

Original Article

Perception of facial profile attractiveness by orthodontists and general public in Dakshina Kannada population

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Abstract

Background and objectives: The purpose of this study was to assess and determine the perception of facial profile attractiveness by orthodontists and general public using Silhouette method. In addition, the orthodontists and the general public (laypeople) compared the facial profile components that they considered desirable for males and females

Methodology: 30 Subjects in the age group of 18-25 years who met all the inclusion and exclusion criteria's were selected from a local Dakshina Kannada Population. After examining each subject for his/her dental occlusion and facial profiles, profile photographs of the subjects were taken. These photographs were shown to Orthodontists and laypeople for their approval, and a subject with the most pleasing profile was selected. After the subject was selected, a lateral cephalogram was taken and various angular and linear measurements were recorded. Using the average values recorded, an androgynous facial Silhouette was constructed. These facial Silhouettes (30) were evaluated by 50 Orthodontists and 50 laymen from local population.

Results: Perception differences were noted between males and females or among Orthodontists and laypeople. No statistically significant difference ($P > 0.05$) was reported in all series of profiles selection for most preferred and least preferred profile among Orthodontists and laypersons and between males and female profiles.

Conclusions: This study showed the perception of well balanced and imbalanced faces. In some of the variables, there was a clear contrast in preference of profiles for males and females by the Orthodontists and laypeople, while in some variables it was not. A universal standard of facial aesthetic is not applicable to diverse populations.

Introduction

Today's cutting-edge society places a strong emphasis on facial aesthetics. It has been shown that human beings with attractive features appear socially as more successful, likable and are treated more positively than unattractive adults and youngsters. ¹Overall physical appearance, and more specifically facial balance and symmetry, give an indication of how people are perceived by others, as well as how they perceive themselves. A lot of money is spent on improving this facial appearance.

With the intention to attain a harmonious soft tissue relation, there should be harmony within the underlying dental, skeletal and neuromuscular system as all these

systems are interdependent. Therefore, among the various definitions of Orthodontic objectives, perhaps the most succinct and lucid is that of Jackson, who lists it as the triad of "Structural balance, functional efficiency and aesthetic harmony".²

The most common reason why people are searching for treatment via an orthodontist is to enhance facial aesthetics ³but this can be a challenging task because the outlook of an attractive face is largely subjective due to various factors such as ethnicity, age, gender, culture, and personality, all of them which influence the average facial traits.⁴An objective for the orthodontist should not only be to treat the patient in an ideal manner; but also include

cautious communication to judge the expectancies of the patient as ideals of aesthetic profiles may vary.

Differences in profile aesthetics understanding, between the patient and specialist may lead to a few uncertainties in selecting a treatment plan that will satisfy the patient. Therefore the study of facial attractiveness must be critical for orthodontists while addressing their patients need for improved facial aesthetics. Failure to understand the patients expectation of treatment could bring about patient dissatisfaction, despite satisfactory results from the orthodontic and surgical techniques.³

Due to the fact that every man or woman is different and each face unique in its very own manner, it is impossible to produce same results in all patients as far as facial aesthetics in orthodontic treatment is involved.

The Orthodontist does and should play a decisive role in figuring out the aesthetic outcome of a patient's face. This attitude is justifiable and regularly essential in severe, emergent or functionally debilitating cases. However in a non handicapped or cosmetic procedure the orthodontist may do well to acknowledge the patient's and parent's perception of the face before finalizing the treatment plan.

The purpose of this study was to assess and determine the perception of facial profile attractiveness by orthodontists and the general public by the use of Silhouette technique. In addition comparison of the facial profile components considered desirable for men and for women was carried out by means of orthodontists and laypeople.

Materials and Methods

Selection of the sample subject

Profile photographs of 30 individuals (15 males and 15 females) in the age group of 18 to 25 years who were of Dakshina Kannada origin and had a pleasing profile, class 1 molar and canine relationship, ideal over jet and overbite (2-4mm), no missing teeth and no history of previous orthodontic treatment were selected for the study. Patients who had undergone prior orthodontic/surgical treatments, skeletal abnormalities, cleft lip and palate and

missing teeth or were wearing prosthesis were excluded.

The profile photographs were taken with a Sony Cyber Shot T90 digital camera at a distance of 5 feet in extra oral photography room equipped with slave flashes. While taking profile photographs Frankfort horizontal plane of the subject was kept parallel to the floor. These photographs were shown to Orthodontists and laypeople (15 each) for their approval, so that a subject with the best pleasing profile among all could be selected.

After selection of an appropriate subject, lateral cephalogram of the subject was taken with the help of a cephalostat (PLANMECCA CEPH CM) adjusted to standards of exposure for an adult, preventing any distortion and magnification (68 KV and 12mA).

Tracing of lateral cephalogram of the subject

Soft tissue profile tracing from the lateral cephalogram film was done on a cellulose acetate tracing sheet with a 3H pencil. The tracing obtained was used for construction of varied profiles or facial silhouettes.

Construction of varied profiles / silhouettes

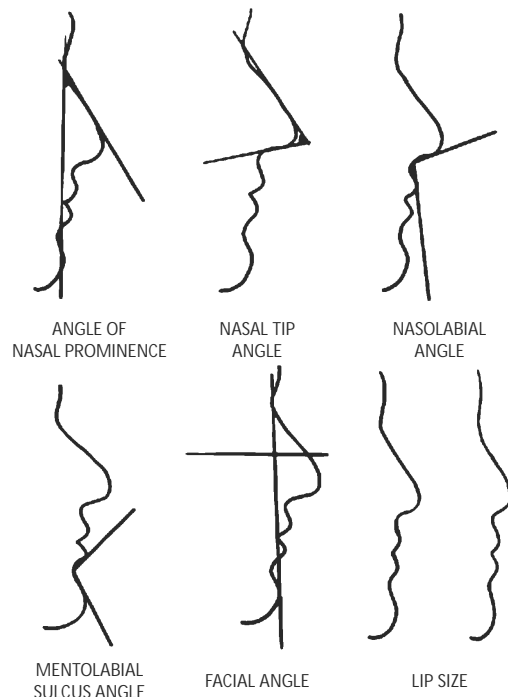


Figure 1 : Image depicting the selected ideal angles and linear measurement

This process involved the making of varied profiles from the selected subject by variation of following components of facial profile (Figure 1);

1. Angle of nasal prominence
2. Nasal tip angle
3. Nasolabial angle
4. Mentolabial sulcus angle
5. Soft tissue facial angle
6. Size of the Lips

There were total four pages consisting of different facial profiles, first two pages depicted male profiles and next two pages depicted female profiles. The constructions were identical for both sexes.

There were six series of profiles, three series to each page. Each series consisted of five profiles. The variation in each parameter for the silhouettes is given in table 1;

S. No.	Measurements	Decreased Values		Original Values	Increased Values	
Series 1	Angle of Nasal Prominence (degrees)	21	25	29	33	37
Series 2	Nasaltip Angle (degrees)	53	60	67	74	81
Series 3	Nasolabial Angle (degrees)	88	96	104	112	120
Series 4	Mentolabial Sulcus Angle (degrees)	110	120	130	140	150
Series 5	Soft Tissue Facial Angle (degrees)	83	86	89	92	95
Series 6	Lip Size (mm)	-6	-3	0	3	6

Table 1:- angles and measurements of varied profiles. Changes made in one series were restricted to the particular parameter selected and were not carried out to the next series.

Transfer of tracings to computer

All the tracings were scanned with the help of HP COMPAQ 2400 DPI SCANNER and were further converted to black facial silhouettes using ADOBE PHOTOSHOP CS2 software. The profiles were presented as black facial silhouettes to avoid any distractions and bias. (Figure 2 and 3)

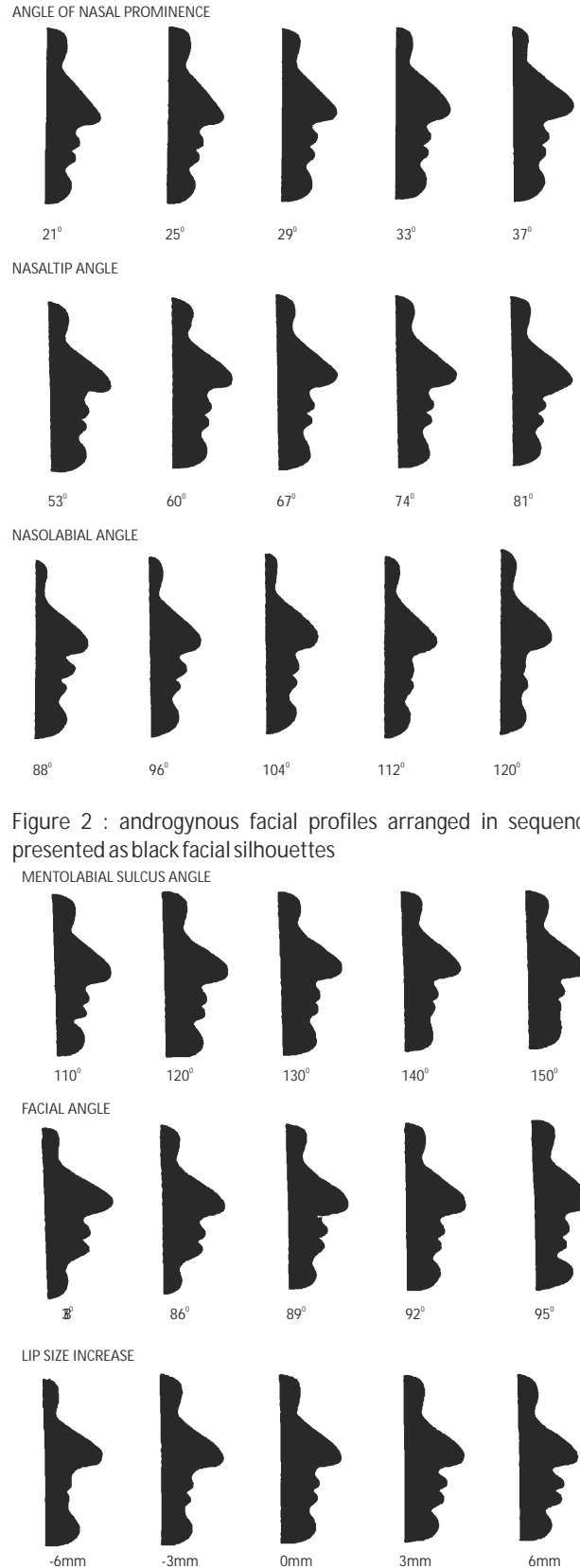


Figure 3 : androgynous facial profiles arranged in sequence, presented as black facial silhouettes

Random placement of silhouettes

There was a random placement of facial silhouettes in each series presenting varied angles and measurements, so that any bias could be avoided (e.g. Complexion, cheek fullness and eyes). (Table 2)

S. No.	Measurements	Profile 1	Profile 2	Profile 3	Profile 4	Profile 5
Series 1	Angle of Nasal Prominence (degrees)	21	25	37	33	29
Series 2	Nasal Tip Angle (degrees)	81	74	53	60	67
Series 3	Nasolabial Angle (degrees)	120	96	104	112	88
Series 4	Mentolabial Sulcus Angle (degrees)	110	120	140	130	150
Series 5	Soft Tissue Facial Angle (degrees)	95	92	86	89	83
Series 6	Lip Size (mm)	6	3	-3	0	-6

Table 2 : angles and measurements of randomly arranged profiles

Evaluation of facial silhouettes

30 Constructed facial silhouettes were evaluated by 50 Orthodontists and 50 laymen population. Profiles were presented in two sets and the evaluators were requested to grade them separately for male and female sexes, to record if the evaluator's perception of facial balance included gender bias in facial profiles. Silhouettes were placed in altered sequence from the original to avoid any bias

Ranking of best and worst profile

Evaluators were asked to rank order each series of profiles from 1 to 5 in order of their preference, 1 being the best and 5 being the worst profile. Scores were divided according to ratings given to different profiles evaluated.

Statistical Analysis

Data was evaluated, to assess the frequency and significance of the following independent variables:

1. Most and least favoured male and female profiles in a particular series.

2. Whether the assessor was an Orthodontist or a layperson.

The results of the study are based on the frequency (mode) as depicted by percentage of a particular profile as the most preferred and the least preferred in each series.

The statistical significance level was set at $P > 0.05$ for all of the statistical analyses. Significance levels of the most and least preferred profile among orthodontists and laymen and between male and female profiles were calculated using Pearson Chi-Square test.

Results

The results of this study are based on the frequency (mode) as depicted by percentage of a particular profile as the most preferred and the least preferred profile in each series selected by the Orthodontists and lay persons. These results are explained by the tables (Tables 3 – 8) and bar diagrams (Figures 4 – 11)

Table 3: Percentage Preference of Most Favoured Profile by Orthodontists (As Depicted By Frequency – Mode)

Series No.	Profile 1		Profile 2		Profile 3		Profile 4		Profile 5	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	14	14	24	34	24	24	18	14	20	14
2	4	4	28	48	2	6	20	24	46	18
3	2	0	4	16	88	78	4	6	2	0
4	0	0	12	16	26	14	62	70	0	0
5	4	4	52	48	2	0	42	48	0	0
6	0	2	20	54	8	14	72	30	0	0

Table 4 : Percentage Preference of Least Favoured Profile by Orthodontists

Series No.	Profile 1		Profile 2		Profile 3		Profile 4		Profile 5	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	40	38	10	10	26	24	10	10	14	18
2	50	42	4	2	40	46	2	0	4	10
3	78	84	0	0	2	0	2	0	18	16
4	10	18	2	2	0	0	0	0	88	80
5	24	30	0	0	42	34	0	0	34	36
6	24	14	0	4	0	0	0	0	76	82

Table 5 : Percentage Preference Of Most Favoured Profile By Laypersons

Series No.	Profile 1		Profile 2		Profile 3		Profile 4		Profile 5	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	6	18	18	20	28	8	14	26	34	28
2	2	2	32	36	8	10	30	28	28	24
3	0	0	10	24	74	62	10	10	6	4
4	2	2	22	24	34	18	42	56	0	0
5	8	8	42	42	2	4	48	46	0	0
6	6	0	28	30	4	4	60	66	2	0

Table 6 : Percentage Preference of Least Favoured Profile By Laypersons

Series No.	Profile 1		Profile 2		Profile 3		Profile 4		Profile 5	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1	34	32	20	12	24	26	6	12	16	18
2	52	50	4	0	34	36	0	2	10	12
3	74	72	0	0	0	0	4	0	22	28
4	20	24	4	0	2	4	0	2	74	70
5	20	26	0	0	34	20	0	0	46	54
6	12	16	0	0	2	0	0	0	86	84

Table 7 : Significance Levels of Most Favoured Profile

Series No.	Orthodontists (M/F)	Laypersons (M/F)	Male	Female
1	0.271	0.517	0.271	0.517
2	0.841	0.673	0.151	0.224
3	0.086	0.198	0.074	0.081
4	0.398	0.161	0.085	0.147
5	0.689	0.841	0.689	0.841
6	0.062	0.534	0.205	0.221

Table 7: Shows the significance levels of most preferred profile among Orthodontists and laypersons and between males and female profiles. Pearson Chi square test was used to calculate significance levels. No statistically significant difference ($P > .05$) was reported in all series of profiles selection.

Table 8 : Significance Levels of Least Favoured Profile

Series No.	Orthodontists (M/F)	Laypersons (M/F)	Male	Female
1	0.838	0.832	0.534	0.529
2	0.689	0.841	0.841	0.689
3	0.444	0.822	0.64	0.148
4	0.275	0.656	0.074	0.248
5	0.539	0.424	0.687	0.07
6	0.461	0.779	0.202	0.790

Table 8: Shows significance levels of least preferred profile among Orthodontists and laypersons and between males and female profiles. Pearson chi square test was used to calculate significance levels. No statistically significant difference ($P > .05$) was reported in all series of profiles selection.

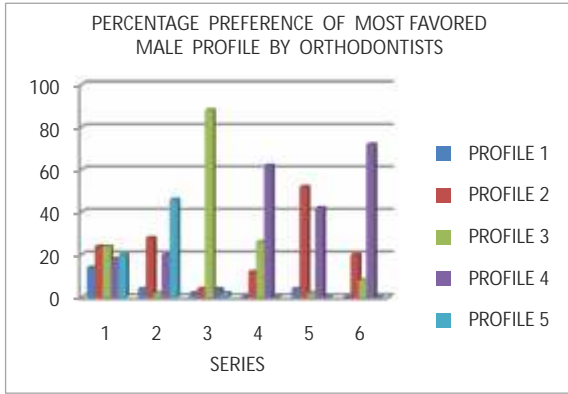


Figure 4

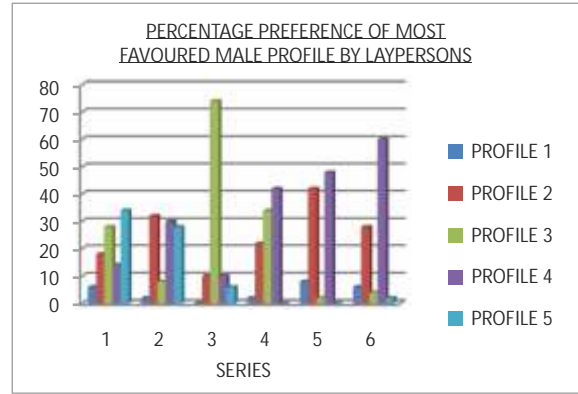


Figure 8

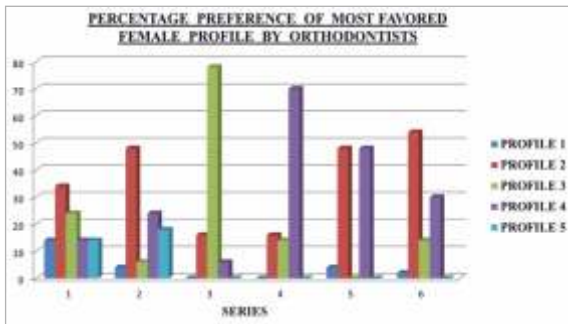


Figure 5

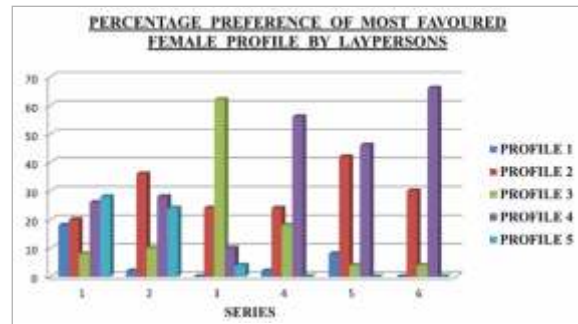


Figure 9

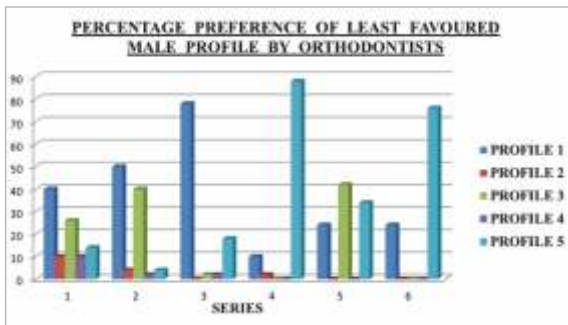


Figure 6

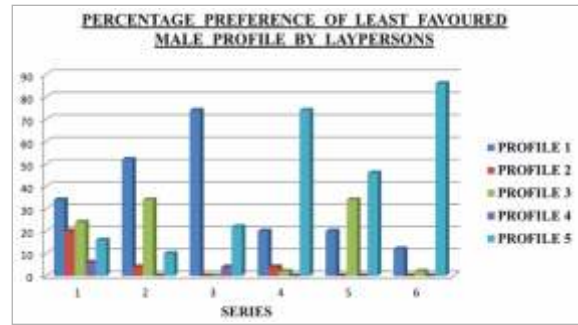


Figure 10

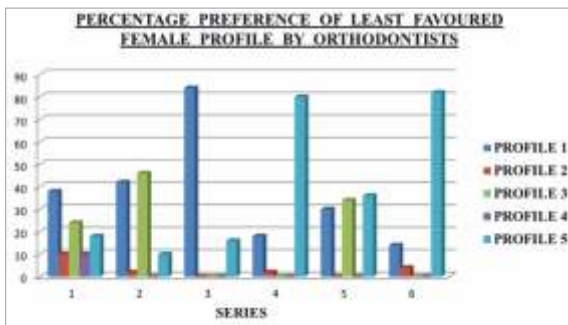


Figure 7

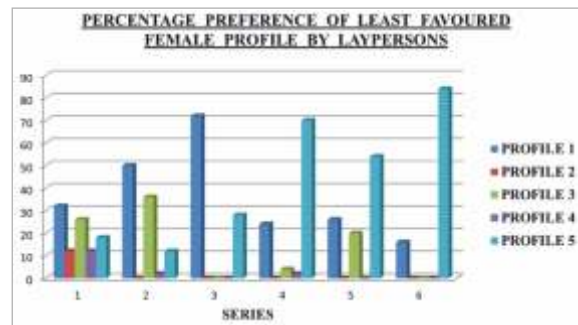


Figure 11

Discussion

The objectives in today's diagnosis and treatment planning revolve around the balance and harmony of the various facial features. The standard of beauty is never constant; it

varies among people, racial groups and socioeconomic status. The perception of facial aesthetics has always been and still is varied between the lay public and the orthodontists. A complete and thorough facial

examination must not only include the orthodontist's perception of normality, but also what the patients deem attractive. Ultimately, it is the public that judges the improvement in facial beauty after the orthodontist does his/her work.

The objective of this study was to understand the role of soft tissue structures namely, the nose, lips, and chin in achieving a facial profile that was balanced, pleasing and to assess the perception of varied facial profiles among Dakshina Kannada population by Orthodontists and laypeople to determine the difference in their preference based on the sex. For this silhouette profiles were constructed based on original selected profile.

The justification for the use of silhouette was to eliminate all extrinsic and intrinsic distracting variables (which include hair, fashion accessories, skin and complexion) that could influence an evaluator's aesthetic rating score, making it one of the most simplified methods for assessing facial aesthetics. However, rankings obtained in this manner may not reflect the attractiveness of the complete face because the same profile outline form could produce a distinctive aesthetic result when found in specific faces and under the influence of several extrinsic variables.

Facial features have been commonly studied in full-face and profile views. Powell and Rayson⁵ advocated using the three fourth face view in addition for a more complex analysis of the face. The orthodontic literature also has a number of studies^{6, 7, 8, 9, 10, 11, 12} on facial attractiveness that have concentrated on the outline of the face (profile) by using tracings of cephalograms and/or the silhouettes method instead of profile photographs. However, the silhouette profile does not substitute for any other method of evaluation and can only complement them for a more accurate description. Evaluation of facial aesthetic correlations should be assessed between the silhouette and other methods through viewing, grading and measurement of features. Sexual bias was easily eliminated in this study, as the profiles that were used were 'mask types' rather than pictorial representations of living persons whose gender could have been obvious. Statistical

analysis of the subject's choices demonstrated differences between their preferences for male and female profiles.

In the evaluation of Angle of nasal prominence, the silhouette that was most preferred was profile 2 and 3 for males with an angle of 25 and 37 degrees, while for females, profile 2 was preferred the most (table 3) by Orthodontists. This was significant as females with less prominent noses are preferred as compared to males, which is in concordance with the study by Lines and colleagues⁶ and Czanecki ST, Ram Nanda, Currier GF¹³. Laypersons preferred profile 5 for both males and females (table 5), therefore slight prominence of nose was preferred. In his studies, Jacques Joseph⁶, the German father of rhino plasty, observed that 23 to 37 degrees was the ideal range for aesthetic nasal prominence and that the ideal degree of prominence was 30 degrees, which is slightly higher as compared to results of this study.

A preference for the range of 60 to 75 degrees for the Nasal tip angle was demonstrated. Orthodontists preferred profile 5 with a nasal tip angle of 67 degrees for males and profile 2 with angle of 74 degrees for females (table 3). Laypeople preferred profile 2 with nasal tip angle of 74 degrees for males and females (table 5). Significant difference was noted in profile selection by Orthodontists as well as lay people. A significant sexual preference was also noted, a more acute being preferred in males than in females which is in concordance with the study done by Lines and colleagues⁶. Profile 1 was least favoured for males with an angle of 81 degrees by Orthodontists and Laypeople and profile 3 (orthodontists) and profile 1 (laypeople) for females (table 4). Joseph⁶ believed that this angle should be about 90 degrees. Other profile preferred for males and females was profile 4 with a nasal tip angle of 60 degrees.

In the Nasolabial angle evaluation, 104 degrees was the most frequently chosen angle for both males and females by Orthodontists and laypeople (table 3 and 5). The second and third choices were 96 and 112 degrees, with females getting more preference on acute Nasolabial angle as compared to the males, which is in contrast to Hinds and

Kent¹⁴. The least preferred profile was Profile 1 with an angle of 120 degrees for both males and females by Orthodontists and laypeople (table 4 and 6). The second least preferred was profile 5 with an angle of 88 degrees (table 4 and 6).

The Angle of the Mentolabial sulcus of the general profile that received the most preference was 130 degrees for both males and females by Orthodontists and laypeople (table 3 and 5). The second and third most popular sulcus angle for the general profile was 140 degrees and 120 degrees by both Orthodontists and laypeople. This indicates that most participants thought that 130 degrees or a slightly greater angle resulted in a more pleasing profile. This gives us a range of 120 to 140 degrees, which was significant. Arnett and Bergman¹⁵ stated that the sulcus should have a gentle curve and a deeply curved sulcus indicates lip tension which is in concordance with their study. The angle of the inferior labial sulcus of sculptures in Greek was 122 degrees, which was below the mean found in this study. The angle least preferred was that of 150 degrees for both males and females (profile 5) by both Orthodontists and laypeople (table 4 and 6). Profile 1 with mentolabial sulcus angle of 110 degrees was considered second least desirable by more of laypeople than Orthodontists. There was no sexual preference based upon this angle as compared to Lines and colleagues⁶ and Spradley¹².

In the evaluation of Soft tissue facial angle, Profile 2 (orthodontists) with angle of 92 degrees and Profile 4 (laypeople) was the most preferred for males and profile 4 with an angle of 89 degrees for females by both the Orthodontists and laypeople (table 3). Therefore a more prominent chin was preferred for males than females. Profile 2 with facial angle of 92 degrees was second most preferred by lay people. Therefore a range of 89 to 92 degrees was preferred. The least preferred was profile 3, with a soft tissue angle of 86 degrees for males and profile 5, with a soft tissue facial angle of 83 degrees for females by Orthodontists (table 4). Profile 5 and 3 were considered least favourable for both males and females by laypeople

(table 6). All these findings show severe convexity was the least desirable when it comes to attractiveness of the face.

This study demonstrated that in the evaluation of Lip size, the judgments of both lip protrusion and lip retrusion were varied. Orthodontists and laypeople preferred profile 4 for males with no incremental increase or decrease in lip size, but with good fullness of lips. More lip protrusion was acceptable for female profiles (profile 2 for females with 3 mm lip incremental increase), while few preferred profile (4) as the second most preferred value (table 3). For the least preferred variable, profile 5 and 1 with lip decrease of -6mm and increase of + 6mm, were the least preferred among males and females by both Orthodontists and laypeople (table 4 and 6). This can be justified by the fact that too much lip protrusion or retrusion is not acceptable for males and females. In females lip retrusion was least desirable as compared to males. These results are in concordance with the study by Czanecki ST, Ram Nanda¹³, Hans Pancherz¹⁶ and Foster¹⁷

This study shows the importance of the perception of a well balanced face. In some of the variables discussed, there was a clear contrast in preference of profiles for males and females among Orthodontists and laypeople, while in some variables it was not. The differences in the perception of facial esthetics between Orthodontists and the lay public were probably related to the differences among these groups in the knowledge and experience in the subject, as mentioned by Secord and Backman¹⁸, but in cases where the opinion was not different Wylie's¹⁸ study holds ground, which stated that in the matter of esthetics orthodontists could not claim superior judgment over layman and that a layman's opinion on the perception of beauty could be better than an orthodontist's as it would not be conditioned by orthodontic means.

Orthognathic surgery and orthopaedic force therapy have been proved to be clinically effective in bringing out major profile changes. Treatment capabilities currently available for the orthodontist include – conventional orthodontic mechano therapy, orthopaedic force therapy, orthognathic

surgery and rhinoplasty. The orthodontic profession has advanced in possessing the necessary diagnostic tools and the treatment capabilities, to provide an individual good dental function and best possible facial aesthetics. There are various studies that attempt to define a beautiful face, but no definition can be considered as a constant as the society and its aesthetic values change constantly. The study of facial aesthetics and balanced faces remain important because dentofacial characteristics are not always perceived the same.

Since every individual is different and each face unique in its own way, it is impossible to produce identical results in all patients as far as facial aesthetics in orthodontic treatment is concerned. Therefore, orthodontic treatment should be directed more towards enhancing the aesthetic features which are present and improvement of profile, which is severed due to dento skeletal or skeletal mal relationship.

Conclusion

Facial aesthetics is one of the main goals of orthodontic treatment. Increased emphasis has been placed on it in recent years by both patients and orthodontists. The method of silhouette tracing and evaluation used in this study was a simplified method for assessing facial

aesthetics, since it focuses mainly on the outline of the profile while eliminating the influence of bias.

The following were the views of the orthodontists and laypeople on facial aesthetics as based on the silhouettes made in this study.

1. Difference in perception was noted as Orthodontists preferred lesser angle of nasal prominence for females than males, while the laypeople accepted slightly increased angle of nasal prominence.
2. More acute angle of nasal tip was overall considered pleasing. Significant sexual preference was also noted, a more acute being preferred in males than in females.
3. There was a tendency to prefer slight acute Nasolabial angle for females than males, overall 104 degrees Nasolabial angle was most acceptable. No significant difference in perception was observed.
4. Overall there was a preference of Mentolabial sulcus angle of 130 degrees, that is a gentle curve or slight acute angle was considered aesthetic.
5. Increased soft tissue facial angle was preferred for males than females.

Increased lip fullness was desirable for both the sexes but more for females especially by Orthodontists.

References

1. Eser Tufekci, Arousha Jahangiri, Steven J.Lindauer - Perception of Profile among Laypeople, Dental Students and Orthodontic Patients: *Angle Orthod*, 2008; 78(6) 983-987.
2. Jackson VH. *Orthodontia*, 1st Edition, Philadelphia: JP Lippincott; 1904. P. 11-21.
3. Jenny R.Maple, Katherine W.L.Vig, F.Michael Beck – A Comparison of Providers and consumers Perceptions of Facial-Profile attractiveness: *Am J Orthod Dentofacial Orthop* 2005; 128:690-696.
4. Sandra Anicy-Milosevicy, Lapter-Varga M, Slaj M. - Analysis of the soft tissue facial profile by means of angular measurements. *Eur J Orthod* 2008; 30(2):135-140.
5. Powel and Rayson: profile in facial esthetics; *Br J Orthod* 1976; 3; 207 – 215.
6. Lines PA, Lines RR., Lines CA. Profilemetrics and facial esthetics. *Am J Orthod Dentofacial Orthop* 1978; 73: 648 – 57.
7. De Smit, and L. Dermaut Soft tissue profile preference –*Am J Orthod Dentofacial Orthop* 1984;87: 67 – 73.
8. Barrer and Ghafari. Silhouette profiles in assessment of facial esthetics –*Am J Orthod Dentofacial Orthop* 1985;88: 385 – 391.
9. Mayumi Nomura: Esthetic preferences of European American, Hispanic American, Japanese, and African judges for soft-tissue profiles. *Am J Orthod Dentofacial Orthop* 2009; 135:87-95?
10. Selin Kale Varlık: Influence of lower facial height changes on frontal facial attractiveness and perception of treatment need by lay people. *Angle Orthod*. 2010; 80:1159–1164.
11. Cox and Vanderliden; Facial harmony; *Am J Orthod Dentofacial Orthop* 1971; 60: 175 – 183.
12. Spradely FL, Jacobs JD, Crowe DP., Assessment of the anterior-posterior soft-tissue contour of the lower facial third in the ideal young adult. *Am J Orthod Dentofacial Orthop* 1981; 79: 316 – 325.
13. Czanecki ST, Nanda Ram, Currier GF, Perception of a balanced facial profile. *Am J Orthod Dentofacial Orthop* 1993; 104: 180-87
14. Hinds and Kent. J. N.: *Surgical treatment of developmental jaw deformities*. St. Louis. 1972. The Mosby Company.
15. Arnett and Bergman; Facial keys to orthodontic diagnosis and treatment planning. *Am J Orthod Dentofacial Orthop* 1993; 103: 299 – 312. Part I
16. Stamatia Matoula; - Hans Pancherz – Skeletofacial Morphology of Attractive and Nonattractive Faces. *Angle Orthod*: 2005 Vol. 76, No. 2, pp. 204 – 210.
17. Foster EJ. Profile preferences among diversified groups. *Angle Orthod* 1973; 43: 34.
18. Secord, P. F., and Backman, C. W.: Malocclusion and psychological factors, *J. Am. Dent. Assoc.* 1959; 59: 931 – 938.