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# Influence of upper lip inclination on facial profile attractiveness: A perceptive analysis

Prateeksha Bora, Poonam Agrawal, Dinesh Kumar Bagga, Kanak Priya, Neelam Singh<sup>1</sup> and Rishibha Bhardwaj

## Abstract

**BACKGROUND:** One of the major objectives of orthodontic treatment is to improve facial attractiveness. To orthodontists, this means that the nose, lips, and chin form an attractive outline when the faces are viewed from one side. The aim of the study is to evaluate the influence of lip inclination on perceived attractiveness using North Indian observer ratings on profile silhouettes.

**MATERIALS AND METHODS:** A profile photograph of an Indian male and female were converted to silhouettes for the study using computer software. The lip inclination of the idealized profile image was altered in two-degree increments to create a series of profiles with different upper lip inclination angles and rated by laypersons on a Likert scale.

**RESULTS:** An angle of 79° was deemed to be neither attractive nor unattractive. Therefore, within the range of 65°–75°, the pictures were deemed acceptable. Angles above or below this range, up to 91° were perceived as slightly unattractive, and anything outside the range of 93°–105° was deemed very unattractive.

**LIMITATIONS:** The study is not generalizable to ethnic groups other than the North Indian population. Another limitation is the inability to visualize the entire face for a complete facial analysis.

**CONCLUSION:** An upper lip inclination of 75°–85° in the male profile was associated with perceived attractiveness in all three groups whereas it was in the range of 65°–75° for a female profile. An upper lip inclination angle ranging from 95° to 105° was associated with unattractiveness in all three groups of observers and requires correctional intervention.

## Keywords:

Attractiveness, lip inclination, silhouettes

## Introduction

Edward H. Angle stated that “the orthodontist for each of his efforts, whether he realizes it or not, makes for beauty or ugliness, for harmony or disharmony, or for perfection or deformity of the face.” There is a high association between physical attractiveness and beauty toward a positive outlook in modern society. Studies have often shown that there is a positive relation between attractiveness

and how people are treated in society as compared to less attractive people. Therefore, we cannot understate the paramount importance of orthodontics and orthognathic surgery for the aesthetic welfare of an individual.<sup>[1]</sup> The human face is the most important criterion for the judgment of superficial beauty. The concepts of self-perception as well as perception by others in a society are governed by overall physical appearance, and more specifically by facial balance and symmetry. The perception of what is considered beautiful may be an individual preference that can be influenced by training, cultural, and ethnic

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Department of  
Orthodontics and  
Dentofacial Orthopedics,  
School of Dental Sciences,  
Sharda University, Greater  
Noida, Uttar Pradesh,

<sup>1</sup>Department of  
Conservative Dentistry  
and Endodontics, Faculty  
of Dentistry, Jamia Millia  
Islamia, New Delhi, India

## Address for correspondence:

Dr. Poonam Agrawal,  
Department of  
Orthodontics and  
Dentofacial Orthopedics,  
School of Dental  
Sciences, Sharda  
University, Knowledge  
Park III, Greater Noida,  
Uttar Pradesh - 201 306,  
India.  
E-mail: poonam.agrawal@  
sharda.ac.in

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biases. There have been many attempts by artists and professionals to define and recreate the “ideal,” but there are no standardized parameters to gauge why a face is considered “perfect.”<sup>[2]</sup>

The perception of facial profiles by laypersons and professionals has been studied extensively as an improvement of the profile is one of the major reasons why people seek orthodontic treatment. Even though there is considerable agreement across cultures about which facial anatomical relationships are attractive, there are cultural influences on the perception of attractiveness.<sup>[3]</sup> In the 1900s, the focus was only on the alignment of teeth irrespective of the soft tissue profile. After the *soft tissue paradigm shift*, it was generally accepted that both esthetics and stability of results rely more on the soft tissue rather than the hard tissue structures. Lip position has a critical role in the assessment of facial profile esthetics and influences the outcome of orthodontic treatment.

The attractiveness of the face is difficult to assess due to the presence of several confounding factors like facial features, skin complexion, etc., These factors which can be distracting in assessment using facial photographs can be eliminated by using the profile silhouettes.<sup>[4]</sup>

There is an increasing trend toward awareness for improved facial aesthetics in recent years and it can be considered as one of the growing demands of both the patient as well as orthodontists. There is a strong link between physical appearance and social approval. The patients undergoing orthodontic treatment view it as a means to obtain better social acceptance owing to improved facial and dental aesthetics.<sup>[5,6]</sup>

## Aim and Objectives

### Aim of the study

The aim of this study is to determine the impact of upper lip inclination on the perceptual attractiveness of the face using facial silhouettes.

### Objectives of the study

1. To evaluate facial profile attractiveness on different upper lip inclinations using silhouettes by ratings from three observer groups, i.e., orthodontic patients, laypersons, and orthodontists.
2. To make a comparative evaluation of the perception of the three observer groups for the male and female profiles.
3. To find the range in degrees of upper lip inclination beyond which orthodontic interception may be sought.

## Materials and Methods

A profile photograph of five Indian males and five Indian females was taken using a digital SLR camera (Canon EOS 1500D 24.1MP). These images were shown to five orthodontists to select the most preferred image which was converted to silhouettes for the study using computer software (Adobe® Photoshop® software) with soft tissue angular measurements according to standardized norms. The upper lip inclination is the angle formed between the upper lip and a true horizontal line intersecting through the subnasale when the patient is in a natural head position [Figure 1]. This angle was increased by 2° from 65° to 105° to depict variations in the nasolabial morphology and angulations [Figures 2 and 3].

The observers were grouped in the following order: Orthodontic patients ( $n = 50$ ), laypersons ( $n = 50$ ), and orthodontists ( $n = 50$ ). Observers were shown the images in random order in a PowerPoint presentation and went through the images one by one. They were asked to go through the images according to their convenience. A randomly assigned double letter was used to identify the images on the left corner of the slide. One image was repeated to check for intra-examiner reliability. Likert-type scale is the most accepted rating method used in perception-based studies.<sup>[7]</sup>

The observers were asked to rate each individual image on the following rating scale:

1. Exceedingly unattractive
2. Very unattractive
3. Slightly unattractive
4. About average
5. Slightly attractive
6. Very attractive
7. Exceedingly attractive.



Figure 1: Upper lip inclination

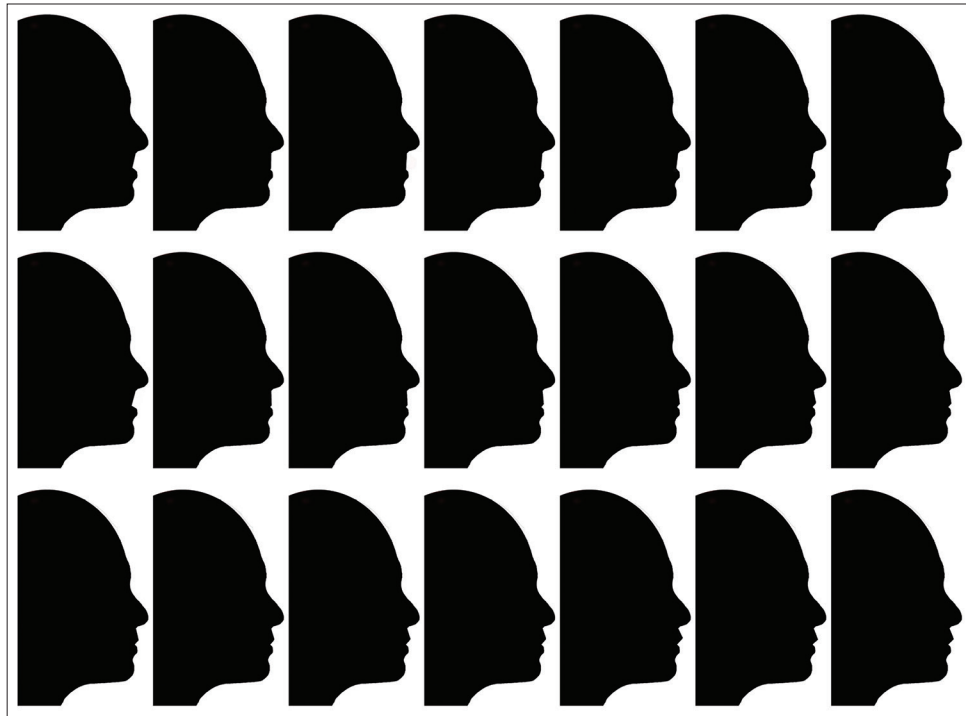


Figure 2: Upper lip inclination altered in the following degrees: Female (105, 103, 101, 99, 97, 95, 93, 91, 89, 87, 85, 83, 81, 79, 77, 75, 73, 71, 69, 67, 65)



Figure 3: Upper lip inclination was altered in the following degrees: Male (105, 103, 101, 99, 97, 95, 93, 91, 89, 87, 85, 83, 81, 79, 77, 75, 73, 71, 69, 67, 65)

The observers were seated in the same setting and environment to rate the images in a PowerPoint® presentation for attractiveness using the 7-point rating scale described earlier to rate the attractiveness of each image. The images were assigned a random double

letter for identification. The same image was used twice to check for intra-examiner reliability. To enhance the similarity of the image proportions with the actual size, an average human head was used for comparing dimensions.

The ethical clearance was procured from the Institutional Ethics committee of XXX University XXX Hospital (SU/SMS&R/76-A/2018/141).

### Statistical analysis

The data compiled in a Microsoft Excel spreadsheet was analyzed using Statistical Package for Social Sciences version 25. The mean and standard deviation were calculated and graphs were prepared. Measurement and analysis of the data were carried out by a single researcher. The normality of the data was checked by the Mann-Whitney test. Inferential statistics were performed using parametric tests of significance in accordance with the Central Limit Theorem. In this study, 0.05 was set to be the level of statistical significance.

### Results

This study was carried out to evaluate the influence of upper lip inclination on perceived facial profile attractiveness. Table 1 shows the median attractiveness rating of the observers on a Likert scale from 1 to 7, where 1 indicates "extremely unattractive" and 7 indicates "extremely attractive" and demonstrates the data in rank order from most to least attractive.

For the male profile, an upper lip inclination angle outside the range of 75°–85° was associated with a reduction in the median attractiveness scores in all three groups of observers. Repeatability was good as images RG and JS (81°) were identical with groups having the same median score for the images.

For the orthodontist rater, the top two profiles were images JL and SA, representing images 77° and 83°, respectively. For the layperson raters, it was in the range of images JL and SA, representing images 77°–88°. Similarly, for the patient raters, the top two profiles were images JL and RB, representing 77° and 79°.

Table 2 shows the median attractiveness rating of the observers on a Likert scale from 1 to 7, where 1 indicates "extremely unattractive" and 7 indicates "extremely attractive" and demonstrates the data in rank order from most to least attractive. For the female profile, an upper lip inclination angle outside the range of 89°–105° was associated with a reduction in the median attractiveness scores in all three groups of observers. Repeatability was good, as images RD and BH (75) are identical, with laypersons, patient, and orthodontist groups having the same median score.

For the layperson raters, the top 2 profiles were images XY representing 67° and images OS representing 73°;

**Table 1: Data in order of most to least attractive of male profile (orthodontist ranking first)**

| Image | Angle (°) | Median scores |          |               |
|-------|-----------|---------------|----------|---------------|
|       |           | Lay persons   | Patients | Orthodontists |
| HF    | 65        | 3             | 3        | 2             |
| DS    | 67        | 3             | 3        | 2             |
| JS    | 69        | 3             | 3.5      | 3             |
| BS    | 71        | 3.5           | 3        | 3             |
| DT    | 73        | 4             | 4        | 3             |
| AS    | 75        | 4             | 3        | 3             |
| JL    | 77        | 5             | 5        | 4             |
| RB    | 79        | 5             | 5        | 3             |
| IS    | 81        | 5             | 4.5      | 3             |
| RG    | 81        | 5             | 4        | 3             |
| SA    | 83        | 5             | 4        | 4             |
| CK    | 85        | 4             | 4        | 3             |
| KR    | 87        | 4             | 4        | 3             |
| SK    | 89        | 4             | 4        | 3             |
| VM    | 91        | 3             | 3        | 3             |
| KB    | 93        | 3             | 3        | 3             |
| OC    | 95        | 2             | 3        | 3             |
| ED    | 97        | 2             | 3        | 2             |
| RY    | 99        | 1.5           | 2        | 2             |
| PK    | 101       | 2             | 2        | 2             |
| SF    | 103       | 2             | 2        | 2             |
| LA    | 105       | 2             | 1        | 1             |

**Table 2: Data in order of most to least attractive of female profile**

| Image | Angle (°) | Median scores |          |               |
|-------|-----------|---------------|----------|---------------|
|       |           | Lay persons   | Patients | Orthodontists |
| PA    | 65        | 5             | 5        | 5             |
| XY    | 67        | 6             | 6        | 5             |
| SM    | 69        | 5             | 5        | 5             |
| LP    | 71        | 5             | 5        | 5             |
| OS    | 73        | 6             | 5        | 5             |
| BH    | 75        | 5             | 5        | 5             |
| RD    | 75        | 5             | 5        | 5             |
| FG    | 77        | 5             | 4.5      | 4             |
| HN    | 79        | 4             | 4        | 4             |
| ST    | 81        | 5             | 5        | 5             |
| PS    | 83        | 4             | 4        | 4             |
| AK    | 85        | 4             | 4        | 4             |
| PG    | 87        | 4             | 4        | 3.5           |
| OB    | 89        | 3             | 3        | 3             |
| WP    | 91        | 3             | 3        | 2             |
| HS    | 93        | 3             | 2        | 2             |
| AZ    | 95        | 2             | 2        | 2             |
| TS    | 97        | 2             | 2        | 2             |
| WD    | 99        | 2             | 2        | 1             |
| RP    | 101       | 2             | 2        | 1             |
| AB    | 103       | 2             | 2        | 1             |
| NS    | 105       | 1             | 1        | 1             |

for the patient raters, it was in the range of images PA to RD, representing 65°–75°; and for the orthodontist raters also, it was in the range of images PA to RD, representing 65°–75°.

The means and standard deviations of the female profiles as ranked by the three groups in each series are shown in Table 3 and Figure 4. Significant differences were found among the groups in ranking some images ( $P < 0.05$ ),

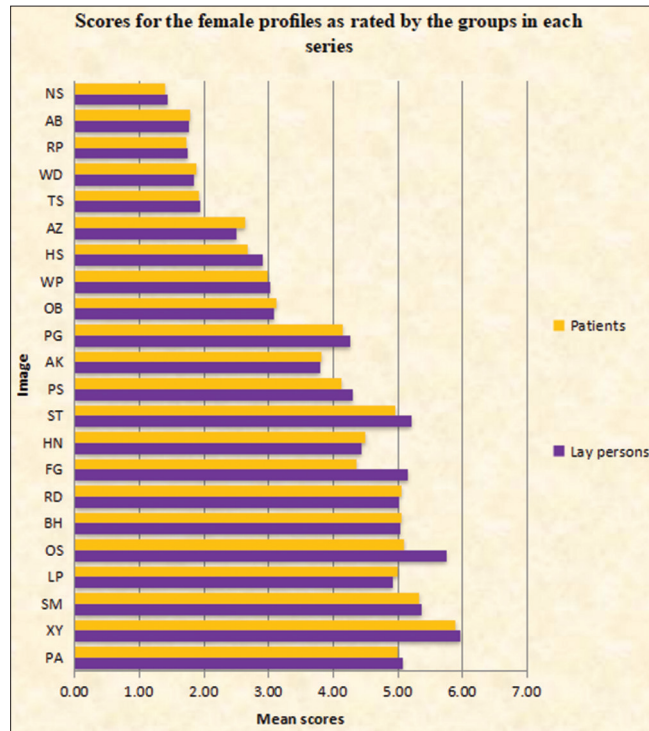


Figure 4: Scores for the female profiles as rated by the groups in each series

most of which were related to laypeople, who showed significant differences from the ranking of other groups.

The means and standard deviations of the male profiles as ranked by the three groups in each series are shown in Table 4 and Figure 5. Significant differences were found among the groups in ranking some images ( $P < 0.05$ ), most of which were related to laypeople, who showed significant differences from the ranking of other groups.

### Discussion

The combination of stabilization of dentition and production of a pleasing and esthetic dental complex helps in achieving facial balance through orthodontic treatment and this is one of the prime objectives of the procedure.<sup>[8]</sup> So, as far as our inter and intrapersonal relationships are concerned, a lot of emphasis is given to physical attractiveness. A person with pleasing physical traits is considered to be likable. Such a person is considered to exuberate positivity and possess better social skills compared to an unattractiveness person.<sup>[9]</sup> This physical attractiveness is in itself ambiguous even today. There is not one single entity that makes a person attractive. It may range a variety of qualities, from objective features such as eyes, nose, and lips, or subjective qualities like grooming, body posture, hairstyle, etc.<sup>[10,11]</sup>

The positioning of lips plays a vital role In the evaluation of the profile. When a change in profile position

Table 3: Ratings for the female profiles as scored by the groups in each series

| Image | Angle (°) | Scores for the female profiles |      |          |      |               |      | P        |
|-------|-----------|--------------------------------|------|----------|------|---------------|------|----------|
|       |           | Laypersons                     |      | Patients |      | Orthodontists |      |          |
|       |           | Mean                           | SD   | Mean     | SD   | Mean          | SD   |          |
| PA    | 65        | 5.08                           | 0.99 | 5.00     | 0.97 | 5.20          | 1.11 | 0.709    |
| XY    | 67        | 5.96                           | 0.78 | 5.88     | 0.75 | 5.68          | 0.79 | 0.154    |
| SM    | 69        | 5.36                           | 1.08 | 5.32     | 1.10 | 4.68          | 1.04 | 0.008**  |
| LP    | 71        | 4.92                           | 0.85 | 5.00     | 0.86 | 5.06          | 0.82 | 0.704    |
| OS    | 73        | 5.76                           | 0.77 | 5.10     | 0.71 | 5.30          | 0.91 | 0.001*   |
| BH    | 75        | 5.04                           | 0.81 | 5.06     | 0.91 | 5.08          | 0.83 | 0.931    |
| RD    | 75        | 5.02                           | 0.82 | 5.06     | 0.89 | 5.02          | 0.85 | 0.997    |
| FG    | 77        | 5.16                           | 0.96 | 4.36     | 1.01 | 4.20          | 0.99 | 0.000*** |
| HN    | 79        | 4.44                           | 1.16 | 4.50     | 1.18 | 4.22          | 0.89 | 0.485    |
| ST    | 81        | 5.20                           | 0.99 | 4.96     | 0.83 | 4.68          | 1.20 | 0.126    |
| PS    | 83        | 4.30                           | 1.02 | 4.12     | 0.92 | 4.32          | 1.10 | 0.624    |
| AK    | 85        | 3.80                           | 0.83 | 3.82     | 0.83 | 3.88          | 0.80 | 0.851    |
| PG    | 87        | 4.26                           | 1.10 | 4.14     | 1.07 | 3.60          | 1.05 | 0.016*   |
| OB    | 89        | 3.08                           | 1.03 | 3.12     | 0.98 | 3.10          | 1.06 | 0.960    |
| WP    | 91        | 3.02                           | 0.77 | 2.98     | 0.74 | 2.28          | 0.97 | 0.000*** |
| HS    | 93        | 2.90                           | 0.81 | 2.68     | 0.89 | 2.22          | 0.98 | 0.002**  |
| AZ    | 95        | 2.50                           | 0.95 | 2.64     | 1.19 | 1.84          | 0.82 | 0.001*** |
| TS    | 97        | 1.94                           | 0.82 | 1.92     | 0.85 | 2.32          | 1.00 | 0.102    |
| WD    | 99        | 1.84                           | 0.79 | 1.88     | 0.82 | 1.52          | 0.76 | 0.037*   |
| RP    | 101       | 1.74                           | 0.72 | 1.72     | 0.73 | 1.52          | 0.79 | 0.137    |
| AB    | 103       | 1.76                           | 0.77 | 1.78     | 0.82 | 1.58          | 0.73 | 0.371    |
| NS    | 105       | 1.44                           | 0.50 | 1.40     | 0.50 | 1.50          | 0.76 | 0.920    |

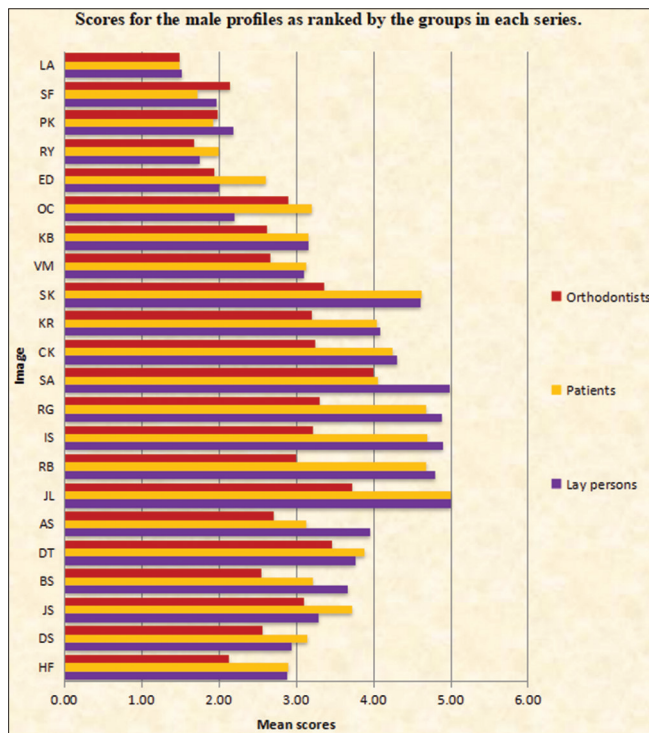
P>0.05 – nonsignificant, \*P<0.05 – significant, \*\*P<0.01 –highly significant, \*\*\*P<0.001 – very highly significant



**Table 4: Ratings for the male profiles as scored by the groups in each series**

| Image | Angle (°) | Scores for the male profiles |      |          |      |               |      | P        |
|-------|-----------|------------------------------|------|----------|------|---------------|------|----------|
|       |           | Laypersons                   |      | Patients |      | Orthodontists |      |          |
|       |           | Mean                         | SD   | Mean     | SD   | Mean          | SD   |          |
| HF    | 65        | 2.88                         | 0.87 | 2.90     | 0.93 | 2.12          | 0.96 | 0.000*** |
| DS    | 67        | 2.94                         | 0.89 | 3.14     | 1.05 | 2.56          | 1.11 | 0.051    |
| JS    | 69        | 3.28                         | 0.99 | 3.72     | 0.81 | 3.10          | 1.07 | 0.003*   |
| BS    | 71        | 3.66                         | 1.24 | 3.22     | 1.09 | 2.54          | 0.97 | 0.000*** |
| DT    | 73        | 3.76                         | 1.10 | 3.88     | 0.96 | 3.46          | 1.50 | 0.035*   |
| AS    | 75        | 3.96                         | 0.99 | 3.12     | 1.15 | 2.70          | 0.74 | 0.000*** |
| JL    | 77        | 5.00                         | 0.78 | 5.00     | 0.81 | 3.72          | 1.44 | 0.000*** |
| RB    | 79        | 4.80                         | 0.76 | 4.68     | 0.68 | 3.00          | 0.81 | 0.000*** |
| IS    | 81        | 4.90                         | 0.81 | 4.70     | 0.79 | 3.22          | 1.00 | 0.000*** |
| RG    | 81        | 4.88                         | 0.82 | 4.68     | 0.79 | 3.30          | 0.97 | 0.000*** |
| SA    | 83        | 4.98                         | 0.82 | 4.06     | 0.96 | 4.00          | 0.97 | 0.000*** |
| CK    | 85        | 4.30                         | 0.97 | 4.24     | 0.96 | 3.24          | 1.04 | 0.000*** |
| KR    | 87        | 4.08                         | 0.83 | 4.04     | 0.83 | 3.20          | 1.09 | 0.000*** |
| SK    | 89        | 4.60                         | 0.73 | 4.62     | 0.73 | 3.36          | 1.17 | 0.000*** |
| VM    | 91        | 3.10                         | 0.84 | 3.12     | 0.82 | 2.66          | 0.94 | 0.028*   |
| KB    | 93        | 3.16                         | 0.65 | 3.16     | 0.65 | 2.62          | 1.11 | 0.002**  |
| OC    | 95        | 2.20                         | 0.99 | 3.20     | 0.99 | 2.90          | 1.02 | 0.000*** |
| ED    | 97        | 2.00                         | 0.78 | 2.60     | 0.99 | 1.94          | 0.82 | 0.001*** |
| RY    | 99        | 1.74                         | 0.83 | 2.00     | 0.76 | 1.68          | 0.68 | 0.081    |
| PK    | 101       | 2.18                         | 1.00 | 1.92     | 0.85 | 1.98          | 0.65 | 0.437    |
| SF    | 103       | 1.96                         | 0.97 | 1.72     | 0.78 | 2.14          | 1.07 | 0.164    |
| LA    | 105       | 1.52                         | 0.51 | 1.48     | 0.51 | 1.48          | 0.76 | 0.488    |

P>0.05 – nonsignificant, \*P<0.05 – significant, \*\*P<0.01 –highly significant, \*\*\*P<0.001 – very highly significant



**Figure 5:** Scores for the male profiles as ranked by the groups in each series

cannot be achieved, it becomes pertinent to have a well-balanced face along with achieving functional occlusion. The central esthetic unit of the face is the nasolabial angle. Significant alteration may be made in

this region by LeFort I maxillary osteotomy. In addition to this, there can be movement of the maxillary incisors within this sagittal plane. Several factors contribute to the comprehensive treatment planning. These factors include the accurate diagnosis of the nasolabial region and an estimation of the potential esthetic changes post the planned orthodontic surgery. Here, the desirable and undesirable components also have an important role to play. For some patients, a significantly increased or decreased nasolabial angle may be an area of major concern. They may seek corrective treatment options like rhinoplasty.<sup>[8,11]</sup>

The nasolabial angle consists of "wo l'nes, one taken from the nose and another from the upper lip which are independent of each other. It is important to study each component of this angle to determine the accurate diagnosis of normal and its variation. Hence in orthodontic diagnosis and treatment planning, the nasolabial angle, and its lower component, i.e., the upper lip inclination play a key role. The overall management of the nasolabial angle may not be adequate as diagnostic information as it cannot be ascertained whether the lip, nose, or both are liable for the variation.<sup>[12]</sup> For instance, if an individual has an upturned nose, he may have a normal nasolabial angle with proclination of the upper incisors. Like the nasolabial region, there are other facial parameters contributing to the diagnostic process. Such facial parameters include age, gender,

and ethnicity also.<sup>[13]</sup> However, no longitudinal data is available for the same, and limited cross-sectional data is available. Ranges of variability should be measured through observer perception, and it is important to compare the perceptions of various groups within a normative population. This has been dealt with in detail in this study. We have seen that the nasolabial angle plays an important role in the profile esthetics of an individual.<sup>[12, 14]</sup> The clinician should emphasize this area particularly while planning for the treatment mechanics within the accepted norms.

This particular study explores the evaluation of the quantitative norms of the esthetic impact of upper lip inclination on perceived attractiveness and the desire for treatment based on threshold values. As for the results of this investigation, it has been observed that increasing the upper lip inclination angle deviation in either direction from an angle of 75° (image BH) was related to a decrease within the median attractiveness scores for three groups of observers. The female profile images display the following pattern: Ie best attractiveness scores were for 73° (image OS), closely followed by 67° (image XY) and 75° (BH and RD). Image HN which displays an angle of 79° is neither attractive nor unattractive, i.e., essentially acceptable albeit not attractive. The range in which the images are deemed acceptable falls in the 65°–75°. Above 75°–91° were perceived as slightly unattractive. Very unattractive images range from outside 93° to 105°.

For the male profile images, an upper lip inclination angle outside the range of 75°–85° was related to a discount within the median attractiveness scores altogether three groups of observI The very best attractiveness scores were for image JL (ULI angle of 77°), closely followed by image SA (angle of 83°) and pictures IS and RG (angle of 81°). An angle of 87° (image KR) was deemed to be neither attractive nor unattractive, i.e., essentially acceptable, albeit not attractive. Therefore, within the range of 85°–89°, the pictures were deemed acceptable. Angles below this range, up to 97° were perceived as slightly unattractive, and anything outside the range of 99°–105° was deemed very unattractive.

The orthodontists agree largely with the results of this study. This estimates their high degree of agreement in terms of higher critical capability acquired during their training. On the contrary, the group of patients also exhibited high reliability and agreement. This can also be related to the point that patients developed a greater amount of sensitivity during their treatment.<sup>[15]</sup> Moreover, they kept a keen eye on the deviations from their perceived personal experiences notion. We have used silhouettes in this study for the evaluation of profile esthetics based on the advocacy of previous authors

working in this area as this eliminates other possible esthetic variables like hair, eyes, and complexion.

### Limitations

The notion of attractiveness varies to a large extent and different racial groups perceive attractiveness differently. Here, we would like to mention that the profile silhouette image was created by using North Indian proportions and normative values. Therefore, it cannot be generalized to different ethnic groups and populations. The impact scope may be limited in terms of direct relevance to other ethnic groups. However, it definitely provides insight as to how other different groups view North Indian faces. With the help of this study, other images of other ethnic groups may be studied from a broader perspective. This study based on North Indian faces has opened up the possibility of repeating this study for different ethnic groups. Further research on the scope/limitations of assessing the preference of soft tissue profile among different populations within an increased sample size and power of the study seems to be validated.

### Conclusion

The following inferences can be drawn from the study:

1. There is a good agreement in the three observer groups, i.e., orthodontists, orthodontic patients, and laypersons for the perception of profile attractiveness associated with changes in upper lip inclination.
2. An upper lip inclination of 75°–85° in the male profile was associated with perceived attractiveness in all three groups, whereas it was in the range of 65°–75° for the female profile.
3. An upper lip inclination angle in the range of 95°–105° was associated with unattractiveness in all three groups of observers and requires correctional intervention.
4. Further research needs to be conducted by incorporating observers from different populations.

### Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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