Research Article

AHB Advances in Human Biology

Adv Hum Biol 2013; 3(1):29-36.

Perception of Smile Esthetics: A comparative Evaluation in Orthodontist and Laypersons

Divyaroop Rai[1*] Anuroop Rai[2] Vikas Gill[3] Tripti Rai[4]

[1]Private Practioner, Rai's Smile Central Dental Hospital, Jaipur, India.
[2]Director, Rai's Smile Central Dental Hospital, Jaipur, India.
[3]Reader, Department of Orthodontics, Rajasthan Dental College, Jaipur, India.
[4]Assistant Professor, Department of Pedodontics, Government Dental College, Jaipur, India.

ABSTRACT

Aims: The purpose of this investigation was to compare the difference in esthetic perception of the professionals and the laypersons in posed/social smile among young adults seeking orthodontic treatment.

Materials and Methods: Images of the posed smile were captured with a digital camera from the 60 non-orthodontic treated young adults (30 males, 30 females) and were judged by panels of 10 laypersons and orthodontists each. Visual analog scale was used to measure the pleasantness of smile and Likert scale was used to observe the importance of inciso-gingival display, upper vertical lip thickness, lower vertical lip thickness, buccal corridor and smile arc in smile attractiveness. Pearson's correlation and chi square test was used to identify determinants of the "pleasing smile" from the results of a Visual analog scale and Likert scale.

Results: The esthetic smile judgment of orthodontists disagreed with those of laypersons. Three factors formed significant components of a pleasant smile, for orthodontists (inciso-gingival display, upper lip & buccal corridor) and three for laypersons (upper lip, lower lip & smile arc).

Conclusion: Inciso-gingival display, upper lip, lower lip and buccal corridor proved to be the most influential variables in smile esthetics.

Keywords: Esthetics, Orthodontics, Treatment

INTRODUCTION

In today's competitive and trendy world the significance of a beautiful face and facial characteristics is of high priority to the demanding patients. Being beautiful is an advantage in a variety of important real-life situations, and is found to be as important for males as for females and for children as for adults.

Esthetic perception varies from person to person and professional opinion regarding evaluation of facial esthetics may not coincide with the perceptions and expectations of patients or lay people. Earlier studies have revealed that orthodontists, general dentists, and lay people detect specific dental esthetic discrepancies at varying levels of deviation, which may aid the dental professional in making specific treatment recommendations.[1,2] Therefore, a visualization treatment strategy for the evaluation of esthetics in the frontal view must be created to address the patient's chief concerns.[3]

This study was designed to compare the judgment of laypersons and orthodontists on overall attractiveness and its correlation with five selected parameters of posed smile. This provided subjective indications of what constitutes a pleasing smile.

Received: Dec. 05, 2012: **Accepted**: Jan. 06, 2013
***Correspondence**: **Divyaroop Rai**
Rai's Smile Central Dental Hospital, Jaipur, Rajasthan, India.
E-mail: divyaroop@hotmail.com

pISSN 2321-8568
eISSN 2348-4691

MATERIALS AND METHODS

The study samples were selected from the students of Meenakshi Ammal Dental College, Chennai, INDIA, after getting approval from ethical committee review board of MAHER University. To be included in the study, the samples were required to meet the following criteria; young adults (Indian origin) between the age group of 18 to 25 years with good profile and clinically acceptable smile (no reduced lip length, reverse smile line or gummy smile >3mm gingival show), no history of any orthodontic treatment, no clinically evident skeletal asymmetry, absence of anterior or posterior cross-bite, absence of missing or malformed teeth causing a tooth size discrepancy. 60 subjects (30 males and 30 females) fulfilling the above criteria were selected and their posed smile photographs were taken. A digital camera (Nikon –D70S) with an EX Sigma F28 DG macro lens, focused at 1:1 ratio was used to record anterior tooth display while the subjects were smiling. To standardize the technique, a fixed patient camera distance, a cephalometric head holder, and natural head position were used. The patient were asked to relax and give a social/posed smile. Ten frames per patient were captured of the Dynamic Oral Aperture and adjacent tissues (including parts of the nose & the chin). These frames were transferred to the computer and those showing maximum similarity of the posed/social smile were considered and one best representing the patient's natural unstrained social smile (the most reproducible smile in all the frames) was selected. The frame was imported to Adobe Photoshop CS4 program, to eliminate any rotations due to head positioning. In addition, the image was cropped to eliminate most of the nose, cheeks and chin to minimize the influence of background facial attractiveness.*(Figure 1 & 2).*

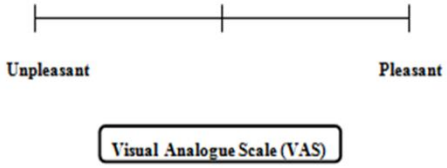
Visual Examination of the Images

The influence of variations in facial appearance was minimized by using computer-imaging techniques. Facial blemishes were removed from the smiling photographs, and severely discoloured teeth were whitened to match the adjacent teeth digitally using Adobe Photoshop version CS4. Detailing was completed and the frames were standardized to width of 4 inches. Each frame identified with its patient number was pasted on a power-point presentation along with their identification number. The photographs were divided into two separate groups (males – 30, females – 30). The evaluations were made by 10 orthodontists and 10 laypersons (all of Indian origin). For the current study, an orthodontist was defined as a specialist who had completed advanced training in an orthodontic residency program & had been practicing orthodontia for a minimum of 5 years, and a layperson was defined as someone with no formal education in dentistry or dental hygiene, and of a good socioeconomic status.

Each evaluator completed a given performa *(Figure 3)* containing a Visual Analogue Scale (VAS), i.e. a horizontal line, 100 mm in length, anchored by word descriptors at each end. The photographs of individuals were judged by the panel members on a line from 0 (Unpleasant) to 100 (Pleasant). A center mark was made on the scale to help the panel members, deliberately lean one way or another. Evaluators used their own esthetic values to rank the patients' smiles from "Unpleasant" to "Pleasant". The word "Pleasant" was used to subjectively rate the of the maxillary incisal edges and canines relative to the curvature of the lower lip on smile).

Fig 1. Posed smile image (Female)

Fig 2. Posed smile image (Male)



Which of the following factors affect the smile:

Factors	Rating
F1. Incisogingival Display	
F2. Upper Vertical Lip Thickness	
F3. Lower Vertical Lip Thickness	
F4. Buccal Corridor	
F5. Smile Arc	

Rate according to the scale below:

1. Very Unattractive
2. Unattractive
3. Average
4. Attractive
5. Very Attractive

Fig 3. Performa for VAS & Likert scale score

The above five factors of smile were evaluated with the help of a 5 point Likert scale (from 1 being very unattractive to 5 being very attractive). Likert scale has been used in the evaluation of dentofacial and facial aesthetics, to reduce the variations in VAS scale and to deliberately lean the evaluator towards a point of decision. *(Figure 4)*

The five factors were given an individual coding for the ease of statistical analysis; Inciso-gingival display (F1), Upper vertical lip thickness (F2), Lower vertical lip thickness (F3), Buccal corridor (F4), Smile arc (F5).

A panel of orthodontists and laypersons worked independently without any time restrictions. A performa was given to all the judges to check appropriate attributes affecting the smile. The laypersons were given a brief explanation regarding five factors selected for smile esthetics, before performing the evaluation. No specific criteria were suggested for rating the smiles. The judges were told that they did not have to use the extremes of the line if they did not think it was required. Each judge received all 60 images simultaneously and rated the smiles from least pleasing to most pleasing.

The VAS score was then determined by measuring in millimetres from the left hand end of the line to the point marked by the evaluator. The acquired values were stored in a Microsoft Excel Spread Sheet. Average values were drawn for VAS score and Likert scale score of five factors, thereby providing 2 values (orthodontist & layperson) for each parameter of every single photograph. Unpleasant smiles were defined as those with "mean numerical scores of 0 to 50". Pleasant smiles were defined as those with "mean numerical scores of 51 to 100". Factors responsible for attractive smile were given mean numerical scores of 3 to 5 and the unattractive smiles factors were scored from 0 - 2.99.

RESULTS

Statistical analysis was performed with a software program (SPSS version 12.0, for Windows). Pearson's Chi-square test was used to determine number of pleasant and unpleasant smiles and to correlate the esthetic scores between orthodontists and laypersons. Chi-square test was used for determining the significance of the factors contributing in pleasantness and unpleasantness of smiles. A highly significant difference was observed in perception of smiles by the Orthodontist & Layperson ($p = 0.002$) (Table 1). Orthodontists rated inciso-gingival display as highly significant factor ($p=0.000$) in pleasantness of smile for both males and females, but laypersons did not rate it as a contributing factor to the pleasantness of smile in either group. Less buccal corridor width, contributed significantly ($p=0.000$) to the pleasantness of the smile by orthodontist irrespective of gender whereas laypersons showed no such correlation between smile esthetics and buccal corridor. In the present study, laypersons rated smile arc as a highly significant factor, contributing in the pleasantness of the smile for both male ($p=0.001$) and female ($p=0.000$) groups. Both laypersons (males – $p=0.000$, females - $p=0.012$) and orthodontists (male & female - $p=0.000$) used upper lip thickness as an important factor in determining the pleasantness of a smile among male and female groups. However only the laypersons rated lower lip thickness as significantly

Table 1: VAS* – Orthodontist v/s Layperson

			VAS - LAYPERSON		Total
			UNPLEASANT	PLEASANT	
Vas*-Ortho	Unpleasant	Count	7	13	20
		% of Total	11.7%	21.7%	33.3%
	Pleasant	Count	2	38	40
		% of Total	3.3%	63.3%	66.7%
Total		Count	9	51	60
		% of Total	15.0%	85.0%	100.0%

*VAS: Visual Analog Scale

Table 2: Males – Factors in Pleasant Smiles by Orthodontist (O) & Layperson (L)

	Orthodontist (n=18) Layperson (n=25)	ATTRACTIVE	UNATTRACTIVE	p-value
F1	O	18	0	0.000**
	L	17	8	0.072
F2	O	16	2	0.001*
	L	22	3	0.000**
F3	O	10	8	0.637
	L	25	0	0.000**
F4	O	17	1	0.000**
	L	16	9	0.162
F5	O	13	5	0.059
	L	21	4	0.001*

F1: Inciso-gingival display; **F2:**Upper vertical lip thickness; **F3:** Lower vertical lip thickness; **F4:** Buccal corridor; **F5:** Smile arc

O: Orthodontist; **L:** Layperson

* P=.001; **P=.0001

Table 3: Females – Factors in Pleasant Smiles by Orthodontist (O) & Layperson (L)

	Orthodontist (n=22) Layperson (n=26)	Attractive	Unattractive	p-value
F1	O	21	1	0.000**
	L	13	13	1.000
F2	O	22	0	0.000**
	L	19	7	0.012
F3	O	15	7	0.088
	L	24	2	0.000**
F4	O	21	1	0.000**
	L	15	11	0.433
F5	O	14	8	0.201
	L	24	2	0.000**

F1: Inciso-gingival display; **F2:**Upper vertical lip thickness; **F3:** Lower vertical lip thickness; **F4:** Buccal corridor; **F5:** Smile arc

O: Orthodontist; **L:** Layperson

* P=.001; **P=.0001

pleasant factor in both males (p=0.000) and females (p=0.000). (Table 2 & 3).

DISCUSSION

Panel assessment has been widely used to evaluate facial esthetics before and after orthodontic treatment. In the development of a measuring instrument it is important to know if patients and/or their parents evaluate facial esthetics similar to the orthodontists. Research in this field has led to conflicting results. Although studies have reported high correlations between professionals and laymen,[4,5] some investigators found professionals as more critical than laymen6 while, others found the opposite.[7,8]

Present study showed a statistically high significant difference (*p=0.002*) in perception of smile by the Orthodontist & Layperson. Supporting the present study, Johnson and Smith9 found that dental professionals were more sensitive to minor dental disharmonies and later Kokich VO Jr et al.[10] showed that orthodontists, general dentists, and lay people detect specific dental esthetic discrepancies at varying levels of deviation, which may aid the dental professional in making specific treatment recommendations. The findings of the present study may be the result of the subconscious critical evaluation of smile esthetics by orthodontic specialists, considering their past experiences in treating various malocclusions. In addition, the smiles were judged as an esthetic whole, and minor discrepancies in specific smile features were less of a decisive factor, according to laypersons. While, in contrast to the results of the present study, McNamara L et al.[11] showed significant agreement in the judgments between laypersons and orthodontists regarding the perception of smile in general.

According to Peck et al.[12,13] lip coverage of the maxillary incisors increases with age. Therefore, a high smile with 100% maxillary incisor exposure with a contiguous band of gingiva is characteristic of a younger population.[14] Therefore, considering the age of the subjects taken in the present study, it was hypothesized that, less incisor display would be correlated with unpleasant smile, while more incisor display would be correlated with more pleasing smile esthetics. Orthodontists rated inciso-gingival display as highly significant factor (*p=0.000*) for the pleasantness of smiles in both males and females, however in contrast laypersons did not consider incisogingival display to be a significant contributing factor in either male or female group. The inciso-gingival display did not show considerable effect for the unpleasantness of the smile by both orthodontists and laypersons. In a similar study, McNamara L et al.[11] stated that there was no correlation between the less pleasing smile esthetics with less incisor display.

Previous studies have shown variable effects of buccal corridor size on smile esthetics. Moore et al.[15] observed broader smile (minimal buccal corridors) as most attractive and suggested the inclusion of large buccal corridors in the problem list during orthodontic diagnosis and treatment planning. Later, Parekh et al.[16] studied the attractiveness of buccal corridor space variations and found that orthodontists and laypersons rated excessive buccal corridors as less attractive in both males and females. McNamara L et al.[11] found no correlations between smile esthetics and the size or ratio value of the buccal corridors and the corridors distal to the most posterior teeth visible on smile. For this study, buccal corridors were defined as the horizontal distance from the distal aspect of the canines to the corners of the lips when the patient smiles.[11] It was hypothesized that less buccal corridor width would be correlated with a more pleasing smile. According to orthodontists, less buccal corridor width, contributed significantly (*p=0.000*) to the pleasantness of the smile, for both male and female groups. Laypersons showed no correlation between smile esthetics and buccal corridor in any of the groups.

The ideal smile arc has the maxillary incisal edge curvature parallel to the curvature of the lower lip upon smile; the term consonant is used to describe this parallel relationship. A non-consonant, or flat, smile arc is characterized by the maxillary incisal curvature being flatter than the curvature of the lower lip on smile.[17] Hulsey et al.[18] and Zachrisson BU[14] suggested the harmony between the arcs of curvature of the incisal edges of the upper incisor teeth and the upper border of the lower lip as an important feature of an attractive smile however it can be influenced by the orthodontist during the treatment, making the smile arc flat rating it as less attractive. Parekh et al.[16] observed the attractiveness of smile arc and found that flat smile arcs were rated as less attractive by

both orthodontists and laypersons irrespective of gender. They also noted that flat smile arcs decreased the attractiveness ratings regardless of the buccalcorridor.[29] However McNamara L et al.[11] found no correlation between smile arc and esthetic judgment.

In the present study, laypersons rated smile arc as a highly significant factor, contributing in the pleasantness of the smile for both male (*p=0.001*) and female (*p=0.000*) groups. In agreement to the previous studies conducted by Hulsey et al.[18] and Zachrisson BU[14] the present study also showed that orthodontists did not give much importance to the esthetic value of smile arc.

Vertical lip thickness was considered important in the determination of the attractiveness of the smile. Hall D et al.[19] observed the preference for more prominent lips in American black patients than in white. Much commercialism today on television, radio, and the internet is aimed at self-improvement, specifically on society's interest in fuller lips. Plastic surgery and other cosmetic treatments are all the rage and many involve enhancement of the size of the lips. Yet little information about lip esthetics is found in the orthodontic literature, most of which concerns cleft repair and norms for the lips at rest.[11] McNamara L et al.[11] stated that both laypersons and orthodontists used the thickness of the upper lip, whereas laypersons also considered the thickness of the lower lip, as variables in determining the pleasantness of a smile.

In support to the study done by McNamara L et al.[11] the present study showed that laypersons (males – *p=0.000*, females - *p=0.012*) and orthodontists (male & female - *p=0.000*) used the thickness of the upper lip as a factor determining the pleasantness of a smile in both genders whereas lower lip thickness was rated significantly pleasant in both males (p=0.000) and females (p=0.000) only by laypersons.

CONCLUSION

Present study observed a strong disagreement between the orthodontists and laypersons in smile evaluation. This study confirmed the hypothesis that increased incisor display correlated with more pleasing smile esthetics and vice versa and was rated as an important factor by orthodontists, in both the male and female groups.

The vertical thickness of the upper lip was an esthetic determinant for both the orthodontists and the laypersons, whereas the vertical thickness of the lower lip was an important determinant for laypersons alone: fuller lips were associated with better smiles, in both male and female groups.

The orthodontists correlated narrow buccal corridor width with a more pleasing smile, in both male and female groups, giving no importance to the esthetic value of the smile arc. In contrast laypersons showed a strong correlation of a consonant smile arc with smile esthetics.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Johnson DK, Smith RJ. Smile esthetics after orthodontic treatment with and without extraction of four first premolars. Am J Orthod Dentofacial Orthop 1995; 108:162-7.
2. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. J Esthet Dent 1999; 11:6:311-24.
3. Sarver DM, Ackerman MB. Dynamic smile visualization and quantification: part 1. Evolution of the concept and dynamic records for smile capture. Am J Orthod Dentofacial Orthop 2003;124:4-12.
4. Peerlings RHJ, Kuijpers-Jagtman AM, Hoeksma JB. A photographic scale to measure facial aesthetics. Eur J Orthod 1995;17:101-109.
5. Spyropoulos MN, Halazonetis DJ. Significance of the soft tissue profile on facial esthetics. Am J Orthod Dentofacial Orthop 2001;119:464-471.
6. Kerr W JS, O Donnell JM. Panel perception of facial esthetics. Br J Orthod 1990;17:299-304.
7. Phillips C, Trentini CJ, Douvartzidis N. The effect of treatment on facial esthetics. J Oral Maxillofac Surg 1992;50:590-594.
8. Tedesco LA, Albino JE, Cunat JJ, Green LJ, Lewis EA, Slakter MJ. A dental facial attractiveness scale.

Part I. Reliability and validity. Am J Orthod 1983; 83:38-43.
9. Johnson DK, Smith RJ. Smile esthetics after orthodontic treatment with and without extraction of four first premolars. Am J Orthod Dentofacial Orthop 1995; 108:162-7.
10. Kokich VO Jr, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. J Esthet Dent 1999; 11:6:311-24.
11. McNamara L. et al. Hard and soft-tissue contributions to the esthetics of the posed smile in growing patients seeking orthodontic treatment. Am J Orthod Dentofacial Orthop 2008; 133:491-9.
12. Peck S, Peck L, Kataja M. Some vertical lineaments of lip position. Am J Orthod Dentofacial Orthop 1992; 101:519-24.
13. Peck S, Peck L, Kataja M. The gingival smile line. Angle Orthod 1992; 62:91-100.
14. Zachrisson BU. Esthetic factors involved in anterior tooth display and the smile: vertical dimension. J Clin Orthod 1998 ;35:432-45.
15. Moore T et al. Buccal corridors and smile esthetics. Am J Orthod Dentofacial Orthop 2005; 127:2:208-13.
16. Parekh SM et al. Attractiveness of variations in the smile arc and buccal corridor space as judged by orthodontists and laymen. Angle Orthod 2006; 76:4:557-63.
17. Sarver DM. The importance of incisor positioning in the esthetic smile: The smile arc. Am J Orthod Dentofacial Orthop 2001; 120:98-111.
18. Hulsey CM. An esthetic evaluation of lip-teeth relationships present in the smile. Am J Orthod 1970; 57:132-44.
19. Hall D, Taylor RW, Jacobson A, Sadowsky PL, Bartolucci A. The perception of optimal profile in African Americans versus white Americans as assessed by orthodontists and the lay public. Am J Orthod Dentofacial Orthop 2000; 118:514-25.