ORIGINAL RESEARCH

# Observation and Assessment of the Parameters of Facial Esthetics in 6-year-old Children with Healthy Dentition

Deepanjali Potsangbam[1], Nidhi Agarwal[2], Zohra Jabin[3], Ashish Anand[4]

## Abstract

**Aim:** This study was conducted to observe and assess the dental and facial parameters of esthetics in children with healthy dentition and evaluate whether they are comparable to those of adults.

**Materials and methods:** An observational study included 70 children with ages ranging from 5 to 6 years who had come to the Department of Pediatric & Preventive Dentistry, Institute of Dental Studies & Technologies, Ghaziabad, Uttar Pradesh, India, with intact primary dentition. Standardized photographs of the children were taken and evaluated. Their facial and dental parameters were recorded and compared to that of those of adults.

**Result:** The relation of tooth and facial components was established, and it was found that they were not in the same proportion as those of adults.

**Conclusion:** The proportions of facial and dental parameters of esthetics of children at 6 years of age are different from those of adults.

**Clinical significance:** Since esthetic rehabilitation of primary teeth is becoming an important requisite of successful dental treatment, it is important to establish a standard guideline of dental and facial parameters for children for prosthetic rehabilitation.

**Keywords:** Dentofacial esthetics, Esthetics, Primary dentition, Smile.

*International Journal of Clinical Pediatric Dentistry* (2023): 10.5005/jp-journals-10005-2639

## Introduction

One of the most important factors that determine the physical appearance of an individual is the face.[1] Numerous studies have been conducted on the significance of physical and facial attractiveness, which may be greatly influenced by a person's smile.[2]

Not only adult patients but even child patients are slowly yet increasingly becoming mindful of the importance of a magnificent smile in terms of facial beauty.[3]

To improve their smile for the greater good and be driven by attractive looks and lovely smiles, patients have sought numerous treatment approaches to enhance dentofacial function and esthetics.[4,5] To be able to obtain the best esthetic results possible, various reference parameters have been introduced and followed previously in a number of studies for adults, but the same has not been done for children.[6–8]

Pediatric dentists should be mindful and aware of children's esthetic perception because, by the age of 6 years, children are capable of comprehending the significance of an esthetic smile, given that they are aware of their appearance.[9] This is so because, at this time, they are exposed to the outside world, and social acceptance among peers becomes an important aspect, and an esthetically pleasing smile plays an important role.

A smile not only helps in expressing a range of emotions but also helps to determine how well a person/child functions in society. A smile that is esthetically pleasing tends to have a significant impact on the patient's quality of existence and sense of self.[10] It also aids in boosting a person's confidence and helps avail a sense of contentment. Thus, in order to harmonize an esthetic smile, a perfect integration of the facial and dental components is required in children as well.

Thus, this study was conducted to determine the dental and facial parameters of esthetics in children and observe whether they are comparable to those of adults.

[1–4]Department of Pediatric & Preventive Dentistry, Institute of Dental Studies & Technologies, Ghaziabad, Uttar Pradesh, India

**Corresponding Author:** Deepanjali Potsangbam, Department of Pediatric & Preventive Dentistry, Institute of Dental Studies & Technologies, Ghaziabad, Uttar Pradesh, India, Phone: +91 9873377150, e-mail: deepanjalip@yahoo.com

**How to cite this article:** Potsangbam D, Agarwal N, Jabin Z, *et al.* Observation and Assessment of the Parameters of Facial Esthetics in 6-year-old Children with Healthy Dentition. Int J Clin Pediatr Dent 2023;16(4):608–611.

**Source of support:** Nil

**Conflict of interest**: None

**Patient consent statement:** The author(s) have obtained written informed consent from the patient's parents/legal guardians for publication of the case report details and related images.

## Materials and Methods

The study was conducted in the Department of Pediatric & Preventive Dentistry, Institute of Dental Studies & Technologies, Ghaziabad, Uttar Pradesh, India, on children between 5 and 6 years of age. The participants were selected on the basis of the following criteria:

### Inclusion Criteria

- Children with caries-free intact primary dentition and proportionally acceptable facial components with all of the teeth intact in both arches.
- The absence of skeletal asymmetries, diseases, and craniofacial deformities.

## Exclusion Criteria

Children having restorations, caries, any trauma, caries-related apparent loss of the anterior tooth structure, or fracture.

Any maxillofacial surgery that could affect and disfigure the dentition and face was excluded.

Children with any dental and skeletal malocclusion.

Standardized extraoral and intraoral photographs were taken. Subjects were seated on a chair with the head upright, and two photographs of each subject were taken.

- Smiling (anterior teeth visible).
- Nonsmiling.

The heads were fixed so that the mid-sagittal plane and the horizontal plane of the Frankfort were in line with the center of the camera's lens.

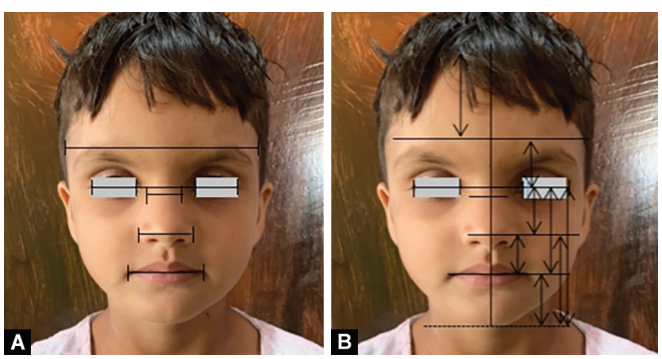
A single-lens reflex digital camera was used with standardized distance, height, and orientation values. The photographs were taken by a single person in one room and were examined and assessed by an independent examiner. Photographs were realigned to determine the facial midline. The division between the philtrum and pupillary line were two anatomical landmarks that were considered and recorded. The dental midline, which is a line that passes through the place where the central incisors of the maxilla make contact with one another and is parallel to the pupillary line, was compared to this face midline.

The pictures were resized and cropped to a typical image size of "5" by "4."

According to Rickett's approach of evaluating the divine proportions in vertical and horizontal facial planes, all images were examined. The reference points used for the face were:

- The extreme lateral commissures of the eyelids are where the lateral canthi of the eyes are placed.
- The supraorbital foramen, which is situated above the eyebrows.
- The dacryons that indicate the intersection of the maxillary, lacrimal, and frontal bones and are situated at the medial commissures of the eyes.
- The lateralmost spots on the face where the soft tissue border of the temporal is located.
- On the edges of the nose's wings are the lateral alae, which are the furthest to the side.
- The chilions, which are situated at the angle of mouth at the most lateral extremes.
- At the inferior most point of the face is the soft tissue menton [soft menton (SM)].

On the basis of the reference points, there were six horizontal measurements taken (Fig. 1A):




**Figs 1A and B:** (A) Horizontal parameters; (B) Vertical parameters

- Intercanthal (IC): The distance in horizontal terms between the right and left lateral canthus of the respective eyes. The intereye (IE) point was taken as the midpoint of this measurement.
- Interdacryon (ID): The distance horizontally between the left and right dacryons of the eye.
- Interalae (IA): The distances in meters along the horizontal axis between the left and right lateral rims of the nasal ala. The line's center was at the ala point (AP).
- Interchilion (IC): The distance horizontally between the mouth's left and right chilions. The line's midway was the stomion (S).
- Intertemporal (IT): A line drawn across the projected position of the head's supraorbital foramen was used to measure the distance horizontally between the soft tissue lateral borders of the left and right temples.
- Nose width (NW) and eye width (EW).

The origin of the hairline and Ricketts' index point for the vertical measures was taken into account.

Along the facial bisecting vertical line, seven vertical measurements were taken (Fig. 1B).[11]

- Forehead height: Trichion to the intertemporal plane's dividing line.
- Intereye (IE) point to SM.
- Intereye (IE) point to S.
- Intereye (IE) point to AP.
- Ala point (AP) to S.
- Ala point (AP) to SM.
- Stomion (S) to SM.

Using the aforementioned reference points, different parameters were calculated in the horizontal and vertical planes. Comparison was done with standard values of adults. The measurements obtained were subjected to statistical analysis. On the data of the selected children's and adults' smiling and nonsmiling faces, the mean, *N*-value, and standard deviation were determined. Mann–Whitney *U* test was applied for *p*-value.

## Result

Tables 1 and 2 depict the mean values of the various parameters in children with smile and without smile, respectively.

When the parameters of the adult and children groups were compared, the findings revealed with a smile, the horizontal measurements had highly significant differences among the mean difference, with their *p*-value ranging from 0.001 to 0.01 (significant *p*-value < 0.05) (Table 3).

In the case of the vertical measurements, there was again a highly significant difference noted among the mean difference with *p*-value = 0.001 (significant *p*-value < 0.05) (Table 3).

On comparison of the dental parameters of children and adults, a highly significant difference was noted, with *p*-value being 0.004 in the case of the length of central incisor and the remaining parameters having *p*-value of 0.001 (significant *p*-value < 0.05) (Table 3).

In the nonsmiling category, the horizontal measurements had highly significant differences among the mean difference with their *p*-value as 0.001 (significant *p*-value < 0.05) (Table 4).

In vertical measurements, not all the parameters could be measured for comparison; those which could be compared were IE–SM, IE–AP, and AP–SM. Highly significant difference noted was 0.001 with *p*-value < 0.05 (Table 4).

The dental parameters could not be measured in this category.

**Table 1:** Mean values of various parameters of face in children with smile

| | *Child* | |
|---|---|---|
| *Parameter* | *Mean* | *Standard deviation (SD)* |
| IC | 3.31 | 0.21 |
| ID | 1.12 | 0.09 |
| IA | 1.36 | 0.19 |
| IC | 1.76 | 0.10 |
| IT | 4.60 | 0.43 |
| N/W | 0.96 | 1.30 |
| E/W | 0.93 | 0.06 |
| IE–SM | 3.34 | 0.26 |
| IE–S | 2.12 | 0.21 |
| IE–AP | 1.39 | 0.22 |
| AP–S | 0.60 | 0.04 |
| AP–SM | 1.83 | 0.16 |
| S–SM | 1.15 | 0.11 |
| IL | 0.22 | 0.03 |
| WOCI | 0.44 | 0.49 |
| WOLI | 0.18 | 0.03 |
| Canine | 0.16 | 0.04 |
| IP–CI | 0.19 | 0.12 |
| CI–LI | 0.13 | 0.03 |
| LI–C | 0.14 | 0.12 |

WOCI, width of central incisor; WOLI, width of lateral incisor; LI, lateral incisor; IL, interlip; IP, incisive papilla; CI, central incisor; C, Canine

**Table 2:** Mean values of various parameters of face in children without smile

| | *Child* | |
|---|---|---|
| *Parameter* | *Mean* | *SD* |
| IC | 3.13 | 0.38 |
| ID | 1.13 | 0.11 |
| IA | 1.43 | 0.19 |
| IC | 2.63 | 3.34 |
| IT | 4.49 | 0.44 |
| N/W | 0.90 | 0.96 |
| E/W | 0.89 | 0.07 |
| IE–SM | 3.30 | 0.24 |
| IE–AP | 1.43 | 0.18 |
| AP–SM | 1.98 | 0.19 |

WOCI, width of central incisor; WOLI, width of lateral incisor; LI, lateral incisor; IL, interlip; IP, incisive papilla; CI, central incisor; C, Canine

## Discussion

In this era of social media, where every moment of a child is captured on screen by doting parents, esthetics has gained immense significance in pediatric dentistry. Previously, while anterior tooth loss in a toddler or preschooler was acceptable, in today's society, even discolored primary anterior tooth or unesthetic composite restoration is discarded as bad practice. Esthetic concerns are now prioritized heavily by society, and this applies to both adults and children. It is also becoming more and more important when considering dental treatment.[12] In earlier times, pedodontists concentrated on repairing the primary and permanent dentition's structural integrity and functionality.

**Table 3:** Mean difference among the two groups with smile

| *Parameter* | *Mean difference* | *p-value* |
|---|---|---|
| IC | 3.60 | 0.01 |
| ID | 0.73 | 0.01 |
| IA | 0.85 | 0.01 |
| IC | 1.98 | 0.01 |
| IT | 4.76 | 0.01 |
| N/W | 0.87 | 0.001 |
| E/W | 1.07 | 0.001 |
| IE–SM | 4.89 | 0.001 |
| IE–S | 4.25 | 0.001 |
| IE–AP | 1.50 | 0.001 |
| AP–S | 1.85 | 0.001 |
| AP–SM | 3.54 | 0.001 |
| S–SM | 2.20 | 0.001 |
| IL | 0.35 | 0.001 |
| WOCI | 0.51 | 0.004 |
| WOLI | 0.29 | 0.001 |
| Canine | 0.22 | 0.001 |
| IP–CI | 0.20 | 0.001 |
| CI–LI | 0.25 | 0.001 |
| LI–C | 0.15 | 0.001 |

WOCI, width of central incisor; WOLI, width of lateral incisor; LI, lateral incisor; IL, interlip; IP, incisive papilla; CI, central incisor; C, Canine

**Table 4:** Mean difference among two groups in nonsmiling category

| *Parameter* | *Mean difference* | *p-value* |
|---|---|---|
| IC | 3.51 | 0.001 |
| ID | 0.74 | 0.001 |
| IA | 0.93 | 0.001 |
| IC | 1.28 | 0.002 |
| IT | 4.47 | 0.001 |
| N/W | 0.87 | 0.001 |
| E/W | 1.39 | 0.001 |
| IE–SM | 5.25 | 0.001 |
| IE–AP | 1.54 | 0.001 |
| AP–SM | 3.68 | 0.001 |

WOCI, width of central incisor; WOLI, width of lateral incisor; LI, lateral incisor; IL, interlip; IP, incisive papilla; CI, central incisor; C, Canine

As a relatively new field, smile designing is constantly developing its approaches and philosophies.[13] Clinicians must be able to assess what forms the essential elements of the ideal smile. This concept extends beyond only the teeth to one of total dentofacial harmony. Understanding the delicate blending of the key elements of a smile—facial esthetics, gingival esthetics, and macro- and microesthetics of the teeth—is necessary for this.[14]

Many people believe that the golden ratio, commonly referred to as the divine proportion, is the key to comprehending esthetics, attractiveness, and human beauty. It is a number on the order of 1.618033988 and is represented by the symbol phi. To determine and assess the ratios between the many components of the attractive face, Ricketts created a "golden proportion calliper."

He asserted in 1982 that he had discovered numerous excellent lateral and frontal cephalograms after carefully examining them. After looking at pictures of models, he also

discovered several divine ratios within the face. Therefore, Ricketts recommended using these divine proportion ratios as a reference while organizing orthognathic surgery. The golden ratio was first suggested for use in dentistry by Lombardi, who added, "It has proved too strong for dental use."

The dentist must carefully examine the situation and design the appropriate course of action to get a satisfying functional and esthetically pleasing result.[15] A successful esthetic outcome can be obtained if clinicians comprehend their patients and provide them with a smile that suits both their aspirations and personalities.

The proportions that were described are simply suggestions because optimal proportions, particularly for growing children, alter over time and depend on the patient's expectations. In orthognathic procedures, the horizontal facial proportions can be used to change the form of the jaws to improve dental occlusion stability, improve temporomandibular joint function (corrective jaw surgery), and correct bilateral asymmetries to improve the patient's face proportions.[11] The optimal facial appearance is the result of a detailed process that takes into account how each feature interacts with the other features of the face.

Therefore, one must take into account the (*n*) number of different measurements that can be taken in children in an area as anatomically complex as the human skull, and more research regarding this mathematical relationship is required before determining its clinical implications as a crucial parameter for achieving esthetic harmony. Other age ranges and racial characteristics can be the subject of future investigation.

## Conclusion

Consequently, one conclusion that can be drawn from the current study is that certain adult facial parameters that have been used previously in studies for the purpose of smile designing cannot be used in those of children.

To solve the purpose of smile designing in children, there is a need for further studies to be effortlessly done so that we can achieve a certain set of standardized parameters that can be utilized for designing smiles.

## Orcid

*Deepanjali Potsangbam* https://orcid.org/0000-0001-7963-9947
*Nidhi Agarwal* https://orcid.org/0000-0002-9231-8256

## References

1. Durgekar SG, K N, Naik V. The ideal smile and its orthodontic implications. World J Orthod 2010;11(3):211–220.
2. Desai S, Upadhyay M, Nanda R. Dynamic smile analysis: changes with age. Am J Orthod Dentofacial Orthop 2009;136(3):310.e1–310.e10. DOI: 10.1016/j.ajodo.2009.01.021
3. Pabari S, Moles DR, Cunningham SJ. Assessment of motivation and psychological characteristics of adult orthodontic patients. Am J Orthod Dentofacial Orthop 2011;140(6):e263–e272. DOI: 10.1016/j.ajodo.2011.06.022
4. Machado AW, Moon W, Gandini LG Jr. Influence of maxillary incisor edge asymmetries on the perception of smile esthetics among orthodontists and laypersons. Am J Orthod Dentofacial Orthop 2013;143(5):658–664. DOI: 10.1016/j.ajodo.2013.02.013
5. Machado AW, McComb RW, Moon W, et al. Influence of the vertical position of maxillary central incisors on the perception of smile esthetics among orthodontists and laypersons. J Esthet Restor Dent 2013;25(6):392–401. DOI: 10.1111/jerd.12054
6. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. J Prosthet Dent 1973;29(4):358–338. DOI: 10.1016/s0022-3913(73)80013-7
7. Rufenacht CR. Fundamentals of esthetics. Chicago: Quintessence; 1990.
8. Chiche G, Pinault A. Esthetics of anterior fixed prosthodontics. Chicago: Quintessence; 1994.
9. Pani SC, Saffan AA, AlHobail S, et al. Esthetic concerns and acceptability of treatment modalities in primary teeth: a comparison between children and their parents. Int J Dent 2016;2016:3163904. DOI: 10.1155/2016/3163904
10. Nold SL, Horvath SD, Stampf S, et al. Analysis of select facial and dental esthetic parameters. Int J Periodontics Restorative Dent 2014;34(5):623–629. DOI: 10.11607/prd.1969
11. Anand S, Tripathi S, Chopra A, et al. Vertical and horizontal proportions of the face and their correlation to phi among Indians in Moradabad population: a survey. J Indian Prosthodont Soc 2015;15(2):125–130. DOI: 10.4103/0972-4052.155033
12. Alshiddi IF, BinSaleh SM, Alhawas Y. Patient's perception on the esthetic outcome of anterior fixed prosthetic treatment. J Contemp Dent Pract 2015;16(11):845–849. DOI: 10.5005/jp-journals-10024-1768
13. Sharma PK, Sharma P. Dental Smile esthetics: the assessment and creation of the ideal smile. Semin Orthod 2012;18(3):193–201. DOI: 10.1053/j.sodo.2012.04.004
14. Sarver DM. The importance of incisor positioning in the esthetic smile: the smile arc. Am J Orthod Dentofacial Orthop 2001;120(2):98–111. DOI: 10.1067/mod.2001.114301
15. Ishida Y, Fujimoto K, Higaki N, et al. End points and assessments in esthetic dental treatment. J Prosthodont Res 2015;59(4):229–235. DOI: 10.1016/j.jpor.2015.05.002