Comparing the esthetic impact of virtual mandibular advancement, bichectomy, jawline, and their combination

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Introduction: The purpose of this study was to compare the effects of mandibular advancement (MA), bichectomy, jawline, and their combination on facial attractiveness. The 3-dimensional (3D) visual sculpting is a method to perform the task. **Methods:** FaceBuilder software, a Blender 2.93 LTS add-on, was used to generate a 3D head and face model of a female patient with Class II Division I malocclusion. MA, bichectomy, jawline, and combination modifications were performed on the model using a 3D virtual sculpting tab, and 4 new head models were created. Five hundred thirteen participants scored lateral and frontal views of the modified and reference models. The Mann-Whitney U, Kruskal-Wallis, and Wilcoxon tests were used for statistical analysis. **Results:** MA modification received the highest frontal and lateral image scores. The raters found the jawline frontal photograph to be the least attractive. Significant differences were observed between the lateral and frontal attractiveness scores in all modifications except bichectomy. The combination of 3 modifications in both frontal and lateral images received the second-lowest score. **Conclusions:** Facial esthetic modifications receive different attractiveness scores in lateral or frontal evaluations. MA outperforms bichectomy and jawline augmentation in terms of improving facial attractiveness. (Am J Orthod Dentofacial Orthop 2023;■:■-■)

Class II malocclusions are one of the most common developmental anomalies, with their prevalence ranging from 15% to 30%.[1,2] This anomaly, which is frequently characterized by mandibular retrognathia, has a negative impact on facial esthetics, resulting in negative psychological and social consequences.[3-5] In nongrowing patients with skeletal Class II malocclusion, orthodontic-orthognathic combined treatment improves occlusion, function, and facial esthetics.[6] However, when it comes to major and complicated surgery such as mandibular advancement (MA), patient motivation has shown individual variability.[7,8]

The significance of facial esthetics has grown to an undeniable level in recent years. Facial attractiveness gives patients self-confidence and enables them to have good social relations.[9] Full cheek volume and a well-defined jawline are the cornerstones of the beauty triangle in facial esthetics.[10,11] In particular, women desire a more attractive face with commonly applied facial esthetic improvement techniques such as bichectomy and jawline.[12,13] In the bichectomy technique, the buccal fat pad (BFP) is removed, and the prominence of the zygomatic bones increases, which involves a simple intraoral incision.[14] BFP is a lobulated mass of adipose tissue surrounded by a thin fibrous capsule lying between the buccinator muscle medially, the anterior margin of the masseter muscle anteriorly, and the mandibular ramus and zygomatic arch laterally.[15] With injectable fillers such as calcium hydroxyapatite, facial contours (particularly the lower third of the face) are made angular and more prominent in the jawline method.[16] Jawline is a minimally invasive cosmetic procedure similar to a bichectomy. In this context, patients may find bichectomy and jawline more tolerable esthetic approaches than orthognathic surgery.

One of the primary goals of orthodontic treatment is to achieve balanced facial esthetics.[17-19] Nevertheless, the perception of attractiveness has demonstrated individual or social differences.[20,21] Orthodontists use survey studies on facial esthetics to determine the most appropriate treatment approach for patients. However, these studies evaluate lateral or frontal photographs by making 2-dimensional (2D) facial

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Fig 1. Initial lateral and frontal photographs used to create a 3D head model.

modifications.[22] Only silhouette images are used in some similar studies.[23] However, patients perceive and evaluate esthetic appeal in 3 dimensions in real life. To eliminate the shortcomings of previous studies (2D modification, only lateral or only frontal view scoring), modifications in facial esthetics were performed 3-dimensionally in this study. In addition, the participants were asked to score both lateral and frontal images of the modified head models. Thus, this study will allow us to learn whether esthetic perception changes according to the evaluation angle (frontal or lateral).

The primary aim of the study was to compare different applications related to facial esthetics (MA, bichectomy, and jawline) by scoring lateral and frontal photographs. The secondary goal of the study is to test if different esthetic applications can improve facial attractiveness in patients who do not want to undergo MA surgery.

MATERIAL AND METHODS

The protocol of this study was approved by the clinical research ethics committee of Afyonkarahisar Health Science University (ID no. 424-2021). Lateral and frontal photographs of a 17-year-old Class II Division 1 female patient were used in the study (Fig 1). All photographs were taken with a Canon EOS 60D (Canon, Tokyo, Japan) camera and a Sigma 105 mm f/28 EX DG macro lens (Nikon, Tokyo, Japan) mounted on a tripod 1.5 meters from the patient. An informed consent form was obtained from the patient. A 3-dimensional (3D) head-face model of the patient was created in Blender 2.93 LTS software using the right lateral, left lateral, and frontal photographs. The 3D reference head model was sculpted in the following 4 ways: (1) only bichectomy, (2) only MA, (3) only jawline (lower facial contouring), and (4) a combination of the previous modifications (bichectomy, MA, and jawline). Lateral and frontal images of reference and modified head models were standardized and included in the survey. The participants were asked to rate the images on a scale of 1 (very unattractive) to 10 (very attractive). Finally, the Google Forms platform created an online survey with 7 demographic questions and 10 image scoring (5 lateral and 5 frontal). The survey was sent to participants via e-mail and WhatsApp messenger (WhatsApp Inc, Menlo Park, Calif).

When the sample size was calculated using the G*Power software (version 3.0.10, Franz Faul, Christian-Albrechts-Universitat, Kiel, Germany), it revealed at least 337 participants (effect size = 0.8; significance level = 0.05, and power = 0.90) were required. A total of 513 persons (341 female, 172 male) were included in the study. They were divided into 5 groups on the basis of their social status: orthodontists, dentists, dental students, patients, and laypeople.

FaceBuilder (version 2021.2.0) is a Blender add-on that allows for the construction of 3D human faces and heads from photographs. It also enables the creation of a high-quality head model with clean topology without requiring face-scanning equipment. A 3D head and face model is created by matching photographs of a person from various angles on a model. This model is then ready for sculpting. The steps for converting 2D images to 3D models are presented in Figure 2.

The sculpting tab was used to make 3D modifications to the reference model. There were a bunch of brushes over there in the sculpting layout. The x- and y-axis in the symmetry tab were marked so that the changes in all 3D modifications were symmetrical (same size and localization for both the right and left half of the face).

A sculpt that resembles a bichectomy was created while obtaining the first model by generating a concavity

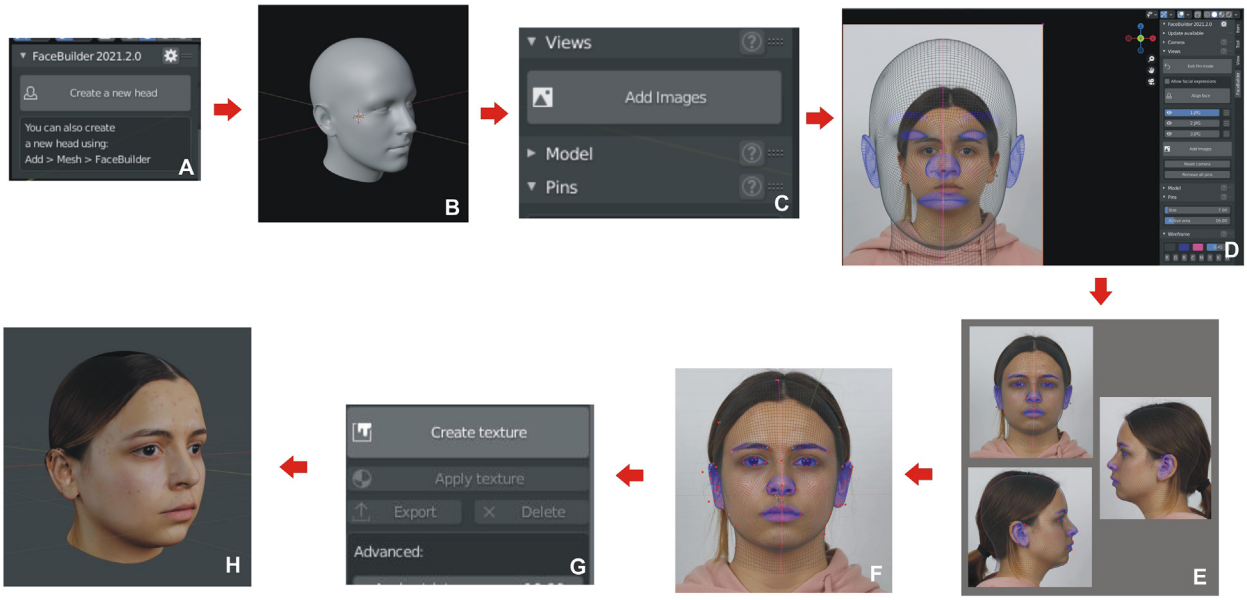

Fig 2. The steps involved in creating a 3D head model: **A,** Create a new head button; **B,** Standard 3D head model; **C,** Add images button; **D,** Align face button; **E,** Alignment of each of the 3 photographs with the standard head model; **F,** Adding additional pins to improve alignment; **G,** Create texture button; **H,** 3D reference head and face model.

3-4 cm wide and 2-3 mm deep on the close localization of the BFP (Fig 3). Thus, zygomatic prominence was enhanced.

MA was performed in the second model. The AudaxCeph software's virtual treatment objective tab simulates mandibular autorotation. The mandible was moved forward 8 mm and downward 4 mm.

The lower face contours were made more angular in the third model, and the prominence of the chin contours was enhanced. In addition, the increased submental-cervical angle was reduced (Fig 4).

In the fourth model, a combination of bichectomy, MA, and jawline modification was performed the same way as previously described. Lateral and frontal images were obtained from each of the 5 head models (1 reference, 4 modified), in which 10 photographs were added to the survey (Fig 5). The participants were asked to rate the images on a scale of 1-10 (very unattractive to very attractive). It was emphasized that during scoring, a photograph should only be looked at for a maximum of 5 seconds, and the photographs should not be compared with one another.

Statistical analysis

SPSS software (version 21.0; IBM, Armonk, NY) package program was used for statistical analysis. Initially, the Shapiro-Wilk normality test was performed. For each parameter, the mean value and standard deviation were calculated. Different photographs were evaluated with different variables such as gender, level of education, geographic regions, social status, and years of experience. The Mann-Whitney U test was used to compare the scores of male and female participants. A Kruskal-Wallis H test was employed to compare groups according to the level of education, geographic regions, social status, and years of experience. In addition, the post-hoc Bonferroni test was carried out separately for each multiple comparison. Wilcoxon test was used to compare the mean scores of frontal and lateral photographs. A P value of <0.05 was considered statistically significant.

RESULTS

The survey was completed by 513 subjects aged 15-56 years. The demographic distribution of the participants is shown in Figure 6.

The mean scores of the frontal and lateral photographs are reported in Table I. MA modification had the highest scores on both frontal (F) and lateral (L) photographs (MA-F, 5.39 $\pm$ 2.06; MA-L, 5.76 $\pm$ 2.16). Jawline frontal (JF) was the photograph found least attractive (3.65 $\pm$ 1.91) by the participants. Bichectomy

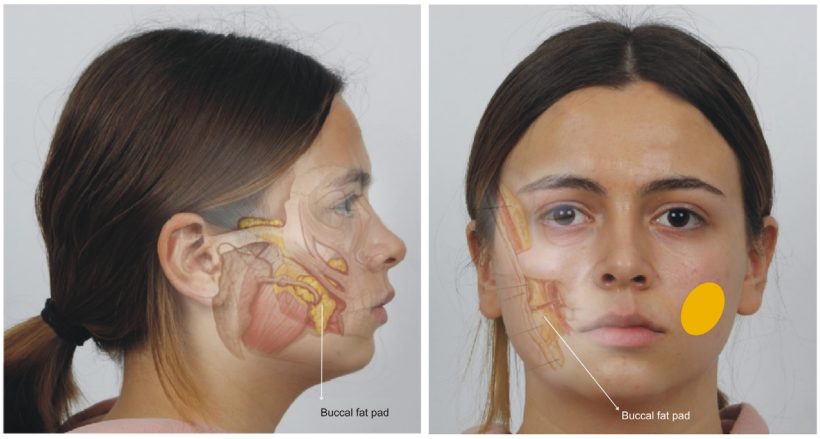

Fig 3. Anatomic localization of the BFP from the lateral and frontal views is depicted in the illustration.

lateral had the lowest score (4.26 ± 1.90) among lateral photographs. There was no difference in the mean scores of the frontal and lateral photographs of the bichectomy modification ($P = 886$). However, all other modifications significantly differed between lateral and frontal attractiveness scores ($P < 0.05$).

The results of comparing the mean scores of male and female participants are outlined in Table II. Only the mean scores of the JF photograph revealed a statistically significant difference on the basis of gender ($P < 0.05$). Other frontal and lateral photographs were given similar attractiveness scores by the male and female participants ($P > 0.05$).

Table III presents the outcomes of the comparisons conducted on the basis of education level. A statistically significant difference was found between the groups only in the reference frontal and bichectomy frontal photographs ($P < 0.05$). In contrast, other esthetic modifications revealed no statistically significant relationship between attractiveness assessment and educational status ($P > 0.05$).

The results of the comparison based on geographic regions are shown in Table IV. Only JF and combined frontal photographs indicated a statistically significant difference between the groups ($P < 0.05$). The geographic region showed no statistically significant effect on the mean scores of the other photographs ($P > 0.05$).

Table V lists the mean scores of the comparison based on social status. It was found that there was a significant difference between the mean scores of the reference frontal, bichectomy frontal, MA-F, JF, and reference lateral photograph ($P < 0.05$). There was no statistically significant difference in mean scores between the other photographs based on social status ($P > 0.05$). The MA-F and MA-L photographs were given the highest scores by orthodontists (5.86 ± 1.98 and 6.20 ± 1.94, respectively). Similarly, the MA-L photograph received the highest score (5.49 ± 2.33) from laypeople.

The relationship between years of experience and mean scores is reported in Table VI. It was observed that the years of experience did not result in a statistically significant change in the scores for all photographs ($P > 0.05$).

DISCUSSION

Facial beauty is a subjective and indefinable concept. A face with ideal esthetic proportions may not be regarded as attractive because esthetic perception is influenced by various factors, including age, gender, education level, social status, and geographic location.[24,25]

Patients with Class II Division 1 malocclusion characterized by mandibular retrognathia are commonly seen in many populations.[26] Adults with Class II malocclusion are treated with camouflage therapy or orthognathic surgery. In severe malocclusion, camouflage treatment is not appropriate, and MA is the only choice. In contrast, patients may not always be able to accept this difficult surgical procedure. This study aimed to determine if bichectomy and jawline esthetic techniques improve facial attractiveness in patients with Class II Division 1 malocclusion.

Previous studies evaluating the perception of attractiveness have used either profile or frontal photographs.[21,27,28] In these studies, photographs are modified 2-dimensionally using Photoshop (Adobe Systems, San Jose, Calif) or equivalent software. Researchers have also used silhouette images in similar studies.[22,29] This is the first study in which 3D esthetic modifications

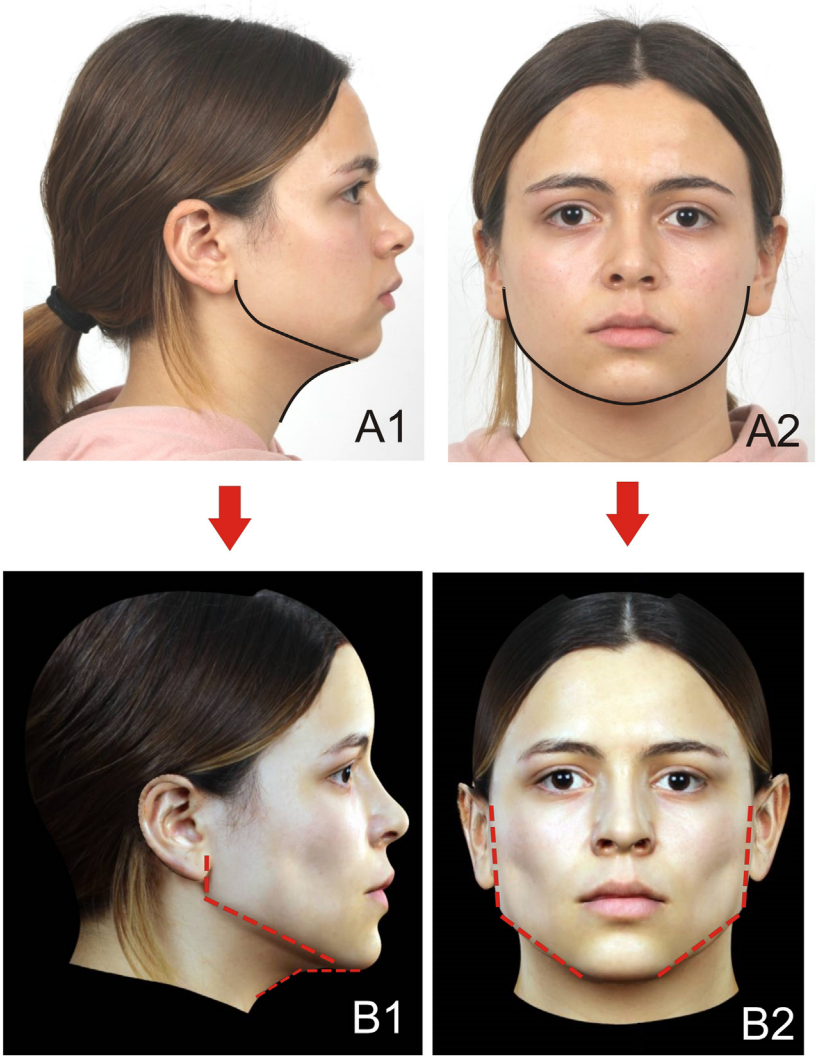

Fig 4. A visual representation of the changes in facial contours generated by the jawline modification: **A1,** Reference lateral photograph with rounded mandible contours and a wide chin-throat angle; **A2,** Reference frontal photograph with oval lower facial contour; **B1,** Prominent and angular lower facial contours and reduced chin-throat angle after jawline modification; **B2,** Frontal view of prominent and angular face after jawline modification.

(bichectomy, MA, jawline, and combination) were performed on a 3D head model of a female patient with Class II Division 1 malocclusion. Attractiveness was assessed in lateral and frontal images of the same head-face models. This is also the first study to compare lateral and frontal esthetic perceptions. The scoring system used in the evaluation is a reliable method that has been applied in numerous similar studies.[28,30]

Facial scanning devices are used in collaboration with computed tomography images for orthognathic surgery patients.[31] In addition, facial scanners are frequently preferred in facial analysis studies.[32] However, devices with high image quality are expensive, and their long image acquisition time is another disadvantage.[33] Although portable versions are less expensive, their accuracy and sensitivity are inadequate. Patients are commonly asked to close their eyes when using face-scanning technology, although the eyes are one of the most important parts of facial attractiveness.[34] The method for creating a 3D head-face model used in this study is more practical and simpler. It does not necessitate a high level of technical precision. Another significant benefit of the technique is that the patient's eyes are visible in a 3D head-face model.

Fig 5. Ten photographs were scored by the participants. *RF*, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.

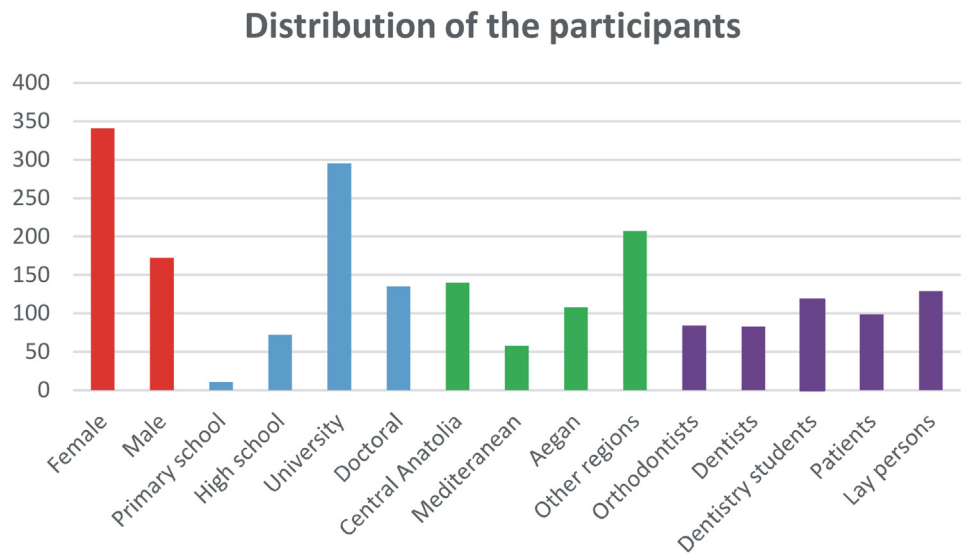

Fig 6. Distribution of raters by gender (*red*), education (*blue*), geographic region (*green*), and social status (*purple*).

Laypeople's opinions are important in determining a patient's treatment plan with Class II Division 1 malocclusion. Previous research has found that orthodontists and laypeople perceive facial attractiveness differently. For example, Lines et al,[35] Marchiori et al,[36] and Peerlings et al[37] found no difference in facial esthetic perception between laypeople and professionals. Although some authors suggest that orthodontists were more critical than laypeople,[3,38] other researchers found that laypeople were more critical.[39,40] In this study, both orthodontists and laypeople gave the highest score to MA modifications in frontal and lateral photographs. Ng et al[41] also found that facial attractiveness increased after MA therapy. Dentists, dental students, and patients

Table I. Comparison of different esthetic modification scores on frontal and lateral views

Photographs	*Frontal*	*Lateral*	P *value*
Reference	4.53 ± 1.87^{Aab}	4.70 ± 1.98^{Ba}	0.043*
Bichectomy	4.21 ± 1.86^{Ab}	4.26 ± 1.90^{Ab}	0.886
MA	5.39 ± 2.06^{Ac}	5.76 ± 2.16^{Bc}	0.001*
Jawline	3.65 ± 1.91^{Ade}	5.30 ± 2.17^{Bd}	0.001*
Combination	3.96 ± 2.10^{Abe}	4.65 ± 2.45^{Bae}	0.001*
P value	0.001*	0.001*	

Note. Values are presented as mean ± standard deviations. Lowercase superscripts represent differences in columns, whereas uppercase superscripts represent differences in lines. A Wilcoxon test was used to compare rows, and a Kruskal-Wallis test was used to compare groups in columns.
*Different superscripts denote statistically significant differences between groups ($P < 0.05$).

Table II. Comparison of male and female scores

Photographs	*Female (n = 341)*	*Male (n = 172)*	P *value*
RF	4.55 ± 1.89	4.50 ± 1.85	0.642
BF	4.18 ± 1.86	4.26 ± 1.86	0.735
MA-F	5.44 ± 2.11	5.30 ± 1.96	0.339
JF	3.43 ± 1.87	4.06 ± 1.94	0.001*
CF	3.87 ± 2.10	4.14 ± 2.09	0.166
RL	4.61 ± 1.99	4.88 ± 1.94	0.167
BL	4.19 ± 1.92	4.41 ± 1.86	0.223
MA-L	5.73 ± 2.17	5.84 ± 2.13	0.698
JL	5.28 ± 2.19	5.35 ± 2.15	0.745
CL	4.53 ± 2.46	4.88 ± 2.42	0.120

Note. Values are presented as mean ± standard deviations.
RF, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.
*Statistically significant difference determined by Mann-Whitney U test, $P < 0.05$.

also gave the MA-F and MA-L photographs the highest scores. However, the standard deviation in the mean scores of orthodontists and dentists (Table V) was lower than in laypersons, revealing that professionals analyze more precisely than laypersons. Another interesting finding of the study is that laypeople gave lower scores to reference photographs (convex profile and low lower face height) than orthodontists and dentists. However, Kurado et al,[30] Chong et al,[42] and Soh et al[28] reported that laypersons might find the convex profile more attractive than orthodontists. This disparity in findings could be due to geographic location, culture, age, gender, educational level, and other factors. This study found that these factors may influence the mean score of some, but not all, photographs. Leopold et al[43] and Little et al[44] reported similar results.

Cheek volume, according to plastic surgeons, is an important factor in facial esthetics and youthful appearance.[45] Orthodontists believe that maxillary protraction or rapid maxillary expansion improves facial esthetics by enhancing zygomatic bone prominence.[46] In the study of Feng et al,[47] in which they evaluated the effects of cheek volume on facial esthetics, it was observed that orthodontists and nonspecialists gave different esthetic scores to different cheek volumes. In our study, bichectomy, which added extra volume to the cheek, received lower scores than the reference photograph. In addition, according to our findings, the esthetic perception of increased cheek volume was affected by some variables (social status, education level) but not by others (gender, years of experience). Usually, the orthodontist is not obligated to manipulate a patient's cheek volume. However, cheek volume awareness might be one of the factors that can improve overall orthodontic diagnosis and analysis capacity.

Asians generally find the oval face type more attractive than the angular face.[48] However, prominent, angular, and masculine facial features are in high demand in the West.[49] Jawline is a procedure that makes facial lines more prominent and angular. The low scores for the JF photograph in our study, which was conducted in an Asian population, were unsurprising.

Facial attractiveness is a subjective and complex concept.[50] This can be explained by interperson differences in esthetic perception. The origin and meaning of facial beauty represent a long-standing conundrum. Despite numerous research assessing facial attractiveness, the nature of interperson differences continues to be a contentious topic.[51] This may explain why the average attractiveness scores of the jawline, bichectomy, and combined alterations vary on the basis of gender, education level, geographic regions, and social status (Tables II-V). Humphrey et al[52] suggest that combining multiple esthetic therapies results in greater overall efficacy and higher patient satisfaction. However, based on the findings of this study, such a conclusion cannot be reached. This is because some comparisons showed that combined frontal and lateral photographs have lower scores than bichectomy and jawline modifications, whereas others found greater scores. Kim et al[53] suggested that evaluating the face from various angles influences the perception of facial attractiveness. This study showed a statistically significant difference between the lateral and frontal photographs (except BF-BL) (Table I). These findings are in line with the results of the study by Kim et al.[53]

People seek facial cosmetic enhancement not only from orthodontists but also from plastic surgeons.

Table III. Comparison of mean scores according to education level

Photographs	*PS (n = 11)*	*HS (n = 72)*	*UN (n = 295)*	*DL (n = 135)*	P *value*	*Significance between*
RF	5.91 ± 1.70	4.17 ± 2.01	4.44 ± 1.80	4.80 ± 1.91	0.014*	PS and HS
BF	5.91 ± 1.75	3.97 ± 2.00	4.18 ± 1.80	4.24 ± 1.85	0.026*	PS and HS, UN, DL
MA-F	5.45 ± 1.86	5.04 ± 2.38	5.32 ± 1.98	5.75 ± 2.03	0.091	
JF	4.91 ± 2.16	3.83 ± 2.11	3.60 ± 1.94	3.55 ± 1.70	0.178	
CF	5.27 ± 1.84	3.83 ± 2.20	4.01 ± 2.18	3.81 ± 1.83	0.151	
RL	5.64 ± 2.37	4.51 ± 2.18	4.59 ± 1.94	4.96 ± 1.89	0.084	
BL	5.64 ± 2.01	4.04 ± 2.25	4.26 ± 1.91	4.28 ± 1.63	0.068	
MA-L	5.73 ± 1.48	5.47 ± 2.71	5.67 ± 2.10	6.13 ± 1.96	0.150	
JL	5.09 ± 1.92	5.39 ± 2.61	5.22 ± 2.12	5.44 ± 2.06	0.637	
CL	4.64 ± 1.74	4.43 ± 2.89	4.68 ± 2.43	4.70 ± 2.28	0.685	

Note. Values are presented as mean ± standard deviations.
PS, primary school; *HS*, high school; *UN*, university; *DL*, doctoral; *RF*, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.
*$P < 0.05$.

Table IV. Comparison of average scores according to geographic regions

Photographs	*CA (n = 140)*	*MD (n = 58)*	*AG (n = 108)*	*OR (n = 207)*	P *value*	*Significance between*
RF	4.36 ± 1.63	4.36 ± 1.72	4.81 ± 2.00	4.55 ± 1.99	0.297	
BF	4.06 ± 1.80	4.38 ± 1.63	4.60 ± 1.98	4.05 ± 1.87	0.050	
MA-F	5.21 ± 1.94	5.47 ± 1.96	5.81 ± 2.13	5.29 ± 2.11	0.162	
JF	3.35 ± 1.57	3.43 ± 1.77	4.38 ± 2.11	3.52 ± 1.97	0.001*	AG and CA, MD, OR
CF	3.84 ± 2.04	3.95 ± 1.86	4.45 ± 2.08	3.79 ± 2.18	0.038*	AG and OR
RL	4.70 ± 1.84	4.53 ± 1.87	5.08 ± 2.24	4.55 ± 1.94	0.180	
BL	4.32 ± 1.80	4.17 ± 1.59	4.40 ± 2.09	4.18 ± 1.96	0.851	
MA-L	5.66 ± 2.08	5.97 ± 2.28	6.04 ± 2.25	5.63 ± 2.12	0.389	
JL	5.25 ± 2.11	5.50 ± 2.22	5.54 ± 2.19	5.15 ± 2.20	0.288	
CL	4.72 ± 2.46	4.91 ± 2.48	4.84 ± 2.51	4.42 ± 2.40	0.309	

Note. Values are presented as mean ± standard deviations.
CA, Central Anatolia; *MD*, Mediterranean; *AG*, Aegean; *OR*, other regions; *RF*, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.
*Statistically significant difference as determined by Kruskal-Wallis and post-hoc Bonferroni tests, $P < 0.05$.

Table V. Comparison of mean scores according to social status

Photographs	*OD (n = 84)*	*DN (n = 83)*	*DS (n = 118)*	*PT (n = 99)*	*LP (n = 129)*	P *value*	*Significance between*
RF	4.87 ± 1.74	4.98 ± 1.96	4.39 ± 1.70	4.64 ± 1.88	4.07 ± 1.95	0.004*	OD and LP; DN and LP
BF	4.33 ± 1.83	4.41 ± 1.95	4.24 ± 1.61	4.55 ± 2.01	3.71 ± 1.85	0.002*	PT and LP
MA-F	5.86 ± 1.98	5.90 ± 1.84	5.31 ± 1.81	5.31 ± 2.11	4.91 ± 2.29	0.003*	OD and LP; DN and LP
JF	3.54 ± 1.57	3.87 ± 1.95	3.28 ± 1.64	4.24 ± 2.11	3.45 ± 2.08	0.005*	DS and PT; PT and LP
CF	3.77 ± 1.87	4.07 ± 2.04	4.19 ± 1.96	4.28 ± 2.19	3.55 ± 2.27	0.120	
RL	4.98 ± 1.77	5.28 ± 1.85	4.56 ± 1.87	4.66 ± 2.06	4.32 ± 2.13	0.004*	DN and LP
BL	4.29 ± 1.58	4.53 ± 1.79	4.33 ± 1.74	4.25 ± 2.05	4.02 ± 2.17	0.154	
MA-L	6.20 ± 1.94	6.00 ± 2.06	5.72 ± 2.01	5.61 ± 2.30	5.49 ± 2.33	0.127	
JL	5.31 ± 1.90	5.70 ± 2.16	5.17 ± 1.98	5.25 ± 2.21	5.19 ± 2.48	0.313	
CL	4.85 ± 2.18	4.76 ± 2.50	4.81 ± 2.46	4.47 ± 2.56	4.43 ± 2.49	0.447	

Note. Values are presented as mean ± standard deviations.
OD, orthodontists; *DN*, dentists; *DS*, dental students; *PT*, patients; *LP*, laypeople; *RF*, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.
*Statistically significant difference as determined by Kruskal-Wallis and post-hoc Bonferroni tests, $P < 0.05$.

Therefore, orthodontists must be aware of the impact of other facial esthetic changes performed by plastic surgeons. In this study, MA received the highest score. Based on the findings of this study, it can be concluded that jawline or bichectomy, which is widely used to improve facial esthetics, can not be an alternative for

Table VI. Comparison of average scores according to years of experience

	Years of experience				
Photographs	*0-3 y (n = 68)*	*4-6 y (n = 38)*	*7-10 y (n = 34)*	*>10 y (n = 27)*	P *value*
RF	5.06 ± 1.87	4.50 ± 1.64	4.97 ± 1.94	5.11 ± 1.98	0.483
BF	4.56 ± 2.04	4.39 ± 1.96	4.26 ± 1.48	4.00 ± 1.88	0.622
MA-F	5.84 ± 2.01	5.76 ± 1.93	5.97 ± 1.83	6.04 ± 1.80	0.956
JF	3.65 ± 1.81	3.50 ± 1.85	3.82 ± 1.42	3.96 ± 1.99	0.666
CF	3.90 ± 1.85	4.18 ± 2.19	3.91 ± 1.58	3.63 ± 2.32	0.652
RL	5.00 ± 1.78	4.71 ± 1.88	5.65 ± 1.75	5.37 ± 1.75	0.155
BL	4.34 ± 1.58	4.66 ± 1.84	4.47 ± 1.74	4.15 ± 1.70	0.715
MA-L	6.18 ± 1.97	5.84 ± 2.15	6.35 ± 2.05	5.96 ± 1.82	0.710
JL	5.63 ± 1.98	4.97 ± 2.33	5.91 ± 1.64	5.41 ± 2.15	0.298
CL	5.03 ± 2.36	4.97 ± 2.57	4.50 ± 2.17	4.37 ± 2.18	0.541

Note. Values are presented as mean ± standard deviation.
RF, reference frontal; *BF*, bichectomy frontal; *CF*, combination frontal; *RL*, reference lateral; *BL*, bichectomy lateral; *JL*, jawline lateral; *CL*, combination lateral.

MA. Clinicians should explain this to patients or their legal guardians when discussing alternative treatment options.

The evaluation of modified photographs of only 1 woman can be considered a limitation of this study. Three-dimensional modifications for a male head-face model were not evaluated. Another study limitation was the age range (15-56 years). Economic status and psychological differences between adults and children influenced the results. Furthermore, the study is limited because of differing perceptions of beauty among races. As a result, applying these methodologies globally in terms of facial esthetic recognition is difficult. Thus, this study's findings may be generalized with caution. Further research with a larger sample size in different geographic regions is required.

CONCLUSIONS

1. How esthetic modifications are perceived in lateral or frontal photographs varies.
2. In all the different variables, such as education, gender, and social status, MA was rated highest on both the lateral and frontal aspects. This revealed that MA plays a primary role in improving facial attractiveness.

AUTHOR CREDIT STATEMENT

Hasan Camcı contributed to conceptualization, methodology, software, data curation, original draft preparation, visualization, investigation, supervision, software, validation, and manuscript review and editing; and Farhad Salmanpour contributed to visualization, investigation, supervision, software, and validation.

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