Smile Esthetics Comparison Amongst Genders With Pleasing Smile

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Abstract

Introduction: The smile is an important feature of facial appearance and is highly correlated with a better quality of life and interpersonal success. The facial morphology and feature are different in males and females so is the overall soft tissues profile which affects smile that would also vary in males and females. Thus this study was intended to compare smile esthetics in male and female subjects with pleasing smile on digital videographic images, using Digimizer software.

Materials and Method: The posed smile, reproducible in maximum frames, was selected from the digital videographic images of 600 subjects. The images were cropped and edited in Adobe Photoshop for rating by a panel of judges (2 Orthodontists, 2 plastic Surgeons, 2 beauticians and 2 laymen) on a 10-point Visual Analogue Scale. The subjects with scores 7-10 considered to be having smile was divided in Group I (101 females) and Group II (108 males). 10 Horizontal, 10 Vertical and 4 Angular parameters were measured using Digimizer Software and adequate comparisons were made.

Results: Sexual dimorphisms was seen with females having significantly increased smile width, buccal corridor, visible posterior teeth show, increased upper incisor to lower lip distance and increased upper lip curvature, whereas males had increased 3-3 distance, 4-4 distances, more amount of midline deviation, interlabial gap, lower lip vermilion height and gingival display ($p < 0.001$).

Conclusions: The adequate treatment plan must be formulated for males and females separately with emphasis on variable smile attributes as per the genders. The ultimate goal of any orthodontic treatment should be to achieve consonant or curved smile arc for both males and females.

Key-words: Posed smile, Digital videography, Digimizer, Smile width, Smile Arc

Introduction

The smile is an important feature of facial appearance and is highly correlated with a better quality of life and interpersonal success. Smile composition is guided by teeth and gingiva and is framed by the upper and lower lips. Since an Orthodontist corrects these dental and facial structures hence plays a vital role in creating a beautiful smile by a logically sequenced smile design after an accurate smile analysis for harmonic and symmetric smile.

The facial morphology and feature are different in males and females thus the overall soft tissues profile which affects a smile also vary in males and females. Hence the knowledge of smile characteristics in males and females is must for diagnosis and treatment planning of orthodontic case based on soft tissue paradigm approach[1-2]. To understand sexual dimorphism in smile attributes, it was decided to conduct this study on subjects with pleasing smile who were selected by panel of judges comprising of 2 Orthodontists, 2 plastic Surgeons, 2 beauticians and 2 laymen.

The basic requirement of this study was a smiling photograph. For this the social/posed smile was taken which is not elicited by emotions, is sustained, unstrained and reproducible. This was captured by digital videographic method instead of static recording of social smile[3-5]. Digital videographic methods hold the advantage of capturing all the three periods of smile namely, initial attack period, a sustaining period and a decay period thereby recording the dynamic nature of smile, where as a static photograph would be inaccurate especially if it was taken during the initial attack period or decay period. The single photograph that is reproducible in maximum number of video frames is selected as the social smile[6,7].

The smile analysis can be done manually or by using softwares. To overcome the inaccurate and time consuming manual analysis, software like, 'Smile Mesh' designed by Ackerman[1] in 1998 and Smile Analyser software developed by Sodagar et al, are used but they are expensive and do not include all the parameters of smile analysis. Digimizer software[7-9] is a simple and easily available software which not only allows linear and angular measurements, but can also do area

measurements after locating the desired landmarks and can simultaneously store the data in form of a table for each subject, hence the Digimizer software is used to do comprehensive smile analysis in the present study.

Considering this, the aim of the present study was to compare the various attributes of smile, by assessing the parameters involving lips, commissure, buccal corridor, smile symmetry, arc and index, gingival display, and visible dentition in males and females with pleasing smile as selected by a panel of judges, using Digimizer software.

Material Method

The present study included 209 subjects with pleasing smile divided into two groups, Group I had 101 females (mean age of 21.4±1.77 years) and Group II had 108 males (mean age of 21.32±1.96 years). These subjects were selected from 600 (300 females and 300 males) students, from various colleges of BBD University, Lucknow and from the patients coming to our department. All the subjects were adults to ensure that soft tissue growth was complete.

Digital videographic images of these subjects were taken using Nikon D-5200(LENS:18-55) 14 megapixel Digital single lens reflex (DSLR) camera, with subjects standing in an upright position wearing a spectacle frame with a horizontal and vertical ruler attached to the frame for calibration of the photograph. The total duration of the recording was 10 seconds for each subject starting approximately 1 second before each subject began speaking their name and continued 1 second after the subject had stopped smiling. Thus a total of 300 frames were obtained (30 frames/ second) from which the social/posed smile that was reproducible in maximum number of frames was selected. The facial midline was marked on the selected images and photos were edited in Adobe Photoshop. After cropping, only the lower third of the face was visible so as to remove the bias because of appearance, colour etc of the facial structures. (Figure 1). The power-point presentation with cropped photographs of all the subject was shown to a panel of judges (2 Orthodontists, 2 plastic Surgeons, 2 beauticians and 2 laymen) to rate the edited photographs on a 10-point Visual Analogue Scale. The scores given by each judge were added to obtain the mean score for that subject.

The subjects with a score between 7-10 were considered as having pleasing smile and were included in the present study. The photographs from both groups were analysed for Smile analysis using Digimizer Image Analysis software after adequate callibration. (Figure 2,3,4,5)(Table 1).

Statistical Analysis

Continuous data were summarised as Mean ± SD (standard deviation) and compared by Student's t test. Discrete (categorical) groups were summarised as no. and percentage and compared by chi-square (χ^2) test. A two-tailed (α=2) p<0.05 was considered statistically significant.

Result

The results are summarized in Table 2, 3 and 4.

The tables 2,3 and 4 shows comparison of Group I and Group II for Horizontal, Vertical and Angular parameters respectively.(Table 2,3 and 4).

Discussion

Evaluating beauty is always subjective. Just as there are parameters to evaluate skeletal and dental disharmony using lateral cephalogram, similarly aesthetics problems require adequate tools and parameters to quantify them. In orthodontics, it is not enough only to recognize that there is something wrong with the smile, but a diagnosis of what is not normal with respect to gender as well and what all can be treated by orthodontic treatment is required.

Sexual dimorphism was seen with parameters like smile width, commissure corridor, 3-3 distance, 4-4 distance, upper dental deviation, interlabial gap, upper lip thickness, vertical symmetry that had significantly more values in males than females whereas buccal corridor, visible posterior teeth left and right, commissure height and lower lip to upper incisor distance had significantly higher values in females than males (p<0.001). Upper lip thickness and gingival display has just significant difference between males and females with values more in males than females. Both males and females had curved smile arcs.

In the present study, Smile width of males had significantly higher values than females (Group I> Group II). Chetan et al evaluated the smile width in two frames, the first at relaxed lip position and second frame was of unstrained posed smile. It increased from rest to smile and decreased with age in both males and females. The range of smile width during smiling for different age groups were quite comparable to our studies. Similarly, Ackerman[2] et al found smile width increased from rest to smile and males had wider smile width that can be attributed to the difference in facial morphology of males and females.

In this study, males had significantly higher values of the 3-3 Distance and 4-4 Distance than females..In a study by McNamara,[9] 3-3 width was lesser than our study. The difference could be due to difference in mesiodistal width of tooth with races or their readings were of overall sample that included both genders. The visible posterior width was comparable to our values for 4-4 distance. Similar values for visible posterior width were seen in a study by Schabel[7] et al. Though we did not calculate ratios but the ratios of these parameters with smile width had higher values in study by Isikal[11]. The reason could be that their study was done on still photographs where smile width is generally less than videographic images as also proved in previous studies[10,17] . Similarly Johany[10] et al found 60% of female celebrities with best smile displayed all the six anterior teeth along with two premolars. Thus it can be inferred that more teeth show is considered as attractive for both males and females.

For Interlabial gap males had significantly higher values than females in our study. The youthful smile of the studies[11,16.] had comparable values with our study which suggests wider smiles vertically are considered pleasant. Ackerman[2] et al had contrary results because of difference in way of recording smile and younger age group of the sample (11-14 years).

Though males had more gingival display than females but was less than 1mm for both the groups making it an important determinant of smile.

Females had larger Buccal corridor width than males in this study. On contrary, in a study by Ritter[15] et al, buccal corridor width was more in males, but the difference was statistically insignificant. The reason could be that their study was conducted on still photographs of forced smile and difference in way of measuring negative space.

In this study, females had significantly increased value for upper incisor to lower lip distance than males. Ideally lower lip should follow curvature of incisal edges of upper incisor with minimal space between them. Johany[10] et al found that in 42% of the females celebrities with best smile, maxillary anterior teeth did not touch the lower lip and was considered more attractive.

Both males and females had curved smile arc that did not differ significantly amongst them and was considered pleasing. Singh[16] et al found that smile arcs became flatter in videographic method in comparison to still photograph as they had recorded spontaneous smile of the subject where there is more outburst of emotions resulting in flatter smile arc. Johany[10] et al found that curved smile arc were seen in maximum number of female celebrities with best smile and none had reverse smile arc. Similarly, many studies[1518 27,29] found consonant smile arcs as pleasant.

The adequate treatment plan must be formulated for males and females separately with emphasis on variable smile attributes as per the genders. The ultimate goal of any orthodontic treatment should be to achieve

consonant or curved smile arc for both males and females.

Further studies should be done to compare these smile attributes with subjects of non pleasing smile so as to get an idea what smile attributes make it unpleasant for the society.

Conclusion

The conclusion for gender comparison indicated that females had significantly increased smile width, buccal corridor, visible posterior teeth show, increased upper incisor to lower lip distance and increased upper lip curvature, whereas males had increased 3-3 distance, 4-4 distances, more amount of midline deviation, interlabial gap, lower lip vermilion height and gingival display. Consonant smile arc was considered pleasing for both the sexes.
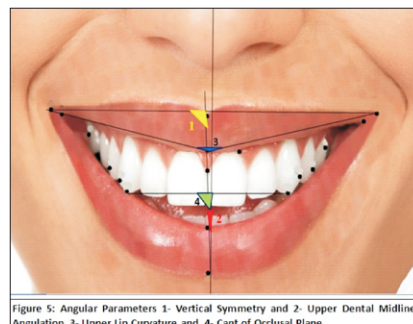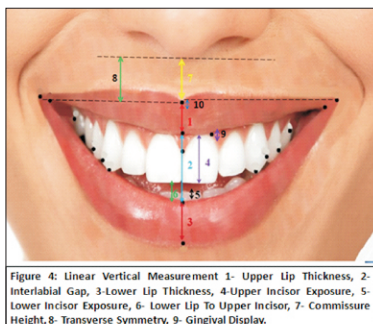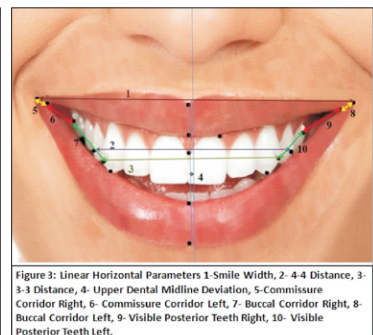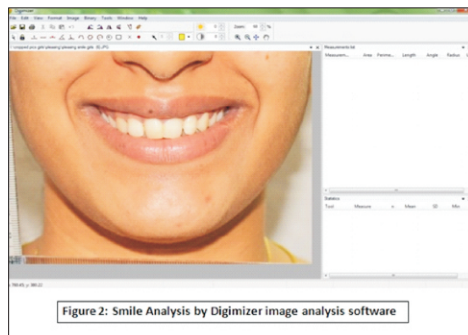
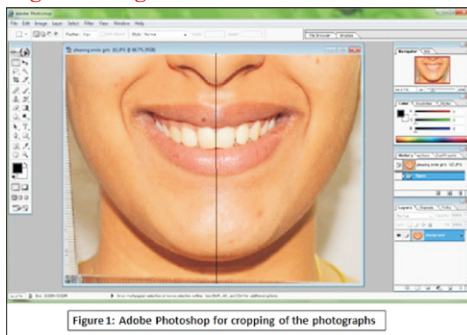## Reference:

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Figure of Legends:

Figure 1: Adobe Photoshop for cropping of the photographs

Figure 2: Smile Analysis by Digimizer image analysis software

Figure 3: Linear Horizontal Parameters 1-Smile Width, 2- 4-4 Distance, 3-3-3 Distance, 4- Upper Dental Midline Deviation, 5-Commissure Corridor Right, 6- Commissure Corridor Left, 7- Buccal Corridor Right, 8- Buccal Corridor Left, 9- Visible Posterior Teeth Right, 10- Visible Posterior Teeth Left.

Figure 4: Linear Vertical Measurement 1- Upper Lip Thickness, 2- Interlabial Gap, 3-Lower Lip Thickness, 4-Upper Incisor Exposure, 5- Lower Incisor Exposure, 6- Lower Lip To Upper Incisor, 7- Commissure Height, 8- Transverse Symmetry, 9- Gingival Display.

Figure 5: Angular Parameters 1- Vertical Symmetry and 2- Upper Dental Midline Angulation, 3- Upper Lip Curvature and 4 -Cant of Occlusal Plane

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Table 1: Parameters Used For Smile Evaluation divided into Horizontal, Vertical and Angular parameters

	Parameter	Definition
		Horizontal parameters
1	Smile width	Distance from the outer commissure right to the outer commissure left.
2	Commissure corridor right	Horizontal distance from the inner commissure right to the outer commissure right.
3	Commissure corridor left	Horizontal distance from the inner commissure left to the outer commissure left.
4	Buccal corridor right	Horizontal distance from the most lateral aspect of the right most posterior visible tooth on the right side to the right inner commissure.
5	Buccal corridor left	Horizontal distance from the most lateral aspect of the left most posterior visible tooth on the left side to the left inner commissure.
6	Visible posterior teeth width	Distance from the most lateral aspect of the most visible maxillary posterior tooth on the right side to the contact point on the distal surface of canine of the right side.
7	Visible posterior teeth width	Distance from the most lateral aspect of the most visible maxillary posterior tooth on left side to the contact point distal surface of canine of the left side.
8	3-3 distance	Distance measured between the most distal points of maxillary canines at their contact point with the tooth distal to it.
9	4-4 distance	Distance measured between the most distal points of maxillary first premolars at their contact point with the tooth distal to it
10	Upper dental midline deviation	Distance between upper dental midline and facial midline and its direction of its deviation to right and left side.
		Vertical parameters
11	Interlabial gap on smile	The distance between inferior upper lip border (IULP) and superior lower lip border(SLPP).
12	Commissure height	The distance between the line passed from subnasale parallel to alar base to outer commissure
13	Upper lip vermilion height	Vertical distance from the most superior margin of the upper lip(SULP) to the most inferior portion of the tubercle of the upper lip

Table: 2 Comparisons of Group I and Group II for horizontal parameters

Horizontal parameters	Female (n=101)	Male (n=108)	Mean difference	t value	p value
Smile width	66.96 ± 0.45	71.02 ± 0.40	4.06 ± 0.61	6.69	<0.001***
Commissure corridor left	3.17 ± 0.07	3.38 ± 0.06	0.22 ± 0.09	2.38	<0.05**
Commissure corridor right	2.98 ± 0.06	3.43 ± 0.06	0.45 ± 0.09	5.02	<0.001***
Buccal corridor left	2.10 ± 0.04	1.25 ± 0.04	0.85 ± 0.06	14.99	<0.001***
Buccal corridor right	2.08 ± 0.04	1.41 ± 0.05	0.67 ± 0.06	10.48	<0.001***
Visible posterior teeth left	7.93 ± 0.11	7.17 ± 0.16	0.77 ± 0.20	3.91	<0.001***
Visible posterior teeth right	7.96 ± 0.11	7.36 ± 0.16	0.60 ± 0.19	3.09	<0.05**
3-3 distance	40.67 ± 0.24	42.39 ± 0.19	1.72 ± 0.31	5.55	<0.001***
4-4 distance	45.58 ± 0.28	49.80 ± 0.48	4.22 ± 0.56	7.52	<0.001***
Upper dental midline deviation	0.44 ± 0.03	0.92 ± 0.04	0.47 ± 0.05	9.59	<0.001***

= Moderate significant (p <0.01), *= Highly significant (p <0.001)

Table 3: Comparisons of Group I and Group II for vertical parameters.

Vertical parameters	Female (n=101)	Male (n=108)	Mean difference	t value	p value
Inter-labial gap	10.20 ± 0.17	11.47 ± 0.14	1.27 ± 0.22	5.81	<0.001***
Commissure height	13.88 ± 0.21	12.87 ± 0.12	1.01 ± 0.24	4.21	<0.001***
Upper lip thickness	6.22 ± 0.11	6.57 ± 0.09	0.34 ± 0.14	2.44	<0.05**
Lower lip thickness	9.58 ± 0.12	11.21 ± 0.12	1.62 ± 0.17	9.80	<0.001***
Philtrum height	9.32 ± 0.15	9.70 ± 0.14	0.38 ± 0.21	1.82	NS*
Gingival display	0.27 ± 0.04	0.46 ± 0.06	0.19 ± 0.07	2.60	<0.05**
Upper incisor exposure	8.30 ± 0.12	8.07 ± 0.06	0.23 ± 0.13	1.78	NS*
Lower incisor exposure	1.35 ± 0.09	1.35 ± 0.06	0.01 ± 0.11	0.07	NS*
Lower lip to upper incisor	1.68 ± 0.10	1.15 ± 0.07	0.54 ± 0.12	4.29	<0.001***
Transverse symmetry	0.69 ± 0.04	0.66 ± 0.05	0.03 ± 0.06	0.49	NS*

*Not significant (NS)(p > 0.05), **= Moderate significant (p <0.01), ***= Highly significant (p <0.001)

Table 4: Comparisons of Group I and Group II for angular parameters

Angular parameters	Female (n=101)	Male (n=108)	Mean difference	t value	p value
Upper dental midline angulation	1.04 ± 0.08	1.21 ± 0.07	0.17 ± 0.11	1.59	NS*
Vertical symmetry	89.79 ± 0.17	90.55 ± 0.10	0.76 ± 0.20	3.90	<0.001***
Transverse cant of occlusion	89.70 ± 0.15	89.91 ± 0.09	0.21 ± 0.17	1.22	NS*
Upper incisor curvature	172.13 ± 0.36	168.26 ± 0.18	3.88 ± 0.39	9.87	<0.001***

*Not significant (NS), ***= Highly significant (p <0.001)