Section A-Research paper
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EVALUATING THE ROLE OF SOFT TISSUE NASAL PARAMETERS ON THE PERCEPTION OF FACIAL ATTRACTIVENESS IN PROFILE VIEW: A PHOTOGRAPHIC STUDY

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Abstract

Aim: To evaluate the role of soft tissue nasal parameters on the perception of facial attractiveness in profile view.

Study Design: 152 profile photos were rated by 50 laypersons. Parameters evaluated for each profile photo were 6 Angular (Nasofacial Angle, Nasal Tip Angle, Nasofrontal Angle, Nasomental Angle, Inclination of the Nasal Base and Nasolabial Angle) and three linear (Nasal Prominence, Subnasal depth and Canut's Nasal Prominence). Needful statistics were then applied.

Results: Based on the categorization of individuals into less attractive and more attractive groups, it was observed that individuals with higher perceived attractiveness had a smaller Nasofacial Angle when compared with the less attractive individuals. Nasofacial Angle & Average Aesthetic Score, shows an Excellent Negative Correlation. Nasolabial Angle & Average Aesthetic Score shows a Moderate Positive Correlation.

Conclusion: Nasal parameters are of great importance in treatment plan and diagnosis in Orthognathic surgery and cosmetic surgeries as well. Nasofacial Angle significantly defines More & Less Attractive Profiles.

Key words: Nose, Aesthetic score, Pleasing Profiles, Nasofacial Angle, Nasolabial Angle

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Introduction: Around 5000 years ago, the ancient Egyptians demonstrated their understanding of beauty and aesthetics. Present-day clinicians still rely on the guidelines for facial beauty and attractiveness that were initially described in art. Albrecht Dürer, an artist, suggested that while proportionate features are generally acceptable, they may not always be considered beautiful. Nevertheless, the perception of beauty ideals varies across different cultures, as evidenced by historical sculptures from various civilizations such as Greek or Roman, which showcased diverse notions of beauty and facial aesthetics.

At the time of orthodontic and orthognathic treatment planning, the lateral cephalogram analysis, serves as a useful tool in determining the facial profile. The human face is a distinct structure that communicates a great deal about an individual. Facial attractiveness holds significant importance in social interactions and personal behavior. In fact, the growing awareness of facial aesthetics is one of the key inspiration for individuals to get orthodontic treatment. As the face represents the most prominent aspect of a person's overall physical appearance, achieving optimal facial aesthetics is a key objective for orthodontists, maxillofacial surgeons, and those seeking orthodontic care.

The concept of a paradigm can be likened to the foundation upon which a systematic structure is constructed, with each brick symbolizing new discoveries and insights. However, when a paradigm shift occurs, it often leads to an explosion of new ideas and information, resulting in rapid advancements in the field. As a new paradigm replaces the previous one, what is considered true today may become a myth tomorrow. Attaining exceptional facial aesthetics is one of the primary objectives in orthodontics, maxillofacial surgery, and for individuals pursuing orthodontic treatment.

Twentieth-century orthodontic practice was grounded in the Angle Paradigm.[1] However, the emphasis on soft tissue and the pursuit of perfection have combined to form a biologically driven paradigm that better serves orthodontics in the twenty-first century.[2]

The nose holds significant importance in facial attractiveness as it contributes to the overall balance and harmony of the face. A well-proportioned nose that complements the other facial features can enhance facial beauty, whereas an asymmetrical or disproportionate nose can detract from it. The size, shape, and symmetry of the nose play crucial roles in determining facial attractiveness.

Facial beauty relies on harmonious balance among all facial components, with the nose assuming a prominent role due to its central location on the face. Various methods,

such as direct clinical measurements (morphometry), photogrammetry, radiographs (cephalometry), or three-dimensional stereo photogrammetric systems, can be employed to evaluate the nose. Both morphometry and photogrammetry provide cost-effective means for conducting anthropometric studies.[3]The nose's significance in facial aesthetics is exemplified by the remarkable improvements observed in patients who have undergone even minor rhinoplasty procedures. The ideal nose is one that harmonizes with the other facial features. However, nasal characteristics vary among different races, along with other facial attributes.

The soft tissue profile has been studied extensively in orthodontics, primarily from Lateral Cephalometric Radiographs, under the assumption that the form of the soft tissue outline largely determines the esthetics of the whole face. A standard might represent the normal or average patterns. Even so, it does not identify the best or most attractive in the eyes of a given population. Therefore, an evaluation of the nasal form and its position relative to other facial structures should be assessed to evaluate its role in facial attractiveness. As well as what part it has in the assessment of patients before Orthognathic Surgery, Rhinoplasty or Fixed Mechanotherapy.[4]

Need of the study: For thorough diagnosis, appropriate treatment planning and accurate results in day to day Orthodontic practice; Soft Tissues plays a pivotal role. Although Nose is one of the key soft tissue parameter affecting facial attractiveness; veryfew[5-6] studies are found in existing literature till date showing the impact of nose on facial attractiveness. In the previous studies the only parameter studied was NasoLabial Angle and Depth of nose. Thus, here in this study we aimed to evaluate nine (6 Angular and 3 Linear) different Nasal Parameters to assess Facial Attractiveness.

Aim: To evaluate the role of soft tissue nasal parameters on the perception of facial attractiveness in profile view.

Objectives:

- ✓ To evaluate the role of each parameter under study, individually on facial attractiveness in profile view.
- ✓ To derieve which parameter(s) affect the perception of facial attractiveness.

Material and Methodology

Sample description: The samples for the present study will be Students of K. M. Shah Dental College and Hospital as subjects for photography and Lay Persons visiting K. M. Shah Dental College and Hospital as raters who will rate the photographs.

The sample size for Subjects for Photography: As per the base article, the number of subjects for photographic records will be 152 students (considering 95% Confidence Level) studying in KM Shah Dental College and Hospital.

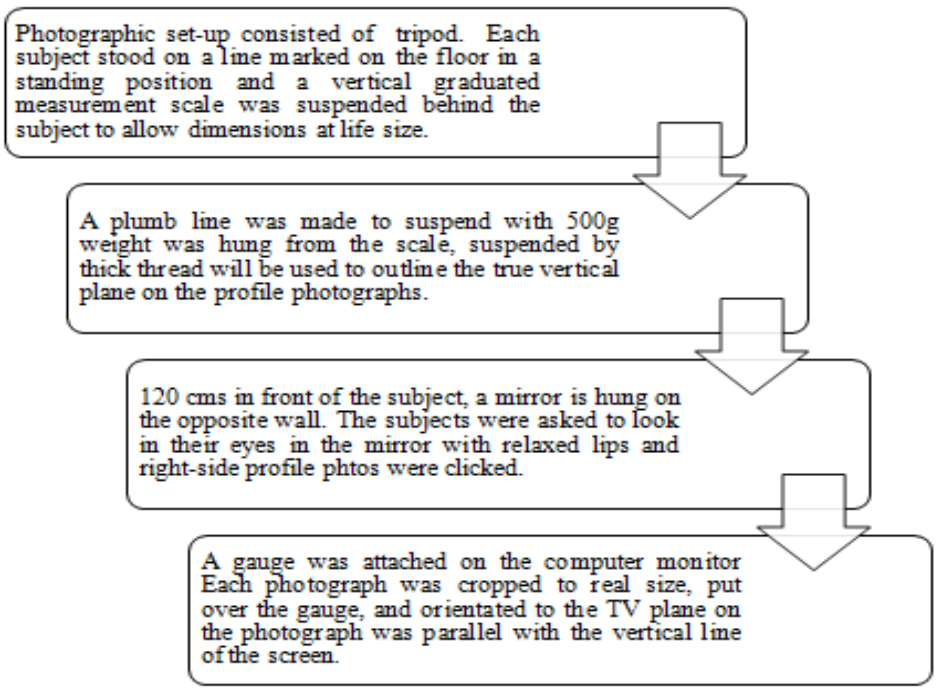
The sample size for the Raters: It is assessed using the following norms. Alpha error = 5%, beta error = 20%, reading in group 1= 1.61, reading in group 2= 0, common standard deviation = 0.81 according to a study conducted by Pandey et al[7], The sample size obtained thus is 50 Raters.

Inclusion Criteria: 18 to 25 years of age. **Exclusion Criteria:** Congenital anomalies/defects, Facial asymmetry/disharmony, Facial muscular imbalances, History of facial trauma, Plastic surgery or Orthognathic surgery.

Methodology: The subjects for photography for the present study will be Students of K. M. Shah Dental College and Hospital. After selection (inclusion and exclusion criteria), participants will be made familiar with the study design using participant information sheet. Every participant will be asked to sign on the informed consent form before participating in the study.

The Raters for the present study will be Laypersons visiting K. M. Shah Dental College and Hospital. define

A. Steps of taking photographs of the subjects' profile view in Natural Head Position (NHP)[8]



B. Parameters

Parameter	**Formation**	**Normal Range**		**Inference**
		Men	Women	
Angular parameters				
Nasofacial Angle[9]	Angle at the intersection of the glabella to soft tissue Pogonion with a line drawn along the axis of radix	30-35°		> Convex Profile < Concave Profile
Nasomental Angle[9]	Angle formed at the intersection of the axis of radix and a line drawn from Pn to Pog'	120-132°		> Concave Profile <Convex Profile
Inclination of the Nasal Base[10]	The angle formed at the intersection of true vertical and a line through the long axis of the nostril	90°	105°	> Raised Nasal Base <Lowered Nasal Base
Nasofrontal Angle[11]	The angle formed between the dorsum of nose and N'-G	130-137°		> Concave Profile < Convex Profile
Nasal Tip Angle[11]	Formed by the axis of the dorsum and Columella tangent	83°	84°	>Flat Nose <Prominent Nose
Nasolabial Angle[12]	Formed between Columella tangent and upper lip tangent.	90-110°		>105° - Open. <90° - Close (Arnett II)
Linear measurements				
Nasal Prominence[12]	Nasal tip prominence is evaluated relative to nasal height (G-Sn).	Horizontal nasal prominence (G-Prn) was approximately one-third the vertical height of nose		>Prominent nose
Subnasal depth[13]	Sn to N-Ort line (Ort is the intersection of True Vertical and True Horizontal)	2.21mm	1.7mm	>Concave Profile <Convex Profile
Canut's Nasal Prominence[13]	Prn to Sn-Sm	13.4 ± 2.5 mm	2.39 ± 1.9mm	> Prominent nose

All the above parameters were evaluated by Principle Investigator on all the profile photographs. A few (10% of sample size) were re-evaluated after 4 weeks to check Intra rater Reliability[14].

All the images were shown to Fifty Lay persons (Raters) on a Power-point presentation. They were asked to provide aesthetic ratings for the profile on the basis of facial attractiveness on VAS Scale. The VAS Scale has 0 to the left (very unattractive) & 10 on the right (very attractive).[15] Intra-examiner reliability was measured by randomly including a replica of any 5 profiles. The Raters were uninformed of the replica image and were asked to rate it as additional images. VAS scores were matched by applying the intraclass correlation coefficient amongst both the original and replica pictures.[14]

Hundred photographs were further divided in two groups, i.e. Attractive and Non-Attractive by the average rating of all the 50 raters using VAS Scale. The score of 0-5 was considered Non-Attractive and 5-10 as Attractive.

Further statistical analysis were carried out to evaluate the role of all the nine parameters on facial attractiveness in profile view and to derive which parameter(s) affect the perception of facial attractiveness[14].

Observations and Results

Table 1: Mean measurements of all parameters of both (more attractive and less attractive) groups.

	Less Esthetic/ Attractive (Mean ± SD)	More Esthetic/ Attractive (Mean ± SD)	t	p value
Nasofacial Angle	34.9 ± 3.71 º	31.28 ± 2.04 º	7.743	**<0.001**
Nasomental Angle	125.86 ± 11.45 º	125.17 ± 4.44 º	0.532	0.596
Inclination of Nasal Base	94.43 ± 9.44 º	96.09 ± 4.63 º	-1.451	0.149
Nasofrontal Angle	133.9 ± 3.31 º	134.19 ± 3.29 º	-0.511	0.61

Nasal Tip Angle	84 ± 2.06 º	83.23 ± 0.91 º	3.179	0.002
Nasolabial Angle	97.45 ± 9.07 º	101.66 ± 8.14 º	-2.729	0.007
Subnasal Depth	3.5 ± 0.85 mm	3.55 ± 0.69 mm	-0.413	0.68
Nasal Prominence	16.51 ± 3.37 mm	16.62 ± 3.46 mm	-0.172	0.864
Canut's Nasal Prominence	13.53 ± 1.01 mm	13.44 ± 1.03 mm	0.529	0.598

Based on the categorization of individuals into less attractive and more attractive groups, it was observed that individuals with higher perceived attractiveness had a smaller Nasofacial Angle when compared with the less attractive individuals. (**Table 1**)

Table 2: Pearson's Correlation Test for each Parameter & Average Aesthetic Score

Parameters being correlated	Correlation (r)	p value
Average Aesthetic Score &Nasofacial Angle	-0.684	**<0.001**
Average Aesthetic Score &Nasomental Angle	0.053	0.515
Average Aesthetic Score & Inclination of Nasal Base	0.094	0.247
Average Aesthetic Score &Nasofrontal Angle	0.071	0.384
Average Aesthetic Score & Nasal Tip Angle	-0.198	0.015
Average Aesthetic Score & Nasolabial Angle	0.31	**<0.001**
Average Aesthetic Score &Subnasal Depth	0.04	0.628
Average Aesthetic Score & Nasal Prominence	0.006	0.941
Average Aesthetic Score &Canut's Nasal Prominence	-0.095	0.245

The correlation between the parameter **Nasofacial Angle**& Average Aesthetic Score, shows an **Excellent Negative Correlation**, and significant with a p value of <0.001 (**Table 2 & Chart 1**). The correlation between the parameter **Nasolabial Angle**& Average Aesthetic Score shows a **Moderate Positive Correlation**, and is significant with a p value of <0.001. (**Table 2 & Chart 2**).

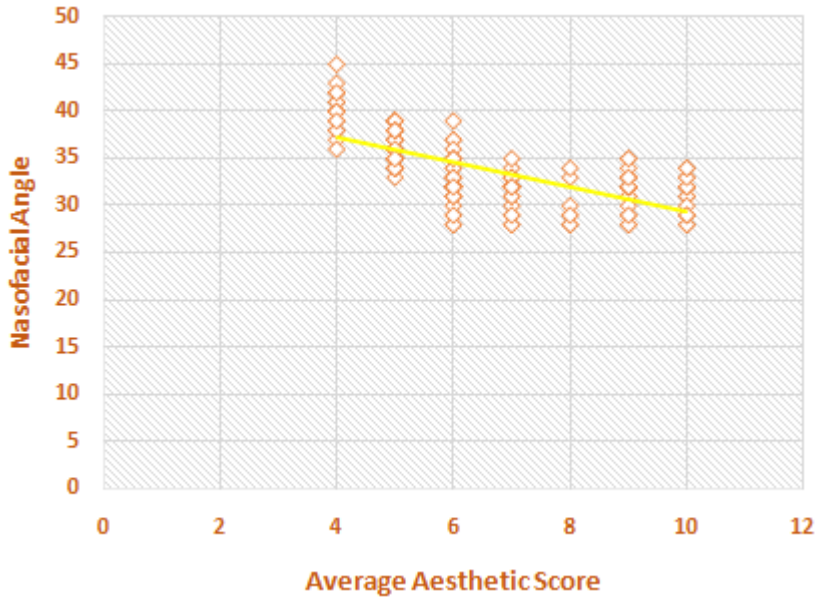


Chart 1: Negative Pearson's Correlation between Nasofacial Angle and Average Aesthetic Score.

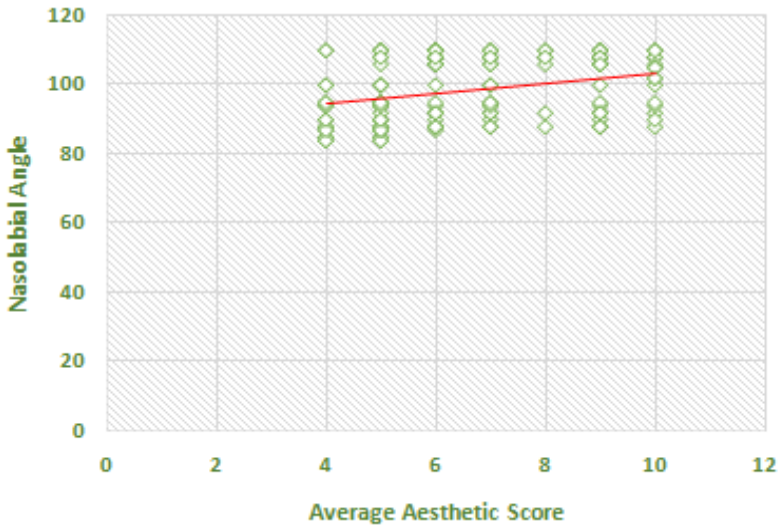


Chart 2: Positive Pearson's Correlation between Nasolabial Angle and Average Aesthetic Score

Cronbach's Alpha	N of Items
.750	5

Table 3: Cronbach's alpha test for reliability analysis.

The outcome presented the Cronbach's alpha co-efficient for 5 items is 0.750, suggesting relatively high internal consistency and the ratings are validated.

Discussion: Orthodontic tooth movement can have an effect on the appearance of the nose, but the extent of this effect is generally minimal. Changes in nasal shape resulting from orthodontic tooth movement are typically minor and do not significantly affect facial aesthetics. While orthodontic treatment did result in some changes to the nose, the overall impact on facial appearance was minimal and not typically noticeable.

Therefore, while orthodontic tooth movement can have an effect on the shape of the nose, this effect is generally minor and not a primary consideration in orthodontic treatment planning.

Ayse Tuba Altug-Ataca et al[15] stated that avoiding maxillary advancement would benefit more in borderline Class III patients and proceeding with just mandibular setback alone, as it does not provide substantial enhancements to nose/upper lip tissues. The remarkable enrichment observed in profiles of the subjects undergoing bi-jaw surgery chiefly results from the setback of the mandible and the notable reduction in the superior lower lip region

Stephen A. Schendel et al[16] that the surgical modification of the maxilla can bring about alterations in the nasal structure, which can have either beneficial or undesirable effects depending on the initial nasal anatomy determined during the initial phase. The authors emphasize the importance of conducting anall-inclusive assessment of both serviceable and appealing aspects of the nose in relation to the overall facial appearance. Furthermore, they highlight the significance of properly sequencing the specific nasal morphological changes in combination with the appropriate orthognathic procedure.

Tian EeSeah et al[17] stated that when strategizing for a rhinoplasty procedure, the nasal changes associated with maxillary osteotomies are carefully considered. It is important to identify certain nasal disfigurements that could be rectified through maxillary osteotomies, such as a slender alar base, aa touch drooping nasal tip and a minor dorsal hump. These issues can be effectively addressed through Lefort I advancement. An initial step involves

examining preoperative photographs of a female patient to guide the surgical planning process, including impaction techniques.

Kurt K. BUI et al[5] recommended that it may be advantageous for cosmetic surgeons to suggest that rhinoplasty patients with misaligned teeth consider consulting an orthodontist for further evaluation and treatment.

Wagner Ranier Maciel Dantaset al[18] examined the nasal anatomical changes in who underwent Le-Fort I osteotomy for either advancement or superior impaction. The outcomes indicated that surgeries involving maxillary advancement and superior repositioning generally lead to the rise and advancement of the nasal tip, along with an amplification of the nasal base.

Conclusion: Nasal parameters are of great importance in treatment plan and diagnosis in Orthognathic surgery and cosmetic surgeries as well.

- ✓ Nasofacial Angle significantly defines More & Less Attractive Profiles.
- ✓ Positive Correlation is seen in Nasolabial Angle & Average Aesthetic Score (r = 0.31).
- ✓ Negative Correlation is seen in Nasofacial Angle & Average Aesthetic Score (r = -0.684).

References

1. Proffit WR. Masters of esthetic dentistry: The soft tissue paradigm in orthodontic diagnosis and treatment planning: A new view for a new century. Journal of Esthetic and Restorative Dentistry. 2000;12(1):46.
2. Mhatre A, Tandur A, Gaikwad S, Doshi S, Khushalani N. Orthodontic Treatment: The Soft Tissue Paradigm. Contemporary Dentistry :43.
3. Gulsen A, Okay C, Aslan BI, Uner O, Yavuzer R. The relationship between craniofacial structures and the nose in Anatolian Turkish adults: A cephalometric evaluation. Am J OrthodDentofacialOrthop 2006;130:131. e15 25.
4. Begg RJ, Harkness M. A lateral cephalometric analysis of the adult nose. J Oral MaxillofacSurg 1995;53:1268 74.
5. Bui KK, Rinchuse DJ, Zullo TG, Cozzani M. Perception of facial attractiveness following modification of the nose and teeth. International orthodontics. 2015 Jun 1;13(2):195-209.

6. Denize ES, McDonald F, Sherriff M, Naini FB. Facial profile parameters and their relative influence on bilabial prominence and the perceptions of facial profile attractiveness: A novel approach. The Korean Journal of Orthodontics. 2014 Jul 1;44(4):184-94.
7. Pandey S, Kapoor S, Agarwal S, Shukla I. Evaluation of Lip Position in Esthetically Pleasing Profiles Using Different Reference Lines: A Photographic Study. Journal of Indian Orthodontic Society. 2021 Jul;55(3):261-9.
8. Anicÿ-Miloševicÿ S, Lapter-Varga M, Šlaj M. Analysis of the soft tissue facial profile by means of angular measurements. The European Journal of Orthodontics. 2008 Apr 1;30(2):135-40.
9. Jacobson A, White L. Radiographic cephalometry: from basics to 3-D imaging. American Journal of Orthodontics and DentofacialOrthopedics. 2007 Apr 1;131(4):S133.
10. Rohrich RJ, Bell WH. Management of nasal deformities-An update. In: Bell WH (ed). Modern Practice in Orthognathic and Reconstructive Surgery, vol 1. Philadelphia: Saunders, 1992:262-283.
11. Aung SC, Liam FC, Teik LS. Three dimensional laser scan assessment of the Oriental nose with a new classification of Oriental nasal types. British journal of plastic surgery. 2000 Mar 1;53(2):109-16.
12. Scheideman GB, Bell WH, Legan HL, Finn RA, Reisch JS. Cephalometric analysis of dentofacialnormals. American journal of orthodontics. 1980 Oct 1;78(4):404-20.
13. Fernández-Riveiro P, Suárez-Quintanilla D, Smyth-Chamosa E, Suárez-Cunqueiro M. Linear photogrammetric analysis of the soft tissue facial profile. American Journal of Orthodontics and DentofacialOrthopedics. 2002 Jul 1;122(1):59-66.
14. Johnston DJ, Hunt O, Johnston CD, Burden DJ, Stevenson M, Hepper P. The influence of lower face vertical proportion on facial attractiveness. The European Journal of Orthodontics. 2005 Aug 1;27(4):349-54.
15. Altug-Atac AT, Bolatoglu H, Memikoglu UT. Facial soft tissue profile following bimaxillaryorthognathic surgery. The Angle Orthodontist. 2008 Jan;78(1):50-7.
16. Schendel SA, Carlotti Jr AE. Nasal considerations in orthognathic surgery. American Journal of Orthodontics and DentofacialOrthopedics. 1991 Sep 1;100(3):197-208.

17. Seah TE, Bellis H, Ilankovan V. Orthognathic patients with nasal deformities: case for simultaneous orthognathic surgery and rhinoplasty. British Journal of Oral and Maxillofacial Surgery. 2012 Jan 1;50(1):55-9.
18. Dantas WR, da Silveira MM, do EgitoVasconcelos BC, Porto GG. Evaluation of the nasal shape after orthognathic.