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RESEARCH AND EDUCATION

Effect of variations in facial flow curves on the perceptions of smile esthetics by laypeople

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ABSTRACT

Statement of problem. Information about the effect of the facial flow concept on the smile esthetic perception of laypeople is lacking.

Purpose. The purpose of this study was to determine the effect of the facial flow concept on laypeople's perception of smile esthetics.

Material and methods. Frontal full-face images of a female volunteer were digitally altered to create commissural line and transverse occlusal plane inclinations, a dental midline shift, and facial asymmetries. A questionnaire was developed, and a single researcher asked 400 evaluators to rate the attractiveness of the different smiles by using a visual analog scale. The subsequent data were analyzed by using 3-factor repeated measures ANOVA and post hoc Bonferroni tests.

Results. Images with commissural line and transverse occlusal plane inclinations pointing toward the green side of the facial flow curve were found to be more attractive than those with inclinations pointing to the red side ($P<.001$). Asymmetric facial images with the dental midline coinciding with the facial flow curve had higher esthetic scores than those without ($P<.001$). Images that showed parallelism between the transverse occlusal plane and commissural line inclinations were perceived as more esthetic ($P<.001$).

Conclusions. In an asymmetric face model, the degree and direction of commissural line and transverse occlusal plane inclinations and dental midline shift influenced the perceived attractiveness of a smile. (J Prosthet Dent 2021;■:■-■)

Dental care not only treats oral health but also improves the appearance of a patient's smile.[1] In contemporary dental practice, patients increasingly demand outcomes with exceptional esthetics. In order to improve smile esthetics, dentists should comprehensively analyze the face and smile in an objective and standardized manner while also considering the patient's expectations and concerns. The main criteria for esthetic analysis in dentistry should include dental, dentogingival, and facial esthetics.[2-12]

A dentofacial analysis is performed by diagnosing asymmetries and establishing the horizontal and vertical reference lines developed for frontal views of the face. The horizontal reference lines include the interpupillary line and the commissural line,[13-18] while the vertical reference lines include the facial midline and the maxillary dental midline. The facial midline has been described as "the vertical line bisecting a horizontal line originating at the exocanthion of one eye and meeting the exocanthion of the other eye" and as "the midline of the esthetic frame of the face."[19] The dental midline has been described as "a vertical line drawn through the tip of the incisal embrasure between the 2 maxillary central incisors and parallel to the vertical lines of the esthetic frame of the face."[19]

From a frontal perspective, the transverse occlusal plane has been stated to be ideally parallel to the interpupillary and commissural lines to maintain facial harmony.[13-15] Although most studies[20-24] have reported that a dental midline that coincides with the facial midline provides a sense of harmony, balance, and symmetry, a certain deviation from the midline is acceptable.[23,25-29] The interpupillary line and the facial midline together form a figurative "T" that helps establish facial architecture.[20] Furthermore, having the dental and facial

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Clinical Implications

Understanding how variations in facial flow curves affect the smile esthetic perceptions of laypeople may help clinicians perform optimal restorative treatment procedures.

midlines coincide has been reported to be more important than having the mandibular and facial midlines coinciding because of the dominant visibility of the anterior maxillary teeth (Fig. 1).[30]

However, the definition of the facial midline has been controversial.[31] Silva et al[31] stated that as human faces have irregular shapes, defining a midline is not possible. Some variations and facial asymmetries such as chin and nose deviations are common,[24] and there are no objective scientific criteria for distinguishing normal from abnormal asymmetry.[32] Silva et al[31] further stated that defining strictly parallel horizontal and vertical lines for an attractive smile was unnecessary and that a facial "T" does not have to be perpendicular to the face to create visual comfort.

Therefore, Silva et al[31] developed a concept for a more organic facial analysis called the facial flow concept. This concept generated a new vertical reference curve that connects the glabella, nose bridge, philtrum, and chin for a facially driven smile design. All the facial structures, including the teeth and smile, are considered to have a position relative to the facial flow curve, which has an important effect on overall facial balance. The direction of the facial flow curve should be understood. The side of the face to which the facial flow curve points is called the green side, whereas the opposite side is called the red side. If the face flows to the right, the right side of the face is green, and the left side is red (Fig. 2). The facial flow curve may also be straight, which means that a neutral flow is present and that there is no green or red side (Fig. 3). Sometimes the nose and chin may flow in opposite directions, which describes a curved or banana-shaped facial flow curve. In these patients, the direction of the facial flow curve within the lip frame will allow clinicians to determine which side is green and which is red (Fig. 4).[31]

The esthetic perception of different facial and dental asymmetries by laypersons has been investigated.[1,16-18,23,32,33] However, information on how smiles oriented to different sides of the facial flow curve affect their esthetic perception is lacking. The purpose of this study was to investigate the effect of different orientations of smiles according to the facial flow concept on the perception of smile esthetics. The null hypothesis was that no statistically significant difference would be found in the esthetic perception of laypeople.

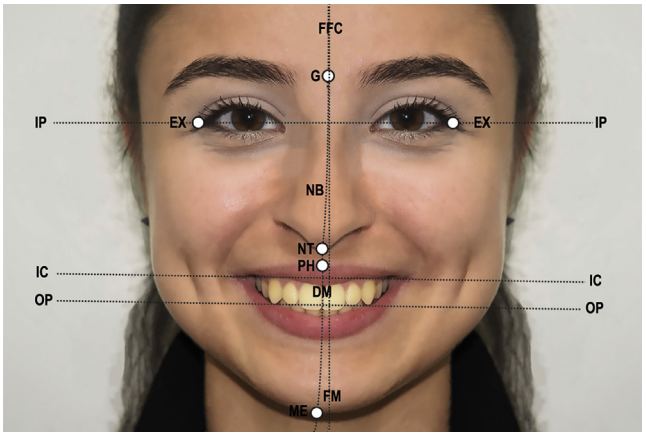

Figure 1. Anatomic landmarks and reference lines of face. DM, dental midline; EX, exocanthion; FFC, facial flow curve; FM, facial midline; G, glabella; IC, commissural line; IP, interpupillary line; ME, menton; NB, nasal bridge; NT, nasal tip; OP, occlusal plane; PH, philtrum.

MATERIAL AND METHODS

The protocol was approved by the Sakarya University research ethics committee (protocol number: 71522473/050.01.04/536). Information about the purpose of the study was given to and written consent was obtained from the evaluators. The woman whose photographs were used signed an authorization form for the use of her images. Inclusion criteria for the survey were older than 18 years; not employed in the dental health care field; not in social contact with dentists, dental hygienists, or dental laboratory technicians; and without cognitive disability. The participants were 400 laypeople from different cities (İstanbul, Ankara, Sakarya) in Turkey, and the sample size was consistent with that of other similar studies.[32-34] The laypeople completed the questionnaires in various shopping malls.[34]

Frontal full-face views of a female volunteer with an attractive smile[35] were captured by a video camera. As suggested by previous studies,[31] screenshots of her social smile in a natural head position were isolated from the video and used as the reference images.[36]

The images were manipulated with a software program (Photoshop CS6 v.13.0.1; Adobe Systems Inc, Co),[1,23,32-35] and the interpupillary line, commissural line, transverse occlusal plane, and dental midline were identified in the photographs. The control group images without any asymmetry or inclination alterations were created by merging right and left mirror images of the female volunteer (Fig. 5). Different degrees and directions of the commissural line and transverse occlusal plane inclinations and dental midline shifts were then created incrementally. Using the maxillary central incisor as a reference, each inclination was measured on both the digital and printed photographs to ensure that they were equivalent to the volunteer's clinical measurements. The smiles in the images were also oriented to the different

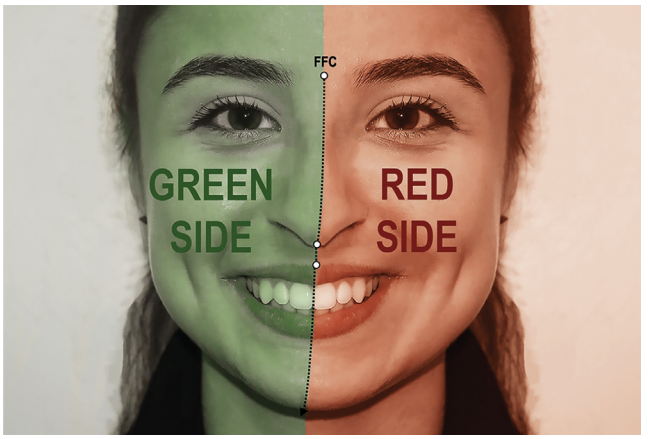

Figure 2. Facial flow curve direction points to "green" side of face.

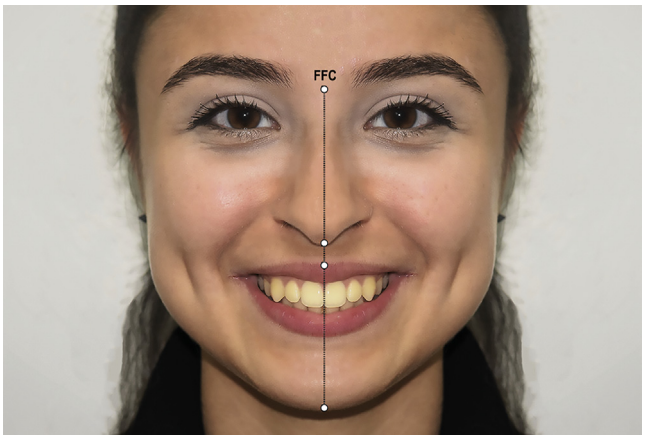

Figure 3. Straight facial flow not pointing to green or red side.

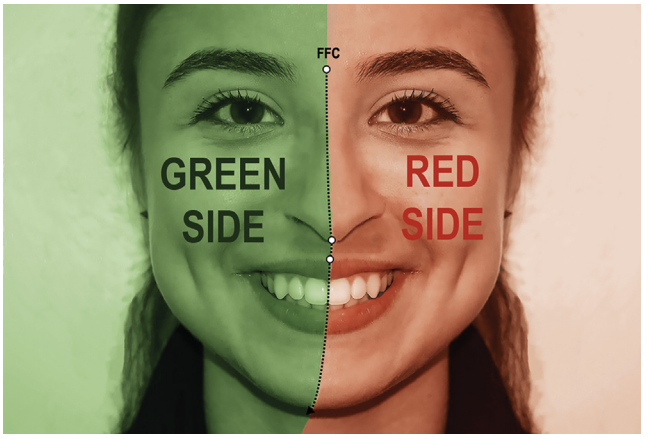

Figure 4. "Banana"-shaped facial flow curve. Direction of facial flow curve between lips determines green or red side.

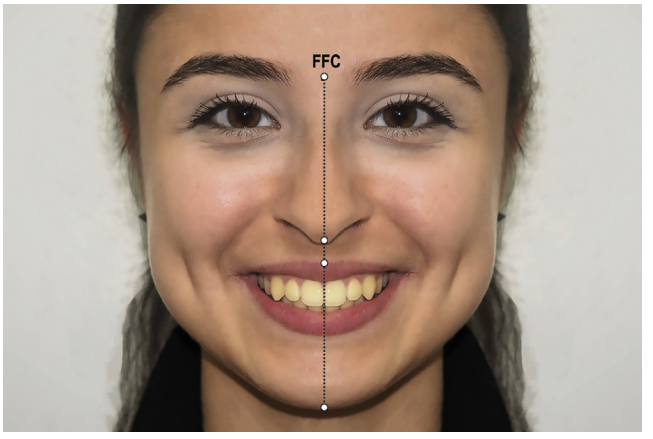

Figure 5. Symmetrical face image (control group).

sides of the facial flow concept (Figs. 6-8).[31] The commissural line and transverse occlusal plane deviations in a clockwise direction were labeled as "+", and those in a counterclockwise direction as "-". Nose and chin deviations and dental midline shifts were also made to the right (R) and kept below the visual recognition thresholds as determined in previous studies.[1,23,32] Figures 6-8 were divided into subgroups (Table 1). The final images were standardized with a resolution of 300 dots per inch (dpi)[37] and used to formulate a questionnaire administered with the help of a software program (Google Docs; Google Inc) by using a personal computer.[32,37]

Voluntary response questions were used to gather each evaluator's age, sex, education level, and occupation.[27] The images were shown to the participants, with the software randomizing the order in which participants viewed each pair. A single researcher (M.K.) presented them to the participants individually. The observation time allowed for each photograph was 20 seconds.[38,39] The participants could view only 1 image at a time and could not go back to previous photographs to make comparisons.[40]

The study was explained to each participant, who was subsequently asked to rate the attractiveness of the total 23 smile images by using a visual analog scale (VAS).[34,35,37,39,40] The participants were asked to score each image between 0 (unattractive) and 10 (most attractive), and the subjective esthetic score of each smile was determined by the participant indicating a position on a 10-cm-long VAS.[5]

The data were analyzed with a statistical software program (IBM SPSS Statistics, v22.0; IBM Corp). Descriptive statistics were used to determine the frequency of the sociodemographic characteristics of the participants.

Normality tests were first performed to determine skewness, kurtosis, and outliers, and it was found that the data were distributed normally. Descriptive statistics determined the esthetic score of each figure. The educational background of the participants was not statistically analyzed because some of the subgroups had too few members for statistical evaluation. Finally,

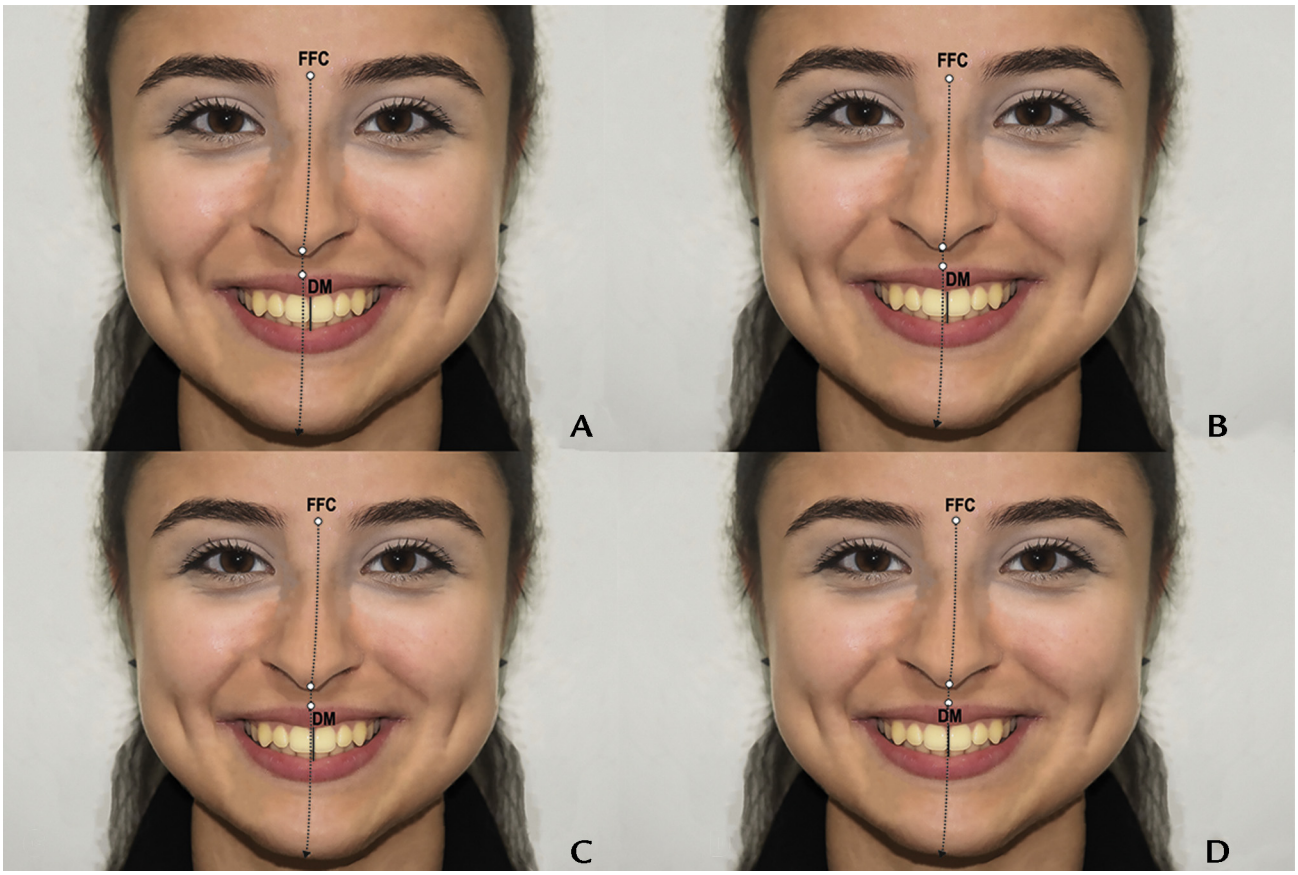

Figure 6. Asymmetrical face images. A, Dental midline coinciding with midline of face. B, One-millimeter dental midline shift toward right side. C, Two-millimeter dental midline shift toward right side. D, Three-millimeter dental midline shift toward right side, coinciding with facial flow curve.

repeated measures ANOVA with 2 between-subject factors (sex and age) and 1 within-subject factor (repeated measurements of images) and post hoc Bonferroni tests were performed to compare the esthetic scores and determine how they differed from one another (α=.05).

RESULTS

Of the 400 participants, 52% were women, and 48% were men; 4% had a master's or doctoral degree, 47% had a bachelor's degree, 33% had completed high school, and the remainder had not completed high school. The 2 largest age groups were 18 to 25 years old (36%) and 26 to 35 years old (34%). The esthetics scores did not differ between sexes (P=.521).

The esthetic scores of all the groups are presented in Table 2. The highest scores were found in the control group, which had no facial asymmetries, commissural line or transverse occlusal plane inclinations, or dental midline shifts. The image with the lowest esthetic scores is shown in Figure 8I and entails an asymmetrical face with 3 degrees of commissural line and occlusal plane inclinations pointing to the red side of the facial flow curve (P<.001).

The influence of the dental midline's position relative to the facial flow curve was also investigated. The esthetic scores were lowest in Figure 6A-C, in which the dental midline was located on the red side of the facial flow curve but increased as the dental midline approached the facial flow curve. The esthetics scores in Figure 6D, in which the dental midline coincided with the facial flow curve, were higher than those in Figure 6A-C, where the dental midline was located on the red side of the facial flow curve (P<.001). However, the control group with no facial asymmetries (Fig. 5) still had the highest esthetic scores among all the groups (P<.001).

The effects of smile orientations according to the different sides of the facial flow curve and commissural line and transverse occlusal plane inclinations on smile esthetic perception were investigated. The esthetic scores of smiles with commissural line or transverse occlusal plane inclinations were similar (P<.001), and there were no differences between Figure 7A, 7B (P=.358), Figure 7D, 7E (P=.664), Figure 7G, 7H (P=.212), Figure 8A, 8B (P=.296), Figure 8D, 8E (P=.464), or

Figure 7. Asymmetrical face images with dental midline shift coinciding with facial flow curve. A, +1 Degree commissural line cant. B, +1 Degree transverse occlusal plane cant. C, +1 Degree commissural line and transverse occlusal plane cants. D, +2 Degrees commissural line cant. E, +2 Degrees transverse occlusal plane cant. F, +2 Degrees commissural line and transverse occlusal plane cants. G, +3 Degrees commissural line cant. H, +3 Degrees transverse occlusal plane cant. I, +3 Degrees commissural line and transverse occlusal plane cants pointing toward green side of facial flow curve.

Figure 8G, 8H (P=.370). The esthetic scores of Figure 7C, 7F, in which the commissural line and transverse occlusal plane inclinations were in the same direction and pointed toward the green side of the FFC, were higher than those that had either commissural line or transverse occlusal plane inclinations (Fig. 7A, 7B, 7D, 7E) (P<.001). However, Figure 8C, 8F, 8I that had both commissural line and transverse occlusal plane inclinations pointing toward the red side of the facial flow curve had lower esthetics scores than Figure 8A, 8B, 8D, 8E, 8G, 8H that had only commissural line or transverse occlusal plane inclination (P<.001).

Finally, the influence that the degree of commissural line and transverse occlusal plane inclination had on smile esthetic perception was examined. For Figure 8 which had commissural line and transverse occlusal plane inclinations pointing to the red side of the facial flow curve, the lowest esthetics scores are shown in Figure 8I, where the commissural line and transverse occlusal plane inclinations were 3 degrees. Figure 8A with a 1-degree commissural line had the highest esthetic scores. Furthermore, when the degree of commissural line and transverse occlusal plane cant increased, the esthetic scores decreased (P<.001). However, for Figure 7, which had commissural line and/or transverse occlusal plane cants that pointed to the green side of the facial flow curve, the highest esthetic scores are seen in Figure 7F, where a 2-degree commissural line plane and transverse occlusal plane inclination is present, and the lowest scores are seen in Figure 7I, which has a 3-degree commissural line cant. As the commissural line and transverse occlusal plane inclinations increased from 1 degree to 2 degrees, the esthetics scores increased, but they decreased again at 3 degrees (P<.001).

DISCUSSION

The facial flow concept was created by Silva et al,[31] who stated that most faces have an asymmetrical pattern. They suggested that if orthognathic or plastic surgeries that affect an individual's facial form are not planned, the best way for dentists to achieve harmony is to follow the facial flow curve, which provides a more organic approach to the asymmetrical nature of the face.[31]

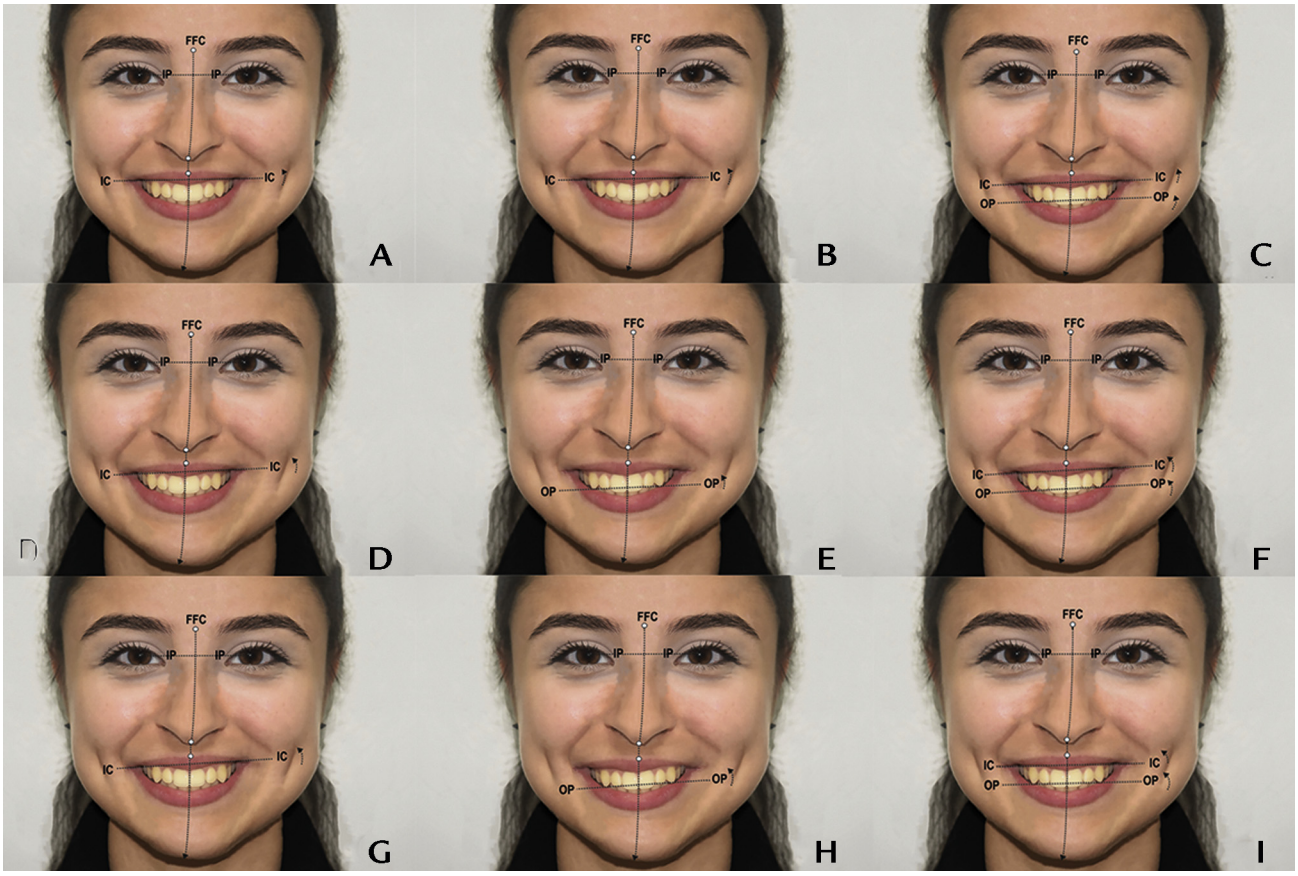

Figure 8. Asymmetrical face images with dental midline shift coinciding with facial flow curve. A, +1 Degree commissural line cant. B, +1 Degree transverse occlusal plane cant. C, +1 Degree commissural line and transverse occlusal plane cants. D, +2 Degrees commissural line cant. E, +2 Degrees transverse occlusal plane cant. F, +2 Degrees commissural line and transverse occlusal plane cants. G, +3 Degrees commissural line cant. H, +3 Degrees transverse occlusal plane cant. I, +3 Degrees commissural line and transverse occlusal plane cants pointing toward red side of facial flow curve.

However, where the degression of inclinations and dental midline shifts create less visual tension or what is considered to be esthetic or not was not clearly explained. Furthermore, Silva et al[31] stated only the vertical components of this concept and have also suggested that both the vertical and horizontal components should be investigated.[31] In the present study, the effects of both the vertical components, such as the relative position of the dental midline to facial flow curve, and some of the horizontal components, such as the different degrees of commissural line and transverse occlusal plane inclinations, on the smile esthetic perception of laypeople were investigated. The esthetic scores of full-face images were found to be statistically significantly different from each other depending on the different transverse occlusal plane and commissural line inclinations, dental midline shifts, and to which side of the facial flow curve the smile was pointing. The obtained data led to the rejection of the null hypothesis that no statistically significant difference would be found in the esthetic perception of laypeople.

Beyer and Lindauer[25] affirmed the role of facial structures in smile esthetics, reporting that the different facial structures and their deviations influenced the observer's perception of smile esthetics. According to Silva et al,[23] the dental midline does not need a completely straight orientation to be esthetically harmonious as has been suggested by others.[13,27,28] For asymmetric faces with nose and chin deviations, the direction of the dental midline shift may be a major factor in the esthetic perception of a layperson, and the threshold level for recognition of a dental midline shift can be lower when it does not follow the facial asymmetries.[23] Silva et al[33] stated that when the axial inclination of the dental midline follows the chin and nose inclinations, it is more esthetically pleasing to laypeople. Furthermore, they stated in their conceptual study that, if small midline shifts or inclinations fall on the green side of the facial flow curve, this blends with the patient's facial structures and creates less visual tension; however, when the dental midline shift falls on the red side, it creates greater visual tension.

Table 1. Symmetrical or asymmetrical face patterns with different degrees of dental midline shift, commissural line cant, and transverse occlusal plane cant

Figure	Face Pattern	Dental Midline Shift	Commissural Line Cant (Degrees)	Transverse Occlusal Plane Cant (Degrees)	Side of Facial Flow Curve
Figure 5	Symmetrical	0 mm	0	0	–
Figure 6A	Asymmetrical	0 mm	0	0	–
Figure 6B	Asymmetrical	1 mm R	0	0	–
Figure 6C	Asymmetrical	2 mm R	0	0	–
Figure 6D	Asymmetrical	3 mm R	0	0	–
Figure 7A	Asymmetrical	3 mm R	+1	0	Green
Figure 7B	Asymmetrical	3 mm R	0	+1	Green
Figure 7C	Asymmetrical	3 mm R	+1	+1	Green
Figure 7D	Asymmetrical	3 mm R	+2	0	Green
Figure 7E	Asymmetrical	3 mm R	0	+2	Green
Figure 7F	Asymmetrical	3 mm R	+2	+2	Green
Figure 7G	Asymmetrical	3 mm R	+3	0	Green
Figure 7H	Asymmetrical	3 mm R	0	+3	Green
Figure 7I	Asymmetrical	3 mm R	+3	+3	Green
Figure 8A	Asymmetrical	3 mm R	-1	0	Red
Figure 8B	Asymmetrical	3 mm R	0	-1	Red
Figure 8C	Asymmetrical	3 mm R	-1	-1	Red
Figure 8D	Asymmetrical	3 mm R	-2	0	Red
Figure 8E	Asymmetrical	3 mm R	0	-2	Red
Figure 8F	Asymmetrical	3 mm R	-2	-2	Red
Figure 8G	Asymmetrical	3 mm R	-3	0	Red
Figure 8H	Asymmetrical	3 mm R	0	-3	Red
Figure 8I	Asymmetrical	3 mm R	-3	-3	Red

L, left; R, right.

Table 2. Minimum, maximum, mean, and standard deviation of esthetics scores of each figure

Figure	Minimum	Maximum	Mean	Standard Deviation
Figure 5	7.00	10.00	9.25	0.67
Figure 6A	4.00	6.00	4.65	0.88
Figure 6B	5.00	6.00	5.14	0.32
Figure 6C	5.00	7.00	5.56	0.54
Figure 6D	6.00	8.00	6.76	0.62
Figure 7A	6.00	8.00	7.03	0.73
Figure 7B	6.00	8.00	7.21	0.66
Figure 7C	7.00	8.00	7.65	0.52
Figure 7D	7.00	9.00	8.04	0.81
Figure 7E	7.00	9.00	8.28	0.78
Figure 7F	7.00	9.00	8.46	0.91
Figure 7G	6.00	8.00	6.51	0.57
Figure 7H	6.00	8.00	6.66	0.77
Figure 7I	7.00	8.00	7.09	0.68
Figure 8A	5.00	7.00	5.94	0.59
Figure 8B	5.00	7.00	5.72	0.65
Figure 8C	5.00	7.00	5.24	0.93
Figure 8D	4.00	6.00	4.81	0.95
Figure 8E	4.00	6.00	4.51	0.52
Figure 8F	3.00	6.00	4.03	0.98
Figure 8G	3.00	5.00	3.44	0.92
Figure 8H	2.00	4.00	3.19	0.73
Figure 8I	1.00	4.00	2.69	0.97

In the present study, similar to the one by Silva et al,[23] in an asymmetric face model with nose and chin deviations, the direction of the dental midline shift affected the esthetic perception of laypeople. In support of the facial flow concept,[31] photographs in which the dental midline shifted toward the green side of the facial flow curve had higher esthetic scores than those that moved to the red side. In asymmetric faces, the esthetic scores of photographs decreased as the dental midline shifted in the direction opposite the facial flow curve.

Various studies have been carried out on the effect the transverse occlusal plane cant on the esthetic perception of laypeople when evaluating symmetrical faces. Ker et al[27] stated that laypeople found a transverse occlusal plane cant of 0 degrees to be esthetic, while Padwa et al[16] reported that 70% of the population recognized occlusal cants greater than 3 degrees in symmetrical faces. In other studies on symmetrical faces, occlusal cant acceptability varied from 2 to 5.[1,16-18] However, the authors are unaware of studies investigating laypeople's perception of the transverse occlusal plane and commissural line in asymmetric faces.

In the present study, similar to the one by Ker et al,[27] the symmetrical facial model without any commissural line or transverse occlusal plane inclinations was found to be more esthetic by laypeople. However, in the asymmetrical facial models, the commissural line and transverse occlusal plane inclinations affected the esthetic scores differently from the symmetrical facial models. Supporting the facial flow concept,[31] the present results showed that in asymmetrical faces, 1 to 3 degrees of commissural line and transverse occlusal plane inclinations pointing toward the green side of the facial flow curve were preferable to 0 degrees. In addition, the esthetics scores of images with a 1- to 3-degree commissural line and transverse occlusal plane inclinations pointing to the green side of the facial flow curve were higher than those of images with inclinations pointing to the red side. When comparing the esthetics scores of smiles that pointed to the green side of the facial flow curve, an increase in commissural line and transverse occlusal plane inclination up to a threshold of 3 degrees positively impacted esthetics scores. Images with 3 degrees of commissural line and transverse occlusal plane inclinations had lower esthetics scores than those with 1- or 2-degree inclinations. However, an increase in inclination had a negative impact on the esthetics scores of images pointing to the red side of the facial flow curve, with the esthetics scores decreasing as the commissural line and transverse occlusal plane cants increased.

Silva et al[32] investigated the esthetic perception of laypeople regarding the transverse occlusal plane and

commissural line orientation from a frontal perspective in symmetrical faces. They reported that, in the symmetrical facial model, 40% of laypeople preferred a transverse occlusal plane that was parallel to the interpupillary line, and if the commissural line and interpupillary line were not parallel to each other, most laypeople preferred a transverse occlusal plane canted in the same direction as the commissural line.

In the present study, the laypeople's esthetic perception regarding parallel or unparallel transverse occlusal plane and commissural line in an asymmetrical facial model was investigated. The parallelism between the transverse occlusal plane and commissural line had a positive effect on the esthetic perception of smiles pointing to the green side of the facial flow curve, while it had a negative impact on the esthetics scores of those pointing to the red side. When the esthetic scores of smiles pointing to the green side of the facial flow curve are compared, images with parallel transverse occlusal plane and commissural line had higher esthetics scores than those with either a transverse occlusal plane or commissural line. However, the esthetics scores of asymmetrical faces with parallel transverse occlusal plane and commissural line pointing to the red side of the facial flow curve were lower than those with either a transverse occlusal plane or commissural line.

Analyzing the face in motion is essential during the smile design process, as it has been suggested that what matters in beauty is motion and not just static appearance.[36] Therefore, screenshots from a video were used in the present study, as the creators of the facial flow concept suggested 2 or more such images[24] of a social smile; this smile is the one most often adopted. They also recommended that if there is a large discrepancy between an individual's spontaneous and social smiles, the patient and clinician may need to evaluate both these smile references before making a decision.[24] Smile photographs should also be standardized in a natural head position[7-9] with a social smile, as they are reproducible.[7,10] In the present study, reproducible social smile images[7,10] of the volunteer were used as there was no large discrepancy between her spontaneous and social smiles.[24]

Limitations of the study included that instead of a 3-dimensional simulation,[11] only 2-dimensional images were used, and the study only examined the esthetics perceptions of 1 ethnicity, while the esthetics perceptions of laypeople may differ among ethnicities.[12] A multicenter study spanning different countries may therefore be more effective in determining laypeople's esthetics perceptions. Furthermore, only a single female volunteer was used with no male counterpart.[35] Also, because of ethical concerns, the changes to the photographs were made by using a photoediting software program, although the concept was originally defined by using a smile design program.[31] The esthetic evaluation of a patient whose smile is designed according to the facial flow concept by using a smile design software program may be more realistic. Another limitation of this study was that the nose and chin deviations and dental midline shifts were made according to the visual recognition thresholds as determined by previous studies.[1,23,32] It should be taken into account that the threshold of recognition of past studies can only be applied to a specific facial model; however, a different facial model was used in the present study.

The findings from this study focused on the lower third of the face and were mainly affected by the severity and direction of chin deviation, especially in patients with asymmetrical faces. This concept introduces a natural and organic approach to the orofacial analysis of patients with respect to the asymmetrical and imperfect nature of the face,[31] but smile characteristics and esthetic perceptions are subjective and may differ among individuals.[12]

CONCLUSIONS

Based on the findings of this study, the following conclusions were drawn:

1. Laypeople found images that had the transverse occlusal plane and commissural line pointed to the green side of the facial flow curve significantly more attractive than images in which they pointed to the red side.
2. In asymmetric faces, images in which the dental midline followed the facial flow curve had higher esthetics scores than images in which the dental midline did not coincide with the facial flow curve.
3. In images where the transverse occlusal plane and commissural line pointed to the green side of the facial flow curve, 3 degrees of transverse occlusal plane and commissural line cant was the threshold for decreasing esthetics scores.
4. As the commissural line and transverse occlusal plane cants increased, the esthetics scores decreased in images with transverse occlusal plane and commissural line cants pointed to the red side of the facial flow curve.
5. In asymmetrical faces with transverse occlusal plane and commissural line pointed to the green side of the facial flow curve, parallelism between the transverse occlusal plane and commissural line was preferred over the cant of only one or the other.

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