

RESEARCH ARTICLE

WILEY

The impact of dental midline angulation towards the facial flow curve on the esthetics of an asymmetric face: Perspective of laypeople and orthodontists

Panagiotis Ntovas DDS, MSc^{1,2}  | Frantzeska Karkazi DMD, MSc³ |
 Elvan-Onem Ozbilen DDS, MSc⁴ | Juraj Lysy MUDr, PhD² |
 Nikolaos Gogolas DDS⁵ | Hanife-Nuray Yilmaz DDS, MSc, PhD⁴ |
 Efstratios Papazoglou DDS, MSc, PhD⁵ | Christian Coachman DDS, CDT⁶

¹ITI Scholar Implant Program, Department of Prosthodontics, Tufts University School of Dental Medicine, Boston, Massachusetts, USA

²Department of Stomatology and Maxillofacial Surgery, Comenius University in Bratislava, Bratislava, Slovakia

³Department of Orthodontics, Dental School, University of Turin, Turin, Italy

⁴Department of Orthodontics, Faculty of Dentistry, Marmara University, Istanbul, Turkey

⁵Department of Operative Dentistry, University of Athens, Athens, Greece

⁶Department of Preventive and Restorative Sciences, University of Pennsylvania, Philadelphia, Pennsylvania, USA

Correspondence

Panagiotis Ntovas, 630 Washington Street, 02111, Boston, MA, USA.

Email: pan.ntovas@gmail.com

Abstract

Purpose: The objective of the present article was to evaluate the impact of dental midline angulation in asymmetrical faces.

Materials and Methods: A full-portrait image was used to create a set of digitally modified images with a different degree of facial asymmetry, towards the right and the left side of the face respectively. Half of the images were designed with an equivalent angulation of the dental midline in respect to the curve of the lower third of the face and half of them without. Through a web survey, 250 laypeople and 250 orthodontists were asked to assess the attractiveness of each image separately.

Results: As the asymmetry of the face was increased, facial attractiveness was further decreased both for laypersons and orthodontists. For each one of the modified images, when the dental midline was following the curve that was formed from the inclination of the simulated asymmetry of the face, the smile attractiveness scores were significantly higher compared to a straight dental midline.

Conclusion: Facial asymmetries derived from the inclination of the nose, the chin and the commissural line of the lips can significantly affect the smile attractiveness. An orientation of the dental midline towards the facial asymmetry in order to follow the facial curve, can be beneficial for the smile attractiveness compared to a perpendicular to the face dental midline. During the design of a smile, clinicians have to take into consideration deviations in facial midline, in order their restorations to be in harmony with the rest of the face.

Clinical Significance: During the design of a smile, clinicians have to take into consideration deviations in the facial midline, in order their restorations to be in harmony with the rest of the face.

KEYWORDS

asymmetric face, dental midline, midline angulation, smile attractiveness

1 | INTRODUCTION

Facial attractiveness is crucial for the social acceptance, with the smile constituting one of its predominant factors.¹ Smile is an important component of facial expressions, appearance, and attractiveness. The demand for facial and dental interventions aiming to improve smile esthetics, has been increased due to the widespread use of social media. Laypeople have become more critical regarding the esthetics of their smiles and their expectations have been refined.²⁻⁴ Esthetic considerations regarding the harmony of the dentofacial esthetics are of paramount importance for an appropriate treatment plan. However, it is difficult to assess everyone under the same esthetic framework, as most of the esthetic rules have been based on geometrical proportions, which have not been proved scientifically by their implementation on the human face.² Application of esthetic rules through straight lines has been proposed without taking into consideration that faces are not bilaterally symmetrical, as they present by their nature a different level of asymmetry. However, there are no subjective criteria for distinguishing a normal from an abnormal facial asymmetry.³⁻⁶

Dental midline and its relation with the face, constitute one of the most important factors for dentofacial attractiveness, and is a common starting point for every smile design. Dental midline's position and orientation has been on the focus of the scientific literature for many years, as it contributes not only on the balance and the harmony of the teeth but on the whole dentofacial complex.⁴⁻⁹

Even if the coincidence of the dental with the facial midline has been correlated with a sense of harmony, balance and symmetry, in nature this coincidence seems to be presented in less than 70% of the individuals.⁸⁻¹¹ Several studies have been conducted in order to assess the thresholds, within a dental midline can be shifted or canted against the facial midline without a negative impact on the esthetics of the face.^{2,5,12,13} However, the aforementioned studies are difficult to be translated into the clinical practice, especially in asymmetrical faces, as the assessment of the dental midline can be complicated, due to the irregular shape of the face.¹³

The esthetic perception among different dentofacial asymmetries has also been investigated.^{2,13,14} Deviations of the chin and/or the nose are common findings among the patients, who are seeking for an oral rehabilitation or orthodontic treatment. In these cases, a dental midline that is following the curve of the face, as it is defined by the glabella, the nose's bridge, the philtrum, and the chin seems to be beneficial for the overall facial balance, compared to a straight dental midline.^{15,16}

Recently scientific literature has been focused on the impact of the position of the dental midline in patients with facial asymmetries, especially in facial structures that are located in the middle of the face, as their discrepancy can interfere particularly with the perception of the dental midline.^{15,17,18} However, the way that the asymmetrical facial features in combination with the orientation of the dental midline can influence the perception of the smile, demands further investigation, in order to find out how these deviations can become less noticeable.

Thus, the objective of the present article was to evaluate the impact of dental midline's orientation in asymmetrical faces. The first null hypothesis of the present study was that a transverse asymmetry of the lower third of the face would not alter the perception of facial

attractiveness. The second null hypothesis was, that would not be a difference in the perception of the attractiveness of an asymmetrical face, between a perpendicular to the interpupillary line straight midline and of an angulated midline following the curve of the deviation of the lower third of the face; between orthodontists and laypersons, between males and females and between younger and older observers.

2 | MATERIALS AND METHODS

The present cross-sectional study was designed and conducted in a dental school environment from January 2021 to March 2021. The web-based research was approved by the Ethical Committee of Marmara University, Faculty of Dentistry (07.10.2021, 2021-13, Istanbul, Turkey). Due to the regulations regarding Covid-19, data were collected through an internet-based questionnaire. The questionnaire was forwarded to the participants via an open-source online survey 1KA (EnKlikAnketa, Centre for Social Informatics, University of Ljubljana), implementing a database of emails.

A power analysis was performed based on previous studies, utilizing an online calculator (power calculator, University of Iowa), for an effect size of 0.85 at a conventional α level (0.05) and desired power ($1 - \beta$) of 0.85. The analysis revealed that 280 participants, 140 orthodontists and 140 laypersons should be included in the present study. The group of laypersons was consisted of individuals at least 18 years old, who had not any specific dental training or experience in the field of dental health care, from a pool of patients that visited the dental school. The group of orthodontists included members of the Turkish Orthodontic Society. In order to be included in the study, all the participants had to be ≥ 25 years old and orthodontists should have at least 3 years of academic training.

A frontal view full portrait image of a 26-year-old man in a natural head position showing his teeth during a social smile was captured utilizing a digital camera (EOS 80D, Canon), a 100 mm macro lens (IS, USM Canon) and two wireless flashes (270EXII, Canon). The unmodified image of the model presented a fairly symmetrical face, a harmonious smile, and good teeth alignment and for this reason was selected to serve as a reference. Written consent was obtained from the model, whose photograph was used in the present study.

The initial portrait image was modified in order to create images with a different degree of facial asymmetry, utilizing a photo editing and manipulation software (Adobe Photoshop CS 2015, Adobe). Using the upper third of the face as a reference, different degrees of facial asymmetry were simulated by performing an incrementally clockwise rotation of the tip of the nose along with the lower third of the face, with and without an equivalent rotation of the dental midline towards the same curve (Figure 1). Half of the images were designed with a facial asymmetry towards the right side and half of them towards the left side of the face respectively. As a result, a series of 17 images was created with a resolution of 600 dots per inch (dpi) (Figure 2).

Through the web survey, the modified images were forwarded to 250 laypeople and 250 orthodontists. At the beginning of the online survey, participants had to answer sociodemographic questions, in order their gender and age to be declared. Afterwards they were

FIGURE 1 (A) Symmetrical facial model. (B) Asymmetrical facial model (dental midline not following the curve of the face). (C) Asymmetrical facial model (dental midline following the curve of the face).

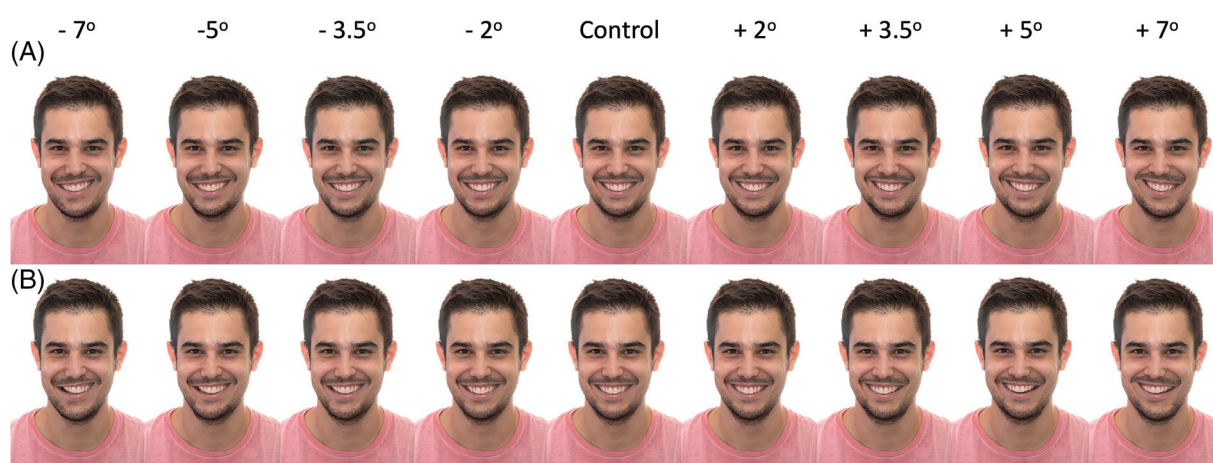
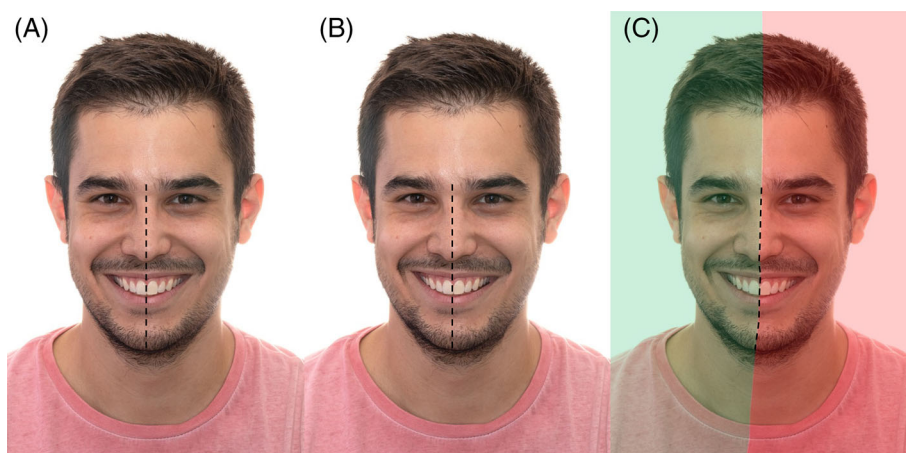


FIGURE 2 Stimulation of an asymmetric face for a different degree of transverse discrepancy. (A) Without the dental midline to follow the asymmetry of the face. (B) With the dental midline to follow the asymmetry of the face.

asked to score the attractiveness of each image separately. Patients were unaware of the kind of the digital manipulations of the presented images. Each image was presented in a randomized order only once up to 20 s, in order to avoid the review of previously assessed images. The evaluation was performed by moving the tab of a virtual analog scale (VAS), ranging from point 0 (extremely unattractive) to point 100 (extremely attractive), based on the observer's perception regarding the attractiveness of each presented smile (Figure 3).

3 | STATISTICAL ANALYSIS

After data collection through the digital questionnaire, statistical analysis was performed utilizing SPSS software (V.27, IBM). The normality of the data was assessed by implementing Shapiro–Wilk test. As the data found to be distributed normally, differences in smile attractiveness were evaluated using multiple pair *t*-tests. Repeated measured ANOVA with 2 between-subject factors were applied in order to assess the differences in the perception of attractiveness based on the age group and the gender, for both types of observers. The analysis was performed considering a significance level of $p < 0.05$.

4 | RESULTS

A total of 378 adults participated in the present study, 170 laypersons (45%) and 208 orthodontists (55%) with a response rate of 68% and 83%, respectively. The group of laypeople was consisted of 76 male and 99 female participants, with a mean age of 39, ranging from 25 to 82 years old. Of the orthodontists, 88 were males and 120 females, with an age between 24 and 64 years old and a mean age of 40 years.

A graphical representation of the evaluated asymmetries of the face, with and without an equivalent angulation of the dental midline (facial flow concept) is presented in Figure 4, both for laypersons and orthodontists. In Table 1, the smile attractiveness scores for each modified image are included for both types of observers. For both groups of participants, the highest smile attractiveness scores were presented in the face without a facial asymmetry or inclination of the dental midline, which was also the image that served as a control. There was not a significant difference between the two identical control images, for the laypersons or the orthodontists ($p > 0.05$).

The smile attractiveness score was significantly reduced for a transverse asymmetry of the face $\geq 2^\circ$, irrespective of the observer's group or the orientation of the asymmetry towards the left or the

How do you evaluate this smile ?



Unattractive

Attractive

FIGURE 3 Facial attractiveness evaluation for each modified image, utilizing a digital VAS-test.

right side of the face ($p < 0.05$). As the asymmetry of the face increased the attractiveness scores were further decreased for both groups of observers. For each one of the simulated asymmetrical faces, when the dental midline was following the inclination of the facial asymmetry, the smile attractiveness scores were significantly higher compared to a straight dental midline ($p < 0.05$).

Regarding the gender of the observers, there was not a significant difference between the evaluated asymmetries ($p > 0.05$). However, in male laypersons with a facial asymmetry $\geq 5^\circ$, the inclination of the dental midline towards the facial curve had not an effect on the attractiveness of the face. The mean smile attractiveness scores, based on the VAS for each type of observer and each gender separately are presented in Table 2.

The age group of the participants had not a significant effect in the perception of facial asymmetry ($p > 0.05$). In the group of laypersons, the smile attractiveness scores, when the dental midline was following the inclination of the facial asymmetry was higher, except for an inclination $\geq 5^\circ$ towards the right side of the face in younger observers. The mean smile attractiveness scores, based on the age group of the participants, for each type of observer are presented in Table 3.

5 | DISCUSSION

The obtained data led to the rejection of the first null hypothesis, as a transverse asymmetry of the lower third of the face led to a

FIGURE 4 Graphical representation of the smile attractiveness, for the evaluated asymmetries of the face, with and without an equivalent angulation of the dental midline.

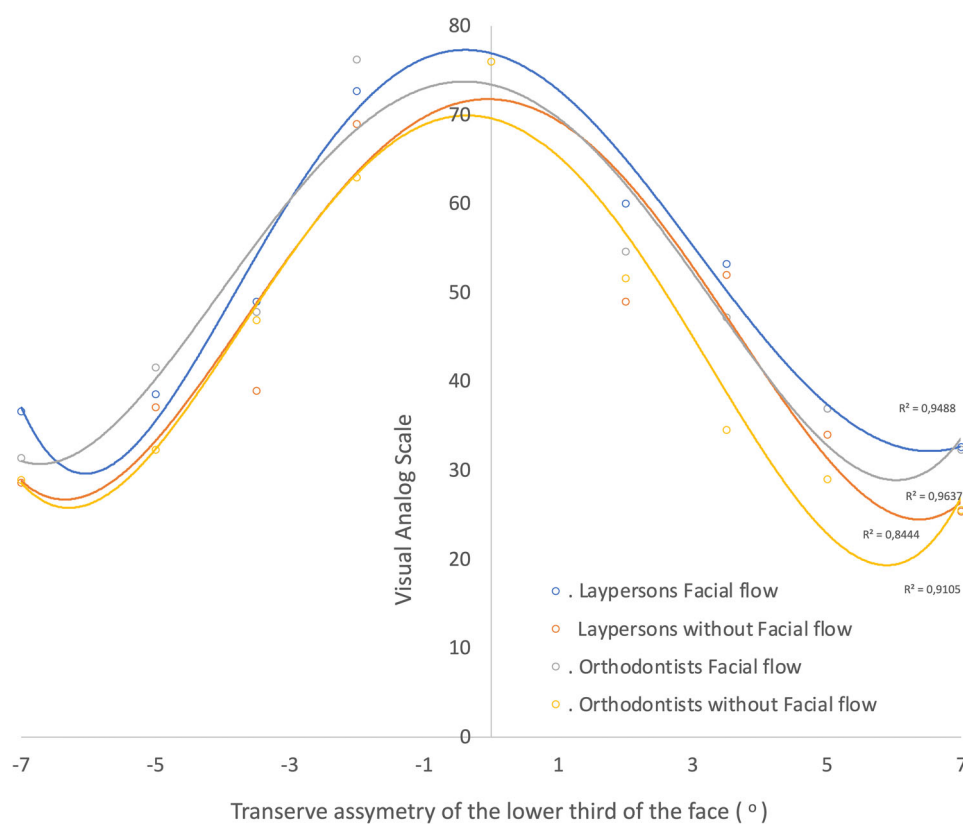


TABLE 1 Mean smile attractiveness scores, based on VAS for each type of observer.

Transverse asymmetry of the tip of the nose along with the lower third of the face (°)		Laypersons		Orthodontists	
		Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face	Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face
Control	0	80	80	76.2	76
Right side	2	72.6 ^a	69 ^b	68 ^a	63 ^b
	3.5	49 ^a	39 ^b	47.0.8 ^a	46.9 ^a
	5	38.5 ^a	35.5 ^b	41.5 ^a	32.3 ^b
	7	36.6 ^a	28.0.6 ^b	31.4 ^a	28.9 ^a
Left side	2	60 ^a	49 ^b	54.6 ^a	51.6 ^b
	3.5	53.2 ^a	51.1 ^b	47.2 ^a	34.5 ^b
	5	38.5 ^a	36 ^b	37 ^a	29 ^b
	7	36.6 ^a	28.6 ^b	32.3 ^a	25.5 ^b

Note: Different superscript letters in each row for each group of observers show statistical differences ($p < 0.05$).

TABLE 2 Mean smile attractiveness scores, based on visual analog scale (VAS) for each type of observer and each gender.

Transverse asymmetry of the lower third of the face (°)			Laypersons		Orthodontists	
			Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face	Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face
Male	Control	0	77.1	77.1	75.6	75.6
	Right side	2	73.1 ^a	60.7 ^a	67.8 ^a	53.9 ^b
		3.5	42.4 ^a	43.6 ^a	52.1 ^a	45.7 ^b
		5	38.5 ^a	33.9 ^b	39.7 ^a	27.3 ^b
		7	32 ^a	29.5 ^a	30.6 ^a	29.6 ^a
	Left side	2	57.1 ^a	51.8 ^b	62.8 ^a	57 ^b
		3.5	55.7 ^a	52.5 ^b	53.1 ^a	47 ^b
		5	36.1 ^a	37.6 ^a	35.6 ^a	27.6 ^b
		7	26.5 ^a	25 ^a	29.4 ^a	31 ^a
Female	Control	0	81	81	76	76
	Right side	2	68.2 ^a	57.1 ^b	69.1 ^a	61.6 ^b
		3.5	47 ^a	37.6 ^b	48 ^a	44.4 ^b
		5	49.2 ^a	36.4 ^b	45.2 ^a	29.7 ^b
		7	30.4 ^a	26.5 ^b	34.3 ^a	31.4 ^b
	Left side	2	64.9 ^a	46.5 ^b	51.2 ^a	49 ^b
		3.5	52.3 ^a	45.9 ^b	42.4 ^a	41.2 ^a
		5	46 ^a	32.4 ^b	39.3 ^a	31.4 ^b
		7	38.3 ^a	23.4 ^b	34.5 ^a	31.3 ^b

Note: Different superscript letters in each row for each group of observers show statistical differences ($p < 0.05$).

statistically less facial attractiveness, compared to the unmodified image that served as a control, even for a transverse asymmetry of $2^\circ \leq$ for both groups of observers, irrespective of observer's gender and age. The second null hypothesis was also rejected as the orientation of the dental midline, led to a significant difference in the perceived facial attractiveness. When the dental midline was following

the curve of the face, the negative effect of the facial asymmetry in the attractiveness of the face was reduced, for the laypersons as well as the orthodontists, without the gender or the age group of the participants to be a relevant factor in this assessment.

The majority of the available studies in the scientific literature evaluate an adult's smile appearance, aiming to identify the thresholds

TABLE 3 Mean smile attractiveness scores, based on visual analogue scale (VAS) for each type of observer, and each age group.

			Laypersons		Orthodontists	
Transverse asymmetry of the lower third of the face (°)			Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face	Dental midline following the asymmetry of the face (facial flow)	Dental midline not following the asymmetry of the face
>35	Control	0	78.1	78.1	74.7	74.7
		Right side	2	72.4 ^a	71.5 ^a	69.3 ^a
			3.5	52.4 ^a	41.3 ^b	54.2 ^a
			5	42.2 ^a	39.5 ^b	42.9 ^a
			7	37.4 ^a	29.9 ^b	35.4 ^a
	Left side	2	61.2 ^a	53.4 ^b	61.8 ^a	49.7 ^b
		3.5	55.4 ^a	52.2 ^b	54.3 ^a	49.7 ^b
		5	38.7 ^a	32.3 ^b	38 ^a	36.9 ^a
		7	34.5 ^a	23.4 ^b	33.5 ^a	29.7 ^b
≤35	Control	0	81.9	81.9	78.1	78.1
		Right side	2	72.7 ^a	67.5 ^b	66.1 ^a
			3.5	37.6 ^a	36.5 ^a	49.7 ^a
			5	35.4 ^a	36.6 ^a	39.1 ^a
			7	33.2 ^a	27.5 ^b	28.5 ^a
	Left side	2	57.6 ^a	46.7 ^b	53.5 ^a	45.9 ^b
		3.5	48.6 ^a	49.7 ^a	55.7 ^a	44.5 ^b
		5	36.4 ^a	36.6 ^a	35.9 ^a	36.3 ^a
		7	28.7 ^a	28.4 ^a	28.1 ^a	20.9 ^b

Note: Different superscript letters in each row for each group of observers show statistical differences ($p < 0.05$).

of acceptance of a shifted or angulated dental midline, in order to assess the minimum level of esthetic disharmony that can be approved as pleasurable.^{2,5} To estimate the perceptibility or the acceptability thresholds, most of the studies are based on specific questions towards the participants about the dental midline deviation. However, these questions can orientate the focus of the observer on a possible deviation of the dental midline and not on the attractiveness or the harmony of the face as a whole, which is the normal situation during social interactions. For this reason, in the present study, participants were asked to evaluate the attractiveness of the face, without making them aware of the research topic.

Most of the available studies are based on symmetrical facial models, that have been created by mirroring the one half of the face, utilizing a photo editing software.^{15,16} However, most of the times in clinical practice, dental professionals have to treat patients that have a various degree of facial asymmetry.^{3,8} Deviations of the chin and the nose are common findings among patients, that can interfere with dental midline shift or angulation, affecting smile esthetics.^{19,20} Moreover, the studies that include an asymmetrical model, simulate different degrees of dental midline deviation, but only one standardized level of facial asymmetry. The present research is the first study that aimed to investigate the implementation of smile flow concept, by orientating the dental midline towards the asymmetry of the lower third of the face, for various degrees of facial asymmetry. Another advantage of the study was that an almost symmetrical real unmodified model was used as a control, without the need to create an artificial

absolute symmetric model, which can lead in an unrealistic simulation, as an absolute symmetry between the left and the right half of the human face does not exist in the nature.^{8,10,12}

Based on the results of the present study, in cases with a transverse facial asymmetry dental professionals is better to position the dental midline according to the curve of the face, in order to improve facial attractiveness by making facial asymmetry less perceptible.^{15,17,18} This outcome can be explained by the fact that a straight-centered midline can transmit a sense of symmetry, balance, and harmony on a symmetrical face, but this can have the opposite result in an asymmetrical face, as a centered midline can make the visual comparison between the two halves of the face more obvious, unveiling the asymmetric structures of the face. A dental midline angulated towards the asymmetry of the lower third of the face seems to assist in preserving facial harmony, even if the occlusal plane is following the commissural lines of the lips, that in a case of an asymmetry is not parallel with the interpupillary line.²¹ Besides the difference in the perception of the dentofacial esthetics between the laypersons and the dental professionals in the scientific literature, in the present study it was found that a dental midline in accordance with the flow of the asymmetric face was beneficial for both groups of observers.^{2,5}

During the treatment planning for a restorative, an orthodontic, or for an interdisciplinary treatment, positioning of the dental midline is of paramount importance as it consists one of the most commonly used starting points for the design of the smile.^{16,17} For a correct smile analysis is very important the clinician to reach to a

global diagnosis, that is based on the perception of the entire face. Therefore, it is fundamental, to take a step back from the routine clinical position or use an image of a full portrait, since a distance less than 45 cm from patient's face, can result to a limited visual examination field, leading to an isolated smile analysis, without the overall impression of the dentofacial esthetics.^{6,10,16,19} For an overall dentofacial balance, especially in asymmetrical faces, a facial-driven smile design using the vertical reference curve of the face, as it is defined by the glabella, the nose bridge, the philtrum, and the chin has to be applied, in order to orient the dental midline according to the curve of the asymmetrical face.^{15,18,22}

The present study aimed to highlight the increasing importance, of the dynamic relationship between the dental and the facial midline angulation in patients with asymmetrical faces. In the future, further research is needed in order to investigate the relationship between the different dentofacial structures, and how the deviation of the structures that compose the smile, influences the attractiveness of the face, in order to be able to achieve a harmonious result, with the adequate dental or facial treatment.

6 | CONCLUSIONS

Within the limitations of the present study, it can be considered that facial asymmetries derived from the nose, the commissural line of the lips, and the inclination of the chin can significantly affect the attractiveness of a smiling face. An orientation of the dental midline towards the facial asymmetry in order to follow the facial curve can be beneficial for the attractiveness of the smiling face compared to a perpendicular towards the face dental midline.

CONFLICT OF INTEREST STATEMENT

The authors declare that they do not have any financial interest in the companies whose materials are included in this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Panagiotis Ntovas  <https://orcid.org/0000-0002-1349-2548>

REFERENCES

- Sakalauskiene Z, Machiulskiene V, Murtomaa H, Vehkalahti MM. Satisfaction with dental care and its role in dental health-related behaviour among lithuanian university employees. *Oral Health Prev Dent*. 2015;13(2):113-121.
- Parrini S, Rossini G, Castrolforio T, Fortini A, Deregis A, Debernardi C. Laypeople's perceptions of frontal smile esthetics: a systematic review. *Am J Orthod Dentofacial Orthop*. 2016;150(5):740-750.
- Khan M, Kazmi SMR. Coincidence of dental midline with facial midline in a sample of Pakistani population. *J Coll Physicians Surg Pak*. 2019;29(3):210-213.
- Silva BP, Tortora SC, Stanley K, Mahn G, Coachman C, Mahn E. Layperson's preference of the transverse occlusal plane in asymmetric facial model. *J Esthet Restor Dent*. 2019;31(6):620-626.
- Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric situations. *Am J Orthod Dentofacial Orthop*. 2006;130(2):141-151.
- Swaddle JP, Cuthill IC. Asymmetry and human facial attractiveness: symmetry may not always be beautiful. *Proc Biol Sci*. 1995;261(1360):111-116.
- Latta GH. The midline and its relation to anatomic landmarks in the edentulous patient. *J Prosthet Dent*. 1988;59(6):681-683.
- Miller EL, Bodden WR Jr, Jamison HC. A study of the relationship of the dental midline to the facial median line. *J Prosthet Dent*. 1979;41(6):657-660.
- Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent*. 1973;29(4):358-382.
- Owens EG, Goodacre CJ, Loh PL, et al. A multicenter interracial study of facial appearance. Part 1: a comparison of extraoral parameters. *Int J Prosthodont*. 2002;15(3):273-282.
- Johnston CD, Burden DJ, Stevenson MR. The influence of dental to facial midline discrepancies on dental attractiveness ratings. *Eur J Orthod*. 1999;21(5):517-522.
- Cardash HS, Ormanier Z, Laufer BZ. Observable deviation of the facial and anterior tooth midlines. *J Prosthet Dent*. 2003;89(3):282-285.
- Beyer JW, Lindauer SJ. Evaluation of dental midline position. *Semin Orthod*. 1998;4(3):146-152.
- Silva BP, Jiménez-Castellanos E, Martínez-de-Fuentes R, Greenberg JR, Chu S. Laypersons' perception of facial and dental asymmetries. *Int J Periodontics Restorative Dent*. 2013;33(6):e162-e171.
- Koseoglu M, Bayindir F. Effect of variations in facial flow curves on the perceptions of smile esthetics by laypeople. *J Prosthet Dent*. 2023;129(3):486-494.
- Silva BP, Mahn E, Stanley K, Coachman C. The facial flow concept: an organic orofacial analysis-the vertical component. *J Prosthet Dent*. 2019;121(2):189-194.
- Martins JM, Costa LG, Carvalho AL, et al. The impact of dental midline on asymmetric faces: perspective of laypersons and dentists. *Int J Environ Res Public Health*. 2021;18(24):12904.
- Silva BP, Jiménez-Castellanos E, Stanley K, Mahn E, Coachman C, Finkel S. Layperson's perception of axial midline angulation in asymmetric faces. *J Esthet Restor Dent*. 2018;30(2):119-125.
- Grimes K, Fleming PS, Sharma PK. The influence of nasal deviation on the perception of maxillary dental centreline and smile aesthetics. *J Orthod*. 2022;50:18-27.
- Sheats RD, McGorray SP, Musmar Q, Wheeler TT, King GJ. Prevalence of orthodontic asymmetries. *Semin Orthod*. 1998;4(3):138-145.
- Padwa BL, Kaiser MO, Kaban LB. Occlusal cant in the frontal plane as a reflection of facial asymmetry. *J Oral Maxillofac Surg*. 1997;55(8):811-816.
- Silva BP, Jiménez-Castellanos E, Martínez-de-Fuentes R, Fernandez AA, Chu S. Perception of maxillary dental midline shift in asymmetric faces. *Int J Esthet Dent*. 2015;10(4):588-596.

How to cite this article: Ntovas P, Karkazi F, Ozbilen E-O, et al. The impact of dental midline angulation towards the facial flow curve on the esthetics of an asymmetric face: Perspective of laypeople and orthodontists. *J Esthet Restor Dent*. 2023;1-7. doi:10.1111/jerd.13177