

Perception of Dental Midline Deviation Amongst Dental Professionals and Lay People

***Monica Ndudi ADEKOYA (BDS, FWACS),
Oluranti Olatokunbo DACOSTA (BDS,
FWACS), Ifeoma Linda UTOMI (BDS, FWACS)**

*[*Orthodontic Unit, Department of Child Dental Health,
Faculty of Dental Sciences, College of Medicine, Lagos
University Teaching Hospital, Lagos, Nigeria.]*

Correspondence

Dr. MN Adekoya

Department of Child Dental Health,
Faculty of Dentistry, University of Calabar,
Cross Rivers, Nigeria.

Email: moniks4life@yahoo.com

ABSTRACT

Objective: This study was conducted to evaluate the perception of midline coincidence as a determining factor in smile aesthetics.

Methods: A single of a female smile was intentionally altered with a software program (Adobe Photoshop, CS5, 1990-2010, Adobe system incorporated). The alteration involved shifting the upper midline by 0.5mm to the left in four variations. These altered images were then rated by two groups, 30 in each group, the professionals and the lay persons using a visual analogue scale.

Results: There was a statistically significant difference between the professionals and the laypeople in the perception of midline coincidence as a factor in assessing smile aesthetics, ($p=0.038$, $T=2.1$).

Conclusion: The orthodontists, general dentists, other professionals and the laypersons detected specific dental aesthetic discrepancies at varying levels of deviation.

Keywords: Midline Coincidence, Facial aesthetics, Perception

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INTRODUCTION

A symmetrical dental arrangement is thought to be a fundamental component of an attractive smile so that facial and dental midline co-ordinations are basic to appreciation of facial harmony and balance.¹⁻⁴ Facial attractiveness is an important objective of orthodontic treatment, frontal symmetry is considered one of the evaluation standards of facial appearance.⁵ The midline is the most important focal spot in aesthetic smile.^{4,6} A properly placed midline in conjunction with a long solid interproximal contact relationship between the two centrals produces a desirable effect of "cohesiveness" of the dental composition.⁶

Based on the craniofacial structures involved, facial asymmetry can be classified into dental, skeletal, and functional components. Dental asymmetry may be due to a congenital missing tooth or teeth, early loss of deciduous teeth, tooth rotation, crowding, spacing, and habits such as thumb sucking etc. Skeletal asymmetry may involve mal-positioning of the maxilla and/or mandible relative to the facial skeleton, or it may affect a number of skeletal structures on one side of the face, as in hemi-facial macrosomia, unilateral TMJ ankyloses, unilateral fibro-osseous lesions involving cleft lip and palate.⁷ In smile architecture, the initial step is to identify facial midline using the midpoint between the eyebrows (Nasion), the base of the nose and the

philtrum or midpoint of the arch in the upper lip.⁸ Arnett and Bergman,⁹ noted that the philtrum is usually a reliable midline structure and can, in most instances, be used as the basis for midline assessment. Facial aesthetic evaluation is an important part of orthodontic treatment-planning process. One of the primary goals of orthodontic treatment is to attain the best facial aesthetic appearance for a given patient.⁹

To attain optimal aesthetics, the facial midline must coincide with the maxillary and mandibular central incisor midline or minimally these lines must be parallel.^{3,8,10,11} The allowable discrepancy between the upper and lower midlines was found to be 3.6mm.⁴ Midline deviation of 1mm is the maximum acceptable by orthodontists without decreasing the smile aesthetics.¹² In cases when it is not possible to match the midline, the upper midline between the central incisors should be parallel to the facial midline.^{6,12,13,14,15} While alignment of the maxillary and mandibular midlines is desirable in orthodontics,

the mandibular midline becomes a lesser issue in aesthetics.^{6,16}

There is a difference not only between what various groups consider aesthetic but also in what is considered aesthetic for different subjects according to their age, sex and race. Evidence suggests that the aesthetic components for men, women, and various races are not entirely the same.^{17,18} A variety of social and cultural factors influence perception of physical attractiveness.^{19,20,21} Investigation of laypeople's self-perception of dental aesthetics has focused largely on gross aesthetic discrepancy relating to debilitating malocclusion.²²

Kokich,²² reported that orthodontists recognize specific dental aesthetic discrepancies more readily than laypeople, and that general dentists and laypeople have similar threshold levels for assessing midline deviation. This study was necessary to evaluate the difference in the perception of midline coincidence between professionals and the laypersons and its importance in smile aesthetics.

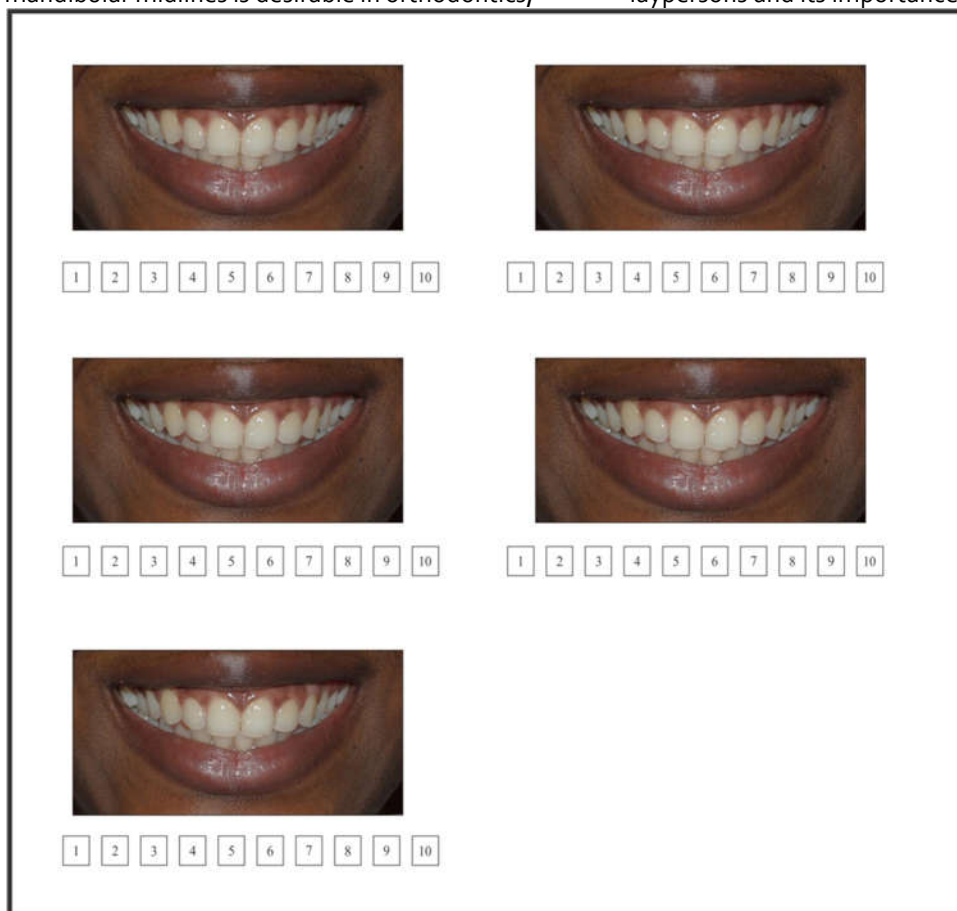


Figure 1: Upper midline deviation to the left

MATERIALS AND METHODS

This was a cross-sectional descriptive study. One image of a female's smile was intentionally altered with a software program (Adobe Photoshop, CS5. 1990-2010, Adobe system incorporated). The alteration in the smile had the upper midline shifted by 0.5mm to the left in four variations (Figure 1). These altered images were rated by two groups (30 in each group): the professionals (general dentists, orthodontists, oral surgeons, restorative dentists, pathologists and periodontists) and lay persons using a visual analogue scale. A total number of 60 questionnaires were sent to the two groups by hand using hard copies and all were recovered. The smile with 4 variations was presented on a page as the questionnaire, arranged in two columns. Rating was carried out using a 10mm visual analogue scale for each smile. The questionnaire was used to assess the perception of midline coincidence by lay persons and professionals.

The average value for each smile was calculated and rated from most attractive to the least attractive with the following calculating system <3, most attractive; 3-4.9, attractive; 5-6.9, average; >7 least attractive.

Statistical analysis

The mean, standard deviation and P value were calculated for the parameters. Overall mean for all the measurements was calculated. The 1-way ANOVA for comparison between the lay persons and the professionals, table 2, and also among the professionals, table 3, was also calculated. The association between smile perception categories and the type of respondent was calculated (table 4). The smiles were scored using a 10mm visual analog scale, where ≤ 3 =most attractive; 3-4.9=attractive; 5-6.9=average; ≥ 7 =least attractive.

RESULTS

For the perception of midline coincidence, thirty (30) professionals (oral surgeons, periodontists, oral pathologists, restorative dentists, general dentists and orthodontists) who are consultants were randomly selected from different Teaching Hospitals in Nigeria. Twelve (40%) out of 30 were males and 18 (60%) were females. There were 30 lay people consisting of parents of orthodontic patients attending orthodontic clinic, non-teaching staff of the department and some dental patients. Sixteen (53.3%) were males and 14 (46.7%) were females ($X^2=1.1$, P value =0.300), (Table 1)

Table 1: Distribution of raters by sex

	Laypersons	Professionals	Total	
Sex	No (%)	No (%)	No (%)	
Male	16(53.3)	12(40.0)	28(46.7)	$X^2 = 1.1$
Female	14(46.7)	18(60.0)	32(53.3)	$p = 0.300$
Total	30(100)	30(100)		

The professionals scored the smile with midline coincident 3.0 ± 1.7 mm. The same smile was scored 4.2 ± 2.5 by the lay persons, (table 2). There was a statistically significant difference between them ($p=0.038$, $T=2.1$).

The threshold level at which the orthodontist rated midline deviation as significantly less aesthetic was 0.5mm deviation (Table 3: 6B, $p=0.927$, F test=0.3). The restorative dentists, general dentists and the periodontists were able to perceive a significant difference in midline deviation when it was 1.5mm deviation (Table 3: 1D, 2D, 5D, $p=0.191$, F test=1.6). Neither the oral surgeons nor the oral pathologists were able to perceive any discrepancy until there was

2mm deviation (Table 21b: 3E, 4E, $p=0.131$, F test=1.9).

About forty-eight percent of the lay persons scored the smile with 2mm midline deviation as most attractive (Table 4, $p=0.620$, $X^2=0.9$), while about thirty-three percent of the professionals scored the same most attractive. About forty percent of the professionals scored the smile with midline coincident most attractive while thirty-one percent of the lay persons scored same smile most attractive (Table 4, $p=0.068$, $X^2=7.1$).

Table 2: Comparison of layperson and professional by their perception of midline variable

	Laypersons	Professionals		
	Mean $\pm$ SD mm	Mean $\pm$ SD mm	T test	P value
A=coincident	4.2 $\pm$ 2.5	3.0 $\pm$ 1.7	2.1	0.038
B=upper midline to the Lt by 0.5mm	4.8 $\pm$ 2.5	3.4 $\pm$ 2.0	2.2	0.030
C= upper midline to the Lt by 1.0mm	4.2 $\pm$ 2.0	4.4 $\pm$ 1.8	0.4	0.650
D= upper midline to the Lt by 1.5mm	4.0 $\pm$ 2.4	3.9 $\pm$ 2.1	0.2	0.818
E= upper midline to the Lt by 2.0mm	5.1 $\pm$ 2.8	4.8 $\pm$ 2.5	0.4	0.662

Table 3: Comparison of mean score of midline perception among the different categories of professionals

	Gen Dent (1)	Periodontist (2)	O/ Surgeon (3)	O/Pathologist (4)	Rest. Dent (5)	Orthodontist (6)	F test	P value
Midline (mm)	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD		
A= coincident	3.2 $\pm$ 2.0	3.0 $\pm$ 0.7	3.7 $\pm$ 1.9	3.3 $\pm$ 2.2	2.4 $\pm$ 1.3	2.6 $\pm$ 2.1	0.4	0.869
B= upper midline to the Lt by 0.5mm	3.8 $\pm$ 3.1	2.6 $\pm$ 1.1	4.0 $\pm$ 2.0	3.5 $\pm$ 2.6	3.4 $\pm$ 1.7	3.2 $\pm$ 2.2	0.3	0.927
C=upper midline to the Lt by 1.0 mm	5.8 $\pm$ 3.3	4.4 $\pm$ 1.1	3.7 $\pm$ 1.5	4.5 $\pm$ 1.7	4.8 $\pm$ 1.5	3.4 $\pm$ 0.5	1.2	0.359
D= upper midline to the Lt by 1.5mm	4.2 $\pm$ 3.0	5.8 $\pm$ 2.8	3.0 $\pm$ 1.1	2.5 $\pm$ 1.3	3.6 $\pm$ 1.9	4.2 $\pm$ 0.4	1.6	0.191
E= upper midline to	6.4 $\pm$ 3.5	4.4 $\pm$ 2.3	3.1 $\pm$ 1.2	3.1 $\pm$ 2.6	6.2 $\pm$ 2.7	5.4 $\pm$ 0.5	1.9	0.131

DISCUSSION

Aesthetics is enhanced when anterior teeth midline coincides with midline of the face.²³ Coincidence between the maxillary and facial midlines is a treatment target of orthodontic therapy, however, a mild degree of facial asymmetry commonly occurs in individuals and is barely recognized by the general public.²³

When analyzing the amount of acceptable dental deviation judged by orthodontists and lay people, there was not a general agreement. According to one study, 1mm of deviation is the maximum acceptable by orthodontists without decreasing the smile aesthetics.¹² Some articles agreed that

deviation of up to 2mm are acceptable by orthodontists.²⁴

Previous studies show that orthodontists were more perceptive to midline discrepancies than the lay person.^{12,13,19,20} The results of this study are in agreement with the latter reports. In this present study, it was found that the orthodontists were more perceptive than other professionals. Some studies suggest that, by virtue of their formal training and experience, orthodontists are more sensitive to aberrations in dentofacial appearance than the general public.¹²

An important result is that several studies agree that a small dental midline deviation does not

Table 4: Association between midline perception categories and the type of respondents

	Laypersons					Professionals						
	MA (%)	A (%)	AV (%)	LA (%)	Total	MA (%)	A (%)	AV (%)	LA (%)	Total	X ²	P value
A= coincident	9(31.0)	7(24.1)	6(20.7)	7(24.1)	29(100)	12(40.0)	13(43.3)	4(13.3)	1(3.3)	30(100)	7.1	0.068
B=upper midline to the Lt by 0.5mm	6(20.7)	9(31.0)	7(24.1)	7(24.1)	29(100)	12(40.0)	9(30.0)	5(16.7)	4(13.3)	30(100)	3.1	0.371
C=upper midline to the Lt by 1.0mm	8(27.6)	10(34.5)	6(20.7)	5(17.2)	29(100)	4(13.3)	11(36.7)	12(40.0)	3(10.0)	30(100)	3.9	0.276
D=upper midline to the Lt by 1.5mm	10(34.5)	7(24.1)	7(24.1)	5(17.2)	29(100)	8(26.7)	11(36.7)	7(23.3)	4(13.3)	30(100)	1.2	0.752
E=upper midline to the Lt by 2.0mm	10(47.6)	4(19.0)	7(33.3)		2(100)	8(33.3)	6(25.0)	10(41.7)		24(100)	0.9	0.620

compromise the smile aesthetics and is not perceived by lay persons.^{3,4,5} The lower midline can be off by approximately half a mandibular incisor width with no aesthetic ramification. This demonstrates that mandibular incisor extractions for example, would be well tolerated by lay persons. Midline shift can be accommodated due to the narrow width and uniform size of the mandibular incisors; this will help accommodate patients who have missing or extracted lower incisors.⁴ The knowledge of acceptable midline deviation will help avoid unnecessary costs, risks, time constraints on the patient and surgical complications associated with correcting midline deviation.⁵

Although subtle dental to facial midline asymmetry within normal limit is acceptable.^{3,4,8} significant midline discrepancies can be quite detrimental to dentofacial aesthetics.^{12,21} and in certain cases modification of maxillary midline to achieve perfect frontal symmetry may require complex procedures.⁵

Limitations of this study are that the scale may mean different things to different raters, all respondents may not be equal in rating the smiles and raters may use different portions of the scale and ignore others particularly the extremes and the alteration to the smiles was minimal in the bid to maintain the natural smile

CONCLUSION

The smile variable under study in this population was obviously important to smile aesthetics, this is supported by the fact that lay people who, in this case represent the general public, and the professionals could discern or detect the effect the altered variable had on the smiles in this study. Therefore, it is only ideal or important that the presence of midline coincidence or a shift (especially the maxillary) is well documented before treatment and treatment tailored towards maintaining a coincidence or correcting a shift.

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