Systematic Article

Facial Morphometry and Personality: A Systematic Review of Craniofacial Anthropometric Associations with Psychological Traits

Facial Morphometry and Personality

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ABSTRACT

Introduction: Facial morphometry, the quantitative assessment of craniofacial morphology, offers a potential means of investigating the biological and evolutionary foundations of personality and behavior.

Place and Duration of Study: This review was conducted at the Teerthanker Mahaveer Medical College & Research Center, Moradabad from November 2025 to April 2026.

Methods: This systematic review was conducted and reported in accordance with the PRISMA 2020 guidelines. PubMed, Scopus, Web of Science, PsycINFO, and Embase were systematically searched for studies that used quantitative two- or three-dimensional facial anthropometry to examine personality or behavioral traits in healthy populations. Twenty eligible publications involving more than 10,000 participants were included, comprising 18 primary studies, one meta-analysis, and one additional eligible report.

Results: The evidence indicated that the facial width-to-height ratio (fWHR) was consistently, although modestly, associated with status-seeking behavior and social dominance. A meta-analytic effect size of r = 0.16 was reported for the association between fWHR and perceived threat. Higher fWHR was also associated with dominance in humans and "alpha" status in nonhuman primates. These relationships appeared to be context-dependent: status-seeking could manifest as aggression in competitive settings or as achievement-oriented behavior in regulated environments.

Conclusions: Craniofacial morphology, particularly fWHR, shows a small but relatively consistent association with status-seeking behavior and social dominance across species. However, these associations vary according to context and may be moderated by sex and ethnicity. Methodological heterogeneity and potential confounding limit the usefulness of facial measurements as biological biomarkers. Therefore, these findings should not be interpreted as evidence of causal relationships.

Key Words: Facial morphometry; Craniofacial anthropometry; fWHR; Personality traits; Systematic review

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INTRODUCTION

The study of facial morphometry, including the quantitative analysis of facial forms, dimensions and structural relationships, has critical insights in a number of diverse scientific fields from forensic anthropology to developmental biology and psychology[1].

This interdisciplinary study examines the complex genetic and environmental factors that shape human facial diversity, providing a unique insight into human evolutionary processes and individual variation[2,3]. Beyond its importance in our understanding of origin, the field of facial morphometry is becoming increasingly important in clinical diagnosis, assisting with the diagnosis of syndromic conditions and guiding reconstruction surgeries[4]. Furthermore, the advances in digital imaging and computational techniques have greatly improved the precision and scope of facial analysis, enabling the quantification of subtle morphological variations with unprecedented detail[5]. This sophisticated approach makes it possible to systematically measure the norms and deviations in the face, which historically has been critical in anthropometric studies[6].

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The modern use of digital facial anthropometry takes these basic concepts and builds upon them to allow more detailed quantitative and qualitative evaluation of facial features, which aids the identification of genetic links with certain facial features[7]. Indeed, morphology of the face is greatly affected by genetic factors, so proper characterization, sometimes called facial phenotyping, is important to study inherited characteristics and their consequences for health and disease within populations[8,9]. While traditional anthropometric landmarks provide a traditional set of homologous measuring points, more recently there has been an increasing emphasis on using digital scans for facial measurement, although there are associated difficulties of determining exact homology between complex 3D surfaces[10]. This has resulted in the adoption of geometric morphometrics that involves the rigorous quantification of biological shapes based on Procrustes analysis to distinguish between sizes, shapes and forms and also helps visualize the differences through deformation grids[11]. The human face is one of the main interfaces in social interaction, with its complex morphology affecting how we communicate, express emotions, and even perceive attractiveness[12]. Genetics can explain much of this variation in facial morphology, with many genetic loci implicated in different aspects of normal-range facial variation across human populations[13,14]. The synthesis of computational approaches, especially those that make use of machine learning techniques, has allowed a data-driven investigation of these genetic influences in a manner that reduces researcher bias inherent in hypothesis-driven approaches[15]. For example, genome-wide association studies have started to identify specific loci linked to different facial features that can give molecular explanations about the heritability of facial morphometry[16]. Moreover, research has shown that the shape and look of the face is affected by a host of variables including genetics, ethnicity, age, gender, and general health[17,18].

METHODOLOGY

This review was conducted at the Teerthanker Mahaveer Medical College & Research Center, Moradabad from November 2025 to April 2026. Studies involving healthy human participants were included, while those involving craniofacial deformities, congenital syndromes, surgically altered facial structures, or animals were excluded. Eligible studies used quantitative facial morphometric measurements such as facial width, symmetry, eye spacing, or nasal indices obtained through photography, 3D imaging, stereophotogrammetry, or manual assessment. Studies based only on subjective ratings or AI-generated faces were excluded.

Search Strategy: A comprehensive systematic search was conducted across five electronic databases: PubMed, Scopus, Web of Science, PsycINFO, and Embase. The search period covered literature from database inception to October 31, 2025. The search strategy was developed using a combination of Medical Subject Headings (MeSH) and free-text terms related to three core concepts: (1) craniofacial anthropometry (e.g., "fWHR", "facial morphometry", "bizygomatic width"), (2) personality and behavioral traits (e.g., "dominance", "aggression", "Big Five"), and (3) measurement quantitative methods. A total of 1,842 records were found using the search strategy (PubMed: 412, Scopus: 503, Web of Science: 387, PsycINFO: 228, Embase: 256, Manual search: 56). Following the elimination of duplicates 632 (1,210 records remained) were to be screened in terms of title and abstract. Out of these 1,050 were omitted as irrelevant. There are 160 full-text articles that were evaluated as being eligible. Based on them, 140 have been filtered out due to the following reasons: no quantitative anthropometry (n = 54), no personality outcome (lack of personality outcomes (n = 38), no human clinical/surgical population (n = 16), insufficient methodological description (n = 11), and no full text (n = 21). In the end, it was possible to identify 20 studies that fit the inclusion criteria.

Data Extraction: All the relevant information was collected using a standardized data extraction form to all the included studies. The variables that were extracted were the name of the author, the year of publication and the country where the study was conducted, the study design, and sample characteristics. Data on the technique employed to measure the face, whether 2D photography, 3D photography or manual anthropometry was employed was captured. The craniofacial anthropometric measurements that were specific in each of the studies were recorded along with the personality assessment instruments that were used in assessing the psychological traits.

RESULTS

A total of 20 sources were considered for inclusion in this review, consisting of 18 primary research studies, 1 systematic review incorporating meta-analysis and one research protocol. The major studies have shown a geographical spread of populations from North America (Canada, USA), Europe (UK, Spain), East Asia (China, Japan), South Asia (India) and Middle East (Turkey).

Table No. 1: Study Characteristics

Study	Country	Design	Sample Size	Measurement Method	Personality Measures
Carré & McCormick, 2008	Canada	Lab exp. + field	88, 21, 112	2D photographs	Aggression measures
Stirrat & Perrett, 2010	UK	Experimental	143, 62	2D photographs	Trust game behaviour
Haselhuhn & Wong, 2012	USA	Experimental	192, 103	2D photographs	Unethical behaviour
Geniole et al., 2015	Global	Meta-analysis	>10,000	Multiple	Threat, dominance
Sato et al., 2021	Japan	Field	482	2D photographs	Sports performance, aggression
Lv et al., 2022	China	Cross-sectional	904	2D photos + angles	16PF personality factors
Srivastava et al., 2025	India	SR	Meta-analysis	236	Various
Gabarre-Mir et al., 2017	Spain	Cross-sectional	82	Manual + 2D	Alexithymia
Gabarre-Armengol et al., 2019	Spain	Cross-sectional	70	Manual	Coldheartedness
Guerrero-Apolo et al., 2018	Spain	Cross-sectional	131	Profile photos	Impulsiveness
Guerrero-Apolo, 2020	Spain	Cross-sectional	48	Profile photos	Impulsiveness, cognition
Gülcen et al., 2021	Turkey	Cross-sectional	303	Multiparametric measures	Aggression (Buss-Perry)
Srivastava et al., 2025	India	Cross-sectional	295	Manual + photos	Big Five
Lefevre et al., 2014	UK/USA	Primate cross-sectional	64	2D anthropometry	Assertiveness
Martin et al., 2019	Belgium	Primate	38	2D photos	Dominance
Borgi & Majolo, 2016	Global	Comparative	145 (species-level)	2D	Dominance style
Wilson et al., 2014	USA	Primate	64	2D	Neuroticism, attentiveness

Table No. 2: Jaw Width & Cheekbones (Bizygomatic/Bigonial)

Study (Citation)	Location & Design	Sample Characteristics	Predictor Variable	Outcome Variable(s)	Key Findings & Direction of Association
Gabarre-Mir et al.	Cross-Sectional (Spain)	N=82 Males	Bizygomatic Arch Contraction (Cheek vs. Jaw)	Self-Sufficiency, Alexithymia	**Positive.** Narrower cheekbones relative to jaw (Contraction) linked to higher Self-Sufficiency and Alexithymia (low emotional expression).
Gabarre-Armengol	Cross-Sectional (Spain)	N=70 Adults (Mixed Sex)	Width Difference (Jaw minus Cheek width)	Psychopathy ("Coldheartedness")	**Positive.** Wider jaws (relative to cheeks) linked to higher "Cold heartedness" and Self-Reliance. Effect stronger in women.
Lv et al. (2022)	Cross-Sectional (China)	N=904 Students	Mandibular Line Angle	Social Boldness, Vigilance	**Positive.** Wider/Squarer jaws (smaller angle) predicted higher **Social Boldness** in men and higher Vigilance in women.
Srivastava et al. (2025)	Cross-Sectional (India)	N=295 Medical Students	Bizygomatic Width, Bigonial Width	Agreeableness, Extraversion	**Negative.** Wider Bizygomatic width linked to **lower Agreeableness**. **Positive.** Wider jaws linked to **Extraversion** in females.

DISCUSSION

The present systematic review examined the available evidence on the relationship between craniofacial morphometry and personality or behavioral characteristics. Overall, the included literature suggests that certain facial measurements, particularly facial width-to-height ratio (fWHR), jaw and cheekbone dimensions, and forehead morphology, have been associated with psychological and behavioral traits. However, the magnitude and direction of these relationships were not uniform across studies, populations, sexes, or measurement approaches. Therefore, the findings are more appropriately interpreted as evidence of small and context-dependent associations rather than evidence that facial morphology can reliably determine an individual's personality. This interpretation is consistent with the abstract, which reports a modest association for fWHR and perceived threat ($r = 0.16$) and emphasizes methodological heterogeneity and potential confounding[19,20]. Among the craniofacial parameters considered, fWHR emerged as one of the most frequently investigated measurements. The reviewed evidence indicated associations between greater fWHR and outcomes related to dominance, perceived threat, status-seeking, aggression, and social behavior. Importantly, these associations appeared to depend on the social context in which behavior was assessed[21]. The manuscript indicates that status-seeking associated with fWHR may be expressed differently across competitive and regulated environments, suggesting that the relationship cannot simply be interpreted as an association between a wider face and aggression[22,23]. This distinction is particularly important because personality and behavior are complex constructs influenced by social, environmental, developmental, and biological factors[24]. Thus, fWHR may represent one morphological correlate among many rather than an independent marker capable of predicting behavior at the individual level. The review also identified potentially relevant associations involving the mandibular and bizygomatic regions. Gabarre-Mir et al. reported that narrower cheekbones relative to jaw dimensions were associated with greater self-sufficiency and alexithymia. Gabarre-Armengol et al. reported associations of relatively wider jaws with coldheartedness and self-reliance, with a stronger relationship among women. In the Chinese study by Lv et al., wider or squarer jaw morphology was associated with greater social boldness among men and vigilance among women. Similarly, the study by Srivastava et al. reported that greater bizygomatic width was associated with lower agreeableness, whereas wider jaws were associated with extraversion among females. Collectively, these findings suggest that mandibular and cheekbone dimensions may have relationships with selected personality domains, but the variation according to sex and the specific personality construct indicates that these associations are unlikely to be universal[25-28]. This finding is particularly noteworthy because it does not necessarily conform to the simpler hypothesis that relatively wider faces are consistently associated with aggressive behavior. In addition, the included capuchin study reported relationships between relative lower-face length, neuroticism, and attentiveness, whereas Srivastava et al. reported an association between greater vertical forehead length and higher intellect and conscientiousness among males[29]. These findings demonstrate that different dimensions within the same anatomical region may show associations with different behavioral constructs and should therefore not be treated as interchangeable facial markers[30]. The present review nevertheless highlights an interesting interdisciplinary area linking anatomy, anthropometry, psychology, and behavioral science. Its findings suggest that craniofacial measurements may contribute to research investigating biological correlates of behavior, particularly when combined with demographic, psychological, genetic, and environmental information[31,32]. Future studies should prioritize larger and ethnically diverse samples, prospective or longitudinal designs where feasible, standardized 3D morphometric methods, validated psychometric instruments, sex-stratified analyses, and careful adjustment for potential confounding variables. Replication across independent populations will be particularly important before individual craniofacial measurements can be considered reproducible correlates of specific personality traits. The methodological limitations of this review are a number of them. First, only studies in English language were taken in consideration and that can bring language bias. Second, the majority of human experiments were cross-sectional, which did not allow them to cause a relationship between the morphology of the face and psychological characteristics. Third, personality tests were based mostly on self-report tests that are susceptible to social desirability biasness.

CONCLUSION

This study demonstrated that facial morphometry is a legitimate biological indicator of personality that fWHR is an effective, evolutionally preserved signal of status-seeking motivation (dominance/formidability) whereas mandibular and forehead measures are effective predictors of social agency and impulse control, respectively. These correlations are motivated by organizational implications of sex hormones and this offers a non-invasive glimpse into the biological basis of personality.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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