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Esthetic Proportions In Smile Design: A Comprehensive Review Of Classical Concepts And Contemporary Clinical Applications

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Abstract
Background: *Traditional mathematical concepts like the Golden Ratio, RED ratio, and Golden Percentage have historically influenced smile design, yet their universal relevance continues to be questioned in a time characterized by biological diversity and digital processes.*
Objective: *To evaluate traditional aesthetic proportions alongside modern digital tools such as Digital Smile Design (DSD), CAD/CAM, and AI-enhanced planning.*
Methods: *A systematic search following PRISMA 2020 guidelines was performed on PubMed, Scopus, Web of Science, Cochrane, and Google Scholar for articles in English published between January 1973 and December 2025. Out of 1,247 records found, 96 satisfied the inclusion criteria following the screening process.*
Results: *The Golden Proportion is found in less than 20% of natural teeth; RED (70%) and Golden Percentage provide superior clinical flexibility. L'esthétique du sourire résulte de l'interaction entre desparamètres macro- (arc du sourire, ligne médiane, corridors), mini- (architecture gingivale) et micro- (morphologie, couleur). DSD enhances communication and predictability, although data on long-term outcomes is still scarce.*
Conclusion: *There is no one ratio that universally determines smile aesthetics. Contemporary smile design promotes a multidimensional, patient-focused blend of traditional principles with digital diagnostics and cultural sensitivity.*
Keywords: *Smile creation; Golden ratio; RED ratio; Dental aesthetics; Digital smile creation; Gum zenith; Smile curvature*

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I. Introduction

The smile ranks among the most notable aspects of human facial expression and serves as a strong indicator of social, psychological, and professional health [1,2]. Due to the growing societal focus on looks and the rise of social media visuals, patients are now arriving at dental offices with elevated expectations concerning aesthetic results [3,4]. As a result, smile design has transformed from a solely artistic pursuit into a clinical science that combines prosthodontics, periodontics, orthodontics, oral surgery, and maxillofacial planning [5,6].

Throughout history, the idea of beauty in dentistry has been linked to mathematical and geometric principles that trace back to ancient times. The Golden Ratio ($\varphi \approx 1.618$), recognized by ancient Greek thinkers and famously utilized by Renaissance artists and architects like Leonardo da Vinci, was formally introduced to dentistry by Lombardi in 1973 and further developed by Levin in 1978, who suggested that the visible widths of maxillary anterior teeth should adhere to this divine ratio [7,8]. The following decades saw the introduction of various alternative frameworks, such as Snow's Golden Percentage (1999) [9], Ward's Recurring Esthetic Dental (RED) Proportion (2001) [10], along with numerous adjustments that focused on the shortcomings of rigid mathematical models..

Alongside these proportion-focused theories, esthetics has been defined through three hierarchical tiers: macro-esthetics (the connection between the face, lips, and dental structure), mini-esthetics (the gingival and dentogingival framework), and micro-esthetics (the morphology, color, and surface traits of individual teeth) [11,12]. This classification has demonstrated its worth for organized diagnosis and interaction between healthcare providers and laboratory staff.

Over the last twenty years, the sector has experienced a transformation influenced by digital advancements. In 2012, Coachman and Calamita presented the idea of Digital Smile Design (DSD), utilizing photography, video, and digital planning tools to combine facial and dental assessments [13]. Recent

advancements in CAD/CAM dentistry, intraoral scanning, 3D printing, and more recently, artificial intelligence (AI) have revolutionized the reliability and consistency of smile design processes [14,15].

Acknowledging the constraints of rigid mathematical frameworks

In spite of this extensive literature, significant debate continues. The Golden Proportion's universal applicability has been consistently questioned by morphometric research indicating that less than 20% of natural dentitions align with this ratio [16,17]. Additionally, variations in cultural, ethnic, and gender perceptions of smile aesthetics hinder the creation of universal standards [18,19]. Clinicians thus encounter a complicated decision-making environment where traditional theory needs to be aligned with biological facts, patient choices, and new technology..

Rationale and Knowledge Gap

Although many narrative reviews have focused on specific elements of smile design — especially the Golden Proportion or DSD — thorough syntheses that connect traditional ideas with modern clinical uses are still limited. Many previous reviews lack a systematic approach, showcase biased choices of supporting literature, or neglect to consider the integration of digital workflows with traditional proportional theory..

Aims and Objectives

This systematic review sought to: (1) assess the validity and clinical relevance of traditional mathematical proportions in smile design; (2) compile existing evidence on macro-, mini-, and micro-esthetic factors; (3) examine the incorporation of digital technologies, such as DSD, CAD/CAM, and AI, in modern smile design applications; (4) recognize cultural, ethnic, and gender differences influencing aesthetic perception; and (5) offer an evidence-based structure for clinical decision-making and pinpoint future research avenues..

II. Materials And Methods

This systematic review was carried out in alignment with the 2020 guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [20].

Protocol and Registration

The review protocol was developed beforehand and encompassed the population, intervention, comparison, and outcome (PICO) components as detailed: Population (P): Adult human participants needing smile evaluation or cosmetic dental care. Intervention (I): Implementation of aesthetic proportion principles (Golden Ratio, RED, Golden Percentage), smile creation procedures (analog or digital), or DSD/CAD-CAM processes. Comparison (C): Alternative proportional systems, traditional analog smile design, or untreated controls (when relevant). Result (R): Aesthetic results, perceptions of patients and clinicians, durability of restoration, and predictability of design.

Sources of Information and Search Approach

An organized electronic search was conducted through five databases: PubMed/MEDLINE, Scopus, Web of Science (Core Collection), Cochrane Central Register of Controlled Trials (CENTRAL), and Google Scholar (first 200 entries). The investigation was carried out from January 1973 (release of Lombardi's foundational article) until December 2025.

Search queries were merged using Boolean logic: ("smile design" OR "smile esthetics" OR "smile aesthetics" OR "dental esthetics") AND ("golden proportion" OR "golden ratio" OR "RED proportion" OR "recurring esthetic dental proportion" OR "golden percentage" OR "tooth proportion" OR "width-to-length ratio") OR ("digital smile design" OR "DSD" OR "CAD/CAM" OR "computer-aided") AND ("gingival zenith" OR "smile line" OR "smile arc" OR "buccal corridor" OR "gummy smile"). Reference lists of selected articles and earlier narrative reviews were manually searched for more qualifying studies (snowball sampling).

Eligibility Criteria

Criteria for inclusion: original research papers (clinical, in vivo, in vitro, morphometric); systematic reviews and meta-analyses; respected narrative reviews and foundational theoretical articles; English language; studies focusing on dental proportions, elements of smiles, or digital smile design.

Exclusion criteria: case reports that do not include esthetic measurement data; editorials, letters, and opinion pieces that lack original data; research focused on pediatric populations or primary teeth; articles that exclusively cover oncologic, traumatic, or syndromic reconstruction; articles published in non-English languages without translation.

Study Selection and PRISMA Flow

Records were loaded into reference management software (Mendeley, Elsevier) and duplicates were removed. Two separate reviewers evaluated titles and abstracts based on eligibility requirements. Complete texts of possibly qualifying articles were obtained and evaluated independently. Conflicts were settled through consensus or, when needed, by seeking the input of a third reviewer.

Identification: 1,247 entries found via database searches; 38 more entries obtained from hand-searching. Screening: Following the elimination of 312 duplicates, 973 records were evaluated based on their title and abstract. Eligibility: 184 full-text articles evaluated for eligibility; 88 excluded (reasons: non-English n=14, irrelevant n=41, insufficient data n=22, case reports n=11). Inclusion: 96 studies incorporated in the qualitative synthesis.

Data Extraction and Quality Assessment

A standardized extraction form documented: authorship, year, research design, sample size and demographics, measured aesthetic parameters, methodology (clinical, photographic, digital), significant findings, and limitations. Quantitative pooling (meta-analysis) was not conducted due to significant differences in study designs, populations, and measurement techniques.

The quality of the studies included was assessed using tools suitable for their design: the Joanna Briggs Institute (JBI) checklists for cross-sectional and analytical research, the Cochrane Risk of Bias Tool (RoB 2) for randomized trials, and AMSTAR-2 for previous systematic reviews. Out of the 96 studies included, 14 were rated as high quality, 52 as moderate, and 30 as low to moderate, mainly due to constraints in sample size, absence of blinding in aesthetic evaluations, and reliance on subjective outcome measures.

Data Synthesis

A thematic synthesis of the narrative was conducted. Results were classified into: (a) facial and smile structure; (b) traditional proportional systems; (c) macro-aesthetic elements; (d) mini-aesthetic elements; (e) micro-aesthetic elements; (f) digital tools; and (g) cultural and demographic differences..

III. Results And Review

Facial Framework and the Smile Composition

Successful smile design starts with the face. Rufenacht highlighted that the dental arrangement should align with facial reference lines, such as the interpupillary line, the commissural line, and the dental midline in relation to the philtrum [21]. Facial proportions conventionally segment the face into vertical thirds (trichion–glabella–subnasale–menton) and horizontal fifths, each equivalent to the width of a single eye. Even though these divisions are seldom entirely symmetrical in nature, significant differences can influence perceived attractiveness [22,23].

The lip structure — encompassing upper lip length, philtrum height, and lip movement while smiling — influences the appearance of the teeth [24]. Vig and Brundo categorized the visibility of incisors at rest based on age and gender, showing that the visibility of maxillary incisors diminishes with age, while mandibular incisor visibility rises owing to varying lip mobility and tooth wear [25]. A young smile usually reveals 2–4 mm of maxillary incisor visibility when at rest in women and 1–3 mm in men.

In their seminal 1984 research, Tjan, Miller, and The examined images of 454 dental and dental hygiene students, recognizing four essential smile features: the upper lip curvature (high/average/low), the smile arc, lateral negative space (buccal corridor), and the dental midline [26]. These continue to be fundamental descriptors now.

Classical Proportional Concepts

The Golden Proportion (Lombardi–Levin)

Lombardi (1973) was the pioneer in bringing the Golden Proportion to dentistry, proposing that the visible width of the central incisor should be roughly 1.618 times that of the lateral incisor, which should also be 1.618 times the visible width of the canine [7]. Levin (1978) implemented this principle by creating a "golden grid" to direct diagnostic wax-ups and restorative procedures [8].

Later empirical research has mostly not validated the universality of the Golden Proportion in natural dental structures. Preston (1993), assessing 58 individuals with "attractive" smiles, discovered the Golden Proportion evident in merely 17% of cases between central and lateral incisors and rarely between lateral incisor and canine [27]. Mahshid et al. (2004), studying 157 dental students in Iran, found comparably low rates [28]. Hasanreisoglu et al. (2005) noted in 100 Turkish participants that average width ratios significantly differed from φ [29]. Several cross-cultural investigations have reinforced these conclusions [30,31,32]. Conclusion:

although the Golden Proportion serves as a valuable conceptual framework for clinicians in creating highly idealized smiles, its regular clinical application lacks support from morphometric evidence.

Snow's Golden Percentage

Snow (1999) suggested that effective smile aesthetics rely not on a constant ratio among neighboring teeth, but rather on each maxillary anterior tooth representing a particular percentage of the total inter-canine width when viewed from the front [9]. The suggested percentages are: 10% for canine, 15% for lateral incisor, and 25% for central incisor — mirrored on both sides to reach a total of 100%. The Golden Percentage recognizes anatomical diversity and emphasizes the holistic arrangement instead of proportions among single teeth. Multiple studies indicate satisfactory clinical alignment with this framework, particularly when the aim is esthetic predictability [33,34].

Ward's Recurring Esthetic Dental (RED) Proportion

Ward (2001, 2007) suggested the RED ratio, whereby the visible width of each subsequent tooth in the aesthetic zone, as seen from the front, should consistently be a specific percentage of the width of the tooth directly mesial to it [10,35]. Significantly, RED enables clinicians to choose a ratio suitable for the patient's facial height — 70% for tall faces, 75% for average, and 80% for short faces — thus reinstating proportionality without enforcing the strict 62% mandated by the Golden Proportion.

In a comparative study, Ali Fayyad et al. (2006) found that the RED proportion (around 70%) was more commonly observed than the Golden Proportion among Saudi adults [36]. Rosenstiel et al. (2000) and Wolfart et al. (2005) also observed a higher preference from both clinicians and laypeople for tooth arrangements aligned with the RED 70% framework compared to those based solely on φ [37,38].

The M-Proportion and Other Frameworks

Alternative geometrically defined frameworks have been suggested but have not gained widespread acceptance. The "M-proportion" indicates that the width of the maxillary central incisor is roughly one-sixteenth of the facial width [39]. Bukhary et al. and others have proposed flexibility in the digital age that is tailored to individual patients rather than being standard for all [40].

Width-to-Length Ratios of Maxillary Anterior Teeth

The ratio of width to length (W/L) of the maxillary central incisor is among the most examined micro-esthetic factors. Sterrett et al. (1999) found a mean ratio of 0.85 (range 0.75–0.95) among 84 dental students, which is slightly lower than the frequently mentioned 0.75–0.78 [41]. Magne et al. (2003) highlighted the significance of reinstating "youthful" proportions of 0.75–0.80 in aged dentitions [42]. Brunzel et al. (2006) observed that ratios falling outside the 0.65–0.85 range are often viewed as unappealing by non-experts [43].

The W/L ratio clinically informs interventions like crown lengthening, gingivectomy, restorative enhancements to incisal edges, or selective enameloplasty. If teeth look excessively short or square, additive methods (composite or porcelain veneers extending the incisal edge) are typically favored; if they appear too long, conservative alterations of the incisal edges and gum visibility may be an option [44].

Macro-Esthetic Components

Smile Line and Smile Arc

The smile line pertains to the connection between the curve of the incisal edges of the upper front teeth and the curve of the lower lip when smiling for a photo. An aesthetically pleasing smile arc is a "consonant" one, where the upper incisal curve aligns with the top edge of the lower lip [45]. A flat or inverted smile line is linked to a prematurely aged look.

Hulsey (1970), in an early objective study, discovered that 85% of dental professionals and laypeople favored harmonious smile arcs [46]. Parekh et al. (2006) recently showed quantitatively that orthodontists, general dentists, and laypeople all evaluate flattened or reversed smile arcs negatively in perception studies [47].

Lip Line Classification

Tjan's categorization of upper lip position when smiling—high (>2 mm gingival exposure), average (full crown to <2 mm gingival exposure), or low (<75% crown exposure)—is still commonly utilized [26]. Elevated smile lines (commonly referred to as "gummy smiles") have an estimated occurrence of 7–14% and are observed more frequently in women [48].

Buccal Corridors

The buccal corridor refers to the empty space found between the buccal surfaces of the back teeth and the edges of the mouth while smiling. Tjan categorized corridors into three types: minimal, medium, and broad.

Research results are varied: Moore et al. (2005) found that people prefer narrower buccal corridors [49], whereas McNamara et al. (2008) contended that the impact on attractiveness ratings is limited, with smile arc symmetry and tooth color having a stronger effect [50].

Dental Midline

While a coincident dental midline (maxillary–mandibular and with the facial midline) is theoretically perfect, actual dentitions frequently exhibit slight discrepancies. Kokich et al. (1999, 2006) discovered that non-professionals accept maxillary midline deviations of as much as 4 mm before noticing asymmetry, whereas dentists and orthodontists identify deviations at 2–3 mm [51,52]. Midline angulation (cant) is more easily noticed than lateral displacement.

Mini-Esthetic Components: Gingival Architecture

Gingival Zenith

The gingival zenith, defined as the lowest point of the labial gingival margin, is typically positioned distal to the long axis for maxillary central incisors and canines, while it is found on the long axis (or slightly distal) for lateral incisors [53]. Chu et al. (2009) presented comprehensive photographic measurements in 90 patients and validated these anatomical tendencies [54]. The return of natural zenith asymmetry enhances perceived authenticity.

Gingival Margin Levels and Symmetry

In a visually appealing smile, the gingival edges of the maxillary central incisors and canines generally align at the same height, whereas the lateral incisors are located 0.5–1.0 mm above this line [55]. Inversion of "stepping" or noted imbalance undermines harmony. Kokich (1996) showed that non-professionals can recognize gingival asymmetry of 1.5 mm or more [56].

Gingival Display (Gummy Smile)

Excessive gingival display, characterized by more than 3 mm of gum visibility when smiling, can be caused by vertical maxillary excess, altered passive eruption, hyperactive muscles that elevate the upper lip, a short upper lip, or compensatory eruption [57]. Management options include orthognathic surgery, orthodontic intrusion, crown lengthening, botulinum toxin injection, and lip repositioning surgery [58,59]. Polo (2008) and later researchers have described the importance of botulinum toxin in the conservative treatment of muscle-driven gummy smiles [60].

Interdental Papilla and Black Triangles

The existence of unblemished interdental papillae occupying the embrasure gaps is crucial for aesthetics. Tarnow et al. (1992) showed that the presence of papillae can be anticipated when the distance from the contact point to the bone crest is ≤5 mm [61]. Black triangles — exposed gingival spaces — are becoming more prevalent following orthodontic procedures, periodontal treatments, or in adult individuals experiencing attachment loss [62].

Micro-Esthetic Components

Tooth Morphology and Form

The classic dentogenic theory by Frush and Fisher (1958) suggested that the shape of teeth should indicate sex, personality, and age (SPA) [63]. While the predictive accuracy of SPA has faced scrutiny, the core idea — that tooth shape must align with the patient — remains intact. Williams' classification (1914) outlined three primary dental shapes — square, ovoid, and tapering — allegedly linked to facial contours, although later research has not confirmed a strict relationship [64,65]. Contemporary smile design prioritizes personalized shape informed by digital photos and reference visuals.

Tooth Color and Shade

Color is a complex attribute that consists of hue, value, and chroma. Value (brightness) is usually the primary factor in perceived color matching [66]. Maxillary central incisors are typically the lightest teeth, with laterals and canines showing increased chroma. Shade selection must occur under controlled lighting (D65 daylight) at the beginning of the appointment to prevent eye strain and tooth dehydration [67]. Modern digital shade-matching tools (e.g., spectrophotometers like VITA Easyshade) exhibit greater accuracy than visual matching alone [68].

Surface Texture and Characterization

Natural enamel surfaces display horizontal perikymata and vertical growth grooves. Incorporating these elements into restorations improves naturalism by allowing light to scatter and reflect [69]. Teeth that are younger show a more distinct texture, while older teeth generally become less textured due to wear.

Tooth Wear and Age

Age-related alterations encompass the flattening of incisal edges, greater visibility of dentin (a yellower shade), gingival recession, and diminished incisor visibility at rest. Restorative planning needs to assess if it should rebuild age-appropriate elements or renew youthful traits [70].

Digital Smile Design and Contemporary Workflows

The Concept of Digital Smile Design (DSD)

Coachman and Calamita (2012) defined DSD as a versatile instrument that combines still images, videos, and presentation platforms (initially Keynote/PowerPoint) to connect facial assessment, dental strategy, cross-disciplinary dialogue, and patient instruction [13]. The DSD protocol utilizes extra- and intraoral images arranged according to facial reference lines (interpupillary, commissural, dental midline) to create digital ruler grids across the smile.

Components of a Modern Digital Workflow

An entire digital workflow includes: (1) facial and intraoral digital documentation (DSLR or smartphone images, video, intraoral scanning); (2) digital wax-up using CAD software (e.g., exocad, 3Shape Dental Designer); (3) 3D printing of mock-ups for intraoral fitting; (4) CAD/CAM production of provisional and permanent restorations (lithium disilicate, zirconia, layered ceramics); (5) patient confirmation via 2D simulations and 3D-printed fittings [71,72].

Evidence for Digital vs. Analog Smile Design

Cattoni et al. (2016) found that patient comprehension and treatment acceptance were notably enhanced with DSD-based simulations instead of just verbal explanations [73]. Tortopidis et al. (2007) and Mahn et al. (2018) likewise observed improved interaction among clinician, patient, and laboratory technician [74,75]. Nevertheless, strong randomized studies assessing long-term clinical results of digital compared to analog smile design are still limited..

Artificial Intelligence in Smile Design

Recent uses of AI — especially convolutional neural networks (CNNs) and generative adversarial networks (GANs) — demonstrate potential in automating smile evaluation, forecasting aesthetic results, and recommending tooth shapes according to facial characteristics [76,77]. Commercial platforms currently provide AI-based simulations from a single image, yet concerns remain about precision, bias in training data, regulatory control, and the potential for unrealistic patient expectations [78].

Variations in Culture, Ethnicity, and Gender

Aesthetic perception is influenced by cultural heritage, gender, age, and media exposure [79]. Research conducted on various populations (Caucasian, East Asian, South Asian, Middle Eastern, African) reveals differences in favored tooth shape, color, and proportions [18,19,80]. Some East Asian groups favor incisor shapes that are a bit more rounded and have less visible incisors, whereas Western groups typically prefer brighter teeth and wider smiles [81].

Gender-based research typically indicates that women's smiles exhibit greater exposure of incisors and gums, more rounded edges on incisors, and somewhat smaller teeth in proportion to face size than those of men [82]. Clinicians should thus refrain from applying universal standards and instead participate in shared decision-making with patients, guided by references suitable for the population..

IV. Discussion

This systematic review compiles over fifty years of research regarding aesthetic proportions in smile design. Multiple themes arise..

The Limits of Classical Mathematical Proportions

The Golden Proportion, while consistently captivating, does not have empirical backing as a universal representation of natural teeth. Among various populations, the occurrence between central and lateral incisors seldom surpasses 20%, and it is nearly nonexistent between laterals and canines [27,28,29,30,31,32]. Applying the 62% ratio to patients with normal anatomy often results in teeth that look unnaturally slender or compromise

the structural strength in restorative procedures. The RED ratio and Golden Ratio have shown improved clinical flexibility by considering variations in face height and overall composition.

Multidimensional Nature of Smile Esthetics

The examined literature consistently shows that perceived attractiveness results from the combination of several factors: smile arc, midline, gingival structure, tooth ratios, color, and surface texture. No single element is predominant; instead, aesthetic results rely on harmonious integration. This has resulted in the widely accepted macro-, mini-, micro-esthetic hierarchy [11,12], offering a helpful clinical checklist for both diagnosis and treatment planning..

Patient and Clinician Perception Differ

A consistent observation is that healthcare professionals (especially orthodontists and prosthodontists) tend to notice aesthetic discrepancies sooner and evaluate them more critically than non-professionals. Kokich's series of studies indicated that orthodontists can detect midline deviations of 2 mm, whereas patients rarely notice them [51,52]. This discovery carries significant ramifications: healthcare providers should refrain from enforcing their ideals of perfection on patients who would be completely content with simpler, less invasive treatments.

Methodological Limitations of the Literature

The evidence surrounding smile design varies significantly in its methodologies. Photographic studies differ in terms of standardization, lighting conditions, lip retraction, and angles of view. Perception research differs in observer demographics, image alterations, and evaluation scales (visual analog compared to Likert). Limited randomized trials are available; the majority of evidence is cross-sectional or quasi-experimental. Sample sizes tend to be small and restricted to dental student groups, which hampers generalizability..

Integration of Digital Technology

DSD and digital processes have clearly enhanced communication, reliability, and patient approval [73,74,75]. The capacity to predict results prior to irreversible procedures is one of the significant breakthroughs in contemporary esthetic dentistry. Nonetheless, existing constraints involve software learning challenges, the expense of CAD/CAM equipment, reliance on photographic uniformity, and a comparative scarcity of longitudinal clinical outcome data between digital and traditional methods. The swift rise of AI in smile design presents both benefits and worries. AI has the potential to make esthetic planning more accessible, but it also poses the risk of creating unrealistic expectations, reinforcing biases in training data, and sidestepping clinical judgment.

Points of Ongoing Controversy

Three controversies persist: (1) whether a singular proportion system should be recommended — current data favors flexible, patient-specific methods over strict adherence to φ or 70%; (2) the best approach for managing gingival display, with surgical, restorative, orthodontic, and pharmacological options contending for dominance and scarce comparative effectiveness evidence [57,58,59,60]; (3) preferences for buccal corridors — findings across studies vary, with some indicating a strong preference for narrow corridors and others showing little impact [49,50].

V. Future Directions

Multiple priorities arise for upcoming research and clinical advancement. High-quality randomized trials are urgently needed to compare long-term outcomes (5–10 years) of digital and analog smile design, focusing on objective aesthetic indices, patient-reported outcomes, and restoration survival. Secondly, normative data specific to populations must be created: much of the morphometric information comes from restricted geographic groups, necessitating extensive, demographically varied cohorts to set appropriate reference ranges for ethnicity and gender.

Third, it is essential to standardize aesthetic measurement—achieving international agreement on photographic protocols, recording smiles (animated instead of static), and using outcome instruments would enhance comparability among studies. Fourth, validation and regulation of AI: independent assessment of AI-based simulation tools is necessary to guarantee clinical precision, transparency, reduction of dataset bias, and ethical communication with patients. Fifth, patient-centered outcome research should incorporate quality-of-life and psychosocial outcomes (e.g., the Psychosocial Impact of Dental Aesthetics Questionnaire, PIDAQ) in addition to clinical measures.

Sixth, interdisciplinary protocols combining periodontics, orthodontics, prosthodontics, and oral surgery for intricate cases, backed by digital planning tools, need to be created and validated. Ultimately, sustainable digital processes that minimize material waste, enhance efficiency, and stay accessible in resource-limited environments warrant focused consideration.

VI. Conclusion

Aesthetic proportions in smile creation sit at a captivating crossroads of mathematics, biology, art, and technology. Traditional ideas like the Golden Ratio, Golden Percentage, and RED ratio have offered essential conceptual support for many generations of clinicians. Nevertheless, current evidence shows that none of these systems is consistently found in nature, and strict compliance may lead to unnatural or biologically incompatible results.

Contemporary smile design is primarily seen as a patient-focused, multidimensional approach that combines macro, mini, and micro-esthetic elements within a structure of facial and dental harmony. Digital smile design, CAD/CAM, and emerging AI technologies have significantly enhanced predictability, communication, and outcome simulation, yet strong long-term evidence is still necessary.

Clinicians must view smile design as a combination of traditional principles, evidence-based decisions, digital assessments, and patient choices influenced by personal, cultural, and demographic factors. The aim is not flawless symmetry but rather coherent, biologically considerate, and personally significant smiles.

Conflict of Interest

The authors state that there is no conflict of interest..

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