

1 **FACIAL SURGERY**
2 **REVIEW ARTICLE**

3
4 **Facial Aesthetic Ideals: A Literature Summary of Supporting Evidence**

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1 **ABSTRACT**

2 **Background:** The challenge of objectively defining the parameters of beauty dates back
3 centuries. As aesthetic physicians and plastic surgeons, our responsibility is to enhance the
4 natural beauty of our patients' faces, whether it is for aesthetic enhancement or reconstructive
5 purposes. To achieve this goal, it is crucial for us to have a deep understanding of the
6 aesthetic ideals that we strive to achieve. While numerous aesthetic criteria have been
7 proposed over the years, there is a lack of empirical analysis supporting many of these
8 standards.
9

10 **Objectives:** This literature review represents the first exploration of the empirical evidence
11 concerning the aesthetic ideals of the face in the existing literature.
12

13 **Methods:** A comprehensive search in MEDLINE, EMBASE, SCOPUS and CENTRAL
14 databases was conducted for primary clinical studies reporting on the classification of the
15 facial aesthetic units as per Gonzales-Ulloa facial aesthetic unit Classification from January
16 1962 to November 2022.
17

18 **Results:** A total of 35 articles were included in the final review. There were 12 case series, 13
19 cohort studies, and 10 comparative studies. We identified 6 studies that described the
20 aesthetic ideals of the forehead with a mean level of evidence of 3.33. We identified 9 studies
21 that described the aesthetic ideals of the nose with a mean level of evidence of 3.6. We
22 identified 6 studies that described the aesthetic ideals of the orbit with a mean level of
23 evidence of 3. We identified 4 studies that described the aesthetic ideals of the cheek with a
24 mean level of evidence of 4.07. We identified 6 studies that described the aesthetic ideals of
25 the lips with a mean level of evidence of 3.33. We identified 4 studies that described the
26 aesthetic ideals of the chin with a mean level of evidence of 3.75. We identified 1 study that
27 described the aesthetic ideals of the ear with a level of evidence of 4.
28

29 **Conclusions:** The units that were most extensively studied were the nose, forehead, and lip
30 units, and they also had a relatively higher impact factor than other subunits. Conversely, the
31 chin and ear subunits had the fewest studies conducted on them and had a relatively lower
32 impact factor. In order to provide a useful resource for readers, we believe it would be
33 prudent to identify and discuss influential papers for each subunit

1 The recognition of facial beauty is a reflexive and universal phenomenon that occurs
2 instantaneously. Our ability to instinctively identify and appreciate facial beauty without
3 consciously unravelling the underlying cognitive processes or reasoning behind it remains a
4 mystery.¹ Throughout history, artists, mathematicians, and surgeons have dedicated
5 themselves to studying this phenomenon in an effort to unravel the secrets behind facial
6 beauty recognition and its defining factors. The challenge of objectively defining the
7 parameters of beauty dates back centuries, with ancient Greece providing clear
8 documentation of its significance. The Greeks firmly believed that beauty was a result of
9 ideal proportions. Aristotle, famously described beauty as "a sense of harmonious or
10 aesthetically pleasing proportionality." It was during this flourishing period of Greek
11 philosophy around 500 BC that various arithmetic principles emerged, such as the 1:1 "unity"
12 ratio, the division of the face into thirds, and the concept of the golden ratio. These principles
13 aimed to provide insights into the foundations of facial beauty.^{2, 3}

14
15 During the Renaissance era, the Euclidean concept of the golden ratio was further developed
16 into the notion of the "Divine proportion" by Luca Pacioli and Leonardo da Vinci.⁴⁻⁶ Their
17 work explored the applications of the golden ratio in geometry, architecture, and the natural
18 world, including the human face. This fusion of mathematics, art, and geometry led to the
19 formulation of early canons of facial aesthetics. In this period of experimentation, various
20 facial indices were introduced, such as the classical facial index, the Bruges facial index, and
21 the Vitruvian proportions in the lower face.^{2, 7, 8} Even in contemporary aesthetics, the golden
22 ratio continues to inspire research in the field of facial aesthetics.⁹ One prominent advocate of
23 the golden ratio, Marquardt, conducted cross-cultural surveys on beauty, both in modern and
24 historical contexts.¹⁰ His research led him to conclude that beauty is a result of the golden
25 ratio, which remains consistent across genders, races, and cultures. Based on this belief,
26 Marquardt developed the controversial "Marquardt mask" as a means to determine optimal
27 beauty. The mask is derived from the application of the "golden decagon matrix," which is
28 created by applying the golden ratio to human faces.¹⁰ However, similar to previous attempts
29 at defining beauty, this "one mask fits all" approach has also proven inadequate in accurately
30 predicting or modelling facial aesthetics.^{11, 12}

31
32 In the twentieth century, the field of facial anthropometry saw significant advancements
33 thanks to the contributions of surgeons like Seghers, Farkas, and Ricketts.¹³⁻¹⁶ Their research
34 involved conducting direct measurements of facial features in both attractive and unattractive
35 individuals, aiming to compare and establish standard values for attractive facial features.
36 Their findings challenged the notion that aesthetic ideals were solely based on the golden
37 ratio. They emphasized that there are multiple components contributing to facial
38 attractiveness beyond mere proportions. Their work revealed that facial beauty arises from
39 the interplay of various factors, including symmetry, averageness, ogee curves (S-shaped
40 curves), measurements of individual subunit features, and overall proportions.¹⁷ A face that
41 harmoniously incorporates these elements adheres to a global standard of beauty, which has
42 been observed to be consistent across different ethnicities and cultures.

43 As aesthetic physicians and plastic surgeons, our responsibility is to enhance the natural
44 beauty of our patients' faces, whether it is for aesthetic enhancement or reconstructive
45 purposes. To achieve this goal, it is crucial for us to have a deep understanding of the
46 aesthetic ideals that we strive to achieve. While numerous aesthetic criteria have been
47 proposed over the years, there is a lack of empirical analysis supporting many of these
48 standards. Therefore, it is essential to have a comprehensive and concise comprehension of
49 the quantitative evidence related to aesthetic standards. This knowledge will enable
50 practitioners to optimize their outcomes and introduce objectivity into our field. To the best

1 of our knowledge, this literature review represents the first exploration of the empirical
2 evidence concerning the aesthetic ideals of the face in the existing literature.

3 4 **METHODS**

5 **Search Strategies**

6 A comprehensive, systematic literature search of published articles was conducted according
7 to the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines.¹⁸ The search
8 collected articles published from January 1962 until November 2022.

9 The literature search was performed using MEDLINE (National Institutes of Health,
10 Bethesda, MD), Embase (Elsevier, Amsterdam, the Netherlands), SCOPUS (Elsevier,
11 Amsterdam, the Netherlands), and CENTRAL (Wiley, Hoboken, NJ) databases. The
12 keywords used in the search were selected from key papers; two search strings were created
13 and combined using the Boolean term 'AND'. Additionally, a MeSH term search was also
14 conducted. Forwards and backwards citation searching, as well as grey literature was checked
15 to identify further articles. A search was carried out for each of the aesthetic subunits as per
16 Gonzales-Ulloa facial aesthetic unit Classification.¹⁹

17 **String 1:** "Face" OR "Forehead" OR "Nose" OR "Eyelid" OR "Cheek" OR "Upper lip" OR
18 "Lower lip" OR "Chin" OR "Ear" AND "Aesthetic" OR "beauty"

19 **String 2:** "Classification" OR "Analysis" OR "Measurement" OR "Anthropometry" OR
20 "Ideal*"

21 **Inclusion criteria**

- 22 1. Original research publications including randomised controlled trials, cohort studies,
23 case-control studies and case series which reported on the aesthetic classification of at
24 least 1 facial unit.
- 25 2. Human female subjects

27 **Exclusion criteria**

- 28 1. Studies reporting on the measurement of facial units without providing aesthetic
29 ideals.
- 30 2. Studies with only male subjects
- 31 3. Review articles
- 32 4. Conference abstracts without full text
- 33 5. Case reports
- 34 6. Non-English studies

35 **Outcome measures**

36 The primary outcome measure was the presentation of data related to aesthetic classification
37 of facial subunits.

39 **Study selection and data management**

1 Study selection was conducted in a two-stage process. Titles and abstracts were initially
2 screened by two reviewers (RF and PS) for potential eligibility, after excluding duplicate
3 records. Next, studies identified as relevant underwent full-text review by both reviewers.
4 Any discrepancies between the reviewers were resolved by discussion or referral to a third
5 reviewer (AP). The data from all full-text articles accepted for the final analysis were
6 independently retrieved by RF and PS using a standardized data extraction form. Any
7 discrepancies between the reviewers were resolved by discussion or referral to AP. All data
8 was then reviewed by AP. The search results, including abstracts, full-text articles and
9 records of reviewers' decisions, including reasons for exclusion, were recorded in Endnote
10 X8 (Clarivate Analytics, USA).

11 The extracted data includes details on study characteristics, number of patients, classification
12 used, methodology, study objectives, outcomes, ideals listed. Data were extracted from the
13 studies as presented.
14
15

16 **RESULTS**

17 **Literature search results**

18 We found 2773 articles in the MEDLINE database search, 2739 articles in the EMBASE
19 database search, 1760 in the SCOPUS database search and 172 in the CENTRAL database
20 search. References from these three searches were combined, and after removing the
21 duplicates, 4640 articles were available for title and abstract reviewing. Of these, 4546
22 articles did not meet the inclusion criteria and were excluded. Following full-text review of
23 the remaining 94 articles, 68 articles were excluded as the inclusion criteria were not met. A
24 secondary search of the reference list revealed an additional 10 articles. A total of 36 articles
25 were included in the final review and formed the basis of this systematic review (Figure 1).
26 Details of the included studies were summarized in Supplemental Table 1. There were 12
27 case series, 14 cohort studies, and 10 comparative studies. The mean level of evidence of the
28 studies included in this review was 3.29.
29

30 **Forehead**

31 We identified 6 studies that described the aesthetic ideals of the forehead. The mean level of
32 evidence for this unit is 3.33. The mean impact factor of the journals that these studies were
33 published in is 4.09.
34

35 **Nose**

36 We identified 9 studies that described the aesthetic ideals of the nose. The mean level of
37 evidence for this unit was 3.33. The mean impact factor of the journals that these studies were
38 published in is 3.60.
39

40 **Orbit**

41 We identified 6 studies that describe the aesthetic ideals of the peri-orbital unit. The mean
42 level of evidence for this unit was 3. The mean impact factor of the journals that these studies
43 were published in is 1.82.
44

45 **Malar**

46

1 We identified 4 studies that described the aesthetic ideals of the malar unit. The mean level of
2 evidence for this unit was 3.25. The mean impact factor of the journals that these studies
3 published in is 4.07.

4 **Lip**

5 We identified 6 studies that described the aesthetic ideals of the lip unit. The mean level of
6 evidence for this unit was 3.33. The mean impact factor of the journals that these studies were
7 published in is 3.40.

8 **Chin**

9 We identified 4 studies that described the aesthetic ideals of the chin unit. The mean level of
10 evidence for this unit was 3.75. The mean impact factor of the journals that these studies were
11 published in is 1.95.

12 **Ear**

13 We identified 1 study that described the aesthetic ideals of the ear unit. The level of evidence
14 for this study was 4. The impact factor of the journal that this study was published in is 2.08.

15 **DISCUSSION**

16 The purpose of conducting this literature review was to gather and analyse the existing
17 evidence regarding the aesthetic standards of different facial subunits. It is not surprising that
18 some subunits received more attention from researchers compared to others. The subunits
19 that were most extensively studied were the nose, forehead, and lip units, and they also had a
20 relatively higher impact factor than other subunits. Conversely, the chin and ear subunits had
21 the fewest studies conducted on them and had a relatively lower impact factor. Interestingly,
22 despite having a large number of studies conducted on it, the peri-orbital area had the lowest
23 average impact factor. Notably, the majority of studies on the peri-orbital area were
24 conducted in east Asia, whereas studies on other facial units were predominantly carried out
25 in western regions; emphasising the cultural significance attached to certain facial subunits.
26 Meta-analysing all the studies in a quantifiable way presents a challenge due to significant
27 heterogeneity in the methodology of the papers and the various measurements used in
28 defining aesthetic standards. This heterogeneity includes the use of different metrics,
29 proportions, degrees, coordinates, and descriptions. Furthermore, authors utilised various
30 methods to compare attractive and less attractive faces, including evaluating fashion models,
31 grouping faces into attractive and unattractive categories by non-medical study participants,
32 having professional make-up artists rank attractiveness, and the authors themselves ranking
33 attractiveness.

34 As a result, it becomes challenging to combine the results of different studies into a single,
35 quantifiable analysis. Our comprehensive search yielded numerous aesthetic classifications
36 for each facial subunit. In order to provide a useful resource for readers, we believe it would
37 be prudent to identify and discuss influential papers for each subunit. By doing so, readers
38 can refer to these papers as a reference point for further investigation and analysis.

39 **Forehead**

40 The forehead aesthetic unit can be subdivided into three subunits: the central forehead, lateral
41 forehead (temple) and brow (Figure 2).^{19, 55}

1 Eyebrows

2 Most of the studies that investigated the aesthetic standards of the forehead focused on
3 defining the standards for the eyebrow. The aesthetics of the eyebrow have evolved over the
4 years, with fashion trends playing a significant role in shaping the standards. One of the
5 earliest definitions of a modern aesthetic ideal for the brow was provided by Westmore
6 (Figure 2a).⁵⁶ However, it is important to note that this definition did not provide any
7 numerical guidelines for the brow. Instead, it was based solely on Westmore's aesthetic
8 ideals, without any empirical evidence to support his suggestion.

9 Gunter and Antrobus conducted a study to explore the relevance of eyebrow shape in facial
10 aesthetics. In their study, the authors compared the difference in brow shape between a group
11 of 'attractive' models from fashion magazines and a second group of patients from their
12 practice who were consulted for facial rejuvenation procedures (many of which underwent
13 brow lifts).²⁰ They suggested that when evaluating eyebrow aesthetics, it is important to
14 consider the entire periorbital area, especially the eyelids. By doing so, one can better
15 understand the impact of the brow shape on the overall appearance of the eyes and
16 surrounding areas.

17 Another important consideration in evaluating eyebrow aesthetics is the patient's facial shape.
18 It has been suggested that although the Westmore brow is considered the most aesthetically
19 appealing in an oval face shape, this may not necessarily be the case for individuals with
20 more round, square, or long face.²¹ Therefore, it is important for practitioners to consider the
21 patient's individual facial features and characteristics when determining the most appropriate
22 brow shape and aesthetic ideal.

23 Forehead Length

24 The ideal vertical height of the forehead is also an important consideration in facial
25 anthropometry and aesthetics. Studies have shown that elongation of the forehead can
26 negatively impact facial attractiveness.²² Several studies have suggested that the ideal
27 forehead height (measured from brow to hairline) in females should be between 5-6cm.^{15, 24,}
28 ⁵⁷ These studies determined the ideal height based on the concept of averageness, where
29 anthropometric measurements of forehead length were obtained from a population of
30 'average' individuals. In addition to metric measurements for forehead length, there are
31 several ideal proportions to consider when assessing facial aesthetics. One of the most widely
32 used canons over the centuries has been the division of the face into horizontal thirds.
33 Leonardo da Vinci described the canon of equal thirds, which states that the following three
34 measurements should be equal: the upper third (trichion to glabella), the middle third
35 (glabella to subnasale), and the lower third (subnasale to menton)⁵⁸ (Figure 2b). Studies have
36 shown that attractive females generally meet the criteria of these proportions in terms of their
37 facial parameters.⁵⁸

39 Forehead Inclination

40 Forehead inclination is a measure of the lateral contour of the forehead, defined as the angle
41 between the line from the trichion to the glabella when the face is placed on the Frankfurt
42 horizontal line (Figure 2b).⁵⁹ In a study of 100 Korean women, Oh et al. found that the mean
43 forehead inclination was 12.47° (ranging from 11.6 to 13.3).⁶⁰ This study, however, did not
44 focus on determining the most attractive forehead inclination. Instead, it emphasises the
45 potential significance of considering forehead inclination as a factor in assessing
46 attractiveness. Furthermore, it highlights the importance of recognising and accounting for
47 racial variations in facial structure and aesthetic preferences. Swift and Jones suggested that a
48 beautiful female forehead has a curve of 12-14° recession off the vertical axis (as shown in a
49
50

1 figure).⁹ Although this measurement is important to consider, there are no studies comparing
2 the curve of the forehead in attractive and unattractive faces.
3
4

5 **Nose**

6 The nose, as the central feature of every face, plays a crucial role in determining overall facial
7 beauty among facial units. However, due to the complex three-dimensional morphology of
8 the nose and its central role in aesthetics, many potential ideals for nasal aesthetics have been
9 suggested. To quantify nasal dimensions, several measurements can be taken into account,
10 including height, width, and inclinations such as nasal tip projection, nasolabial angle, and
11 nasofrontal angle. Additionally, nasal proportions such as nose width/nose height, nose
12 height/face height, and nose width/face width are also considered. (Figure 3)
13

14 **Inter-Alar to Inter-Canthal Ratio**

15 To determine the quantitative parameters of the ideal nose, Farkas et al. conducted a study
16 comparing anthropometric nasal and craniofacial measurements between attractive and
17 below-average faces of young north American Caucasian women.²⁶ The study included 34
18 attractive women and 21 "below average" faces from a group of 200 women, and various
19 nasal and craniofacial parameters were measured and compared. This paper is considered one
20 of the earliest and most influential works in this field. However, the authors did not specify
21 how the attractiveness groups were determined in the study. Farkas not only emphasizes the
22 absence of six neoclassical canons, namely the three-section profile canon, nasoaural canon,
23 orbitonasal canon, nasofacial canon, naso-oral canon and nasoaural inclination canon, in
24 aesthetically pleasing noses, but also presents a detailed quantitative analysis of the
25 dimensions, angles, and proportions of the aesthetically pleasing nose. This analysis is
26 backed by numerical data and measurements.²⁶ The orbitonasal canon, which is one of the
27 earliest canons, proposes that the distance between the nostrils (inter-alar distance) should be
28 equivalent to the distance between the inner corners of the eyes (inter-canthal distance).⁶¹
29 However, Baker et al conducted a study to determine the optimal alar width and measured
30 this ratio in 36 Caucasian females who were objectively rated as the 'most beautiful women'
31 by *People Magazine*. Their findings indicated that the ideal inter-alar distance for aesthetic
32 purposes is slightly wider than the inter-canthal distance, with a ratio of 1:1.17.²⁸
33

34 **Nasal Tip Projection**

35 Nasal tip projection (NTP) refers to the forward extent of the nasal tip from the facial surface,
36 which is most prominently observed in the profile view. NTP is considered to be one of the
37 most critical aspects of both nasal aesthetics and rhinoplasty procedures. The earliest and
38 most frequently referenced method for measuring NTP was established by Goode, who
39 determined it as a ratio calculated by dividing nasal height by nasal length. According to
40 Goode, the optimal NTP range is between 0.55 and 0.6. Since then, several other techniques
41 for measuring NTP have been proposed, such as the Simons, Baum, Powell, and Crumley
42 ratios.^{30, 62-64}

43 Numerous papers have since attempted to examine the relationship between facial
44 attractiveness and the different methods of NTP measurement. These studies applied various
45 NTP measurement techniques to facial images, which were subsequently assessed for
46 attractiveness. The level of correlation between the different NTP measurement methods and
47 facial attractiveness was then evaluated.

48 The Crumley methods (Crumley 1 & 2) demonstrate the strongest correlation with facial
49 attractiveness.^{30, 31, 32} The Crumley 1 method calculates NTP by dividing the sum of upper lip
50 length and nasal length by nasal height, whereas the Crumley 2 method determines NTP by

1 dividing the distance from the vertex of nasofrontal angle to menton by nasal height. Crumley
2 has suggested that the optimal NTP is 3.53 when using the Crumley 1 method and 4.23 when
3 using the Crumley 2 method.

4 **Nasolabial Angle**

5 The available literature provides different methods of measuring the nasolabial angle (NLA),
6 with four commonly used definitions: (1) the angle between the columella and the line that
7 intersects the subnasale and labrale superius, (2) the angle between the columella and the line
8 tangent to the cutaneous upper lip proper, (3) the angle between the long axis of the nostril
9 and the line perpendicular to the Frankfort horizontal, and (4) the angle between the long axis
10 of the nostril and the line that intersects the glabella and pogonion.^{26, 31, 32, 65} However, there
11 are no studies that have compared the aesthetic relevance of these various definitions. In a
12 survey of 82 rhinoplasty surgeons, Harris et al. (2016) found that there is no consensus
13 among surgeons regarding the optimal definition of NLA.⁶⁶ We identified two studies that
14 have attempted to calculate the ideal NLA empirically.

15
16 Sinno et al. defined NLA as the angle between the columella and the line tangent to the
17 cutaneous upper lip proper.³² They conducted a study where 98 members of the public rated
18 the aesthetic appeal of three different nasolabial angles (100°, 105°, 110°) and concluded that
19 the most aesthetically pleasing NLA was 104.9°. On the other hand, Armijo et al. defined
20 NLA as the angle between the long axis of the nostril and the line perpendicular to the
21 Frankfort horizontal.³³ They manipulated lateral photographs of ten women to have various
22 nasolabial angles (90° to 110°) and then had plastic surgery residents and office staff rate
23 these photographs. Their study suggested that the ideal nasolabial angle would be $97.7 \pm$
24 2.32° with a range of 95.56 to 100. It is worth noting that each definition of NLA has its
25 advantages and disadvantages.

26 The method described by Sinno et al. considers the surface anatomy of the patient, which can
27 lead to a better understanding of the patient's aesthetic preferences.³² However, this method
28 can be distorted by underlying bone or soft tissue abnormalities such as upper lip fillers or
29 implants, upper lip deficiency, class II malocclusion, protrusive maxilla, and upper incisor
30 inclination. In contrast, measuring NLA using a line perpendicular to the Frankfort horizontal
31 or a line intersecting the glabella and pogonion is governed by a facial plane and therefore,
32 the bony structures play a larger role in defining the NLA than the soft tissues. These
33 measurements are more constant over time and less likely to be altered, but they are more
34 difficult to make in person and do not consider the labial component of the angle. For
35 aesthetic surgeons, it is important to choose the definition of NLA that is most appropriate for
36 their patient. Additionally, when making comparisons of proposed aesthetic ideals, it is
37 essential to consider how the studies have measured NLA to avoid discrepancies. In
38 summary, the choice of NLA definition should be made based on the patient's individual
39 characteristics and the surgeon's preferences. The advantages and disadvantages of each
40 definition should be taken into account when selecting the most appropriate method, and
41 comparisons between studies should be made with caution.

42 **Orbit**

43
44 The eyes and periorbital area are crucial in determining facial attractiveness and are often the
45 first areas to display signs of aging. Ethnic differences in the morphology of this region also
46 exist, further highlighting the importance of individualized treatment approaches. The
47 primary objective of surgery in this region is typically to restore a more youthful appearance.
48 To accomplish this goal, several measurements must be taken into account. These
49
50

1 measurements may include the degree of brow ptosis the amount of upper eyelid skin
2 redundancy (excess skin), the amount of orbital fat prolapse, and the degree of lower eyelid
3 malposition (drooping or bulging of the lower eyelid).
4

5 **Canthal Tilt**

6 Canthal tilt is defined as the angle between the horizontal line from the medial to the lateral
7 canthus and is considered an important factor in determining facial aesthetics (Figure 4).
8 While a positive canthal tilt is generally preferred, there is still debate regarding the ideal
9 degree of tilt. Research conducted by Kim et al, who measured anthropometric data on a
10 group of 43 Korean beauty pageant models, suggested that the ideal canthal tilt for Korean
11 women is around 8 degrees.³⁴ Similarly, Rhee et al found that a canthal tilt of 8 degrees was
12 desirable in Korean women, while noting that Caucasian women typically have a lower
13 average canthal tilt of 4.12 degrees.³⁸ These findings highlight the importance of taking into
14 account the ethnic background of the population being studied in determining aesthetic ideals
15 of the orbital area.^{34, 35} It is essential to understand and appreciate the cultural, racial and
16 gender based anatomical differences between populations in order to achieve optimal
17 outcomes in facial plastic surgery.
18

19 **Upper Eyelid**

20 The upper eyelid varies greatly among different ethnicities and is the focus of many
21 procedures. One of the key differences between ethnicities is the presence of a supratarsal
22 crease. The supratarsal crease is the fold of skin in between the brow fat span and the tarsal
23 platform show. Numerous studies have delved into the exploration of aesthetic ideals
24 specifically within East Asian populations, shedding light on the significance of the
25 supratarsal crease in defining an aesthetically pleasing eye.^{34, 36, 37} In their research, Rhee et
26 al brought attention to the differing characteristics of the supratarsal crease among various
27 ethnic groups.³⁸ They found that in Caucasian individuals, a lower-positioned supratarsal
28 crease tends to impart a more natural and youthful appearance. On the other hand, in Korea, a
29 higher-positioned supratarsal crease without an epicanthal fold is considered preferable,
30 while in Japan, a higher-positioned supratarsal crease with the presence of the epicanthal fold
31 is favoured.³⁸ In their study, Vaca et al explored the topographic variations of upper eyelid
32 proportions among Caucasian females. 294 individuals were evaluated for their eye
33 “attractiveness” by a panel of 6 members comprising both plastic surgeons and laypersons.³⁹
34 The authors conducted a comparison between eyes categorised as “attractive” and
35 “unattractive.” They specifically directed their attention towards assessing the ratio between
36 the upper lid fold (the crease of the eyelid to the lower margin of the brow) and the pretarsal
37 region (area from lash line to eyelid crease) at multiple positions. The authors illustrated
38 elevated rations in attractive eyes compared to less attractive ones. Furthermore, they
39 emphasised earlier observations indicating a stronger connection between positive canthal tilt
40 and attractive eyes. The authors also investigated the link between the golden spiral and
41 upper lid aesthetics. They discovered that the curvature peaks of attractive eyes aligned more
42 closely with the golden spiral compared to less attractive eyes. However, this observation did
43 not attain statistical significance, underscoring the tendency of conventional standards to
44 come up short under empirical examination. These findings further underscore the crucial
45 importance for surgeons to recognize and consider the influence of ethnicity on beauty ideals
46 when planning aesthetic procedures involving the periorbital region. By acknowledging these
47 ethnic nuances, surgeons can tailor their approaches and techniques to achieve results that
48 align with the aesthetic preferences and cultural norms specific to each ethnic group.
49

1 The tarsal platform show (TPS) refers to the distance between the upper eyelash and the
2 supratarsal crease (Figure 4). In a study conducted by McDonnell et al, 110 individuals were
3 asked to rate 42 Caucasian faces. These faces were divided into two categories: 'attractive'
4 and 'unattractive' by lay people. The researchers measured various eyelid parameters and
5 compared the differences between these two groups. The study revealed that the tarsal
6 platform show was lower in the group perceived as aesthetically pleasing, with an average
7 measurement of 2.97 ± 0.9 mm.³⁵

8 9 **Lower Eyelid**

10 The morphology of the lower eyelid exhibits considerably less variation compared to the
11 upper eyelid. Currently, there is a lack of empirical studies that specifically classify the
12 aesthetic ideal of the lower lid. However, one prominent reason for undergoing lower lid
13 surgery is the age-related lengthening of the lower lid. A crucial measurement utilized to
14 define the lower eyelid is the vertical distance from the lower eyelid margin to the lower lid
15 crease in the mid-pupillary line, as outlined by Fezza and Massry.⁶⁷ In their research, Fezza
16 and Massry demonstrated a strong linear correlation between age and lower lid length. This
17 measurement plays a significant role in assessing the youthfulness of the lower eyelid region
18 and thereby influences the aesthetic ideal associated with it.⁶⁷

19 20 **Cheek/Malar**

21 The intricacy of the subtle curvature found in the malar region poses a challenge when
22 attempting to define it quantitatively. The interplay of facial shadows and highlights plays a
23 significant role in creating the desirable curves associated with a youthful face. Existing
24 literature acknowledges the limitations of analyzing the malar region solely through anterior
25 and lateral views, suggesting that an oblique angle is necessary.⁴⁰ Addressing the aging
26 midface is a critical aspect of facial rejuvenation, as it often involves a loss of malar
27 projection, resulting in a disruption of the youthful ogee curves. The concept of the malar
28 ogee curve was first introduced by Little.⁶⁸ He emphasized that when observing a face from
29 an oblique angle, the soft tissues in the midface form an architectural "S" shaped curve. Little
30 described the ideal malar ogee curve as an elegant transition starting from the lateral tail of
31 the brow, flowing through the convex fullness of the cheek, and tapering into the concave
32 contour of the mandibular border. This configuration creates a harmonious and aesthetically
33 pleasing appearance.

34 35 **Ogee Curve**

36 To gain a comprehensive understanding of the malar area, it is essential to consider the
37 relationship between the Ogee curves and the key landmarks within the midface. These
38 landmarks include the malar eminence, zygomatic point, malar hollow, and the anterior and
39 posterior mandible.^{40, 42} The configuration and alignment of these landmarks contribute to
40 shaping the overall appearance of the midface. However, it is worth noting that only a limited
41 number of studies have successfully established parameters for aesthetically classifying the
42 midface. These studies have attempted to quantify the relationship between landmark points
43 by measuring lengths from the midline, employing coordinates, or calculating distances from
44 reference lines (such as the lateral canthus to oral commissure or interzygomatic distance).
45 Additionally, some early studies have presented aesthetic ideals by defining specific facial
46 coordinates in frontal, lateral, and oblique views. While these approaches are intriguing, they
47 present challenges when it comes to their practical application in current clinical practice.

48 49 **WIZDOM**

1 Linkov et al introduced the WIZDOM (Width of interzygomatic distance of the midface)
2 parameter as a valuable tool for assessing the relationship between midface landmarks
3 (Figure 5).⁴¹ By drawing a horizontal line connecting the zygomaxillary points on both sides
4 of the face, the authors were able to measure various distances and relationships between this
5 line and multiple facial landmarks, including the chin, medial canthus, and lateral brow. In
6 their study, the authors assessed the faces of 55 attractive models and developed the
7 WIZDOM parameter, aiming to identify aesthetic ideal parameters for the midface. The
8 results demonstrated that WIZDOM is a reliable and straightforward tool that can be utilized
9 to define the midface in two-dimensional photographs. By using this tool, clinicians and
10 researchers can objectively assess and quantify the relationship between midface landmarks,
11 providing valuable insights into the aesthetics of the midface region.
12

13 **Beauty Arch**

14 The concept of the "beauty arch" offers another valuable approach to analyze lateral malar
15 projection. This method was developed by Marianetti as a means to determine the ideal
16 position of the zygomatic prominence in the sagittal view.⁴³ In this technique, an arch is
17 constructed in the lateral view by drawing a line from the lateral canthus to the edge of the
18 mouth. From the midpoint of this line, a perpendicular line known as the fulcrum line is drawn.
19 The fulcrum line intersects with a perpendicular line passing through the lateral canthus. Using
20 this intersection point, a compass is utilized to create an arch that passes through the corner of
21 the mouth. This resulting arch is referred to as the beauty arch. Although this method can be
22 complex and challenging to perform on a patient, it was developed based on a study
23 involving 74 "attractive" beauty contestants. The beauty arch has been effectively used in
24 planning malar augmentation for individuals with malar hypoplasia, demonstrating its utility
25 in midfacial reconstruction. While it may require technical proficiency, this approach
26 provides valuable guidance for achieving desirable malar projection and aesthetics in
27 appropriate cases.
28

29 **Lips**

30 Historically, plump lips have been associated with a youthful appearance and have been
31 considered aesthetically desirable. Moreover, efforts have been made to objectively analyze
32 and establish standards for rejuvenation and aesthetic evaluation.
33

34 In 1984, Farkas conducted a study focusing on the proportions of average faces, aiming to
35 establish standards for defining the dimensions of the upper lip, lower lip, and chin area.⁶⁹
36 However, it is worth noting that this study did not specifically address the concept of facial
37 attractiveness. Our investigation highlighted that in perioral aesthetics, several measurements
38 need to be considered. When examining the frontal face, it is important to measure the upper
39 lip and lower lip heights, as well as the distances from the nasal tip to the mouth and from the
40 mouth to the chin (These measurements can be used to formulate several proportions such as
41 the upper lip to lower lip ratio, upper lip height to nose-mouth ratio, and the lower lip height
42 to mouth-chin ratio (Figure 6)).^{44, 46, 69}

43 Talei and Pearlman present a noteworthy study, which outlines a comprehensive
44 methodology for characterising the upper lip and offering guidance on preserving a youthful
45 lip balance through surgery.⁷⁰ While their study lacks a direct comparison between attractive
46 and unattractive lips in terms of empirical aesthetic ideals, it does offer valuable insights into
47 essential factors for approaching a lip lift. The authors introduce the innovative "CUPID lip
48 lift" technique, which has effectively preserved the natural upper lip balance, enhanced muscle
49 function, and ensured favourable long-term results in a cohort of 2440 consecutive patients
50 spanning 6 years.

Upper-Lower Lip Ratio

The ideal ratio between the upper lip and lower lip is a subject of considerable debate in perioral aesthetics. Various studies suggest a range of ideals, spanning from 1:1 to 1:2.^{43, 44, 47} Among these, Bisson and Grobbelaar's research provides the most commonly referenced ideal for the upper to lower lip ratio. In their study, they compared the aesthetic characteristics of lips between 28 fashion models and 14 hospital employees.⁴⁸ Based on their measurements, they proposed a ratio of 1:1.6 for the upper lip to lower lip ratio.⁴⁸ Additionally, they observed that both the upper and lower lip heights were greater in models than the general population. Interestingly, Heidekrueger et al, in a cross-cultural survey, found that lip ratio preferences did not differ significantly across different ethnicities. However, they did note variations between age groups within the same ethnicity, with younger individuals showing a preference for larger lower lips.⁴⁵

Philtrum: Labial Parameters

Similar to the lower eyelid, the elongation of the upper lip over time due to gravitational effects and reduced elasticity of the soft tissues can cause an abnormal balance between the upper lip height and nose-mouth distance. To better analyze the upper lip region, Raphael et al. developed the philtral-labial score (PLS).⁴⁶ To calculate the PLS, three important landmarks need to be identified with the lips touching at rest: the base of columella (subnasale), the midpoint of the superior vermilion border (labiale superius), and the centre of the labial fissure (stomion). These landmarks are then used to define the philtral and labial heights. The PLS is calculated by dividing the philtral height by the labial height. The authors show that with the aging process, the PLS increases over time, and larger PLS values are considered less attractive, with an ideal score of 2.0. Ultimately, this score serves as a measure of lower face disharmony and is a useful tool in defining the aesthetics of the upper lip.⁴⁶

Lip Protrusion

Lip protrusion refers to the point of maximum projection of the lip, as measured in lateral view. To calculate lip protrusion, the point of maximum protrusion of the vermilion is measured on a side view, perpendicular from a vertical line connecting the base of the columella to the fold demarcating the lower lip and chin, as outlined by Lemperle.⁴⁹ In addition to lip protrusion, the nasolabial and mentolabial angles are useful measures in defining the protrusion of the upper and lower lips.^{47, 48} Penna et al. found that when comparing the nasolabial and mentolabial angles in "attractive" and "unattractive" patients (judged by online volunteers through a survey), both angles were significantly less in the attractive cohort.⁴⁶ Specifically, they found that a nasolabial angle of 98° and a mentolabial angle of 130.5° were most attractive in this group.⁴⁶

Chin

Extensive exploration of the chin's cephalometric analysis has been carried out within the field of orthodontics. Numerous methods have been developed to measure the degree of anteroposterior mandibular protrusion (Figure 7).^{14, 71, 72} However, only a limited number of studies have specifically examined the aesthetically appealing positions of the chin. Kuroda et al. determined that, among the Japanese population, faces with a degree of mandibular retrusion were considered most attractive, and this finding correlated well with the Burstone Sn-Pog classification.⁵² When comparing the correlation of different methods of chin protrusion analysis to facial attractiveness, significant cultural differences emerge regarding

1 the preferred method.⁵² Hsu suggested that the Burstone Sn-Pog line is best suited for
2 aesthetic analysis of profiles in the Chinese population as well.⁵³ However, in studies
3 conducted on the Turkish population, Ricketts' norms for upper and lower lips appeared to
4 exhibit a stronger correlation.⁷³ This again highlights the need to take into consideration
5 cross-racial differences for facial aesthetics. Notably, there are currently no studies
6 comparing methods of analysis specifically within the Caucasian population group. (Figure 7)

8 **Ear**

9 While there have been numerous studies analyzing the dimensions of the ear during growth,
10 there is a lack of research specifically focused on empirically defining aesthetic ideals for the
11 ear.⁷⁴ From a lateral facial view, ear position is defined by the angle of the ear axis in relation
12 to a true vertical line of the face extending from nasion to gonion. (Figure 8) Previous work
13 by Farkas indicated that the normal range of auricular inclination fell between 9-29°.⁷⁴
14 However, Broer et al. emphasized that the ideal ear position is slightly reclined, ranging from
15 -5 to 10°.⁵⁴ In their study, they conducted an online survey among plastic surgeons and the
16 general public worldwide.⁵⁴ Participants were asked to modify the axis of a female model's
17 ear to align with their desired ideal. Furthermore, they discovered that participants' country of
18 residence influenced ear axis preferences, with European participants tending to prefer a
19 more vertical ear compared to those from the Middle East. Clearly, the ear unit has received
20 limited attention in terms of defining aesthetic ideals, indicating a need for further research in
21 this area to establish standards for the aesthetically pleasing ear.

23 **The Future of Defining Facial Aesthetics**

24 The majority of papers encompassed within this study employed manual facial measurements
25 and deliberate evaluations of facial aesthetics carried out by both surgeons and volunteers.
26 This approach can be labour-intensive, susceptible to errors, and constrained by the number
27 of faces that can feasibly be assessed. Given the advancements in artificial intelligence
28 capabilities the future of delineating aesthetic standards may rest within AI models.
29 Specifically, there is promise in developing a system proficient in illustrating the perspectives
30 observed when appraising a face, while simultaneously aiding in definition of facial beauty.
31 This can be accomplished through the synergistic integration of computer vision, machine
32 learning, and cognitive psychology. Such a system is able to provide insights into the manner
33 in which people gauge facial attractiveness. It also may have the capacity to unearth
34 disparities in aesthetic preferences across diverse cultural contexts by scrutinising interactions
35 among users from different geographical regions and ethnic backgrounds. Recent studies
36 have embarked upon the utilisation of machine learning techniques to delve into the
37 aesthetics of facial images.^{75, 76} Iyer et al, employed a dataset comprising 5500 facial images,
38 which were evaluated by a panel of 60 volunteers and rated for beauty using a 5-point Likert
39 scale.⁷⁵ This dataset was then employed to train a model capable of tasks including landmark
40 localisation, extraction of facial feature sets, and evaluation of an array of predetermined
41 ratios. Their analysis indicated that facial images deemed aesthetically pleasing exhibited
42 correspondence with the principles of neoclassical facial proportions. However, their study
43 predominantly concentrated on evaluating the ratios of crucial facial landmarks. This
44 underscores the need for more sophisticated algorithms capable of comprehensively
45 appraising the subtler intricacies inherent within facial features.

47 **Limitations**

48 Numerous limitations within this review warrant acknowledgement, foremost among them
49 being the challenge of comparing studies due to the diversity in units employed for defining
50 aesthetic ideals. Secondly, a lack of standardised measurement for attractiveness is

1 noteworthy. The prevailing method involves plastic surgeons assessing faces/units on a Likert
 2 scale; yet discrepancies arise as certain studies solely incorporate laypersons as reviewers,
 3 while others opt for a combination. In an optimal scenario, a balanced review panel is
 4 advocated, alongside the presentation of rater demographics. Reviewers' distinctions rooted
 5 in ethnicity, gender, and age manifest distinctly, evident notably in the periorbital area, with
 6 studies emphasising different east Asian and Caucasian ideals. Hence, it becomes imperative
 7 for studies to elucidate their focal ideals and for surgeons to acknowledge cross-cultural
 8 aesthetic variations. Furthermore, the bulk of studies within this review centred on Caucasian
 9 females, underscoring the need to discern the patient demographic to which the findings of
 10 the included papers predominantly apply to. Another important limitation in establishing
 11 aesthetic ideals for facial units lies in their evolutionary nature. An illustrative instance is the
 12 Westmore brow, emblematic of the 1970s, characterised by a slender, high arched and
 13 medially peaked brow⁵⁶ – a contrast to contemporary inclinations favouring thicker brows
 14 with lateral peaks. This dynamic shift underscores how these ideals evolve over time.
 15 An additional crucial aspect of this study pertains to the predominant focus of the included
 16 papers on delineating optimal parameters for specific female facial anatomical units, rather
 17 than encompassing a compressive definition of beauty. Recognising beauty involves intricate
 18 interplays of numerous elements extending beyond mere measurements and proportions – an
 19 intricacy exceeding the scope of this paper.

22 CONCLUSIONS

23 This review has examined the current evidence regarding the aesthetic ideals of the face. Our
 24 findings indicate that while there are numerous definitions available for the aesthetic ideals of
 25 various facial subunits, many measurements have not been empirically defined or
 26 consistently validated. Farkas's work made progress in quantifying facial dimension
 27 measurements by categorizing and documenting numerous measurements for each facial unit,
 28 although these have not been utilized to establish aesthetic ideals. With the advancements in
 29 computer modelling and automation, we now have the capability to take a significantly
 30 greater number of facial measurements, aiding in the assessment of aesthetic ideals.
 31 Furthermore, we have emphasized the significant gaps in aesthetic classifications for certain
 32 facial units, such as the ear and chin. We have summarized key papers that we believe will be
 33 valuable for aesthetic surgeons. Going forward, it is imperative to conduct more standardized
 34 studies that explore and define aesthetic ideals in a comprehensive manner.

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37 FIGURE LEGEND

38
39 **Figure 1.** The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-
40 Analyses) flow diagram.

41
42 **Figure 2.** (A) Westmore Brow. (B) Forehead length & angle.

43
44 **Figure 3.** (A) Nasal measurements as per Farkas: Nose height (n -sn dotted), nasal bridge
45 length (n-prn), nasal root depth (sagittal) m(s), nasal root width (horizontal) mf-mf, nasal root
46 slope length (m-en), soft nasal tip protrusion (sn-prn), soft nose width (al- al), ala length (ac-
47 prn). (B) Combination of Nasolabial angle and Crumley 1 method for defining nasal tip
48 projection.

1 **Figure 4.** (A) Anthropometric measurements frontal view: (a) horizontal dimension of
2 palpebral fissure (exocanthion–endocanthion); (b) vertical dimension of palpebral fissure
3 (palpebrale superius–palpebrale inferius); (c) interpupillary distance (center of pupil–center of
4 pupil); (d) binocular width (exocanthion–exocanthion); (e) intercanthal width
5 (endocanthion–endocanthion); (f) nasal width (distance between the widest point on each
6 ala); (g) midfacial width (tragus–tragus); (h) slant of palpebral fissure (angle of the line
7 between endocanthion and exocanthion of an eye based on the line connecting the right and
8 left endocanthion); (i) height of upper eyelid (perpendicular distance between palpebrale
9 superius and lower margin of the eyebrow); (j) width of pretarsal crease (palpebrale superius–
10 upper margin of crease). (B) Eyelid measurements: Brow fat span (BFS) – red line, Tarsal
11 Platform show (TPS) – yellow line, margin to reflex distance 1 (MRD1) – green line,
12 palpebral fissure (PF) – blue line and Inferior scleral show (ISS) – pink line.

13 **Figure 5.** (A) WIZDOM: (a) corneal diameter; (b) interpupillary distance; (c) nasal length;
14 (d) medial canthus; (e) brow length; (f) WIZDOM; (g) WIZDOM to medial canthus; (h)
15 Hairline to WIZDOM; (i) chin to WIZDOM; (j) chin to WIZDOM diagonal; (k) angle to
16 WIZDOM; (l) medial canthus to nasal ala; (m) eye length; (n) lateral brow to WIZDOM. (B)
17 Beauty Arch.

18
19 **Figure 6.** Lip analysis: Nasolabial angle (red), Mentolabial angle (green), Lip protrusion
20 (black), Upper lip height (pink), Lower lip height (orange).

21
22 **Figure 7.** Different methods of measuring chin protrusion. Soft tissue analysis: A, Legan and
23 Burstone analysis B, Holdaway soft tissue analysis C, Ricketts profile analysis D, Merrifield
24 Z-angle E, Epker et al soft-tissue relationships.

25
26 **Figure 8.** The ear axis.
27

Figure 1. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.

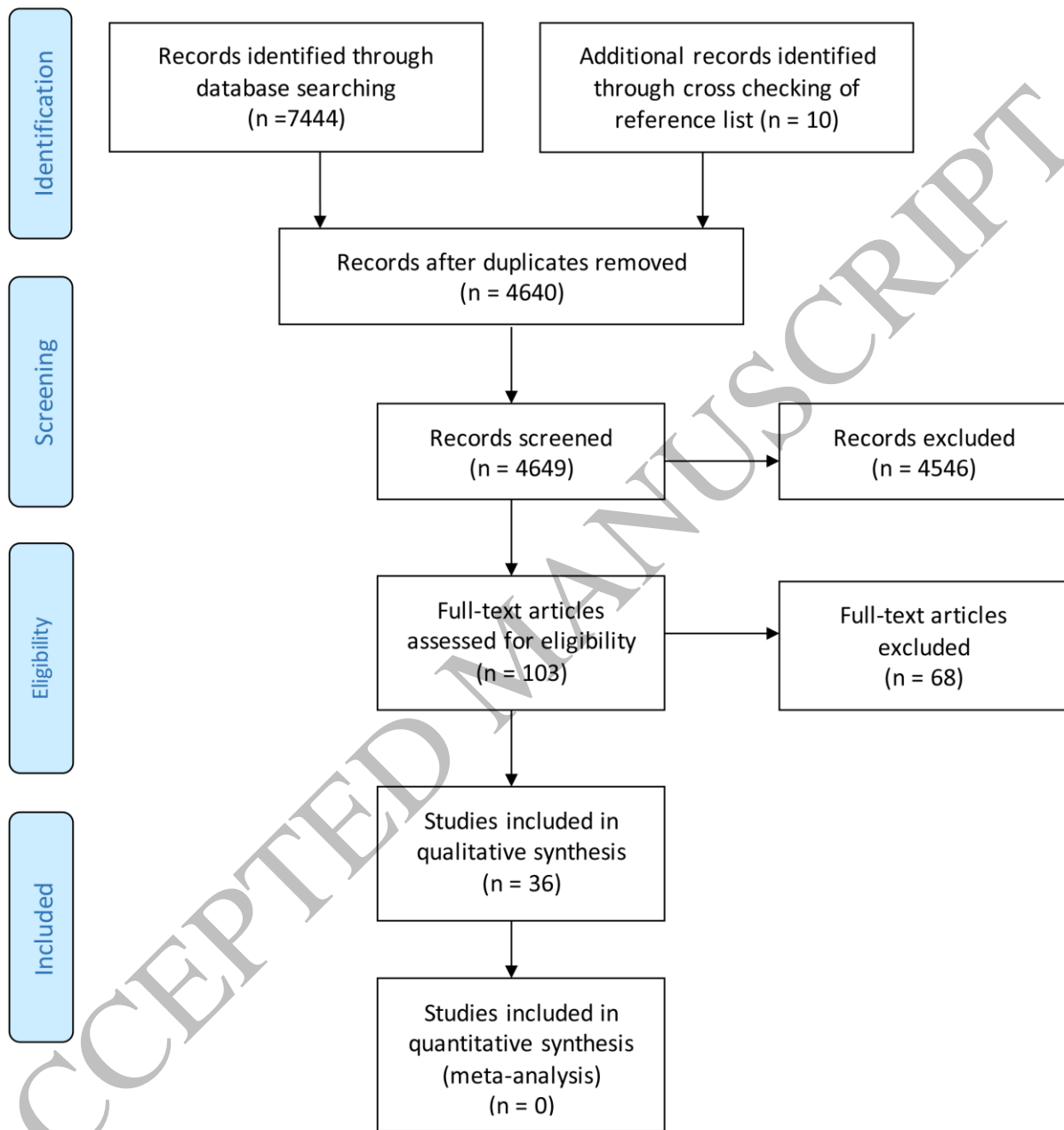


Figure 1
500x375 mm (x DPI)

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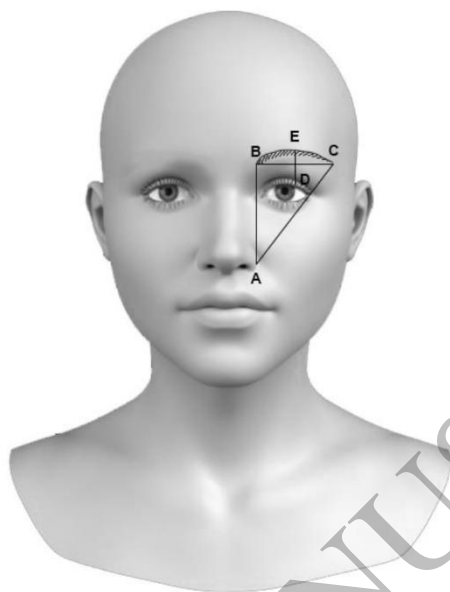


Figure 2a
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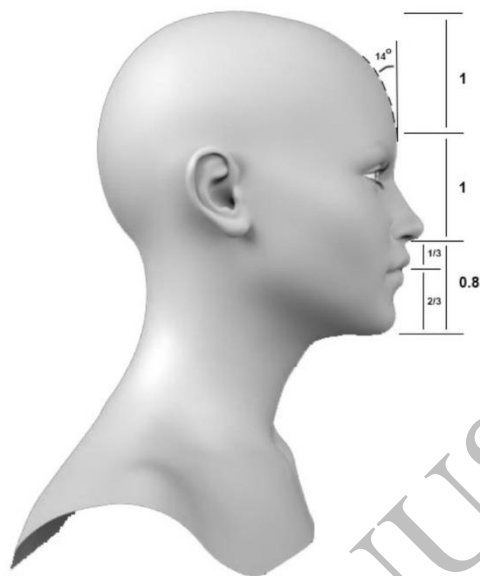


Figure 2b
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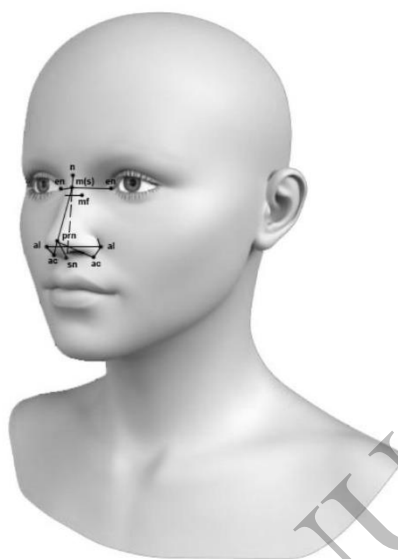


Figure 3a
500x375 mm (x DPI)

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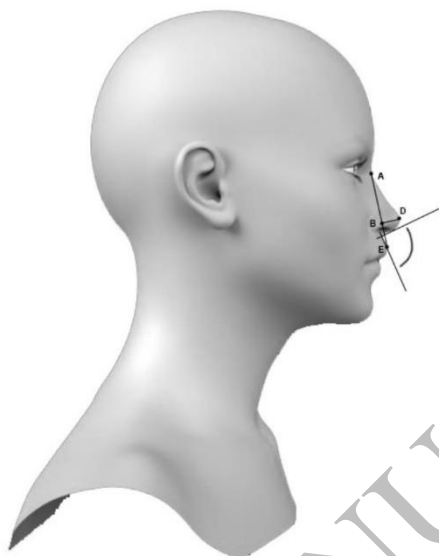


Figure 3b
500x375 mm (x DPI)

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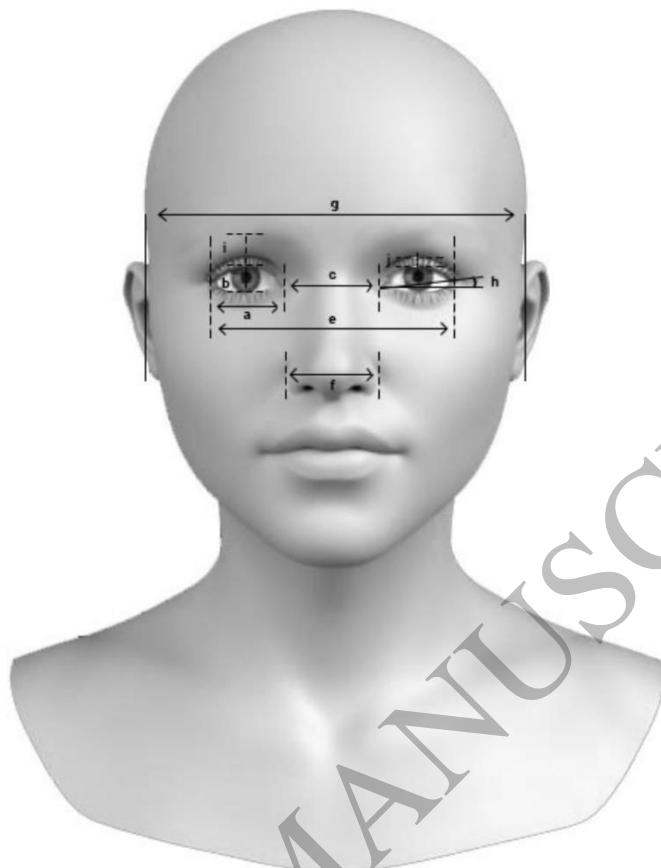


Figure 4a
500x375 mm (x DPI)

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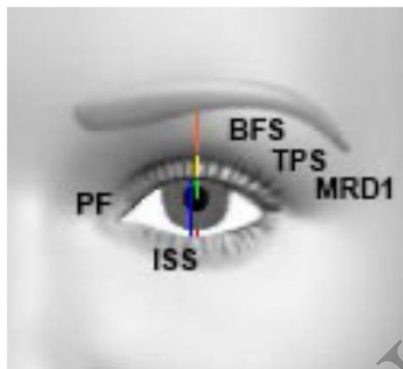


Figure 4b
500x375 mm (x DPI)

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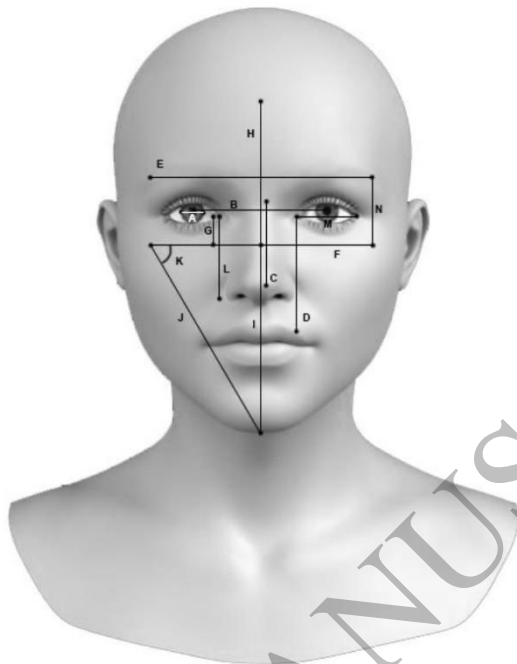


Figure 5a
500x375 mm (x DPI)

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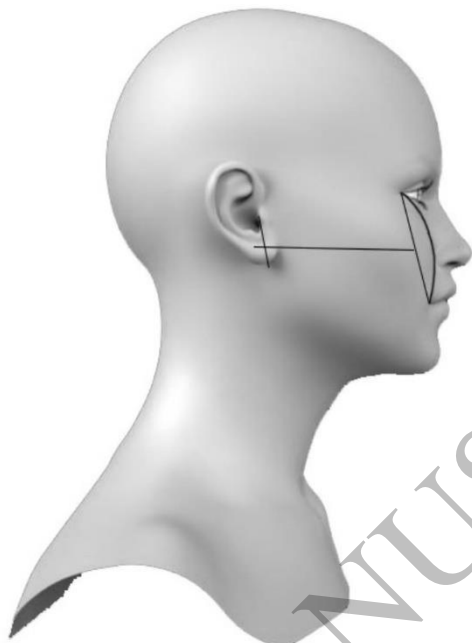


Figure 5b
500x375 mm (x DPI)

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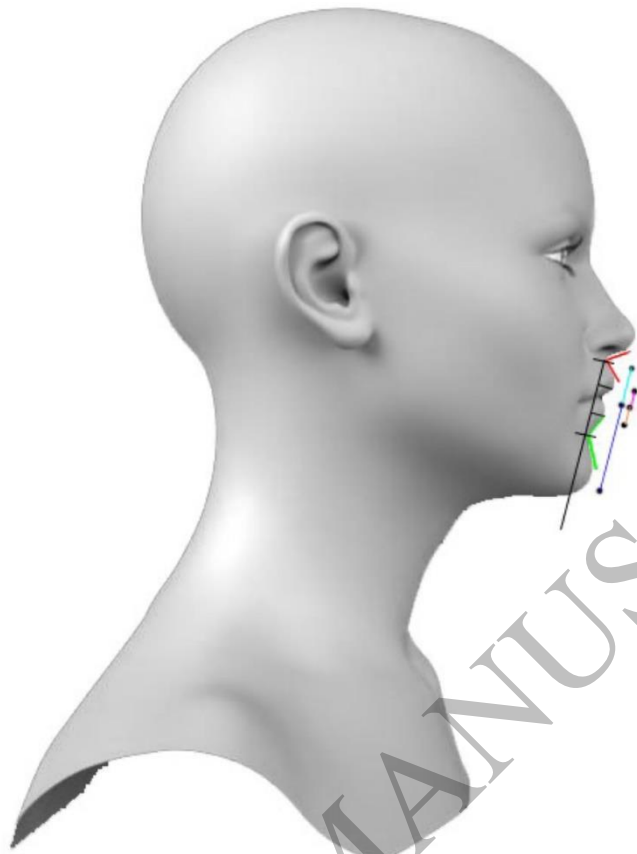


Figure 6
500x375 mm (.x DPI)

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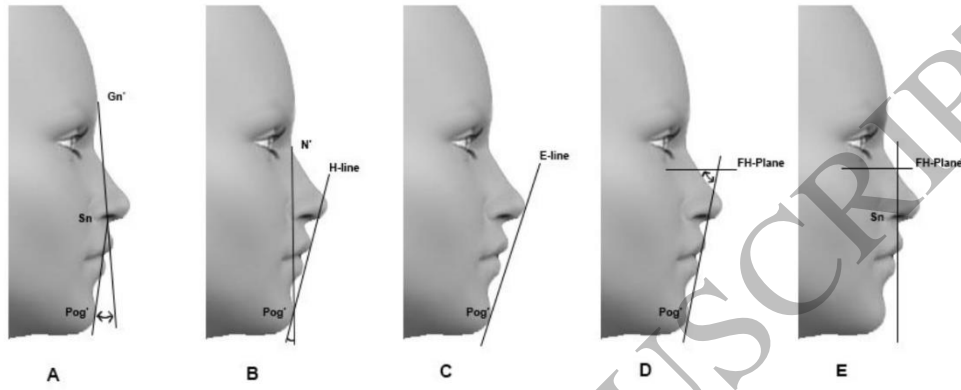


Figure 7
500x375 mm (x DPI)

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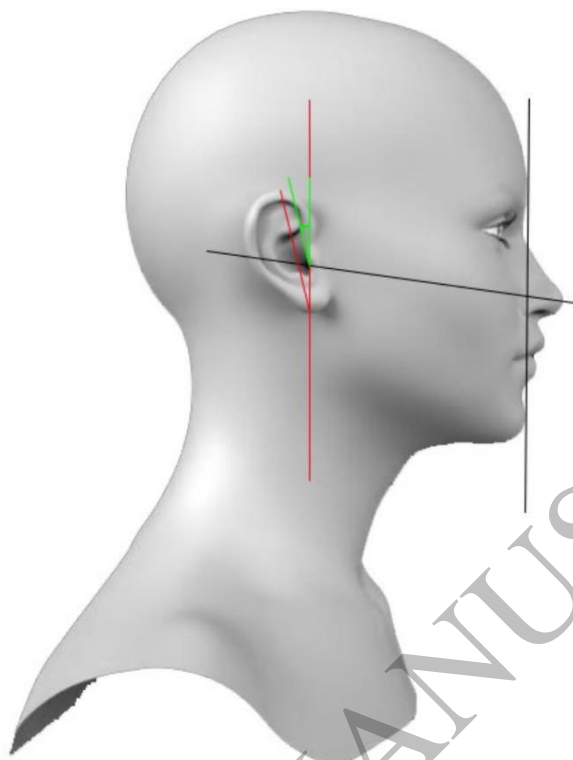


Figure 8
500x375 mm (x DPI)

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