [IB]) were prepared. Evaluators used a visual analogue scale (VAS) to rate their perceptions of the esthetic appeal of each view. Analysis of variance (ANOVA) was used to test differences in mean scores among occlusion types and to test the effect of evaluator characteristics on perceived attractiveness.

Results: The mean score was highest for IB, followed by EE, DB, CB, CwB and OB. One-way ANOVA with Bonferroni post hoc test showed no difference between the highest-scoring occlusion types (IB and EE, $p > 0.99$); each of the remaining groups was significantly different from both IB and EE ($p < 0.001$). The scores for DB, CB, CwB and OB were progressively lower, although not significantly different from one another ($p > 0.05$). Univariate ANOVA to determine the effects of evaluator characteristics (age, level of education, gender and interaction between level of education and gender) showed that gender was a significant factor ($p < 0.034$) for all bite groups except OB. Level of education was significant only for OB ($p = 0.020$) and age only for EE ($p = 0.011$). The interaction between level of education and gender was significant for all bite types ($p < 0.046$).

Conclusions: Lay evaluators identified ideal and EE bite occlusal relationships as esthetically most pleasing. They judged DB, CB, CwB and OB bite relationships as less esthetically pleasing but did not differentiate between these types of malocclusions.

MeSH Key Words: attitude to health; esthetics, dental; malocclusion/psychology; self concept

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Esthetic considerations represent the main reason for seeking orthodontic treatment, and satisfaction with the outcome depends on the patient's expectations. Patients' assessments of dental esthetics are therefore important,¹ and attempts should be made to delineate and understand their perceptions. Such an understanding would permit better fulfillment of treatment expectations.

Within the face, the mouth and teeth are major features in the evaluation of physical appearance.² It has been suggested that

maxillary, mandibular and dental structure have an indirect impact on the perception of facial beauty.³ The dentition is an important part of a person's overall facial appearance and is therefore related to self-esteem.⁴ In previous research, college students had differing perceptions of normal incisor relationships and abnormal dental arrangements in the context of the full smiling face.⁴ Differences in level of education^{5,6} and gender^{3,7} may influence the esthetic perception of facial features.



Figure 1: Ideal bite.



Figure 2: End-to-end bite.



Figure 3: Deep bite.



Figure 4: Anterior crossbite.



Figure 5: Crowded bite.



Figure 6: Open bite.

The aim of this study was to analyze 6 different types of visible anterior occlusion, exclusive of extraoral facial features, in terms of their esthetic appeal as perceived by laypersons. The same types of anterior occlusions have been previously demonstrated⁷ to affect esthetic perceptions of smiling faces by men and women with different levels of education.

Materials and Methods

Eighteen young adults selected from a pool of students in a university dental clinic in Lima, Peru, were arranged into 6 groups of 3 according to their anterior bite arrangements (open bite [OB], deep bite [DB], crossbite [CB], end-to-end bite [EE], crowded bite [CwB] and ideal bite [IB]) (Figs. 1 to 6). Standardized 10 × 15 cm anterior intraoral photographs, with the teeth closed in centric occlusion and with a lip separator in place, were taken at a reproduction ratio of 1:1.5 with a Yashica Dental Eye I camera (Kyocera Co, Kyoto, Japan). This view included the anterior teeth and surrounding gingival tissues.

A 20 × 15 cm booklet of 19 photographs (the 18 photographs described above and 1 example photograph) was prepared. The example photograph was used to explain to the evaluators how they were supposed to use the booklet. One photograph was centred on each page of the booklet. A visual analogue scale (VAS) consisting of 18 lines, each 10 cm long, was used to assess evaluators' esthetic preferences for the photographs. This format of VAS has been

previously used for similar tasks.⁷⁻⁹ Ninety-one adult lay volunteers (45 women and 46 men, of whom 20 had completed elementary school, 37 had completed high school and 34 had completed college) were selected from people accompanying patients to the university dental clinic and from residents of the neighbourhood surrounding the university. The volunteers ranged in age from 17 to 82 years (mean age: 32.7 years ± 14 years). The evaluators may be considered ethnically representative of the population in the area surrounding the dental clinic. None of the evaluators had a health sciences or artistic background. After providing informed consent, the evaluators were asked to examine each view for a maximum of 1 minute; they were not allowed to re-evaluate previously seen photographs. They rated the esthetic appeal of each view on a VAS from 0 (least pleasant imaginable) to 100 (most pleasant imaginable): no further instructions were given.

Eight randomly selected evaluators were approached for a second time 1 week later to rate the photographs again. The intraclass correlation coefficient for reliability was 0.994.

Mean VAS score and standard deviation were calculated for each type of anterior occlusion. A Levene test was used to test the homogeneity of variances, and a one-sample Kolmogorov-Smirnov test was used to evaluate whether the samples came from a normally distributed population. A one-way analysis of variance (ANOVA) with Bonferroni post hoc testing was used to compare the mean

Table 1 Mean esthetic scores (and standard deviation) (maximum score 100)

Evaluator characteristics	Bite type					
	IB	EE	DB	CB	CwB	OB
Gender						
Men (<i>n</i> = 46)	56.34 (27.29)	53.02 (24.74)	28.83 (18.78)	25.70 (17.62)	24.59 (18.54)	20.32 (19.23)
Women (<i>n</i> = 45)	43.04 (25.02)	40.36 (19.66)	18.38 (13.67)	19.00 (13.31)	19.13 (14.73)	18.22 (13.68)
Level of education						
Elementary school (<i>n</i> = 20)	40.20 (26.85)	40.20 (20.61)	21.02 (14.12)	17.27 (13.38)	25.37 (18.35)	15.98 (13.73)
High school (<i>n</i> = 37)	49.49 (28.10)	49.49 (24.43)	25.82 (19.77)	24.50 (17.94)	21.79 (18.73)	22.64 (20.60)
College (<i>n</i> = 34)	47.27 (28.30)	47.27 (22.87)	22.57 (15.78)	22.91 (14.53)	19.81 (13.67)	17.50 (12.55)
Overall (<i>n</i> = 91)	49.62 (21.69)	46.62 (23.08)	23.55 (17.13)	22.32 (15.86)	21.83 (16.85)	19.26 (16.60)

IB = ideal bite, EE = end-to-end bite, DB = deep bite, CB = crossbite, CwB = crowded bite, OB = open bite

scores between occlusion types. Finally, univariate ANOVA was used to evaluate the effects of evaluator characteristics (age, level of education, gender and the interaction between level of education and gender) on the mean VAS scores.

Results

The gender ratio of the evaluators differed according to level of education: there were more women among those who had completed high school and more men among those who had completed college. No differences by age or gender were found in the photographed subjects (10 males and 8 females).⁷

The IB and EE occlusion types received the highest esthetic scores (with no difference between these 2 types, one-way ANOVA, $p > 0.99$). Each of the remaining groups was significantly different from both IB and EE ($p < 0.001$). Although not significantly different from one another ($p > 0.05$), the esthetic scores were progressively lower for DB, CB, CwB and OB respectively (Table 1).

Univariate ANOVA to evaluate the effects of evaluator characteristics on the anterior occlusion esthetic score indicated that gender was a significant factor for all the bite groups except OB ($p < 0.034$). Level of education was significant only for OB ($p = 0.020$) and age only for EE ($p = 0.011$). The interaction between level of education and gender was significant for all bite types ($p < 0.046$).

Discussion

Professional assessment of dental appearance is important, but patients' opinions regarding dental appearance should also be respected and included in assessments for treatment planning.¹⁰ Unfortunately, clinicians do not always realize that it is the perception of esthetic appeal

and not the actual physical characteristics to which laypersons respond; furthermore, laypersons often do not have the ability to communicate their feelings or treatment expectations.¹¹ Of all the possible arrangements of the anterior teeth, orthodontists typically think that one in which the teeth are perfectly arranged is the most beautiful, but laypersons may not agree.¹² Previous studies^{11–15} have shown that laypersons are usually less critical about small esthetic details than are orthodontists, general dental practitioners and dental students.

The results reported here support the findings of a previous study,⁷ which evaluated laypersons' esthetic perceptions of anterior occlusion types seen in the context of the full smiling face. Here, the view of the teeth was restricted to the intraoral region, but the same occlusion types were judged as most pleasing. IB and EE bite types had similar ratings, both being more esthetically pleasing than the other bite types. Apparently these 2 bite types appear very similar to laypersons and have a different appearance from the other bite types, which were rated as less esthetically pleasing. Laypersons may not differentiate morphologically between malocclusions; they may simply categorize certain types as unesthetic, regardless of whether they are viewed in the context of the full face or in a restricted intraoral view. The absence in this study of other facial features, such as skin tone, nasal shape, lip fullness and the eyes did not alter judgement of dental esthetics.

The present study found that women were more critical of dental appearance than their male counterparts, which supports 2 previous reports^{3,7} and contradicts a third study.¹⁵

In some studies^{5,6} the level of education had a significant influence on esthetic perceptions, but the present study and others^{7,15} did not identify a consistent influence of this factor. Apparently people with higher levels of education in an area other than the health sciences or the arts were not more critical of specific types of malocclusion than less-educated persons. Interestingly, well-educated female laypersons were the most critical of dental esthetics for all bite types.

An understanding of laypersons' perceptions of various bite relationships may influence treatment planning decisions. Without considering the functional aspects of establishing anterior occlusal guidance for excursive jaw movement, there is no perceived esthetic advantage for the patient in achieving ideal overbite and overjet. In some instances orthodontic bite correction to adjust an end-to-end bite type to an ideal overbite and overjet would require orthognathic surgery. Without any perceived esthetic benefit, however, it might be difficult for the patient to justify the potential risks and recovery time associated with surgical intervention. Similar implications apply to restorative dentistry.

This study had some limitations. The limited sample size of the evaluators in relation to the number of photos for each bite type was probably a significant factor in the large standard deviations (Table 1). Therefore, caution must be exercised in extrapolating the present findings to clinical situations. Also, some of the evaluators were attending the university dental clinic as patient companions, whereas other evaluators were recruited from the surrounding neighbourhood; some bias may have arisen from the differing exposure to a dental environment in these 2 subgroups.

Efforts to obtain representative examples of the visible anterior occlusion types without large restorations or crowns, gingivitis or periodontitis, or large enamel defects were not always successful, and it was especially difficult to find occlusion types that did not overlap (e.g., open bite without simultaneous crowding). A few photos showed some degree of gingivitis, and one had visible caries (Fig. 3). The influence of these factors on esthetic ratings was not quantified. Also, evaluators' socioeconomic status was not evaluated, although previous research has shown that socioeconomic status influences esthetic perceptions.

Additional research using the same methodology is needed, but with a larger sample of laypersons as evaluators. The influence of the degree of gingivitis or caries should be eliminated through careful selection of example cases. Also, different sociocultural populations should be evaluated, as intercultural differences may prevent direct application of results from one group to other populations.

Conclusions

The IB and EE bite types received the highest ratings, with no statistically significant differences between them. DB, CB, CwB and OB bite types were rated as significantly less esthetically appealing. The OB bite type received the lowest ratings, but there was no statistically significant difference among the 4 lowest-rated bite types. Gender had a significant influence on the perceptions of anterior occlusion except for the OB bite type. ♦

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