

Influence of Symmetry and Balance on Visual Perception in a Smile among Dental Professionals

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Abstract

Purpose: The purpose of our survey is to find out the influence of symmetry and balance on visual perception in a smile among dental professionals. **Materials and Methods:** A 23-year-old female was selected based on her facial harmony and natural, unaltered dentition. Two separate photographs were taken – one extraoral photo of perioral soft tissue that provided a frame for smile and one intraoral photo of entire dentition in occlusion using cheek retractor. Nine sets of frontal view were generated. The altered images compared some of the common characteristics of smile. The survey was distributed among 200 dental professionals. **Results:** Results were subjected to a statistical analysis using Chi-square test. **Conclusion:** It was seen that certain characteristics were favored over others and significant difference exists between general dentists and specialists.

Keywords: Visual Perception, Smile, Image editing software

INTRODUCTION

Esthetics are a subjective notion and tends to vary among different individuals and cultures, so no strict guidelines can be made.^[1] Principles of art and visual perception are applied to dental esthetics, such as cohesive forces and visual tension, which result in deviation from the normality. Asymmetry and visual tensions create charm to have different weightage depending on their location.^[2] Esthetic smile treatment planning in dentistry can be a complex procedure that often requires interdisciplinary treatment between dental specialists in addition to the general dentist. The educational background of each specialist influences their focus in both the detail and composite view of the various characteristics most important for an esthetic smile, and these differences may have an impact on the course and direction of the treatment. In an attempt to develop more objective guidelines for the esthetics of a smile, there have been an increasing number of studies conducted over the past several decades with the purpose of determining the dentist's perception of esthetics as it relates to the smile over a wide range of characteristics, as well as comparing their preferences to those of different dental specialties.^[3,4] Our study is to ascertain by survey, the esthetic smile characteristics preferences of dental professionals in various specialties and among general dentists.

MATERIALS AND METHODS

A 23-year-old female was selected based on her facial harmony and natural and unaltered dentition. Two separate photographs were taken – one extraoral photo of perioral soft tissue that provided a frame for smile and one intraoral photo of entire dentition in occlusion using cheek retractor (Figure 1). Nine sets of frontal view were generated by slightly modifying the original pictures to explore the effect of various visual tensions, color, symmetry, and form. Image editing software (Photoshop CS6 v.13.0.1 × 64, adobe system. Inc) and various tools within the software (mainly, liquefy filter and also the clone stamp and spot healing brush tools) were used to generate the morphological alterations and Smile design software will be used. The colors of the teeth were altered using the selection tool (magic wand) and brightness adjustment. The range of questions aimed to cover some of the most common problems in esthetic dentistry. The survey displayed altered photographs along with questionnaire for

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the following nine esthetic smile characteristics of maxillary anterior teeth.

RESULTS

Data were analyzed using the statistical package SPSS 22.0 (SPSS Inc., Chicago, IL) and level of significance was set at $P < 0.05$. Chi-square test was used for association assessment between the variables and study groups. It was seen that a significant difference exists between the general dentists and specialists.

DISCUSSION

The esthetic results depend on the balanced integration of fundamental esthetic criteria within the smile and, ultimately, the character of an individual. Elements that unify a composition are cohesive forces. Elements which lend to disunity are segregative forces. By introducing cohesive forces and visual tensions, a deviation from normality occurs. The smile can be viewed as a composition in which it is not necessary to eliminate all visual tensions but to rather provide a balanced perception. Asymmetry and visual tensions create charm, and those elements have different weight depending on the location where they are found. Hence, balancing the weight rather than eliminating the tensions might be preferred.

This study was conducted to investigate the influence balance and symmetry on visual perception in a smile among dental professionals. Zenith point of gingival when present at different levels was considered to be more esthetic as compared when the zenith point was at a similar level. It is in accordance with the study done by Chu *et al.*, which states that gingival zenith point of lateral incisor relative to the adjacent central incisor and canine teeth were more coronal by approximately 1 mm was found to be more attractive (Figure 2). Question (2) stated that presence of incisal step is more attractive to the dental professional. This holds true to the study conducted by Machado *et al.* that absence of incisal step gives the smile a worn out appearance whereas smile with incisal step gives a more youthful appearance.^[5]

Question (3) stated that canted canine was more preferred than the upright canine (Figure 3). This is due to the reason that upright canines gives a more masculine appearance given by Lombardi. Whereas slanted canines give a more soft or feminine smile. From question (4), a unanimous answer of no midline diastema was chosen to be more esthetic. This holds true according to the law of dominance which states that the maxillary central incisors are the dominant teeth of the smile so any discrepancy involving them can easily be noticed (Figure 4).

Question (5–7 and 9) visual tensions were created in different teeth and dental professionals were asked to select the most esthetic smile (Figures 5–8). It was seen that visual tension when created on lateral incisor was easily ignored and visual tension when created on the central incisor was most notices. Eye dominance plays an important role in distinguishing the



Figure 1: Question 1 (a) gingival zenith points of all anterior maxillary teeth at similar level and (b) different level of gingival zenith positions



Figure 2: Question 2 (a) similar crown length of maxillary central and lateral incisors and (b) length of maxillary lateral incisor shorter than that of maxillary central incisors



Figure 3: Question 3 (a) canted placement of canines and (b) upright placement of canines



Figure 4: Question 4 (a) midline diastema and (b) no midline diastema. The response to Question (1) demonstrated that gingival zenith point when at different levels were perceived as more attractive by the dental professionals. Question (2) revealed that smile showing incisal step was considered more esthetic. According to the Question (3), canted canine placement was considered to be more pleasing by the dental professionals. Response to Question (4) showed that smile without midline diastema was considered to be more attractive

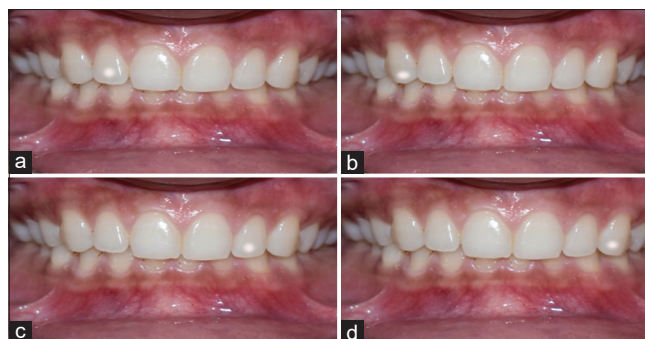


Figure 5: Question 5 (a) white spot lesion on maxillary right lateral incisor, (b) white spot lesion on maxillary right canine, (c) white spot lesion on maxillary left lateral incisor, and (d) white spot lesion on maxillary left canine

right and left visual tensions.^[6] Eye dominance does not play an important role when the defect is closer to the midline



Figure 6: Question 6 (a) shorter distoincisor edge of maxillary right central incisor and (b) shorter distoincisor edge of maxillary left central incisor



Figure 7: Question 7 (a) distobuccally rotated left canine and (b) distobuccally rotated right canine. Response to Question (5) suggested that when the white spot lesion was on maxillary right canine, it was considered to be more attractive. Question (6) revealed that when visual tension was present on left central incisor was attractive. According to question (7), visual tension on the right canine was preferred



Figure 8: Question 8 (a) oval shaped maxillary central incisors, (b) triangular shaped maxillary central incisors, and (c) square shaped maxillary central incisors



Figure 9: Question 9 (a) Shorter distoincisor edge of maxillary left central incisor and (b) distobuccally rotated right maxillary canine. Response to Question (8) suggested that ovoid shaped incisors were considered to be more attractive. Question (9) suggested that visual tension when present on canine was more esthetic

(centrals), whereas it becomes more significant when the defect is located away from the midline (canines). We can say that the focus in the smile goes first towards central incisors and then canines, while lateral incisors seem to have less visual weight in this regard. This agrees with the concept of dominance, according to which the central incisors are the

dominant teeth of the smile by virtue of their location and size. These results also corroborate findings by Ribeiro *et al.* about the negative influence of incisal asymmetries when found on central incisors compared with lateral incisors. When canines were compared (question 4), opposite was seen, with the rotated right canine (left side of the viewer) preferred by both groups over the rotated left canine (right side of the viewer). Participants, like two-thirds of the general population, may have had a right dominant eye, which is very likely to influence visual perception. Preference to question (8) states that most of the dental professionals choose the smile with ovoid central incisors (Figure 9). According to Heravi *et al.* ovoid shape teeth were preferred, this was due to the reason that ovoid shapes give delicate appearance to the teeth whereas the square shaped incisors give a rough appearance to smile which states true to our study.^[7]

It was least noticed by the dental professionals with only undergraduate degrees, thus refusing to the study put forward by Kokich *et al.*^[8] that years of experience of evaluators' age did not influence the esthetic perception^[9-11]. The limitation of our study is that it did not explore the entire spectrum of smile analysis but generated elements to understand important aspects of interactions between common criteria. Another limitation is that it uses two-dimensional assessment based on images only. Further studies should be undertaken in a three-dimensional approach using digital face scanning.

CONCLUSION

The focus in the smile goes first to the central incisors and then canines, while lateral incisors seem to have less visual weight in this regard. Sidedness is less significant when visual tensions are close to midline. However, it becomes more significant when the defect is away from the midline. In this case, visual tension appeared more problematic when located on the right side of the viewer (left side of the patient). Ovoid shaped central incisors were preferred to square or triangular ones and canted canines were considered more feminine. Smile in which gingival zenith point of maxillary lateral incisors was coronal to the adjacent teeth is more attractive. Smile having an incisal step is preferred and presence of midline diastema gives a negative impact to the smile. A clinical significant difference occurs between the visual perception among general dentists and specialists and between different specialties. Prosthodontists and orthodontists were more particular about changes related to teeth and periodontists were most susceptible to changes in soft tissues whereas specialties belonging to non-clinical branches were least susceptible to these changes.

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