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Influence of Anterior Occlusal Characteristics on Self-perceived Dental Appearance in Young Adults

Eduardo Bernabe;[a] Carlos Flores-Mir[b, c]

ABSTRACT

Objective: To determine the individual and combined influence of some anterior occlusal characteristics on self-perceived dental appearance in a sample of young adults.

Materials and Methods: This cross-sectional study was conducted at a dental clinic of a private university in Lima, Peru. A total of 267 first-year students (16 to 25 years old) were randomly selected. A visual analog scale (VAS) was used to determine the self-perceived dental appearance. Clinical examinations were conducted to determine incisal irregularity, anterior dentoalveolar spacing, midline diastema, anterior missing teeth, overjet, and overbite. Simple and multiple linear regression analyses were performed to determine the individual and combined influence of each anterior occlusal characteristic on self-perceived dental appearance.

Results: From the eight occlusal characteristics and two covariables evaluated, only maxillary and mandible incisal irregularity (P = .001 and .002 respectively), presence of anterosuperior spacing (P < .001), and number of missing anterior teeth (P = .003) were inversely associated with self-perceived dental appearance, whereas gender (male) was directly associated to the dependent variable (P = .021). Specifically, anterior maxillary spacing, maxillary incisal irregularity, mandible incisal irregularity, and the number of missing teeth were, in that order, the anterior occlusal characteristics with the most negative influence on self-perceived dental appearance.

Conclusions: This study confirmed that occlusal characteristics in the anterior portion of the mouth play a role on dental esthetics. However, it should be emphasized that their grouped influence is minimal (less than 20%).

KEY WORDS: Malocclusion, Orthodontic treatment need, Young adults.

INTRODUCTION Return to TOC

Dentofacial esthetics plays an important role in social interaction and psychological well-being because it affects how people perceive themselves and how they are perceived by society.[1] Therefore, concern about personal dental appearance has often been found to be a major reason for seeking orthodontic treatment.[2–4] For the patient, the psychological benefits of the orthodontic treatment often prevail over improvements in function and dental health.[2,5,6]

Body image consciousness increases during late childhood and adolescence until adulthood, therefore, young adults are considered to be a relevant age group for the study of self-perceived dental appearance.[5,7] Although teasing and dissatisfaction because of dental appearance may be frequent in children and adolescents, this is not necessarily recognized by them as a need for orthodontic treatment. Only when they attain more maturity do they become more aware of their appearance and associate it with a need for orthodontic care.[8]

Even mild forms of dentofacial deviation, such as malocclusion, can predispose people to psychological distress and anxiety.[9] Because some occlusal traits are specially visible in normal face-to-face interactions, lay and public awareness of malocclusion is almost exclusively limited to the anterior portion of the mouth.[5,8,10,11] Accordingly, increased overjet, extreme deep-bite, dental crowding, and spacing have all been reported to be associated with teasing and dissatisfaction.[1,3,8,10–13]

However, most of the studies[1,3,8,11–13] have assessed only the individual impact of certain occlusal characteristics on self-perceived dental appearance, and not the interactions of all of them together. Because most malocclusions have combinations of several altered occlusal traits, the limitation from previous studies could be solved by using multivariate statistical tests, thus permitting the assessment of several characteristics simultaneously as well as the presence of interactions between them.

The purpose of this study was to determine the individual and combined influence of some anterior occlusal characteristics on self-perceived dental appearance in a sample of young adults.

MATERIALS AND METHODS Return to TOC

A sample of 267 first-year students (16 to 25 years old) was randomly selected from a population of approximately 2,000 students admitted to a private university in Lima, Peru. The registration list of the students admitted to the 2002 academic year was used as a sampling frame for the sample selection. This private university has a population that is likely socio-economically representative of the Peruvian population. The minimum sample size of 267 students was calculated in order to have a 90% power (β = 0.20) to obtain a statistically

significant correlation between self-perceived dental appearance and any occlusal characteristic at the 5% level (α = 0.05).[14] None of the selected students had any type of previous orthodontic treatment, and all of them signed a voluntary consent letter. The ethics review board at the Universidad Peruana Cayetano Heredia approved this study.

A single orthodontist assessed six occlusal parameters by visual examination and a periodontal probe inside the facilities of the university dental clinic. For calibration purposes, 10 students from the evaluated population were examined twice, on different days, in order to calculate the intra-examiner reliability (minimum .85, intraclass correlation coefficient). The following occlusal characteristics were recorded: incisal irregularity, anterior dentoalveolar spacing, midline maxillary diastema, anterior missing teeth, overjet, and overbite.

Incisal irregularity was measured as the distance (in mm) by which the most displaced incisor is out of the ideal dental arch alignment.[5,15] Anterior dentoalveolar spacing was recorded as the excess of space between both canines. A midline maxillary diastema was recorded as the presence of spacing between both upper centrals. The number of missing teeth in the anterior region, from the right second premolar to the left second molar was also recorded.[15] Finally, overjet was defined as the distance (in mm) on the occlusal plane from the labio-incisal edge of the most prominent upper central incisor to the labial surface of the corresponding lower central incisor.[5,8] The overbite was measured as the vertical overlap (in mm) from the labio-incisal edge of the upper central incisor with the greatest overlap to the labio-incisal edge of the corresponding lower central incisor.[16,17]

Thereafter, students were asked to rate their self-perceived dental appearance through a 100-mm visual analog scale (VAS) by drawing a vertical line to intersect the scale where appropriated. The scale was anchored by the phrase "worst imaginable esthetic" at the 0 mm end and "most ideal esthetic" at the other end. This variable was considered as dependent for the statistical analysis.

Simple linear regression analyses were performed to determine the individual influence of each anterior occlusal characteristic over the self-perceived dental appearance. At this stage, individual coefficients of correlation and determination (r and R^2, respectively) were also estimated.[14,17] Then, a multiple linear regression analysis using the stepwise method was carried out to assess the combined influence, including interaction terms, of the evaluated anterior occlusal characteristics and covariables (gender and age) on the dependent variable. Assumptions of independence (colinearity), normality, and homoscedasticity were corroborated through analysis of residuals for each linear regression analysis that was performed.[17]

RESULTS Return to TOC

One hundred and fifty-two men (56.9%) and 115 women (43.1%) participated in the study. The mean age in these young adults was 17.90 ± 1.35 years, with approximately three-quarters of them (77.5%) between 16 and 18 years of age.

On the VAS scale, the mean score was 59.40 ± 18.15 mm, with minimum and maximum values of 0 and 100 mm, respectively. The distribution of the study sample according to the eight anterior occlusal characteristics evaluated is shown in Table 1 O=.

At the bivariate level (simple linear regression analyses), it was found that from the eight anterior occlusal characteristics evaluated, only the amount of maxillary and mandible incisal irregularity (P < .001 in both cases), the number of missing teeth (P = .003), and overjet (P = .011) were inversely associated to self-perceived dental appearance. Similarly, from the two covariables evaluated, only age was inversely associated to the dependent variable (P = .029). Individual influence of all anterior occlusal characteristics and covariables can be seen in Table 2 O=. Then, a multivariate model was built to explain the variability in the self-perceived dental appearance of these young adults (Table 3 O=).

According to the multiple linear regression analysis, from the eight occlusal characteristics and two covariables evaluated, only the maxillary and mandible incisal irregularity (P = .001 and .002, respectively), the presence of maxillary dentoalveolar spacing (P < .001), and the number of missing teeth (P = .003) were inversely associated to the self-perceived dental appearance; male gender (P = .021) was directly associated to the dependent variable. No two-order and three-order interaction term was identified as significant.

The regression coefficients were standardized in order to determine which factors had a greater influence on self-perceived dental appearance (Table 3 O=). Through this measure, it was found that the maxillary anterior dentoalveolar spacing was the most influential occlusal characteristic (−0.24) whereas the gender was the least influential characteristic (.13). Finally, the multivariate model explained 16.7% (R^2) of the variability in the self-perceived dental appearance of the young adults evaluated.

DISCUSSION Return to TOC

This study was based on a representative sample of young adults admitted to a private university in Lima, Peru. Even though a random sampling was followed, the present results should be interpreted with caution because the sampling used was from one particular population.

Since individuals with previous experience with orthodontic treatment were excluded from the study, it is likely that the degree of variation of orthodontic anomalies is smaller in this sample compared to what might be expected in the general Peruvian population. A previous study[18] evaluating a similar sample of subjects showed that orthodontically treated individuals were more satisfied with their esthetic appearance than the ones without previous orthodontic treatment, although the difference was not large. This should be taken into consideration when extrapolating the results to different populations.

Although some previous studies have assessed the influence of the anterior occlusal characteristics on self-perceived dental appearance,[3,8,10–13] the number of prediction variables considered together in comparison to previous studies makes these findings unique and useful. Differences between results of bivariate and multivariate approaches can be better understood when contrasting Tables 2 O= and 3 O=. When anterior occlusal characteristics were assessed individually (Table 2 O=), maxillary and mandible incisal irregularity were more influential than dentoalveolar spacing. Overjet was also found to be influential. Age, not gender, was the covariable that influenced the self-perceived dental appearance. However, the patterns of influence on self-perceived dental appearance changed when all occlusal characteristics were considered together (Table 3 O=). Since diverse components of a malocclusion occur and act simultaneously, findings of multivariate analyses will always be more realistic than those of bivariate analyses.

The multivariate analysis, which was not previously reported, brought to light some interesting discrepancies in relation to the approaches that were previously reported. After controlling for confounding, space-related conditions (incisal irregularity and spacing) in the anterior portion of the mouth were more influential than vertical (OB) or anteroposterior (OJ) conditions on self-perceived dental appearance. Nevertheless, among the assessed space-related conditions, the presence of anterosuperior spacing, more than incisal irregularity, was the occlusal characteristic with the most negative influence on self-perceived dental appearance.

It has been previously reported that Norwegian young adults were more aware of moderate dentoalveolar spacing than crowding or moderate overjet,[5] but studies in different age groups, such as children[8,11,12] or adults,[3,10] have demonstrated that crowding and overjet were the anterior occlusal characteristics with the most influence on self-perceived dental appearance. The hypothesis that occlusal aspects impacting on self-perceived dental appearance could differ according to the individual's age should be further explored. In addition, these new studies could benefit by including quantitative measures of dentoalveolar spacing to the recording of the presence of this condition.

Maxillary and mandible incisal irregularity, in that order, were the second and third anterior occlusal characteristics with the most negative influence on self-perceived dental appearance. This finding is supported by several studies in which crowding was found to be the malocclusion component that most influenced dissatisfaction with appearance and desire for orthodontic treatment,[3,5,10,12] as well as the principal risk factor of esthetic impact on daily living.[1]

A previously unexplored occlusal characteristic was the number of missing teeth between the second premolars. Although this occlusal trait is closely related to the presence of spacing, the authors preferred to distinguish between both characteristics in order to obtain additional information. The results indicate that both factors functioned as completely different entities; in fact, if the number of missing teeth was associated with the same variation explained by dentoalveolar spacing, it would not have significantly altered the final linear model.

The absence of interactions among some of the examined anterior occlusal characteristics could be considered as a plausible indicator that the effect of these clinical traits on self-perceived dental appearance is additive more than multiplicative, ie, no one occlusal characteristic boosted the effect of another. The variables in this study have been treated as individual events. Future research should also consider a simple variable totalling the number of anomalies per individual as another variable that should be interesting to evaluate. It would be expected that individuals with a greater number of anomalies (regardless of the nature of the anomalies) will report lower facial satisfaction than those with only one anomaly. We could not analyze this issue because a few of the occlusal characteristics were quantitatively measured. Determination of cut-off points to be able to dichotomize these variables would likely introduce some bias.

However, it is also likely that the lack of effect for some characteristics may simply be because the number of individuals demonstrating specific anomalies is quite low (Table 1 ◯=). This may have an impact on the power to detect effects, including interaction terms. Studies with larger sample sizes are encouraged to further explore this area.

Although the VAS has been previously used[18–22] to quantify self-perceived dental esthetic appearance in samples from similar origin, there is the possibility that more precise information regarding self-perception may be gained when multiple measuring items are utilized simultaneously. One previously published article[18] used several of these items for the evaluation of dental esthetic self-perception reporting that each of them evaluated different traits which would likely complement themselves. Almost all the available orthodontic literature evaluating esthetic self-perception has used only a single measuring item (ie, VAS, Aesthetic Component [AC] of the Index of Orthodontic Treatment Need [IOTN], Dental Aesthetic Index [DAI], or Oral Aesthetics Subjective Index Scale [OASIS]).

Although the results of this study confirmed that occlusal characteristics in the anterior portion of the mouth play a role in dental esthetics, it should be highlighted that their influence as a group is minimal (less than 20%). This is in agreement with previous researchers who have studied the relationship between self-perceived dental appearance and actual clinical status, concurring that both variables are moderately to poorly correlated.[5,11]

Because other factors not regularly considered must, therefore, be influencing the self-perceived dental appearance, the possibility of studying the influence of extra-oral characteristics should be considered. Previous studies have shown that self-awareness and satisfaction are related mainly to visible features.[5,8,10,11] Other studies have shown that esthetic perception of anterior dental arrangement is influenced by the amount of facial aspects included in the view,[19] and that anterior crowded bites or open bites are more esthetically unpleasant than anterior crossbites or deep bites.[20] None of these aspects were considered in our analysis and may help explain the remaining variability. Therefore, evaluation of traits on the lower third of the face, such as labial competence, nasolabial angle, chin and labial position, or specific anterior dental arrangements could help to better understand what physical traits influence self-perceived dental appearance, and thus, the orthodontic treatment need.

Because a previous study has reported that dental crowding and missing teeth are the two most frequent malocclusion traits among Peruvian young adults,[20] the present findings support the idea that both occlusal characteristics could be causing psychological and social impacts on evaluated individuals, especially caused by a poor self-perceived dental appearance. Dissatisfaction with personal appearance may persist into adulthood and impair an individual's quality of life.[9]

In fact, an unpleasant dental appearance can stigmatize a person, hinder professional achievement, encourage negative stereotypes, and have a negative effect on self-esteem.[1,5] Therefore, in making orthodontic assessments, attention should be given to ascertain fully the particular occlusal and esthetic deviations that are causing concern to the patient. Assumptions based purely on the presenting occlusal condition should be avoided.

CONCLUSIONS Return to TOC

- Space-related conditions were those that most influenced the self-perceived dental appearance among evaluated Peruvian young adults.

- Maxillary anterior dentoalveolar spacing, maxillary incisal irregularity, mandible incisal irregularity, and the number of missing anterior teeth were, in that order, the anterior occlusal characteristics with the most negative influence on self-perceived dental appearance.

- Although these results confirmed that occlusal characteristics in the anterior portion of the mouth play a role in dental esthetics, their combined influence is minimal (less than 20%). Other factors, not considered in the present model (ie, extraoral characteristics), could account for the rest of the variability.

ACKNOWLEDGMENTS

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TABLES Return to TOC

Table 1.   Descriptive Statistics for the Anterior Occlusal Character istics Assessed

Qualitative Variables	Present n	Present %	Absent n	Absent %
Maxillary dentoalveolar spacing	67	25.1	200	74.9
Mandible dentoalveolar spacing	11	4.1	256	95.9
Midline maxillary diastema	36	13.5	231	86.5

Quantitative Variables	Mean	Standard Deviation	Minimum	Maximum
Maxillary incisal irregularity, mm	1.61	1.72	0	9
Mandible incisal irregularity, mm	2.14	1.52	0	8
Missing teeth, number	0.30	0.81	0	4
Overbite, mm	2.03	1.93	−5	8
Overjet, mm	2.63	2.60	−3	22

Table 2.   Individual Influence of the Anterior Occlusal Characteristics and Covariables on Self-perceived Dental Appearance in 267 Young Adults[a]

Studied Variables	R	R²	Regression Coefficients β	Regression Coefficients Standardized β	P
Anterior Occlusal Characteristics					
Maxillary incisal irregularity, mm	−0.24	0.06	−2.54	−0.24	<.001
Mandible incisal irregularity, mm	−0.22	0.05	−2.63	−0.22	<.001
Maxillary dentoalveolar spacing, yes/no	−0.11	0.01	−4.55	−0.11	.075
Mandible dentoalveolar spacing, yes/no	0.06	0.004	5.84	0.06	.297
Midline maxillary diastema, mm	−0.07	0.004	−3.54	−0.07	.277
Missing teeth, number	−0.18	0.03	−8.72	−0.18	.003
Overbite, mm	0.04	0.001	0.33	0.04	.565
Overjet, mm	−0.16	0.02	−1.09	−0.16	.011
Covariables					
Gender, male/female	0.09	0.01	3.37	0.09	.133
Age, years	−0.13	0.018	−1.80	−0.13	.029

Table 3.   Grouped Influence of the Anterior Occlusal Characteristics and Covariables on Self-perceived Dental Appearance in 267 Young Adults[a]

Variables Included in Model	Regression Coefficients			
	β	Standard Error	Standardized β	P
Maxillary incisal irregularity, mm	−2.35	0.68	−0.22	.001
Mandible incisal irregularity, mm	−2.37	0.76	−0.20	.002
Maxillary dentoalveolar spacing, yes/no	−9.86	2.51	−0.24	<.001
Missing teeth, number	−3.86	1.27	−0.17	.003
Gender, male/female	4.84	2.08	0.13	.021
Constant	69.14	2.37	—	<.001

[a] Profesor Asociado, Departamento de Odontología Social, Universidad Peruana Cayetano Heredia, Lima, Perú

[b] Unidad de Investigación en Salud Pública Dental, Universidad Peruana Cayetano Heredia, Lima, Perú

[c] Clinical Associate Professor, Director of the Cranio-facial & Oral-Health Evidence-based Practice Group, Orthodontic Graduate Program, Dentistry/Pharmacy Centre, University of Alberta, Edmonton, Canada

Corresponding author: Dr Carlos Flores-Mir, Associate Professor, University of Alberta, Orthodontic Graduate Program, Room 4051A, Dentistry/Pharmacy Centre, University of Alberta, Edmonton, AB T6G 2N8, Canada (E-mail: carlosflores@ualberta.ca)