

Comparison of Esthetic Perception of Maxillary Central and Lateral Incisors between Dentists and Laypersons

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Abstract

Esthetic dental treatment can improve the appearance of a patient. However, esthetic perception of smile discrepancies is different among evaluators. The purpose of this study was to compare esthetic perception between dentists and laypersons by difference of asymmetrical width and length of maxillary central and lateral incisors under 5 and 15 seconds evaluation time. Photos of women were digitally altered by Adobe Photoshop® program to create images with symmetrical and asymmetrical tooth width or length in 0.5 mm increments. Final images were randomly presented on a computer screen using an equal ratio to the actual tooth. Thirty-six dentists and 36 laypersons were asked to rate the attractiveness of those smiles on a numerical rating scale within 5 and 15 seconds of evaluation time. Mann-Whitney U and Wilcoxon Signed-Rank tests demonstrated that there was no statistically significant difference between two different evaluation times. Dentists could detect 0.5 mm narrowing of the central incisor and 1.0 mm of lateral incisor. 1.0 mm and 1.5 mm narrowing of central and lateral incisors were required for laypersons. Both groups could distinguish all levels of asymmetrical length in the central incisor. Laypersons were more tolerant than dentists with the asymmetrical length in the lateral incisor. Overall, dentists were esthetically more critical than laypersons. Both asymmetrical width and length affected smile attractiveness. Asymmetrical length was easily recognized and should be of concern.

Keywords: Anterior teeth, Dental esthetics, Esthetic perception, Incisal length, Incisal width

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Introduction

Facial appearance plays a significant role in a person's attractiveness¹ impacting an individual's perception of life.² The appearance of a face is affected by many components, including eyebrows, eyes, nose, lips, and teeth.³

However, the eyes and a smile are the most important features which affect human individuality.⁴ In recent years, esthetic dental treatment has become popular. Patients seek dental treatment because their teeth and

smiles are critical factors of facial attractiveness.⁵ Maxillary anterior teeth directly affect a pleasant smile.^{6,7} Patients require for their teeth to be not only be better functioning but also higher in esthetics.⁸ The changing of patient's requirements affect the consequences of dental treatment.⁹ Therefore, dentists must understand the esthetic objective of patients before providing a dental treatment plan.⁸ In addition, when the final outcome of treatment in the esthetic zone could not be achieved fully, it is vital to determine whether or not the patient would be able to accept the less than ideal outcomes.

Dental anomalies caused by heredity and the environment are commonly found.^{10,11} Abnormality in tooth number, size, shape, and structure can cause an unesthetic smile.^{12,13} Microdontia, a smaller size of tooth than normal, is one of the most common dental anomalies observed among patients.^{14,15} Truly generalized microdontia is rare.^{13,16} More often, microdontia is found in the upper anterior teeth, mostly lateral incisors, called peg-shaped lateral incisors.^{13,16,17} To correct this condition, direct and indirect restorations are used to adjust the tooth shape and the tooth length.¹⁸ When the position of the tooth is not proper, orthodontic treatment may be needed prior to restoration.¹⁶ However, in terms of esthetics, an asymmetrical width or length of the tooth may often be a result of treatment, and some width and length asymmetries might even be acceptable. Therefore, orthodontic treatment may be sometimes unnecessary.

Esthetic perception of smile discrepancies is different among general dentists, specialist dentists, and laypersons. Several studies reported that dentists were more sensitive in the perception of smile esthetics than laypersons.¹⁹⁻²⁵ The most and the least attractive smiles were different depending on the evaluators implying that dentists' perspectives may differ from that of patients. As a result, the perceptions and expectations of patients always impact the dental treatment plan. Although symmetry with a good ratio and proper shape of anterior teeth were essential, laypersons could not detect some discrepancies.²⁴ If defects of the anterior teeth, such as asymmetrical size, are not

recognized, they may not need a correction and vice versa. However, if any improper tooth position leads to an unacceptable outcome, those problems should be corrected before a restoration. A multidisciplinary orthodontic and restorative approach could help obtain better results for future restoration.²⁶

Since esthetic dental treatment can improve the appearance of a patient, dentists have to understand the patient's expectations from the patient's perspective to achieve the best outcome of esthetic dental treatment.²³ From literature, esthetic preference of tooth shape, tooth length, incisal edge level, and level of gingival margin have been evaluated. However, the influence of asymmetrical width and length harmony of the anterior teeth is still unclear. Moreover, there have been no studies regarding the influence of time of evaluation on esthetic perception in literature. Therefore, the esthetic perception relating to the asymmetrical width of the maxillary incisor and the harmony of length of the maxillary incisors with the time of evaluation was studied in the present study. The numerical rating scale was used as a measuring method.

The objective of the present study was to compare esthetic perception between dentists and laypersons by the difference of asymmetrical width and length discrepancies of maxillary central and lateral incisors under two different times of evaluation (5 and 15 seconds). The study outcome can be used as a guideline for planning esthetic dental treatment because the restoration may not be performed if the defects of anterior teeth are not spotted as an unesthetic smile by patients. Moreover, if the results of a dental treatment is an asymmetrical restoration, it may be unnecessary to do a correction when it is acceptable.

Materials and Methods

This study was approved by the ethical committee of the Faculty of Dentistry, Chulalongkorn University, Thailand (approval number: HREC-DCU 2020-022). Pilot study data was used to calculate the sample size and the reliability of a numerical rating scale (NRS). There were two groups of evaluators: dentists and laypersons, with 36

participants in each group. Cronbach's alpha of NRS was 0.887. Information about the present study was given to the participants. Volunteer evaluators were selected with equal sex in each group. Selected dentists, who were 25 to 45 years old, must have at least one year of dental practice experience. Laypersons with the same age range must not have had any background experience as a dental profession.

Photographs of two adult women were taken by the same operator using a digital camera (D7200 DSLR, Nikon) mounted on a tripod. The photos were processed using an Adobe Photoshop® program (Adobe Systems Inc, San Jose, CA, USA). They were cropped from the base of the nose to above the chin area to remove other factors.^{19,21,24,25,27-29} They were retouched to adjust color, brightness, contrast,

and discolored lips and skin. Then, the selected photos were edited to produce a mirror image (left to right side). Maxillary right central and lateral incisors were used as the reference width and length of the original tooth. The images were altered to produce four levels of asymmetrical width, including 0 mm (control), 0.5 mm narrower, 1.0 mm narrower, 1.5 mm narrower, and 2 mm narrower of the maxillary left central and the lateral incisor (Fig. 1). Moreover, the images were altered to create four levels of the asymmetrical length of the maxillary left central and the lateral incisor, 0 mm (control), 0.5 mm shorter, 1.0 mm shorter, 0.5 mm longer, and 1.0 mm longer (Fig. 2). Each image consisted of only one condition on the maxillary left central or lateral incisor without altering the adjacent teeth.

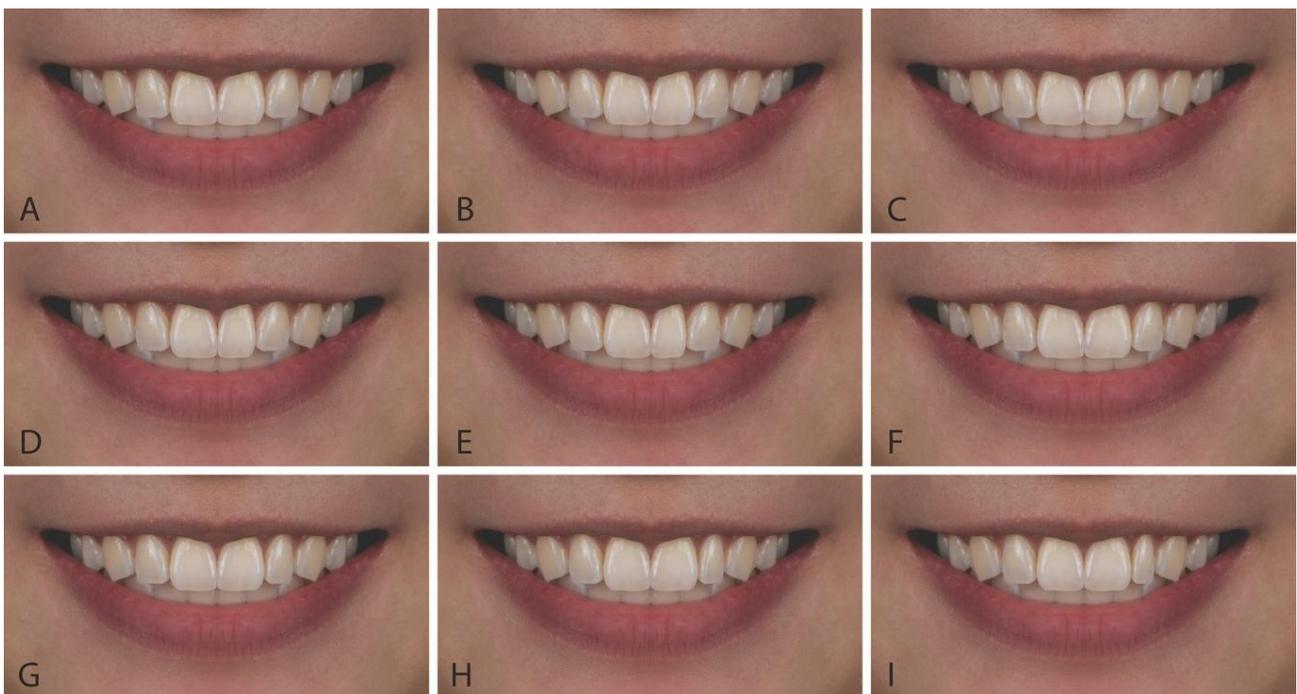


Figure 1 The narrowing width of maxillary left incisors in 0.5 mm increments: A, control; B, 0.5 mm, central incisor; C, 1.0 mm, central incisor; D, 1.5 mm, central incisor; E, 2.0 mm, central incisor; F, 0.5 mm, lateral incisor; G, 1.0 mm, lateral incisor; H, 1.5 mm, lateral incisor; I, 2.0 mm, lateral incisor

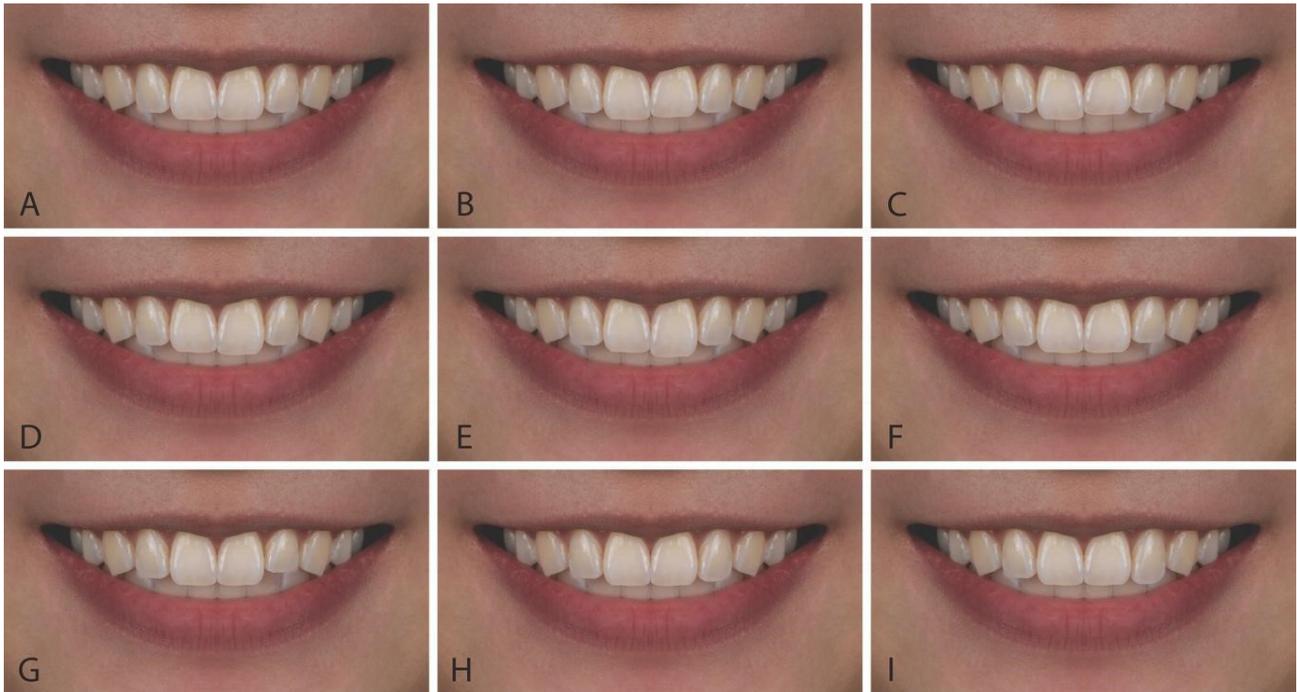


Figure 2 The altered length of maxillary left incisors in 0.5 mm increments: A, control; B, -0.5 mm, central incisor; C, -1.0 mm, central incisor; D, +0.5 mm, central incisor; E, +1.0 mm, central incisor; F, -0.5 mm, lateral incisor; G, -1.0 mm, lateral incisor; H, +0.5 mm, lateral incisor; I, +1.0 mm, lateral incisor

The first adult woman’s processed photos were presented with equal size to the actual tooth as an orientation to evaluators. The images were presented on a computer (MacBook Air, Apple Inc.) using the Keynote program (v9.2.1, Apple Inc.). Evaluators were given the esthetic terms used in the present study, which included symmetrical width and harmony of the length of the maxillary incisors. The photos of the second adult woman were then presented to evaluators with the same computer screen setting, including the highest brightness of the screen, the same distance from the participants, and in the same environment. Only one photo was on each page of the presentation. There were a total of eighteen altered images.

Validity of the questionnaire was tested by three experts using an index of consistency (IOC) to ensure that the questions met the study’s objectives. The IOC was greater than 0.5, showing sufficient consistency. The questionnaire consisted of eleven points - a numerical rating scale was given to evaluators. The NRS scale consisted of 0 to 10 for scoring the esthetic perception of the image; with 0 indicated as “very unattractive” and

10 as “very attractive”. The presentation was divided into two parts. The first part was the images with asymmetrical width of the maxillary incisors. The second part was the images with the alterations of the length of the maxillary incisors. In each part, the images were presented in random order with a slide transition set automatically with Keynote tools. Evaluators were instructed to consider each image for five seconds. Then there was another five seconds for making a mark on the numeric scale to define its attractiveness. Between the first and second parts of the presentation, the evaluators were allowed a break for ten minutes. After two weeks, evaluators were recalled to repeat the evaluation. The presentation was presented under the same conditions and environment. For this time, the evaluators had 15 seconds for considering each image and five seconds for selecting a score.

All scores were collected, and data were statistically analyzed with SPSS 22.0 software (Statistical Package for Social Science; SPSS Inc., Chicago, IL, USA). The normality assumption was tested by the Shapiro-Wilk test. The Mann-Whitney U test was used to compare the differences of

scores rated by dentists and laypersons. Furthermore, to compare differences of scores between 5 and 15 seconds of evaluation and between each level of asymmetries of the image, the Wilcoxon Signed-Rank test was used. The level of significance was established at 5 %.

Results

The data were not normally distributed ($P < 0.05$). Therefore, descriptive statistics were reported as median and interquartile ranges of the scores. In the present study, 72 participants consisted of 36 dentists (50 %) and 36 laypersons (50 %), with an equal number of males and females in each group. The mean age for the dentists group

was 27.78 years and 31.03 years for the laypersons group. When comparing different evaluation times, (Fig. 3 and 4), dentists rated each image with asymmetrical width with no statistically significant difference between 5 and 15 seconds in most situations. For laypersons, they assigned the statistically significant difference of score between 5 and 15 seconds of evaluation time on a smile with symmetrical (control) and slightly asymmetrical width of maxillary incisors (central -0.5 mm narrower, lateral -0.5 mm narrower). However, no statistically significant difference was found between different evaluation times on each image with the asymmetrical length of maxillary incisors in dentists and laypersons groups.

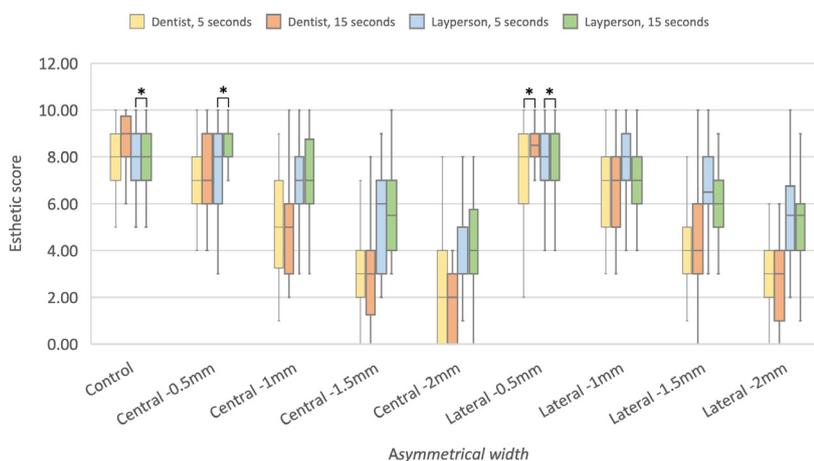


Figure 3 Esthetic scores of images with asymmetrical width of maxillary incisors rated by dentists and laypersons in 5 and 15 seconds of evaluation. The box represents the median \pm 25 percentile values, and the vertical bar indicates the minimum and maximum values. The Asterisk (*) represents statistically significant difference ($p < 0.05$) between 5 and 15 seconds

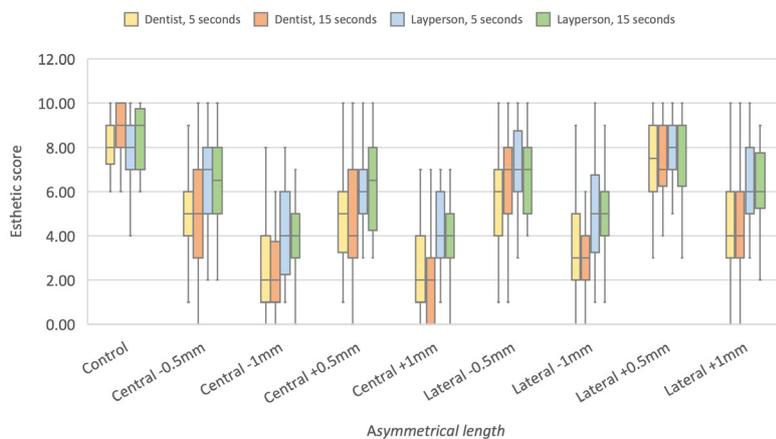


Figure 4 Esthetic scores of images with asymmetrical length of maxillary incisors rated by dentists and laypersons in 5 and 15 seconds of evaluation. The box represents the median \pm 25 percentile values, and the vertical bar indicates the minimum and maximum values. There is no statistically significant difference ($p < 0.05$) between 5 and 15 seconds on each image with the asymmetrical length of maxillary incisors in dentists and laypersons groups

Comparison of the smiles with symmetrical and asymmetrical width of maxillary incisors in both 5 and 15 seconds of evaluation time, Tables 1 and 2, dentists rated as the most attractive smiles when maxillary incisors were symmetrical (median 8.0 and 9.0, respectively) and 0.5 mm narrower than the width of the contralateral lateral incisor (median 8.0 and 8.5, respectively). The most unattractive smiles were given to the smiles with an asymmetrical width of 2.0 mm of the central incisor (median 2.0 and 2.0, respectively) in the dentists' opinion. Laypersons gave the highest score to the control image (median 8.0), 0.5 mm narrowing of the central incisor

(median 8.0), 0.5 mm, and 1.0 mm narrowing of lateral incisor (median 8.0) when the time of evaluation was 5 seconds. Similar results were found when the time of evaluation was 15 seconds. Laypersons gave the highest score to the control image (median 8.0), 0.5 mm narrowing of the central incisor (median 9.0), and 0.5 mm narrowing of the lateral incisor (median 9.0). According to laypersons, the lowest scores were assigned to smiles with an asymmetrical width of 2.0 mm of central incisor in both 5 and 15 seconds of evaluation times (median 5.0 and 4.0, respectively).

Table 1 Median and interquartile range of esthetic scores of images with asymmetrical width of maxillary incisors in 5 seconds of evaluation time

Variables	Dentists			Laypersons			Intergroup comparison
	Median	IQR	Intragroup comparison*	Median	IQR	Intragroup comparison*	
Control	8.0	9.0-7.0	A	8.0	9.0-7.0	A	
Central -0.5 mm narrower	7.0	8.0-6.0	B, C	8.0	9.0-6.0	A	
Central -1.0 mm narrower	5.0	7.0-3.2	D	7.0	8.0-6.0	B	**
Central -1.5 mm narrower	3.0	4.0-2.0	E	6.0	7.0-3.0	C	**
Central -2.0 mm narrower	2.0	4.0-0.0	F	5.0	5.0-3.0	E	**
Lateral -0.5 mm narrower	8.0	9.0-6.0	A, B	8.0	9.0-7.0	A	
Lateral -1.0 mm narrower	7.0	8.0-5.0	C	8.0	9.0-7.0	A	**
Lateral -1.5 mm narrower	4.0	5.0-3.0	D	6.5	8.0-6.0	B	**
Lateral -2.0 mm narrower	3.0	4.0-2.0	E	5.5	6.7-4.0	C	**

IQR, Interquartile range

* Variables with the same letter in the same column mean no statistically significant difference ($p < 0.05$)

** statistically significant difference between groups of evaluators ($p < 0.05$)

Table 2 Median and interquartile range of esthetic scores of images with asymmetrical width of maxillary incisors in 15 seconds of evaluation time

Variables	Dentists			Laypersons			Intergroup comparison
	Median	IQR	Intragroup comparison*	Median	IQR	Intragroup comparison*	
Control	9.0	9.7-8.0	A	8.0	9.0-7.0	A	
Central -0.5 mm narrower	7.0	9.0-6.0	B	9.0	9.0-8.0	A	**
Central -1.0 mm narrower	5.0	6.0-3.0	C	7.0	8.7-6.0	B	**
Central -1.5 mm narrower	3.0	4.0-1.2	D	5.5	7.0-4.0	C, D	**
Central -2.0 mm narrower	2.0	3.0-0.0	E	4.0	5.7-3.0	E	**
Lateral -0.5 mm narrower	8.5	9.0-8.0	A	9.0	9.0-7.0	A	
Lateral -1.0 mm narrower	7.0	8.0-5.0	F	7.0	8.0-6.0	B	
Lateral -1.5 mm narrower	4.0	6.0-3.0	C	6.0	7.0-5.0	C	**
Lateral -2.0 mm narrower	3.0	4.0-1.0	D	5.5	6.0-4.0	D	**

IQR, Interquartile range

* Variables with the same letter in the same column mean no statistically significant difference ($p < 0.05$)

** statistically significant difference between groups of evaluators ($p < 0.05$)

Assessment of smiles with the symmetrical and asymmetrical length of maxillary incisors in both 5 and 15 seconds of evaluation time according to Tables 3 and 4, dentists gave the highest score to the control image in which length of maxillary incisor was symmetrical with contralateral incisor (median 8.0 and 9.0, respectively). They also gave the lowest scores to images in which the maxillary central incisor was 1.0 mm shorter or longer than the length of the contralateral central incisor (median

2.0 and 2.0, respectively). In laypersons' opinion, with two evaluation times of 5 and 15 seconds, the most attractive smiles were assigned to the control image (median 8.0 and 9.0, respectively) and a 0.5 mm longer length of the lateral incisor (median 8.0 and 9.0, respectively). Laypersons ranked as the most unattractive smiles where the maxillary central incisor was 1.0 mm shorter or longer than the contralateral central incisor's length in both evaluation time differences (median 4.0 and 4.0, respectively).

Table 3 Median and interquartile range of esthetic scores of images with asymmetrical length of maxillary incisors in 5 seconds of evaluation time

Variables	Dentists			Laypersons			Intergroup comparison
	Median	IQR	Intragroup comparison*	Median	IQR	Intragroup comparison*	
Control	8.0	9.0-7.2	A	8.0	9.0-7.0	A	
Central -0.5 mm shorter	5.0	6.0-4.0	B, C	7.0	8.0-5.0	B, C	**
Central -1.0 mm shorter	2.0	4.0-1.0	D	4.0	6.0-2.2	D	**
Central +0.5 mm longer	5.0	6.0-3.2	B	6.0	7.0-5.0	E	**
Central +1.0 mm longer	2.0	4.0-1.0	D	4.0	6.0-3.0	D	**
Lateral -0.5 mm shorter	6.0	7.0-4.0	C	7.0	8.7-6.0	B	**
Lateral -1.0 mm shorter	3.0	5.0-2.0	E	5.0	6.7-3.2	F	**
Lateral +0.5 mm longer	7.5	9.0-6.0	F	8.0	9.0-7.0	A	
Lateral +1.0 mm longer	4.0	6.0-3.0	B	6.0	8.0-5.0	C, E	**

IQR, Interquartile range

* Variables with the same letter in the same column mean no statistically significant difference ($p < 0.05$)

** statistically significant difference between groups of evaluators ($p < 0.05$)

Table 4 Median and interquartile range of esthetic scores of images with asymmetrical length of maxillary incisors in 15 seconds of evaluation

Variables	Dentists			Laypersons			Intergroup comparison
	Median	IQR	Intragroup comparison*	Median	IQR	Intragroup comparison*	
Control	9.0	10.0-8.0	A	9.0	9.7-7.0	A	
Central -0.5 mm shorter	5.0	7.0-3.0	B	6.5	8.0-5.0	B	**
Central -1.0 mm shorter	2.0	3.7-1.0	C	4.0	5.0-3.0	C	**
Central +0.5 mm longer	4.0	7.0-3.0	B	6.5	8.0-4.2	D	**
Central +1.0 mm longer	2.0	3.0-0	C	4.0	5.0-3.0	C	**
Lateral -0.5 mm shorter	7.0	8.0-5.0	D	7.0	8.0-5.0	D	
Lateral -1.0 mm shorter	3.0	4.0-2.0	E	5.0	6.0-4.0	E	**
Lateral +0.5 mm longer	7.0	9.0-6.2	F	9.0	9.0-6.2	F	
Lateral +1.0 mm longer	4.0	6.0-3.0	B	6.0	7.75-5.2	B, D	**

IQR, Interquartile range

* Variables with the same letter in the same column mean no statistically significant difference ($p < 0.05$)

** statistically significant difference between groups of evaluators ($p < 0.05$)

In general, dentists and laypersons had no statistically significant difference of perception to control when maxillary incisors had symmetrical width and length. On the other hand, statistically significant differences of perception between dentists and laypersons were found in most situations when an asymmetrical width or length occurred. The esthetic scores rated by dentists were commonly lower than laypersons for any alterations of width and length of maxillary incisors.

When comparing the esthetic perception of participants between symmetrical and all levels of asymmetrical width and length discrepancies, the threshold level with the lowest level of noticeable discrepancies was reported in table 5. The alteration of 0.5 mm narrowing width of unilateral central incisor and 1.0 mm narrowing width of unilateral lateral incisor were

required for dentists to detect those discrepancies. The narrowing width of unilateral central and lateral incisor for laypersons to distinguish from the control image was 1.0 mm and 1.5 mm, respectively. Moreover, dentists could detect crown length discrepancies when the unilateral central and lateral incisors were 0.5 mm longer or shorter than the contralateral incisors. Laypersons could detect changes in the unilateral central incisors at the same level as dentists. However, they could detect the unilateral lateral incisor changes when it was 1.0 longer or 0.5 mm shorter than the contralateral lateral incisor. The overall results showed that dentists were more rigorous than laypersons when evaluating the asymmetrical crown width and length of maxillary incisors.

Table 5 Threshold levels of significant difference

	Dentists	Laypersons
Crown width	Central -0.5 mm narrower Lateral -1.0 mm narrower	Central -1.0 mm narrower Lateral -1.5 mm narrower
Crown length	Central +0.5 mm longer, -0.5 mm shorter Lateral +0.5 mm longer, -0.5 mm shorter	Central +0.5 mm longer, -0.5 mm shorter Lateral +1.0 mm longer, -0.5 mm shorter

Discussion

In the present study, participants were selected as an equal number of males and females to exclude factors from sex in each group, as described in a previous study²⁰, which found that in most situations, women provided slightly higher ratings for discrepancies in anterior teeth. Furthermore, as reported in the literature,^{19,21,30,31} there were no statistically significant differences between the assessment of full-face and close-up view images. Thus, the computer-manipulated images used in this study were only in close-up view.

From the result, no statistically significant difference of scores for each image rated between 5 and 15 seconds of evaluation time was found in most situations of width discrepancies. From nine images of alterations, there was only one image that dentists gave a statistically significantly different score and three images in the laypersons' group.

This finding showed that dentists were more precise than laypersons in evaluating the asymmetrical width of maxillary incisors. Nonetheless, there was no statistically significant difference between two different evaluation times when both dentists and laypersons rated unilateral crown length discrepancies.

Because central incisors are the dominant teeth in the esthetic zone,^{25,32,33} the asymmetrical widths of the central incisor could be recognized by dentists at 0.5 mm and laypersons at 1.0 mm. These thresholds were lower than in the lateral incisor. This finding corroborates with several studies^{19,29,30} that alterations in the central incisors were more easily detected than those in the lateral incisors. In 2006, Kokich *et al.*²⁰ reported that dentists and laypersons could not detect asymmetrical width of the lateral incisors until the discrepancies reached 2.0 mm. In contrast, our

findings showed that dentists could distinguish a 1.0 mm asymmetrical width of lateral incisor whereas laypersons could at 1.5 mm. In addition, when laypersons had more evaluation time, they performed better at detecting a 1.0 mm asymmetrical width of the lateral incisor. The difference in results may be due to a different method of image manipulation. In this study, the alterations of the width of the maxillary incisor were produced without changing the size of adjacent teeth, therefore those images may be more easily detected than images in previous study.²⁰

Asymmetrical length of the central incisors could be noticed by all participants even if there was only a 0.5 mm difference, similar to findings in other studies.^{29,30} However, laypersons in this study could detect the asymmetrical length of lateral incisor at 0.5 mm shorter, in which a similar finding was shown for the central incisor. This result differs from that found by Machado *et al.*²⁹ and Ribeiro *et al.*³⁰ They reported that asymmetrical lengths of the lateral incisors were more acceptable than in central incisors by a group of laypersons. Moreover, when compared with the study by Menezes *et al.*¹⁹ who investigated the influence of the vertical position of maxillary central incisors, the results of this study confirmed that unilateral discrepancies in the esthetic zone were more distinguishable than bilateral discrepancies, as stated by Kokich *et al.*²⁰

The different perceptions of dentists and laypersons in this study supported Machado *et al.*^{25,29} and Menezes *et al.*¹⁹ who hypothesized that an ideal smile could clearly be detected as an attractive smile by all groups of evaluators. However, when those smiles had any alterations, dentists and laypersons had different perceptions. The results of this study showed that both groups of raters were not statistically significantly different for the control and slightly altered images. Dentists were more critical and generally gave lower scores than laypersons, as previously reported in the literature.^{19,21,29,30} Moreover, in this present investigation, the results showed a significant importance of the length of maxillary incisors, corroborating with previous results.²⁵ Asymmetrical length in the esthetic zone tended to have

more influence on esthetic perception than the asymmetrical width of incisors since it was easily recognized by laypersons. Therefore, the asymmetrical length in maxillary incisors should be corrected by restoration or orthodontic treatment. However, if the unilateral crown length discrepancies were caused by the alteration of the gingival margin, a large amount of thresholds was found until it was detected²⁵ as a gingival margin asymmetry up to 1.5-2 mm had been considered to be acceptable for laypersons, and no further treatments were suggested as previously mentioned in literature.²⁰

From a clinical standpoint, although these results can be used as a guideline for dentists to design treatment for any anterior teeth discrepancies, dentists should discuss this with their patients before making any decisions to prevent overtreatments. Furthermore, dentists must give patients enough time to thoroughly evaluate their esthetic concerns, because more evaluation time showed a better perception from laypersons. However, the images in this study were manipulated from only two women, and only two groups of evaluators, this information should be cautiously used with individual patients because esthetic perception is subjective. Further studies with larger and diverse samples should be applied alongside this study for better evaluation of esthetically sensitive cases.

Conclusion

Within the limitations of the present study, from the dentists' standpoint, the most attractive images were symmetrical smiles, and a smile with 0.5 mm narrowing effect of the width of the lateral incisor was acceptable. For laypersons, the most attractive images were symmetrical smiles, and those with an asymmetrical width of 0.5 mm of central and 0.5, 1.0 mm of the lateral incisors could not be differentiated. In general, dentists and laypersons had a statistically significant difference in esthetic perception. Dentists were more critical and gave lower scores than laypersons. In most situations, there was no statistically significant difference between 5 and 15 seconds of evaluation time. However, when the unilateral crown width of a lateral

incisor was narrowed by 1.0 mm and the unilateral crown length of a lateral incisor was lengthened by 0.5 mm, more evaluation time could lead to a better esthetic perception for laypersons.

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References

1. Vallittu PK, Vallittu AS, VP. L. Dental aesthetics—a survey of attitudes in different groups of patients. *J Dent* 1996;24(5):335-8.
2. Li Cao, Ke Zhang, Ding Bai, Yan Jing, Ye Tian, Yongwen Guo. Effect of maxillary incisor labiolingual inclination and anteroposterior position on smiling profile esthetics. *Angle Orthod* 2011;81(1):121-9.
3. Tatarunaite E, Playle R, Hood K, Shaw W, Richmond S. Facial attractiveness: a longitudinal study. *Am J Orthod Dentofacial Orthop* 2005;127(6):676-82.
4. Baldwin DC. Appearance and aesthetics in oral health. *Community Dent Oral Epidemiol* 1980;8(5):244-56.
5. Manevska I, Pavlic A, Katic V, Zrinski MT, Drevensek M, Spalj S. Satisfaction with facial profile aesthetics: are norms overrated? *Int J Oral Maxillofac Surg* 2018;47(1):72-8.
6. Krishnan V, Daniel ST, Lazar D, Asok A. Characterization of posed smile by using visual analog scale, smile arc, buccal corridor measures, and modified smile index. *Am J Orthod Dentofacial Orthop* 2008;133(4):515-23.
7. Liao P, Fan Y, Nathanson D. Evaluation of maxillary anterior teeth width: A systematic review. *J Prosthet Dent* 2019;122(3):275-81.
8. Samorodnitzky-Naveh GR, Geiger SB, Levin L. Patients' satisfaction with dental esthetics. *J Am Dent Assoc* 2007;138(6):805-8.
9. Akarlan ZZ, Sadik B, Erten H, Karabulut E. Dental esthetic satisfaction, received and desired dental treatments for improvement of esthetics. *Indian J Dent Res* 2009;20(2):195-200.
10. Laganà G, Venza N, Borzabadi-Farahani A, Fabi F, Danesi C, Cozza P. Dental anomalies: prevalence and associations between them in a large sample of non-orthodontic subjects, a cross-sectional study. *BMC Oral Health* 2017;17(1):62.
11. Roslan AA, Ab Rahman N, Alam MK. Dental anomalies and their treatment modalities/planning in orthodontic patients. *J Orthod Sci* 2018;7.
12. Guttal KS, Naikmasur VG, Bhargava P, Bathi RJ. Frequency of Developmental Dental Anomalies in the Indian Population. *Eur J Dent* 2010;4:263-9.
13. Fekonja A. Prevalence of dental developmental anomalies of permanent teeth in children and their influence on esthetics. *J Esthet Restor Dent* 2017;29(4):276-83.
14. Ledesma-Montes C, Jiménez-Farfán MD, JC H-G. Dental developmental alterations in patients with dilacerated teeth. *Med Oral Patol Oral Cir Bucal* 2019;24(1):e8-e11.
15. Bozkaya E, Bavbek NC, B U. New perspective for evaluation of tooth widths in patients with missing or peg-shaped maxillary lateral incisors: Quadrant analysis. *Am J Orthod Dentofacial Orthop* 2018;154(6):820-8.
16. Lavery DP, Thomas MB. The restorative management of microdontia. *Br Dent J* 2016;221(4):160-6.
17. Hua F, He H, Ngan P, Bouzid W. Prevalence of peg-shaped maxillary permanent lateral incisors: A meta-analysis. *Am J Orthod Dentofacial Orthop* 2013;144(1):97-109.
18. Ittipuriphat I, Leevaloj C. Anterior space management: interdisciplinary concepts. *J Esthet Restor Dent* 2013;25(1):16-30.
19. Menezes EB, Bittencourt MA, Machado AW. Do different vertical positions of maxillary central incisors influence smile esthetics perception? *Dental Press J Orthod* 2017;22(2):95-105.
20. 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):141-51.
21. Correa BD, Bittencourt MA, Machado AW. Influence of maxillary canine gingival margin asymmetries on the perception of smile esthetics among orthodontists and laypersons. *Am J Orthod Dentofacial Orthop* 2014;145(1):55-63.
22. Sobral MC, Crusoé-Rebello IM, Machado AW. Does the presence of maxillary central incisor edge asymmetry influence the perception of dentofacial esthetics in video analysis? *Angle Orthod* 2019;89(5):775-80.
23. Mora MG, Vera Serna ME, A FL. Perception of smile aesthetics by dental specialists and patients. *Revista Mexicana de Ortodoncia* 2015;3(1):13-21.
24. Pinho S, Ciriaco C, Faber J, Lenza MA. Impact of dental asymmetries on the perception of smile esthetics. *Am J Orthod Dentofacial Orthop* 2007;132(6):748-53.
25. Machado AW, McComb RW, Moon W, Gandini Jr LG. Influence of the vertical position of maxillary central incisors on the perception of smile esthetics among orthodontists and laypersons. *J Esthet Restor Dent* 2013;25(6):392-401.
26. Da Cunha LF, Gaiao U, Silva RC, Gonzaga CC, Correr GM. Cosmetic Remodeling of the Smile: Combining Composite Resin and Ceramics over Teeth and Implants. *Case Rep Dent* 2017;2017.
27. Kokich Jr VO, Asuman Kiyak H, PA S. Comparing the Perception of Dentists and Lay People to Altered Dental Esthetics. *J Esthet Restor Dent* 1999;11(6):311-24.

28. Machado AW, Moon W, Campos E, Gandini Jr LG. Influence of spacing in the upper lateral incisor area on the perception of smile esthetics among orthodontists and laypersons. *J World Fed Orthod* 2013;2(4):e169-74.
29. Machado AW, Moon W, Gandini LG, Jr. Influence of maxillary incisor edge asymmetries on the perception of smile esthetics among orthodontists and laypersons. *Am J Orthod Dentofacial Orthop* 2013;143(5):658-64.
30. Ribeiro JB, Figueiredo BA, Machado AW. Does the presence of unilateral maxillary incisor edge asymmetries influence the perception of smile esthetics? *J Esthet Restor Dent* 2017;29(4):291-7.
31. Nascimento DC, Santos ER, Machado AW, Bittencourt MA. Influence of buccal corridor dimension on smile esthetics. *Dental Press J Orthod* 2012;17(5):145-50.
32. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* 1973;29(4):358-82.
33. Machado AW. 10 commandments of smile esthetics. *Dental Press J Orthod* 2014;19(4):136-57.