BJOS
Brazilian Journal of Oral Sciences

Volume 23
2024
e246902

Critical Review

Orna face analysis: development of a clinical tool for facial aesthetic evaluation

Amanda Lopes[1], Marcelo Germani[2], José Mauro Granjeiro[1*]

[1] ILAPEO Faculty, Post-graduation Program in Dentistry, Curitiba, PR, Brazil.

[2] Department of periodontology and implantology, Guarulhos University, São Paulo, Brazil.

Aim: Facial aesthetics is a dynamic field requiring precise professional assessment, considering beauty concepts, variability in cultural and ethnic facial features, and patient perception. This study aimed to develop the Orna Face Analysis (OFA), an integrated tool for detailed facial evaluation to improve the planning of aesthetic treatments. **Methods:** The OFA integrates multiple analysis methods, considering key aspects such as youthfulness, average appearance, symmetry, and dimorphic features to create a comprehensive evaluation protocol based on a critical review of the scientific literature searched through PubMed, Scielo, Web of Science, and Scopus databases without language or time restrictions. **Results:** The OFA was designed as an electronic form that can generate a printed file, allowing for a deep understanding of patients' faces by highlighting these essential aspects. This approach enables detailed and personalized diagnostics essential for effectively planning facial aesthetic treatments and meeting patient expectations. The OFA emerges as a complementary and integrative tool in facial aesthetics, promoting a personalized and evidence-based approach to facial harmonization. After constructing the OFA prototype in electronic and printed formats, the tool was tested in a clinical setting (TRL 6 – technology readiness level) to assess its objectivity, clarity, coherence, precision, and usability. TRL 6 indicates that the system has been demonstrated in a relevant environment but requires further testing for full validation. **Conclusion:** A preliminary evaluation by a facial harmonization specialist confirmed that the OFA enables the creation of highly personalized treatment plans, accurately reflecting a range of aesthetic outcomes. Further validation will solidify its applicability across diverse patient populations and settings.

Keywords: Face. Esthetics. Anthropometry. Cosmetic techniques. Facial asymmetry.

Corresponding author:
Amanda Lopes,
+55 41 992542500,
insightsbydraamandalopes@gmail.com
José Mauro granjeiro,
+55 21 999883498,
jmgranjeiro@me.com

Editor: Dr. Altair A. Del Bel Cury

Received: June 14, 2024
Accepted: September 09, 2024

Introduction

Facial beauty is a multifaceted concept that fascinates scientists and clinicians due to our innate ability to quickly and effectively process and evaluate facial information[1]. Studies have revealed that we can judge facial attractiveness in just 150-200 milliseconds[2], interpreting features such as sex, age, ethnicity, emotional states, trustworthiness, intentions, and attractiveness[3].

Facial information processing occurs in distinct brain regions, where each element influences perceptions[4]. The facial configuration determines attractiveness, potentially conferring social advantages[5]. Evaluation criteria are shaped by factors such as trends and expectations, leading to varying treatment approaches for the same individual[6-9].

Although quantitative tools like cephalometric analysis[10], anthropometry[11] and the golden ratio[12] are described in the literature, methodologies based solely on measurements may not fully meet patient expectations for facial aesthetics[13]. Improper use can cause adverse effects[14]. Thus, clinical reasoning should combine objective and subjective quantifiers, and treatment plans should align with patient desires[15].

To address these needs, we propose the Orna Face Analysis OFA), a tool designed for clinical use in facial harmonization. The OFA integrates vital factors such as youthfulness, average appearance, symmetry, and sexual dimorphism[16], enabling the development of personalized treatment plans. Applicable for procedures like botulinum toxin[17], dermal fillers[18], biostimulators[19,20], chemical peels[21], resurfacing approaches[22], and surgical interventions[23] the OFA aims to bridge current gaps in facial aesthetic evaluations.

Methods

To identify critical factors in facial attractiveness, we conducted an extensive search in major scientific databases (PubMed, Scielo, Scopus, Web of Science) using keywords such as facial harmonization, cosmetic dermatology, aesthetic medicine, facial analysis, facial aesthetic evaluation, facial symmetry, facial aesthetic treatments, individualization of facial treatments, facial anthropometry, facial anatomy, and facial landmarks. We also considered relevant books, manuals, and documents without time or language restrictions.

The critical analysis of the documents we obtained allowed us to identify the most essential beauty and attractiveness indicators used to construct the OFA tool. The OFA was designed to collect specific data influencing the planning and execution of facial harmonization procedures. Each step was carefully crafted to align treatment with the patient's needs and the professional's analysis. The tool is available in printed and electronic formats for clinics using computerized client management systems.

Four subjective questions were structured to understand patients' desires, habits, and reasons behind facial signs. These questions aimed to capture the client's self-perception and habits. Understanding patient expectations, assessing procedure

history, analyzing the impact of physical activity, and considering sun exposure are crucial for planning practical and personalized facial aesthetic treatments[24-26].

The youthfulness parameter in the OFA evaluates criteria associating youthful faces with greater attractiveness, considering factors like apparent age, skin phototype, skin biotype, and degree of skin aging. Median evaluation classified patients based on physical characteristics into Caucasian, Afro-descendant, or Asian groups[27].

For facial symmetry, we considered the Facial Midline[28], Profile Analysis[29], Facial Index[30], Facial Width Index[30], and Facial Biotype[30], categorizing patients as Mesofacial, Brachyfacial, and Dolichofacial.

For lips analysis, parameters included mucosal lip dimensions, upper cutaneous lip length, lip posture, Ricketts' line, and smile line evaluation. These aspects were assessed to provide detailed diagnoses of lips and perioral region conditions.

Dimorphic differences were identified to assist professionals in recognizing gender differences, evaluating jaw size, chin size, eyebrow thickness, eye size, lip thickness, cheekbone height, beard presence, and neotenous traits. These characteristics are highlighted when they do not match the patient's gender, aiding precise diagnosis and aesthetic procedure planning.

The OFA prototype was tested in a relevant clinical setting (TRL 6 – technology readiness level) to evaluate its objectivity, clarity, coherence, precision, and usability. TRL 6 indicates that the system has been demonstrated in a relevant environment but requires further testing for full validation[31]. This evaluation was conducted by a facial harmonization specialist (AL) in a private clinic, attending to a 38-year-old male patient who complained of forehead wrinkles. The patient consented to use his image for this analysis, which confirmed that the tool enables highly personalized treatment plans, reflecting a wide range of aesthetic outcomes.

Results

The Orna Face Analysis (OFA) tool, available in Appendix 1 (supplementary material), is comprehensive and includes all critical aspects for facial aesthetic evaluation. The OFA addresses key issues (item 1), youthfulness assessment (item 2), median appearance (item 3), symmetry (item 4), lips (item 5), and sexual dimorphism (item 6). This format aims to improve patient-professional dialogue, guiding through critical questions to facilitate treatment planning with focused interventions. Additionally, it is a valuable resource for progress monitoring, allowing precise comparisons of facial measurements before and after procedures. The OFA proved easy to use, maintaining focus on central issues during patient evaluation and recording.

Item 1 (Supplementary material, SM, 1. Key Questions) of the OFA encompasses four subjective questions to capture patients' self-perceptions, desires, and habits. These questions focus on understanding patient expectations by exploring their individual goals and concerns, investigating previous aesthetic treatments to assess risks and compatibility with future procedures, analyzing the impact of physical activity on facial expression and the durability of aesthetic interventions, and evaluating sun exposure habits, crucial for planning protective care and effective skin treatments.

Item 2 (SM, 2. Youth Assessment) assesses youthfulness by evaluating criteria that associate youthful-looking faces with greater attractiveness. Factors include apparent age, skin phototype, skin biotype, and degree of skin aging. Patients' apparent age (item 2.1) was assessed through a multiple-choice question. Skin color was classified using the Fitzpatrick scale (2.2), based on response to ultraviolet (UV) light. The scale details six phototypes, from I (always burns, never tans) to VI (never burns, tans deeply).

This study's evaluation of skin biotypes included parameters such as skin uniformity, hydration, and sensitivity. The OFA tool employed three multiple-choice parameters based on visual assessment and patient feedback[32]. Skin uniformity, categorized under OFA item 2.3.1, focused on pigmentation changes causing cosmetic discomfort[33]. Hydration, assessed through sebum secretion [34], and sensitivity, evaluated based on skin reactivity to external stimuli[35], were categorized under OFA items 2.3.2 and 2.3.3, respectively.

Skin aging signs were analyzed using the Glogau scale[36], classifying photoaging into four categories: Type I (mild), Type II (moderate), Type III (advanced), and Type IV (severe). Each category is based on wrinkle presence and depth (item 2.4).

Item 3 (SM, 3. Average Appearance) classifies patients into one of three major ethnic groups: Caucasian, Afro-descendant, or Asian, based on physical characteristics. Caucasian patients typically have a narrow facial structure with pronounced angles, thin skin with less melanin, and round eyes. Afro-descendant patients have a wide facial structure with higher cheekbones, thick skin with higher melanin content, and prominent eyes. Asian patients have a wide, flat facial structure, thick skin with higher collagen density, and almond-shaped, slanted eyes.

The OFA tool incorporates literature analysis for symmetry parameters (SM, 4. Symmetry), classifying the facial midline as balanced or deviated (item 4.1)[28]. The patient's profile (item 4.2) indicates prognathism, orthognathism, or retrognathism[37]. The tool guides professionals in taking detailed facial measurements through anthropometric points, calculating facial and width indices essential for determining the patient's biotype. The facial index (item 4.3) is calculated using vertical and horizontal morphology, and the facial width index (item 4.4) using the bizygomatic and bigonial widths[30].

The facial biotype, described in item 4.5 of the OFA, is determined by the facial index values. Patients are classified as mesofacial (facial index 85-89.9), brachyfacial (facial index < 84.9), or dolichofacial (facial index > 90)[30].

The focused evaluation of lips (SM, 5. Focused Lip Analysis) considers dimensions of the mucosal lip, upper cutaneous lip length, lip posture, anteroposterior lip position, and smile line[11]. Measurements include Upper Lip (Ls) – Stomion (Es) and Lower Lip (Li) – Stomion (Es) for lip height and Mouth Corner (Che) for lip width. Lip posture is assessed by the space of lip opening at rest. Ricketts' line evaluates lip projection relative to the chin. The smile line is diagnosed as high, medium, or low.

Item 6 (SM, 6. Sexual Dimorphism) identifies sexual dimorphism elements, assisting professionals in recognizing gender differences, with characteristics such as jaw and

chin size, eyebrow thickness, eye size, lip thickness, cheekbone height, beard presence, and neotenous traits. These elements are compiled in Table 1.

The OFA tool was applied to a 38-year-old male patient presenting with complaints of facial asymmetry and signs of aging. The application of the OFA allowed for the efficient summarization of critical patient information, facilitating a comprehensive assessment of his aesthetic concerns. Key parameters, such as skin type, sun exposure habits, history of aesthetic procedures, and physical activity levels, were effectively documented, enabling the formulation of a personalized treatment plan. The critical patient data captured through the OFA is illustrated in Figures 1 to 4.

Table 1. Dimorphic Facial Features by Sex

Dimorphic Characteristics	Male	Female
Largest jaws	Yes	No
Big Chin	Yes	No
Thick Eyebrows	Yes	No
Small Eyes	Yes	No
Thin lips	Yes	No
High cheekbones	No	Yes
Thin Eyebrows	No	Yes
Beard	Yes	No
Retained Neotenic Traces	No	Yes

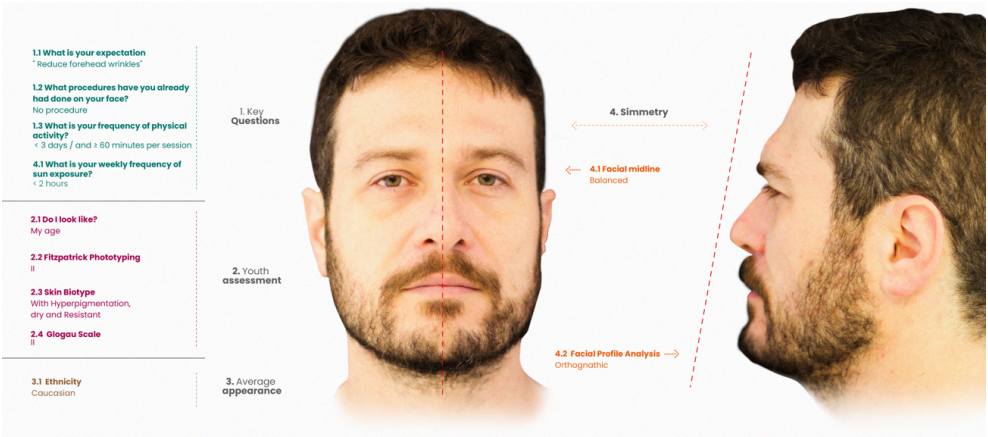

Figure 1. These images demonstrate the application of the OFA (Orna Face Analysis) tool in assessing a 38-year-old male patient with complaints of facial asymmetry and signs of aging. The OFA tool effectively summarizes critical patient information, including expectations, physical activity, sun exposure, and previous procedures. The frontal image observes items 1 to 3 of the OFA sheet, while the lateral image of the patient is used for item 4, providing a detailed assessment of youthfulness, skin biotype, and facial symmetry. This facilitates a comprehensive and personalized treatment plan.

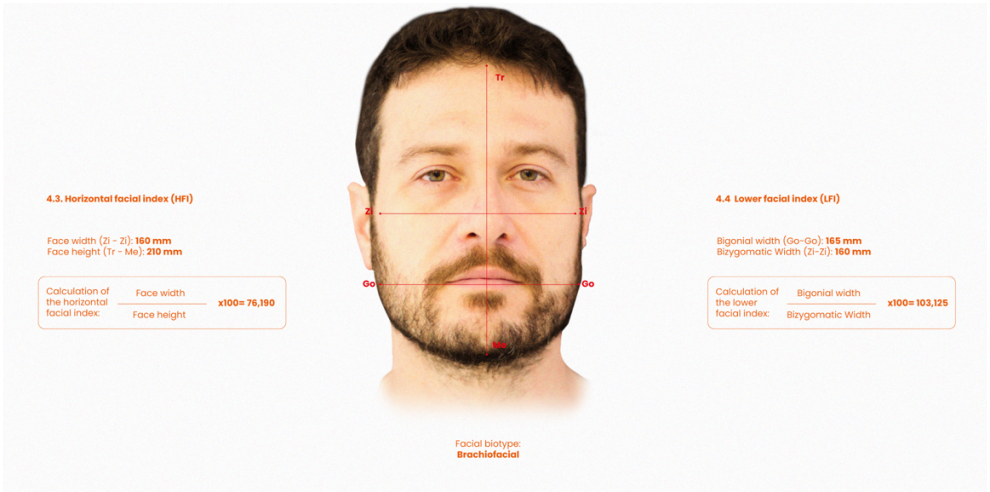

Figure 2. This image demonstrates the assessment of the facial biotype of the patient using the OFA (Orna Face Analysis) tool. The frontal image illustrates the calculations for the Horizontal Facial Index (HFI) and the Lower Facial Index (LFI). The HFI is determined by the face width (Zi-Zi) and face height (Tr-Me), resulting in a value of 76.2. The LFI is calculated using the bigonial width (Go-Go) and the bizygomatic width (Zi-Zi), yielding a value of 103.1. These measurements categorize the patient's facial biotype as brachiofacial.

Figure 3. The frontal images detail the dimensions of the mucous lip, with the upper mucous lip measuring 8 mm in height, the lower mucous lip 9 mm, and the mucous lip width 50 mm. The upper cutaneous lip length is measured at 22 mm. The lateral images evaluate lip posture, showing that the patient's lips are sealed at rest, indicating labial competence. The resting lip position measures 3 mm from the upper lip to the line and 2 mm from the lower lip to the line. Gum exposure when smiling is assessed as medium.

Figure 4. The frontal and lateral views highlight specific facial areas requiring treatment after professional clinical evaluation. These areas include the cheekbones, under-eye region, and jawline, which are assessed for gender-specific characteristics. Identifying these areas helps in planning targeted aesthetic treatments to enhance masculine features and achieve a personalized, harmonious facial appearance.

Discussion

Professionals in facial aesthetics need parameters to understand beauty and patient motivations. This study aims to create the OFA tool that translates clinical evaluations into aesthetic planning based on current literature. The OFA integrates objective and subjective criteria, including youthfulness, average appearance, symmetry, lip analysis, and dimorphic facial characteristics, ensuring clinical decisions align with patient expectations.

The demand for aesthetic procedures is increasing[38]. The tool begins with four key questions to understand the patient's history and expectations. The first question focuses on the patient's motivations, ranging from psychological and social to physical reasons[39]. Recognizing that these desires are influenced by ethnicity, skin type, health history, and experiences is crucial for aligning expectations with treatment options[15].

The second question addresses previously performed aesthetic procedures, providing essential information on the current state of the face and potential dimorphic disorders[40]. The third question explores physical activity levels, categorizing patients as low, regular, or high activity based on the International Physical Activity Questionnaire (IPAQ)[41], noting that regular exercise can impact the durability of aesthetic procedures, such as botulinum toxin[25].

The fourth question concerns sun exposure, with patients indicating their weekly exposure time. Sun exposure is linked to various skin changes and cancer risk, influenced by phototype[42]. UVA and UVB rays affect skin aging and health, making sunscreen use crucial[43]. Aging results from intrinsic and extrinsic factors, impacting all facial layers and culminating in the skin[26]. The evaluation of skin and youthfulness

follows four stages: self-perception of age, diagnosis of phototype, evaluation of skin biotype characteristics, and analysis of aging using the Glogau scale[29].

Discrepancies between chronological and apparent age influence patient openness to treatment plans. Patients perceiving themselves as younger may resist lengthy treatments, while those feeling older seek extensive repairs. Those who see their ages matched often prefer preventive procedures[44].

The OFA categorizes skin color using the Fitzpatrick scale[45]. Though epidermal thickness is consistent across skin colors, the stratum corneum is thicker in dark-skinned individuals, requiring more extensive preparation for effective topical agent penetration[46]. Darker skin with higher melanin content is more prone to hyperpigmentation, hypopigmentation, textural alterations, hypertrophic scars, and keloids than Caucasians[26]. Higher Fitzpatrick scores correlate with lower Glogau scores, reducing the need for aggressive treatments.

Intrinsic aging treatments, such as botulinum toxin, hyaluronic acid fillers, and biostimulators, do not vary by skin color, though treatment quantity, sessions, and techniques differ due to structural complaints among ethnicities. Minimizing punctures and avoiding the dermo-epidermal junction prevent complications in dark-skinned patients. Superficial peels are preferable for dark-skinned patients over medium and deep peels for extrinsic aging[26].

Analyzing skin biotypes is crucial, as small changes can impact appearance significantly[47]. The first step is to evaluate skin homogeneity, which affects attractiveness, age perception, and health. Smooth skin is desired, as unevenness suggests older, less healthy, and less attractive appearances. Uniform pigmentation results from even melanosome distribution within melanocytes[47]. Pigmentation issues are common in Fitzpatrick types IV-VI, while erythema is frequent in types I-III[47]. The OFA classifies patients by pigmentation disorders and records appropriate care.

Adequate hydration is vital for elasticity, firmness, texture, brightness, and overall appearance. Modern technologies allow detailed analyses of hydration, elasticity, and firmness, identifying specific needs and suitable therapies. Dark-skinned patients typically have lower ceramide content in the stratum corneum, affecting epidermal water content[48]. The OFA assesses hydration, noting that oily skin may need pore care, while dry skin requires barrier restoration to avoid discomfort.

Erythema, the reddening of the skin due to stimuli, results from expanded capillary walls impaired by chronic exposure. Identified by a blood flow increase of over 30%, it progresses by decreasing the moisture retention of the stratum corneum, weakening the sebum film, and making the skin rough. Research on skin irritation and color remains inconclusive[26].

The Glogau scale assesses the severity of photoaging by evaluating wrinkles and pigmentation from sun exposure[49]. It correlates with other systems like the VISIA-CR Complexion Analysis System and is widely used by dermatologists and plastic surgeons. Dark-skinned patients typically exhibit less severe photodamage and different wrinkle patterns than lighter-skinned individuals, developing more upper facial lines, while Asians have fewer glabellar wrinkles[50]. The Glogau scale aids in individualized

treatment planning, with higher scores indicating the need for more sessions and advanced treatments like injectables and resurfacing technologies.

Ethnic diversity significantly impacts clinical practice by influencing procedural choices and expanding treatment options for various skin tones[26]. The OFA considers ethnicity essential in establishing the median face, as faces closer to the population average are perceived as more attractive and healthier[51].

Classifying ethnic groups is complex due to varying classifications across sources and regions. Typical groups include White/Caucasian, Black/African, and Yellow/Asian, but these do not fully capture ethnic diversity influenced by social, cultural, and political factors. Sensitivity to human diversity is crucial, considering distinctive physical traits such as face shape, skin color, and nose and lip features[52].

Afro-descendant patients are significantly more prone to developing keloids[53]. Asian patients, with thicker dermis, higher sebocyte activity, and greater melanin content, are more susceptible to post-inflammatory hyperpigmentation. Recognizing unique facial anatomy, such as higher cheekbones and flatter nasal bridges, is vital for appropriate treatment[54]. Incorporating ethnic considerations in facial harmonization treatments is both necessary and ethically correct.

Different ethnic groups exhibit distinct facial characteristics that influence aesthetic procedure outcomes, and previous studies indicate varying aesthetic preferences based on cultural norms, making it essential to respect each patient's individuality in facial harmonization[55].

Symmetry is often considered a marker of beauty, as it is associated with the perception of higher-quality genes and better health[56]. Various methods, including manual anthropometry, 2D and 3D imaging, computational images, and cephalometry, are used to evaluate facial characteristics. While 3D imaging is more accurate, manual anthropometry and 2D techniques are more accessible and faster. Standardizing measurement collection with the patient's head in a natural position and with the horizontal visual axis is essential. Soft tissue landmarks used for measurements are described in Table 2.

The initial facial symmetry analysis involves identifying asymmetry by evaluating a line from the Cupid's bow to the glabella, known as the facial midline[57]. Minor deviations from symmetry can decrease perceived attractiveness[58], often indicating developmental instability due to environmental or genetic factors. A study found more facial asymmetries in children from poorer cities, suggesting environmental impacts on development[59]. However, no direct associations between facial asymmetry and self-reported health were found, indicating that perceptions of asymmetry may be more influenced by aesthetic and social preferences[60].

Analyzing the facial profile is crucial for identifying characteristics such as convexity, concavity, or straightness, which influence therapeutic decisions[57]. Frontal facial analysis measures the height/width ratio, with standard proportions of 1.35:1 for men and 1.3:1 for women[57]. The facial width index, determined by bizygomatic and bigonial measurements, typically shows the latter as 70-75% of the former's width.

These measurements diagnose the facial biotype, guiding treatments by categorizing patients as dolichofacial, mesofacial, or brachyfacial.

Despite the emphasis on symmetry, small asymmetries do not significantly affect perceptions of beauty. Digital mirroring to create perfectly symmetrical faces often results in unnatural and unattractive appearances[61]. Lip augmentation, a standard aesthetic procedure, addresses signs of aging. Ideal lips feature a defined vermilion border and balance between the upper and lower parts. Preferences vary, with Asian surgeons favoring larger lips and Europeans and Caucasians preferring smaller ones[62]. Widespread proportions include 1:1 and 2:1, where the lower lip predominates[62]. The OFA measures lips by the vermilion border and oral fissure, following established guidelines[63].

Table 2. Soft Tissue Landmarks Used for Clinical Measurements in Facial Analysis

Reference Point	Anatomical position
Trichion (Tr)	The transition point between the hairline and the skin of the frontal region. For bald patients, use the curvature of the frontal region as a reference.
Glabella (Gl)	The most prominent point between the eyebrows.
Nasion	The deepest point of the concavity is between the forehead and the nose.
Subnasal (Sub N)	Point where the base of the columella meets the upper lip.
Labrale superioris	Point denoting the red edge of the upper lip.
Stomion	Midpoint of the interlabial fissure.
Labrale inferioris	Point denoting the red edge of the lower lip.
Labiomental fold	Point of greatest concavity in the contour of the lower lip.
Pogonion	The most prominent point on the chin.
Menton (Me)	The lowest point of the chin.
Zygomatic (Zi)	The most lateral point of the zygomatic region.
Gonium (Go)	The most lateral point located at the mandibular angle.
Cheilion (Che)	Corner of the mouth

The perioral region is crucial for conveying age[64] since a youthful perioral region features a non-elongated upper cutaneous lip[65]. This trapezoidal area, the ergotrid, is bounded by the nasal base, vermilion border, and nasolabial folds. Aging causes the upper lip to descend, increasing its vertical height and diminishing the philtrum and Cupid's bow. Reducing this height is a therapeutic option. Research indicates that the cutaneous-to-upper vermilion lip ratio should be 2 to 2.9, and the upper-to-lower vermilion ratio should be 0.75 to 0.8.

Lip posture is evaluated by observing whether the lips can stay together (competent), are separated by more than 3 mm (incompetent), or are separated due to incisor interposition (potentially competent)[57]. Adequate tooth exposure is essential for facial attractiveness, with aesthetically pleasing smiles revealing the upper teeth and 1-3 mm gingival exposure[66]. This evaluation guides treatment decisions, potentially influencing the use of lip filler or botulinum toxin to adjust the upper lip position,

enhancing facial harmony. The vertical exposure of the upper incisors should be 2-4 mm at rest, and the entire crown should have 1-2 mm of gingiva when smiling. A long upper lip reduces upper incisor exposure and vice versa[57].

For evaluating the anteroposterior position of the lips, metrics such as the E line, S Line, H Line, and Merrifield Line are used, with the E line standard being preferred[57]. Excessively projected lips may contraindicate lip fillers. The distance between labial grooves offers insights into maxillary retraction or excess, aiding diagnosis. Asian populations typically have fuller lips than whites, but lip augmentation and remodeling have grown significantly[26]. These measurements help determine the need for surgical interventions like lip lifts or fillers, which are crucial for achieving harmonious smiles and monitoring patient progress. The analysis of the smile line and gingival exposure during smiles also informs the use of botulinum toxin or fillers to correct asymmetries or unfavorable lip proportions.

Evaluating sexual dimorphism highlights facial differences between genders influenced by morphological development. Male and female faces diverge from birth, with pronounced changes during puberty due to estrogen and testosterone. Increased masculine or feminine characteristics enhance perceived attractiveness[67]. High testosterone levels in boys promote lateral growth of the cheekbones, jaws, and chin, while estrogen in girls favors fat deposition in specific areas, inhibiting cheekbone growth and elongating the lower facial bone. Exaggerated sexual maturity affects male faces significantly, while adult female faces retain more neotenous traits. Signs of sexual maturity linked to male dominance can reduce female attractiveness[68]. These differences necessitate gender-segmented approaches in aesthetic treatments to enhance distinctive characteristics, providing a more harmonious and personalized facial appearance. The OFA tool recommends noting structures needing intervention for beautification or aging prevention, considering gender-specific traits. This focus allows for precise treatment planning tailored to the needs of men and women, aiming for satisfactory and natural aesthetic results.

The OFA tool facilitates facial analysis, as demonstrated in two clinical cases. The approach to facial treatment is collaborative, balancing patient expectations with professional judgment. However, the current study's limitation is that the OFA tool focuses on essential facial planning points without integrating a comprehensive patient health history. A complete health history during the patient's systemic analysis is crucial and could be added as an annex to the OFA tool.

Increased attractiveness offers social advantages, including more friendships, sexual relationships, positive interpretations[56], and different legal outcomes.

Future perspectives for the OFA tool include segmenting it into specific treatment plans tailored to various patient needs. This would help identify appropriate techniques for areas marked in the tool and create targeted treatment plans. Additionally, broader validation involving multicentric studies and ethnic diversity is recommended, given that its development was based on clinical experience and literature review.

The OFA tool significantly advances orofacial harmonization, enhancing alignment between patient expectations and clinical interventions. Through detailed, multidimensional analysis, professionals can offer treatments that aim for aesthetically

pleasing results and for respecting each patient's individuality and unique characteristics, reflecting a more humanized and personalized approach to facial aesthetics.

In conclusion, the OFA tool effectively enhanced the dialogue between professionals and patients, addressing crucial aspects such as expectations, procedure history, physical activity patterns, and sun exposure habits. The detailed analysis of skin, youthfulness, symmetry, lips, and facial dimorphic characteristics also allowed for more accurate diagnostics and personalized treatment planning.

Disclosure

This manuscript benefited from the use of artificial intelligence tools for text revision and refinement. Specifically, ChatGPT was utilized to enhance the clarity and coherence of the content, while Grammarly was employed to ensure grammatical accuracy and stylistic consistency. The combined use of these AI technologies contributed to the overall quality and readability of the manuscript.

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Authors contribution:

Amanda Lopes: conception and design of the work, drafting the work, and final approval of the version to be published. **Marcelo Germani:** critical review and significant intellectual content. **José Mauro Granjeiro:** conception and design of the work, drafting the work, and final approval of the version to be published. All the authors actively participated in the manuscript's findings and have revised and approved the final version of the manuscript.

References

1. Wilkinson N, Paikan A, Gredebäck G, Rea F, Metta G. Staring us in the face? An embodied theory of innate face preference. Dev Sci. 2014 Nov;17(6):809-25. doi: 10.1111/desc.12159.

2. Kaiser D, Nyga K. Tracking cortical representations of facial attractiveness using time-resolved representational similarity analysis. Sci Rep. 2020 Oct;10(1):16852. doi: 10.1038/s41598-020-74009-9.

3. Jack RE, Schyns PG. The human face as a dynamic tool for social communication. Curr Biol. 2015 Jul;25(14):R621-34. doi: 10.1016/j.cub.2015.05.052.

4. Diego-Mas JA, Fuentes-Hurtado F, Naranjo V, Alcañiz M. The influence of each facial feature on how we perceive and interpret human faces. Iperception. 2020 Sep;11(5):204166952096112. doi: 10.1177/2041669520961123.

5. O'Connor KM, Gladstone E. Beauty and social capital: Being attractive shapes social networks. Soc Networks. 2018 Jan;52:42-7. doi: 10.1016/j.socnet.2017.05.003.

6. Langlois JH, Kalakanis L, Rubenstein AJ, Larson A, Hallam M, Smoot M. Maxims or myths of beauty? A meta-analytic and theoretical review. Psychol Bull. 2000;126(3):390-423. doi: 10.1037/0033-2909.126.3.390.

7. Hönekopp J. Once more: Is beauty in the eye of the beholder? Relative contributions of private and shared taste to judgments of facial attractiveness. J Exp Psychol Hum Percept Perform. 2006;32(2):199-209. doi: 10.1037/0096-1523.32.2.199.

8. Wang JV, Rieder EA, Schoenberg E, Zachary CB, Saedi N. Patient perception of beauty on social media: Professional and bioethical obligations in esthetics. J Cosmet Dermatol. 2020 May 24;19(5):1129-30. doi: 10.1111/jocd.13118.

9. Greywal T, Dayan SH, Goldie K, Guillen Fabi S. The perception bias of aesthetic providers. J Cosmet Dermatol. 2021 Jun;20(6):1618-21. doi: 10.1111/jocd.13785.

10. Solov'ev MM, Katinas EB, An IA. Pattern of facial beauty: previously undefined proportions. Russian Med Inquiry. 2020;4(4):226-32. doi: 10.32364/2587-6821-2020-4-4-226-232.

11. Armengou X, Frank K, Kaye K, Brébant V, Möllhoff N, Cotofana S, et al. Facial anthropometric measurements and principles – overview and implications for aesthetic treatments. facial plastic surgery. 2024 Jun;40(03):348-62. doi: 10.1055/s-0043-1770765.

12. Ahuja V, Ahuja A, Thosar NR. Evaluation and comparison of facial appearance using the golden ratio: an anthropometric study in preschool and school-going children of Santhal Tribe in west Bengal. Cureus. 2024 Jan 29;16(1):e53200. doi: 10.7759/cureus.53200.

13. Jain R, Huang P, Ferraz RM. A new tool to improve delivery of patient-engaged care and satisfaction in facial treatments: the Aesthetic Global Ranking Scale. J Cosmet Dermatol. 2017 Mar;16(1):132-43. doi: 10.1111/jocd.12297.

14. Dayan S, Romero DH. Introducing a novel model: the special theory of relativity for attractiveness to define a natural and pleasing outcome following cosmetic treatments. J Cosmet Dermatol. 2018 Oct;17(5):925–30. doi: 10.1111/jocd.12732.

15. Haykal D, Treacy P, Lim T, Clatici VG, Fakih-Gomez N, Leal-Silva H, et al. Cross-cultural perspectives on patient expectations in cosmetic dermatology: A comparative analysis across countries and ethnicities. J Cosmet Dermatol. 2023 Dec;22(12):3237-40. doi: 10.1111/jocd.16023.

16. Bashour M. History and current concepts in the analysis of facial attractiveness. Plast Reconstr Surg. 2006 Sep;118(3):741-56. doi: 10.1097/01.prs.0000233051.61512.65.

17. D'Souza A, Ng CL. Applied anatomy for botulinum toxin injection in cosmetic interventions. Curr Otorhinolaryngol Rep. 2020 Dec;8(4):336-43. doi: 10.1007/s40136-020-00308-4.

18. de Maio M, Brenninkmeijer E, Nurlin I, Colucci L, Sanchez T. Applying the MD CodesTM to treat emotional and social attributes with HA Fillers: a retrospective serial case study. Clin Cosmet Investig Dermatol. 2023 Nov;16:3441-53. doi: 10.2147/CCID.S430747.

19. Fisher SM, Borab Z, Weir D, Rohrich RJ. The emerging role of biostimulators as an adjunct in facial rejuvenation: a systematic review. J Plast Reconstr Aesthet Surg. 2024 May;92:118-29. doi: 10.1016/j.bjps.2024.02.069.

20. Contreras C, Ariza-Donado A, Ariza-Fontalvo A. Using <scp>PDO</scp> threads: A scarcely studied rejuvenation technique. Case report and systematic review. J Cosmet Dermatol. 2023 Aug;22(8):2158-65. doi: 10.1111/jocd.15709.

21. Landau M, Bageorgeou F. Update on chemical peels. dermatol Clin. 2024 Jan;42(1):13-20. doi: 10.1016/j.det.2023.06.005.

22. Bhargava S, Goldust M, Singer H, Negbenebor N, Kroumpouzos G. Evaluating resurfacing modalities in aesthetics. Clin Dermatol. 2022 May;40(3):274-82. doi: 10.1016/j.clindermatol.2021.01.019.

23. Devgan L, Singh P, Durairaj K. Minimally Invasive Facial Cosmetic Procedures. Otolaryngol Clin North Am. 2019 Jun;52(3):443-59. doi: 10.1016/j.otc.2019.02.013.

24. Chatham DR. Reducing risks for a dissatisfied patient in facial cosmetic surgery. Facial Plast Surg Clin North Am. 2023 May;31(2):183-93. doi: 10.1016/j.fsc.2023.01.004.

25. Morhy ON, Sisnando AL, Câmara-Souza MB, Carbone AC, De la Torre Canales G. High levels of physical activity reduce the esthetic durability of botulinum toxin type A: A Controlled Single-Blind Clinical Trial. Toxins (Basel). 2023 Jul;15(7):463. doi: 10.3390/toxins15070463.

26. Harnchoowong S, Vachiramon V, Jurairattanaporn N. Cosmetic considerations in dark-skinned patients. Clin Cosmet Investig Dermatol. 2024 Feb;17:259-77. doi: 10.2147/CCID.S450081.

27. Esmaeili S, Malek Mohammadi N, Khosravani S, Eslamian L, Motamedian SR. Effects of age and gender on hard and soft tissue cephalometric features of an iranian population over 12 years old. J Kerman Univ Med Sci. 2022 Dec;29(6):507-19. doi: 10.34172/jkmu.2022.62.

28. Yurdakurban E, Duran GS, Görgülü S. Evaluation of an automated approach for facial midline detection and asymmetry assessment: A preliminary study. Orthod Craniofac Res. 2021 Dec;24(S2):84-91. doi: 10.1111/ocr.12539.

29. Zebrowitz LA, Franklin RG. The attractiveness halo effect and the babyface stereotype in older and younger adults: similarities, own-age accentuation, and older adult positivity effects. Exp Aging Res. 2014 May;40(3):375-93. doi: 10.1080/0361073X.2014.897151.

30. Trussler AP. Facial geometry: graphic facial analysis for forensic artists. Plast Reconstr Surg. 2008 Jun;121(6):2172. doi: 10.1097/PRS.0b013e3181784221.

31. Novaes HMD, Soárez PC. [Health technologies assessment: origins, development, and current challenges. in the international and brazilian scenarios]. Cad Saude Publica. 2020 Sep 4;36(9):e00006820. Portuguese. doi: 10.1590/0102-311X00006820.

32. Kim N-Y, Kim B-R, Park S-H, Jang H-J, Kim S-J. A Study on the changing of biophysical properties of the facial skin according to aging. Asian J Beauty Cosmetol. 2023 Jun;21(2):247-61. doi: 10.20402/ajbc.2023.0023.

33. Raikar D, Javed MW, Takalkar AA. A clinical and epidemiological study of hyperpigmentary disorder of face. Int J Res Dermatol. 2020 Feb;6(2):183-6. doi: 10.18203/issn.2455-4529.IntJResDermatol20200207.

34. Youn SW, Kim SJ, Hwang IA, Park KC. Evaluation of facial skin type by sebum secretion: Discrepancies between subjective descriptions and sebum secretion. Skin Res Technol. 2002 Aug;8(3):168-72. doi: 10.1034/j.1600-0846.2002.10320.x.

35. Wollenberg A, Giménez-Arnau A. Sensitive skin: a relevant syndrome, be aware. J Eur Acad Dermatol Venereol. 2022 Apr 21;36(S5):3–5. doi: 10.1111/jdv.17903.

36. Glogau RG. Aesthetic and anatomic analysis of the aging skin. Semin Cutan Med Surg. 1996 Sep;15(3):134-8. doi: 10.1016/S1085-5629(96)80003-4.

37. Türkkahraman H, Gökalp H. Facial profile preferences among various layers of Turkish population. Angle Orthod. 2004 Oct;74(5):640-7. doi: 10.1043/0003-3219(2004)074<0640:FPPAVL>2.0.CO;2.

38. Fabi S, Alexiades M, Chatrath V, Colucci L, Sherber N, Heydenrych I, et al. Facial aesthetic priorities and concerns: a physician and patient perception global survey. Aesthet Surg J. 2022 Mar;42(4):NP218-29. doi: 10.1093/asj/sjab358.

39. Martinez MJ, Dixit D, White MW, Rieder EA. Motivations for seeking cosmetic enhancing procedures of the face: a systematic review. Dermatol Surg. 2023 Mar;49(3):278-82. doi: 10.1097/DSS.0000000000003702.

40. Toh WL, Lam S, Mangano M, Rossell SL. Multidimensional perfectionism and facial symmetry, attractiveness and approachability: comparing those with high versus low dysmorphic concerns. Psychol Rep. 2023 Oct:332941231205274. doi: 10.1177/00332941231205274.

41. Benedetti TRB, Antunes PC, Rodriguez-Añez CR, Mazo GZ, Petroski ÉL. Reproducibility and validity of the International Physical Activity Questionnaire (IPAQ) in elderly men. Rev Bras Med Esporte. 2007 Feb;13(1):11-6. doi: 10.1590/S1517-86922007000100004.

42. Knipping S, ter Haar E, Alkemade H, Bronkhorst E, Falk M, Hueskes K, et al. Translation and Validation of the Dutch Version of the Sun Exposure and Protection Index. Dermatology. 2024;240(2):282-90. doi: 10.1159/000535510.

43. Cabral LDS, Pereira SDO, Partata AK. [Sunscreens and photoprotection compounds - a review]. Infarma Cienc Farmaceut. 2013 Aug;25(2):107-10. Portuguese. doi: 10.14450/2318-9312.v25.e2.a2013.pp107-110.

44. Voegeli R, Schoop R, Prestat-Marquis E, Rawlings A V., Shackelford TK, Fink B. Differences between perceived age and chronological age in women: a multi-ethnic and multi-centre study. Int J Cosmet Sci. 2021 Oct;43(5):547-60. doi: 10.1111/ics.12727.

45. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. Arch Dermatol. 1988 Jun;124(6):869-71. doi: 10.1001/archderm.124.6.869.

46. Weigand DA, Haygood C, Gaylor JR. Cell layer and density of negro and caucasian stratum corneum. J Investigat Dermatol. 1974 Jun;62(6):563-8. doi: 10.1111/1523-1747.ep12679412.

47. Goldie K, Kerscher M, Fabi SG, Hirano C, Landau M, Lim TS, et al. Skin quality – a holistic 360° view: consensus results. Clin Cosmet Investig Dermatol. 2021 Jun:14:643-654. doi: 10.2147/CCID.S309374.

48. Jungersted JM, Høgh JK, Hellgren LI, Jemec GBE, Agner T. Ethnicity and stratum corneum ceramides. Br J Dermatol. 2010 Dec;163(6):1169-73. doi: 10.1111/j.1365-2133.2010.10080.x

49. Oesch S, Vingan NR, Li X, Hoopman J, Akgul Y, Kenkel JM. A Correlation of the glogau scale with visia-cr complexion analysis measurements in assessing facial photoaging for clinical research. Aesthet Surg J. 2022 Sep;42(10):1175-84. doi: 10.1093/asj/sjac108.

50. Quiñonez RL, Agbai ON, Burgess CM, Taylor SC. An update on cosmetic procedures in people of color. Part 2: neuromodulators, soft tissue augmentation, chemexfoliating agents, and laser hair reduction. J Am Acad Dermatol. 2022 Apr;86(4):729-39. doi: 10.1016/j.jaad.2021.07.080.

51. Rhodes G, Zebrowitz LA, Clark A, Kalick SM, Hightower A, McKay R. Do facial averageness and symmetry signal health? Evol Hum Behav. 2001 Jan;22(1):31-46. doi: 10.1016/S1090-5138(00)00060-X.

52. Tanikawa C, Akcam MO, Gokalp H, Zere E, Takada K. Population affinity and variation of sexual dimorphism in three-dimensional facial forms: comparisons between Turkish and Japanese populations. Sci Rep. 2021 Aug;11(1):16634. doi: 10.1038/s41598-021-96029-9.

53. Taylor SC, Burgess CM, Callender VD. Safety of nonanimal stabilized hyaluronic acid dermal fillers in patients with skin of color: a randomized, evaluator-blinded comparative trial. Dermatol Surg. 2009 Oct;35 Suppl 2:1653-60. doi: 10.1111/j.1524-4725.2009.01344.x.

54. Gao Y, Niddam J, Noel W, Hersant B, Meningaud JP. Comparison of aesthetic facial criteria between Caucasian and East Asian female populations: An esthetic surgeon's perspective. Asian J Surg. 2018 Jan;41(1):4-11. doi: 10.1016/j.asjsur.2016.07.007.

55. Arian H, Alroudan D, Alkandari Q, Shuaib A. Cosmetic surgery and the diversity of cultural and ethnic perceptions of facial, breast, and gluteal aesthetics in women: a comprehensive review. Clin Cosmet Investig Dermatol. 2023 Jun;16:1443-1456. doi: 10.2147/CCID.S410621.

56. Buggio L, Vercellini P, Somigliana E, Viganò P, Frattaruolo MP, Fedele L. "You are so beautiful"*: behind women's attractiveness towards the biology of reproduction: a narrative review. Gynecol Endocrinol. 2012 Oct;28(10):753-7. doi: 10.3109/09513590.2012.662545.

57. Naini FB, Gill DS. Facial Aesthetics: 2. Clinical Assessment. Dent Update. 2008 Apr 2;35(3):159-70. doi: 10.12968/denu.2008.35.3.159.

58. Mogilski JK, Welling LLM. The Relative importance of sexual dimorphism, fluctuating asymmetry, and color cues to health during evaluation of potential partners' facial photographs. Hum Nat. 2017 Mar;28(1):53-75. doi: 10.1007/s12110-016-9277-4.

59. Özener B, Fink B. Facial symmetry in young girls and boys from a slum and a control area of Ankara, Turkey. Evol Hum Behav. 2010 Nov;31(6):436-41. doi: 10.1016/j.evolhumbehav.2010.06.003.

60. Jones AL. The influence of shape and colour cue classes on facial health perception. Evol Hum Behav. 2018 Jan;39(1):19-29. doi: 10.1016/j.evolhumbehav.2017.09.005.

61. Komori M, Kawamura S, Ishihara S. Averageness or symmetry: Which is more important for facial attractiveness? Acta Psychol (Amst). 2009 Jun;131(2):136-42. doi: 10.1016/j.actpsy.2009.03.008.

62. Heidekrueger PI, Juran S, Szpalski C, Larcher L, Ng R, Broer PN. The current preferred female lip ratio. J Craniomaxillofac Surg. 2017 May;45(5):655-60. doi: 10.1016/j.jcms.2017.01.038.

63. Kolte RA, Kolte AP, Kharkar V V., Bawankar P. Influence of facial index, facial profile, lip size, and angulations of teeth on gingival characteristics of anterior teeth: a gender-based evaluation. J Esthet Restor Dent. 2020 Jul;32(5):496-504. doi: 10.1111/jerd.12600.

64. Tonnard PL, Verpaele AM, Ramaut LE, Blondeel PN. Aging of the upper lip: part II. evidence-based rejuvenation of the upper lip—a review of 500 consecutive cases. Plast Reconstr Surg. 2019 May;143(5):1333-42. doi: 10.1097/PRS.0000000000005589.

65. Mally P, Czyz CN, Wulc AE. The role of gravity in periorbital and midfacial aging. Aesthet Surg J. 2014 Aug;34(6):809–22. doi: 10.1177/1090820X14535077.

66. Mezio M, Guarnieri R, Altieri F, Padalino G, Cassetta M, Di Giorgio R, et al. Smile esthetic: comparison of perception amongst orthodontists, dental students, orthodontic patients and surgical orthodontic patients. Braz J Oral Sci. 2023 Dec ;22:e230438. doi: 10.20396/bjos.v22i00.8670438.

67. Rhodes G. The evolutionary psychology of facial beauty. Annu Rev Psychol. 2006 Jan;57(1):199-226. doi: 10.1146/annurev.psych.57.102904.190208.

68. Friedman H, Zebrowitz LA. The contribution of typical sex differences in facial maturity to sex role stereotypes. Pers Soc Psychol Bull. 1992 Aug;18(4):430-8. doi: 10.1177/0146167292184006.