

RESEARCH AND EDUCATION

The influence of lip form on incisal display with lips in repose on the esthetic preferences of dentists and lay people

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ABSTRACT

Statement of problem. Information is lacking for viewer preferences for incisal display with lips in repose.

Purpose. The purpose of this online survey was to establish measurement parameters to classify and define a lip form and to evaluate the influence of lip form on dentists' and laypersons' preferences for the amount of incisal display with lips in repose.

Material and methods. Computer-generated male and female models were created using 3 different lip forms each, straight, moderate, and high. Three images of these models (frontal full face, zoomed-in frontal around the mouth, and oblique zoomed-in image of the mouth) were arranged in an interactive survey that was disseminated on the Websites Facebook, Instagram, DentalTown and by word-of-mouth. Respondents manipulated the incisal display of all 3 images in unison, using a slide bar, and the resulting incisal display was measured in millimeters and served as the primary dependent measure. Survey demographic data were obtained from an online survey site. Data were assessed for skewness, kurtosis, and outliers and analyzed with 5-way ANOVA: 2 sex levels for model, 2 levels for sex of respondent, 3 levels for lip height, 3 levels for occupation, and 5 levels of ethnicity, with multiple comparisons corrected with Bonferroni adjustments and post hoc comparisons performed using the Scheffé test ($\alpha=.05$ for all comparisons).

Results. A total of 1039 individuals consented to the study. A final sample size of 687 respondents was obtained after excluding 352 who failed to complete the survey. The results indicated that lip form affected the esthetic perception of incisal display significantly ($P<.001$), with a preference for a greater amount of incisal display corresponding with increasing lip forms. Sex of the model was also significant, with greater incisal display being preferred for female faces. A significant difference was found for respondents' ethnicity, with African Americans generally preferring smaller incisal displays than other ethnic groups. No other main effects were found to be statistically significant. Only 2 interactions were shown to be statistically significant. Post hoc tests examining the interaction between lip form and sex of model showed a preference for greater incisal displays for female faces with high lip forms. A 3-way interaction was observed between lip form, sex of respondent, and occupation.

Conclusions. Significant differences were identified for the 3 different lip forms for both sexes of models. As the lip form changed from straight to moderate to high, there was a preference for increased incisal display. Incisal display preferences for male and female models were the same for all respondents, except for the high lip form, for which a greater amount of incisal display was preferred for the female model. Sex and occupation of respondent failed to produce main effects. Respondents' ethnicity was shown to be statistically significant, with African Americans generally preferring shorter incisal displays. (J Prosthet Dent 2016;■:■-■)

Tooth display is an important aspect of esthetics. Historically, esthetic evaluation has included incisor length, incisal edge position, incisor display with lips in repose,¹ tooth proportions, tooth and gingival display on smiling, amount of buccal corridor display, and midline position.²⁻¹¹ These values are often gathered from survey

results or by direct measurement.^{12,13} Numerous studies have evaluated the effect of the amounts of gingival and papilla display on esthetic preferences.^{2,14,15} Other studies have evaluated the model attractiveness¹⁶ and the effects of a full face versus a lower face view¹⁷ when presented in a survey format. Data for incisal display, however, are

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Clinical Implications

The definition of lip form is justified based on the results of the study. By identifying proper lip form on a patient, it will be easier to provide more esthetically pleasing restorations.

often obtained in the repose position using static images and usually only a single viewpoint or angle.

Lips in repose has long been considered an esthetic parameter.^{1,18,19} However, the authors are unaware of a readily available definition for “repose” in the dental publications or a defined, acceptable esthetic display in the repose state. Although the definition of repose as described by Merriam-Webster is “the state of reposing or being at rest; rest; sleep,” the application of this term in dentistry is uncertain. Evaluation of lips at repose may differ from dentist to dentist, as it is dependent on varying amounts of muscle flexure and parting of the lips, as well as the technique used to get the patient in that position.

Another variable that has yet to be explored is whether lip form influences the esthetic evaluation of incisal display. Other studies have cited incisal display averages. Vig and Brundo¹ examined the averages for incisal display for different ethnic groups and sexes with the “lips gently parted.” They reported an average of 1.91 mm for men and 3.4 mm for women. However, this article did not indicate how many people were surveyed, how many people were included within each grouping, or how the data were obtained. Another study with a Jordanian population showed incisal display averages of 2.63 ±1.15 mm for 103 men and 3.02 ±1.96 mm for 144 women.²⁰ However, neither of these studies considered the relationship between lip form and incisal display on esthetic evaluation. Misch³ evaluated central incisors and canines in relation to the maxillary lip in repose. He concluded that the canines were a more predictable guideline for tooth display with lips in repose.

A search of PubMed for the defining parameters of lip form, lip classification, lip form classification, and lip anatomy failed to yield any results for a defined lip classification system. Cutbirth²¹ presented a preliminary classification for different lip phenotypes but without defining specific parameters. He suggested 3 lip phenotypes (straight, moderately arched, and maximally arched) but did not define where one form leads to the next or how to obtain specific measurements. Peck and Peck²² concluded that the average upper lip length for men is 23.4 ±2.5 mm and 21.2 ±2.4 mm for women but did not suggest a classification for lip form. The medical literature failed to yield any further results.

Additionally, the differences between an observational versus a preferential study must be noted. An

observational study focuses on the condition of individuals being evaluated, regardless of the condition. Conversely, a preferential study aims to expose a condition that represents an ideal. The survey by Vig and Brundo¹ in 1978 was an observational study, albeit lacking detailed statistics in the study, where the power was determined by evaluating a large population. More recently, esthetic preference studies have evolved.⁴⁻⁶ These studies use digitally generated alterations that have become well established for use in determining esthetic preferences. Kokich et al⁵ used Photoshop software (Adobe Systems) to evaluate anterior dental esthetics by modifying 8 different esthetic variables. The authors wanted to know whether a threshold for abnormality could be established and whether that threshold was the same among a group of orthodontists, periodontists, restorative dentists, and lay people. Rosenstiel et al⁴ used Photoshop software (Adobe Systems) in a Web-based study to evaluate the esthetic value of a golden proportion arrangement of anterior teeth. They found that the golden proportion worked for taller teeth but was not particularly esthetic in normal or short teeth.

While evaluating facial esthetics, it is also important to use defined parameters. Ramos²³ described a method for evaluating the face by evaluating skeletal and occlusal features for optimum smile display to assist in treatment planning. These parameters assist in determining whether optimal restoration is even possible or whether directing a patient to preprosthetic treatment with orthodontics, orthognathic surgery, periodontics, or other restorative treatment is the appropriate course of action.

The purpose of this study was to suggest a lip form classification and to test the following hypotheses. Consistent with previous research, greater incisal displays will be judged more esthetically pleasing in women than in men at repose; greater incisal displays will be appraised as more esthetically pleasing as lip form thickness increases; and differences will be found based on respondents' occupation.

MATERIAL AND METHODS

The institutional review boards of Eisenhower Army Medical Center and Augusta University approved the study. Data were gathered from respondents using an online survey that tested preferences for the amount of incisal display with lips in repose.

As the ethnicity of the test model could influence esthetic choice, for simplicity, model images of a single ethnic group were prepared. Male and female white model images were created using photoediting, animation, and digital painting software (Photoshop CC; Adobe Systems, Maya 2014; Autodesk, and Mudbox 2014; Autodesk), as seen in [Figure 1](#). Three lip forms (straight, moderate, and high) were created for each sex, using a

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