

ORIGINAL ARTICLE

A Comparison Of The Perception Of Dental Professionals And Laypersons to Altered Mini and Micro Smile Aesthetics

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ABSTRACT

Introduction: With the advent of Adult Orthodontics, the number of adults seeking treatment for improvement of aesthetics has increased manifold. The aim of this study was to compare the perception of orthodontists, general dentists and laypersons to altered mini and micro smile aesthetics.

Material and methods: Each group consisted of 10 individuals with equal number of males and females. The three groups rated each of the seven parameters for each of the three patients and rated them on a scale of 1-4. The total number of images in the study were 84. Statistical analyses were performed with a significance level of $P < 0.05$.

Results: A minute deviation of 1mm or 0.25 was noticed by the orthodontists in all seven parameters. The general dentists were as specific as the orthodontists only with regard to midline diastema, black triangles and alteration in width of lateral incisor whereas the laypersons found the photograph most deviated from the ideal to be aesthetic.

Conclusions: The Orthodontists were more critical than the dentists in assessing the alterations who were in turn more critical than the laypersons.

Key Words: Orthodontist, general dentist, laypersons, smile aesthetics

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INTRODUCTION

The entertainment world has since long exposed people across the globe to beautiful faces and esthetic smiles and has increased the demand for beautiful smiles and ideal esthetics. The Orthodontist is at the summit of a group of professionals that is expected to deliver beautiful aesthetics to the patient. Facial attractiveness is determined more by the smile than by soft tissue relationships at rest. As such there are two types of smiles: the posed smile which is reproducible and the one that is presented routinely to the world and the emotional smile. The posed smile is the focus of Orthodontics today.¹

Given all this information, sometimes dental professionals forget that facial attractiveness is a factor of interest to everyone and that the ultimate source of aesthetic value must be the general public and not just what the Orthodontist believes. Smile aesthetics encompasses both mini-aesthetics i.e. tooth-lip relationships as well as micro-aesthetics i.e. dental appearance. This subject has not been researched by various authors in the past, 3-6 however the various parameters of micro and mini- aesthetics have not been analysed all together in the past nor has the influence of gender on perception been considered in different groups. The purpose of this study was to determine the perception of laypersons, general dentists and orthodontists to minor alterations in the various parameters of smile. Study aims that there is no difference in the perception of Orthodontists with respect to general dentists in detecting minor variations in the various parameters and in the perception of laypersons with no dental background when compared to the general dentist group. It even

determines that there are no differences in perception of aesthetic parameters between both genders.

MATERIAL AND METHODS

Three groups of raters were used in this study: Orthodontists, general dentists and laypeople. The orthodontists included faculty of a particular college as well private practitioners from a particular region. The second group consisted of laypersons (50% males and 50 % females) with no dental background whatsoever. The final group of general dentists consisted of dental professionals (BDS) from the same region. Equal number of male and females were chosen in each group. Questionnaires consisting of seven questions for the seven parameters were handed over to each of the thirty raters for evaluation. The raters had to go through 84 photographs of three different patients. Variables and Measurements

The three groups (1- Orthodontists, 2- laypersons and 3- general dentist) rated each of the seven parameters for each of the patients and rated them on a scale of 1-4 (1 being most aesthetic and 4 being the least aesthetic). The total number of images in the study was 84. The following parameters were considered: mini- aesthetics-upper jaw dental to facial midline, occlusal cant, gingival to lip distance, midline diastema and smile arc and micro-aesthetics-alteration of golden proportion and black triangles. Each of these parameters was evaluated on posed smiles of the patients.

The nose and chin were left out. Each aesthetic parameter was altered with 3 progressive variations excluding the original photograph. This was done using Adobe Photoshop (11). The images were then printed to give an appropriate representation of the respective smiles. All the parameters were reduced in certain increments, millimetre (mm) being used as the unit of measurement.

The first parameter was the upper jaw dental midline to facial midline as assessed by the philtrum which is considered to be the most symmetrical of the soft tissue points.⁷ The upper jaw midline was moved progressively to the left in 1mm increments starting with coincident upper

jaw and facial midlines (Figure-1). The occlusal plane was progressively canted downwards toward the left in 1 degree increments (Figure-2). The third parameter was the gingiva to lip distance. The distance was progressively increased in 1mm increments, gradually increasing the gingival show. The measurement was made from the gingival zenith of the central incisors which was the reference point to the lip (Figure-3). A midline diastema was created in 0.25mm increments in between the maxillary central incisors. The measurements were made at the interproximal contact points between the central incisor crowns. (Figure-4)

Smile arc was the last parameter evaluated under mini-aesthetics. The smile arc was gradually flattened in 1mm increments by moving the central and lateral incisors more apically (Figure - 5)

The golden proportion is an important parameter of anterior aesthetics. The most common variation is generally seen in relation to the lateral incisor. The width of the right lateral incisor was progressively reduced in 1mm increments to alter and golden proportion. The measurements were made at the widest portions of the crown between the interproximal contact points (Figure-6).

Black triangles were the last parameter in the micro-aesthetics category that was evaluated. The black triangle was gradually increased in 0.25 mm increments between the maxillary central incisors (Figure-7).

The smiles were grouped in such a manner that all of the parameters of one patient were present on one particular sheet. No information of the patient was divulged to any of the participants. Each sheet consisted of 28 photographs making a total of 84 photographs for evaluation. The raters scored each of the parameters for each of the patients on a scale of 1- 4 as mentioned above.

The ratings were then evaluated statistically.

STATISTICAL ANALYSIS

To test the hypotheses, a series of non-parametric statistics such as Kruskal Wallis and Mann Whitney U tests were applied to the raw data. Significant overall tests were followed with a series of post- hoc multiple comparisons which



Figure-1: Dental midline to facial midline as assessed by the philtrum; **Figure-2:** Cant of the occlusal plane; **Figure-3:** Gingiva to lip distance



Figure-4: Midline diastema; **Figure-5:** Flattening of the smile arc; **Figure-6:** Alteration of golden proportion

were done to assess differences between group 1v/s 2, 2v/s 3 and 3 v/s 1. Gender comparison of perceptions of smile was done by performing the Mann Whitney U test.

RESULTS

In this section we will present the levels of discrepancy each group could distinguish between ideal smiles and the various deviations that followed (Table 1). Also the possibility of a gender difference in perception will be included. Orthodontists were more specific in determining deviations of the upper jaw midline to the facial midline (as determined by the philtrum) when compared to the general dentist who in turn were more specific than laypersons. The Orthodontist could detect the most minor deviation from the ideal while the general dentist could not detect a

difference between an ideal photograph and a deviation of 1mm. Laypersons considered even a deviation of 3mm to be aesthetic.

A mild occlusal cant of 1 degree was detected by the orthodontist by assigning the highest value to the most ideal photograph. However, the general dentist could not detect a difference between an ideal photograph and an occlusal cant deviation of 1mm. In this parameter the laypersons considered a cant of even 3 degree to be aesthetic.

The orthodontists assigned the highest value to the photograph that displayed about 2 mm of gingival show. Gingival show of 3mm or more was considered unaesthetic by them. The general dentist considered no gingival show or upto 1mm of gingival show to be most aesthetic. For this category as well gingival show beyond 3mm was considered as unaesthetic. The layperson group did not find gingival show even upto 4mm to be unaesthetic.

A mild midline diastema of 0.25 mm was considered unaesthetic by the Orthodontist as well as the general dentist group. A midline space of upto 0.75 mm was not considered unaesthetic by the layperson group.

Alteration of the smile arc to flatten it was perceived by the orthodontist group at minor increments of even 1mm. The general dentist group could not detect a difference between the most ideal photograph and a deviation of 1mm laypersons considered a flattening of the smile arc of upto 3mm to be aesthetic.

The Orthodontist as well as the general dentist noticed an alteration in the width of the right lateral incisor as minute as 1mm. The laypersons considered an alteration in the width of the lateral incisor even upto 3 mm to be aesthetic.

Orthodontists as well as general dentists were able to detect a black triangle of 0.25 mm. The layperson group considered a black triangle upto even 0.75 mm to be aesthetic.

Mann Whitney U test was done (Table 2) to assess any gender differences in perception of smile aesthetics. While ratings were slightly more accurate for female Orthodontists as compared to male Orthodontists, overall no statistically significant differences were found.

Kruskal Wallis test was done for all photographs in each parameter. Since it revealed significant

differences among the various photographs, a series of post hoc studies were carried out. These studies revealed that differences in perception of smile aesthetics were statistically significant for a comparison between the orthodontist and layperson and general dentist and layperson. While the readings of the orthodontist and the general dentist show a difference. This difference is not statistically significant.

DISCUSSION

In this study only photographs of the lower face were considered. Orthodontists noticed an upper jaw dental midline to facial midline (represented by philtrum) deviation of 1mm, while the dentists noticed a deviation of 2mm. The group of laypersons however did not notice a deviation of the upper jaw to facial midline of even upto 3mm. This is in contrast to studies by Johnston et al⁸ who found deterioration of dentofacial aesthetics with a deviation of 2mm. Springer et al⁹ studied laypersons perspective on midline deviations and found a deviation of 3.2mm to be unaesthetic. Kokich et al¹⁰ found a deviation of 4mm to be detected by orthodontists while general dentists and laypeople were found to overlook a deviation of 4mm or more. Rodrigues et al¹¹ suggested that midline deviations were still found to be aesthetic by laypeople. Therefore, when aesthetic treatment to obtain a harmonious smile is performed, various factors need to be weighed in this clinical decision, such as: what type of deviation from the norms the smile presents, degree of deviation, patient opinion, cost of treatment and invasiveness of the procedure.

The study revealed that Orthodontists will detect a mild occlusal cant of 1 degree while the general dentist noticed an occlusal cant of 2 degree or more. Laypersons overlooked cants of upto 3 degree. Previous studies by McLeod et al¹² that compared Canadian v/s United States(US)laypeople revealed that Canadian laypeople detected cants as minute as 1 degree while US laypeople could detect cants at 3 degree or more which is similar to our study. Springer et al⁸ found the maximum acceptable cant by laypersons to be 2.75 degree. A 4 degree limit for cant was established by Ker et al¹³ again similar

to the results of this study.



Parameter	Rating	Photograph 1	Photograph 2	Photograph 3	Photograph 4
Dental midline to facial midline	Orthodontist	27.54	32.52	37.56	46.63
	Layperson	49.06	47.58	37.71	19.96
	General dentist	32.90	29.40	34.23	42.92
	P value	.000	.002	.774	.000
Cant of occlusal plane	Orthodontist	30.00	36.79	43.10	41.44
	Layperson	46.71	39.83	28.88	28.29
	General dentist	32.79	32.88	37.52	39.77
	P value	.000	.283	.010	.008
Gingival to lip distance	Orthodontist	32.40	27.67	40.06	44.46
	Layperson	44.17	48.54	33.06	25.63
	General dentist	32.94	33.29	36.38	39.42
	P value	.067	.001	.452	.001
Midline diastema	Orthodontist	31.50	39.00	36.08	37.54
	Layperson	43.58	34.42	34.50	35.90
	General dentist	34.42	36.08	38.92	36.06
	P value	.002	.408	.303	.859
Flattening of the smile arc	Orthodontist	36.73	34.75	40.92	43.00
	Layperson	47.63	40.00	32.25	25.94
	General	35.15	34.75	36.66	40.56

Figure-7: Black Triangles; **Table-1:** levels of discrepancy each group could distinguish between ideal smiles and the various deviations that followed.

Kokich et al¹⁰ determined a threshold level of 2 mm of gingival display for the Orthodontist group before it was found to be unaesthetic. However his study determined that the photograph was not rated as unattractive by the general dentists as well as laypersons upto a gingival to lip distance of 4mm. In another similar study conducted by Kokich et al¹⁴ a threshold value of 3mm of gingival to lip distance was considered unaesthetic for the orthodontist and the layperson group. The general dentists were found to have a higher threshold. Our present study revealed the orthodontist group rating 2mm of gingival show as aesthetic while the general dentist group found no gingival show or 1mm gingival show most aesthetic. Gingival show of 3mm or more was considered unaesthetic by both above groups. Laypersons did not even detect a distance of gingiva to lip of 4mm. Therefore we can conclude that, some amount of gingival show on smile (1-2mm) is considered to be aesthetic when compared to none at all.

When it came to perceiving midline diastemas both the Orthodontist and the general dentist group were capable of perceiving even minute midline diastemas of 0.25 mm. The layperson group perceived midline spaces of even 0.75 mm to be aesthetic. Here the threshold values are

much higher than in a study by Kokich et al where Orthodontists did not rate a diastema unattractive till it was about 1- 1.5 mm whereas the general dentist and laypeople presented with a threshold of 2mm for the same.¹⁴ A midline diastema may relapse at times following the removal of orthodontic appliances due to transseptal fibres which fail to organise immediately after treatment.¹⁵

The parameter of smile arc has been studied extensively in the past. In a study by Parekh et al¹⁶ flattened smile arcs with excessive buccal corridor spaces were found to be unaesthetic while Krishnan et al,¹⁷ found that female smiles were more consonant than male smiles. The arc of the maxillary incisal edges can be altered by therapeutic measures-either orthodontic or restorative treatment. In orthodontics, the brackets can be carefully positioned to create a parallel smile-arc relationship that is also attractive. Springer et al⁹ ascertained that the ideal smile arc must match the lower lip. In a study by Kaya and Uyar et al,¹⁸ it was found that flat smile arcs were preferred when the amount of gingival display was insufficient. On the other hand, vaulted smile arcs were preferred when the amount of gingival display was excessive. In our study the orthodontist could detect a flattening of the smile arc by 1mm while the general dentist detected a flattening of the smile arc of upto 2mm. Further flattening of the smile arc of even upto 3mm went unnoticed by the layperson group.

In literature,¹⁹ various tooth proportion theories exist such as the golden proportion, golden mean, the repeated ratio (which includes the Plato beauty proportion, aesthetic norm proportion, quarter 3:4 proportion and the human norm 5:6 proportion) and the recurring aesthetic dental proportion. In our study, we used the golden proportion. One of the first to describe the golden proportion and its importance in restorative dentistry was Lombardi.²⁰ Since then Levin,²¹ Brisman²² and others have reported its application in anterior aesthetics. Kokich²³ applied the rule to Orthodontics by describing the proper restoration of peg shaped lateral incisors in Orthodontic patients. The golden proportional value for the lateral incisor is 0.618 i.e. two thirds the width of the adjacent central incisor. Previous

studies by Kokich¹⁰ showed a bilateral alteration of the width of the lateral incisors and no panelist was found to rate the alteration as unattractive until it was 3-4 mm narrower than the ideal.¹⁰ In a similar study done again by Kokich et al they observed that asymmetric crown width alteration of the lateral incisor was noticed at about 2mm.¹⁴ In the present study a 1mm alteration in the width of the lateral incisor was noticed by both the Orthodontist as well as the general dentist. Upto 3mm of crown width alteration went unnoticed during the observation by laypersons.

Black triangles or black spaces have been a topic of research for quite a while. Our study showed that Orthodontists as well as general dentists could detect a defect of 0.25mm. Laypersons found it difficult to detect a defect of even upto 0.75mm. A very recent study by Pithon et al evaluated the perception of the following age groups to black triangles or spaces i.e. 15-19, 35-44, and 65-74 years. While all groups detected the defect, the age group of 65-74 yrs were less perceptive in detecting the same, suggesting that advancing age leads to a decreased perception of smile.²⁴

CONCLUSION

In this investigation we evaluated the perception Of Orthodontists, general dentists and laypersons in evaluating alterations in the various parameters of mini and micro smile aesthetics. In general it was clear that the Orthodontists were more critical than the dentists in assessing the alterations who were in turn more critical than the laypersons. The orthodontists and the general dentists were able to detect minute defects while alterations upto 3mm were not considered as unaesthetic to laypersons. The data must be interpreted carefully by allowing each and every patient to evaluate or rate such photographs for himself/herself and avoiding a direct extrapolation of the results obtained here.

REFERENCES

1. Proffit WR, Fields HW, Sarver DM, editors. Contemporary orthodontics. 4th ed. St Louis: Mosby Elsevier; 2007

2. Espan˜a P, Tarazonab B, Paredes V. Smile esthetics from odontology students' perspectives. *Angle Orthod.* 2013;00:1-11
3. Moore T, Southard KA, Casko JS, Qian F, Southard TE. Buccal corridors and smile esthetics. *Am J Orthod Dentofac Orthop.* 2005; 127:208–213.
4. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent.* 1999; 11:311–324.
5. Parekh SM, Fields HW, Beck M, Rosenstiel S. Attractiveness of variations in the smile arc and buccal corridor space as judged by orthodontists and laymen. *AngleOrthod.* 2006; 76:557–563.
6. Wong NK, Kassim AA, Foong KW. Analysis of aesthetic smiles by using computer vision techniques. *Am J Orthod Dentofacial Orthop.* 2005; 128:404–411.
7. Arnett GW, McLaughlin RP Facial and Dental Planning for Orthodontists and Oral Surgeons. Mosby;2004:52
8. Johnston CD, Burden DJ, Stevenson MR. The influence of dental to facial midline discrepancies on dental attractiveness ratings. *Eur J Orthod.* 1999; 21:517-22.
9. Springer NC, Chang C, Fields HW, Beck FM, Firestone AR, Rosenstiel S et al. Smile esthetics from the layperson's perspective *Am J Orthod Dentofacial Orthop.* 2011; 139:e91-e101
10. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent.*1999;11:311-24
11. Rodrigues CDT, Magnani R, Machado MSC, Oliveira OB Jr. The Perception of Smile Attractiveness. *Angle Orthod.* 2009; 79:634-639.
12. McLeod C, Fields HW, Hechter F, Wiltshired W, Rody W Jr, Christensen J. Esthetics and smile characteristics evaluated by laypersons; A comparison of Canadian and US data *Angle Orthod.* 2011; 81:198-205
13. Ker AJ, Chan R, Fields HW, Beck M, Rosenstiel S. Esthetics and smile characteristics from the layperson's perspective: a computer-based survey study. *J Am Dent Assoc* 2008; 139:1318-27.
14. Kokich VO, Kokich VG, Kiyak HA. Perceptions of dental professionals and laypersons to altered dental esthetics: Asymmetric and symmetric situations *Am J Orthod Dentofac Orthop* 2006;130:141-51
15. Sullivan TC, Turpin DL, Årtun J. A postretention study of patients presenting with a maxillary median diastema. *Angle Orthod* 1996; 66:131-8.
16. J. Parekh, H. Fields, M. Beck, and S. Rosenstiel. The perception of selected aspects of smile esthetics—smile arcs and buccal corridors *Am J Orthod Dentofacial Orthop* 2006;129:711
17. 17)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;133:515-23
18. Kaya B, Uyar R. Influence on smile attractiveness of the smile arc in conjunction with gingival display. *Am J Orthod Dentofacial Orthop* 2013;144:541-7
19. Ward DH. Study of Dentists' Preferred Maxillary Anterior Tooth Width Proportions: Comparing the Recurring Esthetic Dental Proportion to Other Mathematical and Naturally Occurring Proportions. *J Esthet Restor Dent* 2007;19:324–339
20. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent* 1973; 29:358-82.
21. Levin EI. Dental esthetics and the golden proportion. *J Prosthet Dent* 1978; 40:244-52.
22. Brisman AS. Esthetics: a comparison of dentists' and patients' concepts. *J Am Dent Assoc* 1980;100:345-52
23. Kokich VG. Anterior dental esthetics: an orthodontic perspective III. Mediolateral relationships. *J Esthet Dent* 1993; 5:200-7.
24. Pithon MM, Bastos WB, Miranda NS, Sampaio T, Ribeiro TP, Gomes do Nascimento LEA et al. Esthetic perception of black spaces between maxillary central incisors by different age groups. *Am J Orthod Dentofacial Orthop* 2013;143:371-5