

## PERCEPTION OF ALTERED SMILE ESTHETIC AMONG DENTISTS, STUDENTS AND LAYPERSONS USING DIGITAL PHOTOGRAPHS: A COMPARATIVE STUDY

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### ABSTRACT

**Objective:** To investigate whether there is any difference in the perception of altered smile esthetics among dentist, students and layperson.

**Study Design:** Comparative cross sectional study.

**Place and Duration of Study:** Armed Forces Institutes of Dentistry Rawalpindi, from Jan to Jun 2019.

**Methodology:** A total of 120 individuals were selected among which 40 were dentists, 40 were students and 40 lay persons to evaluate smile on given questioner. An individual was photographed in frontal posed smile using a digital camera at natural head position. The photograph was digitally manipulated with minor changes and only desired area of face was framed using Adobe Photoshop CC 2018 software to generate a control and ideal smile. Series of photographs were generated by doing modifications to evaluate five variables including Smile arc, Gingival display, Buccal corridor, Midline shift and Midline diastema. The each group was also asked to rate attractiveness each picture on 5 points Visual Analog Scale (VAS) from 1- Most attractive to 5- Least attractive.

**Results:** The *p*-value was for midline diastema and midline shift was  $<0.01$ . Most of the study population was females 75 (62.5%) and the mean age of participants was  $27.51 \pm 5.42$ . Significant difference was observed at VAS in flat smile arc, nil buccal corridor, mid-line shift and midline diastema by study groups.

**Conclusion:** Perception of midline diastema and midline shift differs significantly among dentists, students and lay persons.

**Keywords:** Buccal corridors, Esthetic, Perception, Smile.

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### INTRODUCTION

Facial attractiveness has been considered as a desirable physical characteristic among all societies for many centuries<sup>1,2</sup>. Facial and dental esthetics becomes the most desirable and increasingly important aspect of orthodontic therapy during the last decade. A well balanced attractive smile is a cherished personal strength and is chief treatment goal of current orthodontic treatment. An individual smile is characterized by the dynamic and static relationship between the dentition and supporting soft tissue framework of face<sup>3</sup>. Various basic components of a balanced smile are facial and dental mid-line relationship, upper lip line and curvature, buccal corridor, smile arc, gingival display, diastema, amount of incisor display at rest and smiling, tooth proportions and cant of occlusal plane<sup>4</sup>. Smiles are classified into two broad categories: Social smile is a voluntary unstrained smile with the static facial expressions and enjoyment smile is an involuntary smile driven by emotions<sup>5</sup>.

The field of orthodontics recently has experienced a "paradigm shift"<sup>6</sup> to focus more on esthetics, with specific emphasis on soft tissues around the mouth.

Smile analysis is an essential part of the overall facial analysis carried out by orthodontist. An esthetically pleasing smile is dependent on the harmony and symmetry between certain variables<sup>3</sup>, thus comprehensive knowledge of smile components is essential to satisfy patients esthetic demands<sup>7</sup>.

The establishment of esthetics is the initial step towards a pleasant smile that orthodontic patients anticipate from treatment. The orthodontic treatment planning involve the clear understanding of the threshold of what a community consider acceptable in terms of abnormal smile features<sup>8</sup>, patients seeking orthodontic treatment wish to improve their esthetical and social acceptance more than oral function and occlusion.

The perception of smile esthetics is subjective and is influenced by personal experiences, social environment, education, gender, age and culture<sup>9</sup>, for the same reason there is preference difference among layman and professionals regarding smile aesthetics. This fact is concluded in a study which showed difference in smile evaluation among general practitioners, orthodontist and laypersons in Arabic population<sup>2</sup>.

Upper gingival display of 1mm was considered as attractive while a distance of 3mm is rated as unattractive by both layperson and orthodontists<sup>6</sup>. Large midline diastema was rated as negative influence on

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smile esthetics while a midline diastema of 1.5mm was found attractive<sup>2</sup>. Altered photographic framings can be used in smile analysis as an attempt to create harmony between smiles and facial structures<sup>10</sup>.

The objective of study was to investigate whether there is any difference in the perception of altered smile esthetics among dentist, students and layperson.

## METHODOLOGY

This study was conducted at department of orthodontics Armed Forces Institutes of Dentistry Rawalpindi Pakistan, after approval from Research Ethics Committee (Ltr # 905/Trg - ABP1K2). The duration of study was January to June 2019. Sampling technique was kept non-probability convenience and sample size was calculated by using WHO calculator, Al-Taki *et al*<sup>2</sup> study was used with population prevalence proportion of 90% yielding sample size of more than 100 patients. The formula used as  $n = z^2 p (1-p) / d^2$ ,  $z = 95\%$ ,  $d = 5.5\%$  and  $p = 80\%$ . To develop this study, an individual was selected according to following criteria: (1) Have attractive smile closure to text book norms, (2) Age between 20-30 years and (3) Gave consent to volunteer for study. The individual was then photographed at natural head position in a frontal pose smile using a digital camera (Canon EOS-REBEL). The photograph was digitally manipulated using Adobe Photoshop CC 2018 software so that only desired area of face would be framed (fig-1). Only smile was shown in the photographs omitting all the other facial features to reduce any confounding errors. A series of photographs were generated with mild modifications in the smile variables. These modifications from control smile were purposely created to resemble smile esthetic variations and total of 15 photographs were used in this study. The 120 evaluators were selected randomly, including 40 dentists, 40 students and 40 laypersons. The dentists who participated in the study should have at least 2 years of experience. Students were of Final year BDS,

with dentistry were excluded. Five different variables including i. Smile arc, ii. Buccal corridor, iii. Mid-line shift, iv. Mid-line diastema and v, Gingival display, were evaluated by the participants. A questioner was generated containing age, gender and occupation of the participants on the front page. Each smile variable pictures were grouped on single page but the sequence was randomized and all measurements of modification were removed and only the pictures were shown to participants. The attractiveness of the smile in each of the modified images was assessed by the three groups and scored using a 5-point VAS with "1" indicating the most attractive smile and "5" indicating the least attractive smile. Data was analyzed statistically using SPSS 22. The Mean VAS scores and standard deviation (SD) of each group were calculated. Chi-Square test was conducted with each group to assess how the groups rated each level of deviation. One way ANOVA test was done to compare the means within the group to assess how the groups evaluated each degree of deviation. Post hoc multiple comparisons were made using Bonferroni method to test intragroup significance level between two closely related participants.

## RESULTS

A total of 120 individuals participated in the study. The mean age of participants was  $27.51 \pm 5.42$  years, mean age of dentists group was  $29.65 \pm 4.073$  years, while the mean ages of students and layman groups were  $22.70 \pm 0.823$  years and  $30.18 \pm 5.764$  years respectively. Out of 120 participants 45 (37.5%) were males and 75 (62.5%) were females.

In this study results for midline diastema and midline shift were significant  $p$ -value  $< 0.01$ , showing these smile variables vary significantly among dentists, students and lay persons. On the other hand  $p$ -value for buccal corridor, gingival display and smile arc were insignificant which identify that changes in these smile variables do not affect the three groups (table-I).

**Table-I: Comparison of mean esthetic scores of different smile variables as evaluated by ANOVA in the study populations (n=120).**

Smile Variables	Dentist (n=40) Mean $\pm$ SD	Student (n=40) Mean $\pm$ SD	Layperson (n=40) Mean $\pm$ SD	$p$ -value
Midline Diastema	1.18 $\pm$ 0.385	1.25 $\pm$ 0.439	2.08 $\pm$ 0.730	<0.01
Buccal Corridor	1.83 $\pm$ 0.844	1.55 $\pm$ 0.677	1.8 $\pm$ 0.822	0.141
Gingival Display	1.80 $\pm$ 0.723	1.93 $\pm$ 0.829	1.88 $\pm$ 0.883	0.788
Midline Shift	1.45 $\pm$ 0.503	1.825 $\pm$ 0.635	2.825 $\pm$ 0.384	<0.01
Smile Arc	2.50 $\pm$ 0.679	2.43 $\pm$ 0.747	2.15 $\pm$ 0.834	0.097

while layman were educated and selected on the basis of availability. Layman having if have any affiliation

The fig-2 demonstrates the percentages of studied variable preferred by the different groups of partici-

pants. As shown in fig-1 shows that 40% participants selected 1mm while (31.7%) people choose 2mm mid-line shift showing significant difference in opinions for

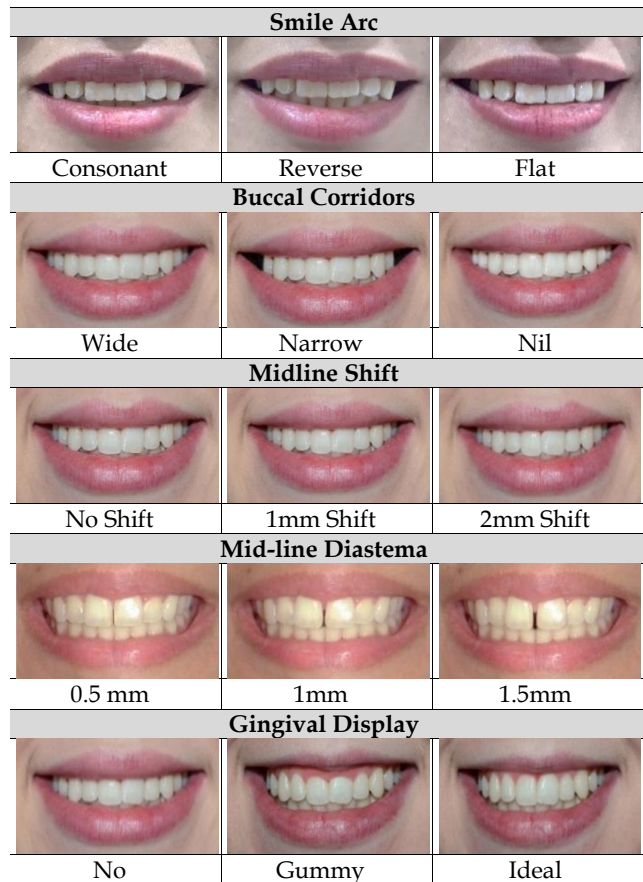


Figure-1: Illustrations of alteration in smile.

midline shift ( $p$ -value <0.01). Multiple comparisons by Boneferroni method concluded a significant difference in smile perception between dentist and layperson and student and layperson ( $p$ -value <0.01) (table-II).

The fig-2 demonstrated that 60% participants selected 0.5mm while (30%) people choose 1mm mid-line diastema. The  $p$ -value was <0.05 ( $p$ -value<0.01)

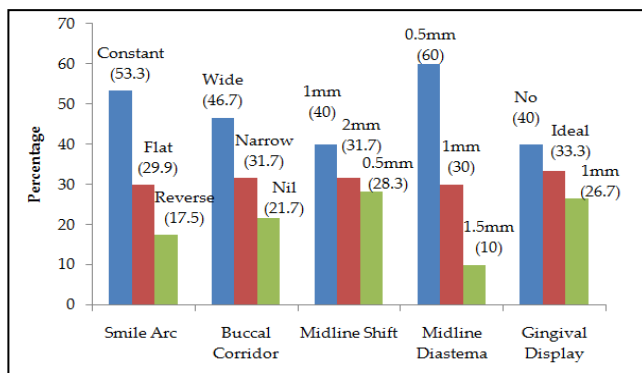


Figure-2: Smile variable preference by study population.

for midline diastema and it reveals significant results. Multiple comparisons by Boneferroni method concluded a significant difference in smile perception between dentist and layperson and students and layperson ( $p$ -value <0.01) (table-II).

Table-II: Intragroup comparison of esthetic scores by Boneferroni’s method.

Smile Variables	Group Comparison		Boneferroni Method
Mid-line Diastema	Dentist	Dentist X Students	1.000
		Dentist X Layperson	<0.01
		Students X Layperson	<0.01
	Students	Students X Dentist	1.000
		Students X Layperson	<0.01
		Layperson X Dentist	<0.01
Layperson	Layperson X Dentist	<0.01	
	Layperson X Students	<0.01	
	Dentist X Students	<0.01	
Mid-line Shift	Dentist	Dentist X Students	0.005
		Dentist X Layperson	<0.01
		Students X Layperson	<0.01
	Students	Students X Dentist	0.005
		Students X Layperson	<0.01
		Layperson X Dentist	<0.01
Layperson	Layperson X Dentist	<0.01	
	Layperson X Students	<0.01	
	Dentist X Students	<0.01	

Table-III reveals the Means scores and SD and significant findings of perceived attractiveness of the smile in each of the modified images assessed by the three groups scored on a 5-point VAS.

**DISCUSSION**

While planning treatment and evaluating its outcome orthodontists must keep in mind the view and perception of society regarding esthetically ideal smile. The perception of society is influenced by multiple factors like education level, ethnicity, age and gender proportions of society<sup>11</sup>. In this study dentists, students and lay persons evaluated the beauty of smile on the basis of five variables, that were; smile arc, midline diastemas, buccal corridor, gingival display and midline shift.

The results of Zabba<sup>12</sup> and Springer<sup>13</sup> studies concluded that, the distance of 2mm between smile arc and lower lip is ideal. Increased curvature or reverse

curvature and flattening of smile arc has negative impact on layman perception<sup>14</sup>. Some previous studies from Parekh<sup>15</sup> and Ker<sup>16</sup> established that flatter smile arcs are more objectionable while more upward curvature than that follows the lower lip was graded unpleasant. These results are in harmony with the results of our study in which consonant smile (53.3%) is preferred by the most individuals as compared to the reverse or flat smile arc, however no significant difference was observed in the perception of smile arc among dentists, students and layman.

**Table-III: Comparison of esthetic scores on visual analog scale.**

Variable	Visual Analog Scale Means $\pm$ SD	p-value
<b>Smile Arc</b>		
Consonant	2.56 $\pm$ 1.172	0.217
Reverse	3.73 $\pm$ 1.282	0.040
Flat	3.41 $\pm$ 1.393	0.283
<b>Buccal Corridors</b>		
Wide	2.08 $\pm$ 1.089	0.895
Narrow	3.23 $\pm$ 1.242	0.391
Nil	3.21 $\pm$ 1.408	0.032
<b>Mid-line Diastema</b>		
0.5mm	3.26 $\pm$ 1.404	<0.01
1mm	2.89 $\pm$ 1.448	0.004
1.5mm	4.13 $\pm$ 1.202	<0.01
<b>Mid-line Shift</b>		
No shift	1.93 $\pm$ 1.067	<0.01
1mm Shift	3.36 $\pm$ 1.075	<0.01
2mm Shift	3.85 $\pm$ 1.171	<0.01
<b>Gingival Display</b>		
No	3.27 $\pm$ 1.510	0.503
Gummy	3.52 $\pm$ 1.432	0.088
Ideal	2.81 $\pm$ 1.259	0.211

A study conducted by Gaikwad *et al*<sup>17</sup> revealed that orthodontists were more specific in perceiving the smile arc and buccal corridor as compared to the dentists and layperson. Similar results were obtained in the study conducted by Kiania *et al*<sup>18</sup> for the evaluation of buccal corridor among orthodontists and lay persons. Smaller buccal corridors are preferred by both orthodontists and lay persons as compared to broader corridors. A study conducted by Taki *et al*<sup>2</sup> revealed that there is a significant difference in the perception of smile esthetics and buccal corridor among orthodontists, dentists and lay persons. These results are inconsistent to this study. This difference in results can be attributed to cultural, ethnical and racial differences.

Midline shift of more than 2.0 mm is noticeable by the lay persons, 7 while some other studies suggested

midline shift as much as 4.0 mm is acceptable by the lay persons<sup>11</sup>. In this study majority of the participants (40%) preferred 1mm midline shift as esthetically preferred smile. A study conducted by Omar<sup>19</sup> revealed that dental students are more precise in picking up midline shift discrepancies than non-dental students. While this study concluded that there is a significant difference in perception of esthetically preferred smile among the three groups with respect to midline shift. Intra-group comparison of esthetic scores (table-II) shows significant difference between students and layperson and dentist and layperson.

Midline diastema of >1mm is find unattractive by orthodontists while general practitioners and lay persons find midline diastema of 2mm or more unattractive<sup>20</sup>. Another study<sup>21</sup> concluded that lay dentists and laypersons found midline diastema of 1mm unattractive<sup>26</sup>. Increasing midline diastema is regarded as an unattractive feature in this study as majority (60%) of participants preferred the smile with 0.5 mm of midline diastema. Ours study also found that there is a significant difference between dentists and layperson and students and layperson in perception of midline diastema.

Orthodontists, dentists and lay persons graded gingival display of 2mm or more unattractive<sup>2</sup>. How Hoe *et al*<sup>22</sup> concluded that 1mm or more of gingival display is unattractive while Kokich<sup>23</sup> and An<sup>24</sup> *et al* concluded that gingival display of 4mm or more is appreciable by general practitioners and lay persons. In this study majority (48%) of the participants preferred no gingival display, while about equal proportions (33.3%) preferred gummy and ideal smiles. Our study also revealed that there is significant difference in perception of gingival display as esthetic smile variable among dentists and laypersons and also among study population. As the concept of beauty is personal, hence subjective, it requires a fast, straight forward and reliable evaluation method. Therefore, VAS was used as research tool in this study. A significant difference in smile perception was observed in scores of midline diastema and midline shift on VAS (table-III), the study based on Korean and Japanese<sup>25</sup> orthodontist showed that was the median esthetic score of standard composite smile in the Korean orthodontist was clinically significantly lower than that of the Japanese orthodontist. In our study means score of midline line diastema was higher as compared to other variables.

The limitations of our study are that all the photographs use were of female smiles and socioeconomic

and education level of laypersons were not considered while selecting laypersons.

### CONCLUSION

Dentists were more analytical in smile perception as compared to students and layperson. Perception of midline diastema differs significantly in between dentist and layperson and students and layperson while perception of midline shift differs significantly between dentist and layperson and student and layperson. The more importance should be given to the esthetics demands of patients before planning any orthodontics treatment.

### CONFLICT OF INTREST

The study has no conflict of interest to be declared by any author.

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