

# Impact of altered gingival characteristics on smile esthetics: Laypersons' perspectives by Q sort methodology

Panchali Batra,<sup>a</sup> Anika Daing,<sup>b</sup> Imam Azam,<sup>a</sup> Ragini Miglani,<sup>a</sup> and Ashu Bhardwaj<sup>b</sup>  
New Delhi, India

**Introduction:** Smile esthetics includes the white esthetics related to the teeth and the pink esthetics related to the mucosa. Many surveys have been conducted to evaluate laypersons' perceptions to altered dental characteristics, but few have focused on the soft tissue factors. This study was designed to determine the perceptions of laypeople to variations in soft tissue esthetics during smile. **Methods:** An ideal smile photograph was intentionally altered to produce variations in gingival inflammation, pigmentation, contour, position of free gingival margins (with and without recession), zeniths, and interdental papilla. Sixty-seven images thus produced were rated for attractiveness by 100 laypersons with the Q sort technique. **Results:** Variations in interdental papilla (black triangles) were the most negatively ranked gingival factor by laypersons closely followed by color changes of the gingiva due to inflammation and pigmentation. Alteration of gingival contour and gingival zenith had the least impact on smile esthetics, and changes in the free gingival margin with and without recession were moderately perceived. Furthermore, laypersons considered unilateral or asymmetric alterations more unesthetic compared with bilateral or generalized alterations for factors such as free gingival margin without the recession, and color changes caused by inflammation and pigmentation. **Conclusions:** Laypersons have considerable negative perception to asymmetric gingival alterations and to optical color changes caused due to black triangles, inflammation, and pigmentation of the gingiva. Whereas alteration in gingival contour and zenith have least impact on smile esthetics. (Am J Orthod Dentofacial Orthop 2018;154:82-90)

A beautiful smile is desirable. Patients from all walks of life tend to express their wishes for a perfect smile. Some visit the doctor precisely for this purpose. An enticing smile demands a balance between macro, mini, and micro esthetic factors that include white esthetics related to teeth and pink esthetics related to the gingiva.<sup>1</sup> Although many studies have been published on perceptions of laypersons and dentists to altered dental esthetics,<sup>2-5</sup> few have focused on the gingival component of mini and micro esthetics.<sup>6-9</sup> Gingival factors such as shape and contour, position of free gingival margins and zeniths, color and pigmentation of the gingivae, position of the

papilla, inflammation, scalloping, and recession make important contributions to soft tissue esthetics. A smile architect pays much attention to these minute details for designing a smile. Designing the teeth in the confines of the gingival architecture impacts smile esthetics to a considerable extent. An uneven free gingival margin height or inflamed gingivae at the anterior teeth can have a dramatic impact on esthetics. Although the position of the zenith or papillary position appears to be a small detail, it can greatly influence the axial inclination and emergence profile of the teeth, and even a small black triangle can spoil all efforts to create a beautiful smile.

To improve the gingival curtain, an interdisciplinary treatment is required spanning orthodontics, periodontics, prosthodontics, endodontics, and at times oral surgery. Procedures such as periodontal plastic surgeries, intrusions, extrusions, or LeFort surgery may be needed to optimize gingival esthetics.

The purpose of this study was to evaluate how a layperson perceives these altered gingival characteristics in both unilateral and bilateral situations. We also aimed to identify the gingival characteristics that are most

From the Faculty of Dentistry, Jamia Millia Islamia, New Delhi, India.

<sup>a</sup>Department of Orthodontics.

<sup>b</sup>Department of Periodontology.

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Address correspondence to: Anika Daing, Faculty of Dentistry, Jamia Millia Islamia, New Delhi, India-25; e-mail, [anika\\_doc@yahoo.com](mailto:anika_doc@yahoo.com).

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negatively and positively marked. We attempted to identify characteristics of a perfect smile. The extent or degree to which the altered gingival characteristics are unnoticed by laypersons will help to determine the characteristics that are noticed and consequently matter.

## MATERIALS AND METHODS

Institutional ethical clearance was obtained from Jamia Millia Islamia in New Delhi, India, before the study, and written informed consent was taken from all participants. The survey was conducted over 3 months.

A frontal close-up smile of a 22-year-old student in the dental college was selected for the study (control image, [Supplement 1](#)). The student's smile was selected because it was considered highly attractive according to the objective principles of the ideal smile described in the literature.<sup>10</sup> The student had no history of orthodontic treatment or restorations of anterior teeth. The image was cropped in Photoshop (version CS2; Adobe Systems, San Jose, Calif) to show only the lips, nasal tip, and mentolabial fold to reduce distractions. The image was then condensed so that each millimeter measured on the digital and printed image was equivalent to each millimeter measured clinically on the patient, using the maxillary central incisor as the reference. This image of an ideal smile was intentionally altered to produce the desired smile with characteristic manipulations (described below). There were 65 modifications. Two copies of the original unaltered ideal smile (control) were added to the 65 photographs to check for reproducibility of the results. Thus, a total of 67 images were produced. Final images were digital files with 300-dpi resolutions. The 3.5 × 5-in images were professionally printed using specialized digital equipment and a photo album was assembled with all images in random order.

The ideal smile image was altered to produce the following modifications: (1) discrepancies in the position of free gingival margin without recession ([Fig 1](#)), (2) variations in the positions of interdental papilla ([Fig 2](#)), (3) discrepancies in the position of zenith ([Fig 3](#)), (4) color changes due to varying degrees of inflammation of the gingiva ([Fig 4](#)), (5) color changes due to varying degrees of pigmented gingiva ([Fig 5](#)), (6) discrepancies in the position of the free gingival margin with recession ([Fig 6](#)), and (7) varying contours of the gingiva ([Fig 7](#)).

Each esthetic characteristic was altered with progressive variations of the original smile photograph both unilaterally and bilaterally. The alterations are described in [Supplement 2](#).

The evaluators consisted of 100 laypersons (45 men, 55 women). A sample size of 100 was used in this study because it is rare to administer a Q sort with more than

100 participants. The participants' viewpoints can be shown effectively with a smaller participant group of 40 to 60 subjects.<sup>11</sup>

The participants were required to have at least intermediate-level qualification and a complete or an incomplete college degree. They were randomly selected from the students enrolled in various courses at Jamia Millia Islamia. Their ages were between 18 and 40 years. Basic information such as ethnicity, education, and socioeconomic status was gathered. Any previous professional dental affiliation disqualified a respondent from participation.

Each rater was given brief information about the study without disclosing the characteristics that were altered. The raters were asked to evaluate the attractiveness of the images using the forced distribution Q sort methodology.<sup>11</sup> A 13-point scale was used with ranking values ranging from -6 to +6. A table containing 13 columns was drawn showing ratings from -6 to +6, with -6 as the most unattractive image, and +6 as the most attractive image ([Fig 8](#)). The 67 photographs was presented to the evaluators who were instructed to arrange them in the 13 columns according to their personal esthetic preference. From the 67 photos, they were instructed to select the 2 most attractive and the 2 least attractive photographs and place them in the +6 and -6 columns, respectively. From the remaining 63 photographs, they were to select the 3 most attractive and the 3 least attractive photographs and place them in +5 and -5 columns, respectively. Continuing with this process, the evaluators were asked to select the 4 most attractive photographs, followed by the 3 most attractive and so on. The same process was used for the least attractive pictures. In the end, the evaluator was left with 11 photographs that were placed in the category 0, or the neither attractive nor unattractive category. The maximum number of images that could be assigned to each ranking position was also mentioned for ease of understanding. This is the forced Q sort methodology whereby the evaluators are forced to put a defined number of photographs in each column. Once the Q sort was accomplished, they were again given some time to check that all photographs were rated and arranged according to their esthetic preference. They were then instructed to leave the Q sort intact so that the scores could be recorded. On average, each evaluator took 15 to 20 minutes to complete the survey.

## Statistical analysis

The descriptive statistics were presented in terms of frequency (counts) and percentages in different

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