



## Neoclassical canons of facial beauty: Do we see the deviations?



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### ABSTRACT

**Aim:** To explore the presence of neoclassical canons of facial beauty among young people in Croatia and to question possible psychosocial repercussions occurring in those who demonstrate deviations in relation to canons.

**Subjects and methods:** The study was cross-sectional and the sample included 249 subjects (60% female) aged 12–39 (median 20). Their en face and profile photographs were taken in Natural Head Position. Photogrammetry included analysis of nine neoclassical canons of facial beauty originating from the Renaissance. Psychosocial issues were assessed using the Self-Esteem Scale, Big Five Inventory and three domains of Orthognathic Quality of Life Questionnaire.

**Results:** Significant deviations from neoclassical facial beauty canons were observed in 55–65% of adolescents and young adults. Gender and age showed no relation to deviations. The deviations from canons that influenced the quality of life were mainly those related to vertical facial proportions and demonstrated increased facial aesthetics concern and social impact, and higher self-reported treatment need ( $p < 0.05$ ). Deviations from canons were not related to self-esteem but a decrease in openness, agreeableness and neuroticism was observed.

**Conclusion:** Neoclassical canons were not valid for the majority of adolescents and young adults in Croatia. Only deviations from some canons appear to provoke mild psychosocial repercussions.

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### 1. Introduction

Canons of human beauty in general, including particularly facial features, originate from the period of ancient Egypt and Greece. They represented standardized proportions for human sculptures. However, it was not until the Renaissance era that canons regained their importance for artists (Kusugal et al., 2015). Great people of science, art and innovation, such as Da Vinci, Vitruvius, Bergmüller, Albrecht Dürer, profoundly revisited and applied canons in their work (Jayaratne et al., 2012). Most of the canons assessed in this study were actually first described by Da Vinci. Therefore, the term “neoclassical” is used. These canons represent assumed occurrence of constant ratios between different parameters in a harmonious human face (Vegter and Hage, 2000).

Parameters of facial aesthetics are of importance in the fields of orthognathic and aesthetic surgery and orthodontics in planning and setting treatment goals (Naini and Gill, 2008).

Although the scientific field is nowadays becoming more oriented towards other conventions such as the averageness theory, neoclassical canons are still widely used in anatomy, art and medicine (Al-Sebaei, 2015). In recent decades researchers have commenced to ask themselves whether these canons still demonstrate validity. A complex issue emerged since the human face did not exhibit major changes over the last two millennia, meaning other factors might have led to canons becoming less applicable in modern time. It is known that cultural aspects such as beauty standards alter over time periods, so it is entirely plausible that what was attractive and pleasant a few decades, not to mention centuries ago, is not considered as such nowadays.

Previous studies have questioned the presence of canons, however did not put them in possible relation with one's perception of his/her attractiveness (Borman et al., 1999; Farkas et al., 2000).

Other rules and concepts, such as the divine ratio, have been formed throughout the history of humankind as scientists and artists sought mathematical calculations of facial aesthetics (Jahanbin et al., 2008). They are, however, without disregarding their importance, beyond the scope of this research.

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Quality of life (QoL) represents the complex product resulting from health conditions, appearance, social and contextual factors (Litner et al., 2008; Kosowski et al., 2009). If neoclassical canons do represent facial beauty, deviations could provoke an alteration of QoL.

Presence of malocclusion appears to influence self-perceived QoL (Kragt et al., 2015; Lukez et al., 2015). However, it remains questionable to what extent laypeople notice the parameters of mini and micro smile aesthetics. It seems people tend not to notice details in smile but altered relations between facial elements could bother them more and provoke psychosocial repercussions (Lukez et al., 2015; Paula et al., 2011).

Therefore, the aim of this study was to explore the prevalence of canons in today's faces and to investigate the self-perceived psychosocial issues caused by the deviations from canons. The hypothesis of this study was that significant deviations from canons could influence the perception of oneself and induce some QoL impairing psychosocial effects. Furthermore, the assessment of potential correlation with one's personality traits was to be inspected, given that personality traits are almost 50% under environmental influence (Bouchard and Loehlin, 2001).

Personality traits demonstrate stability in children, and become more coherent during their somatic and psychological development. Therefore, adolescents were included in the examination (Measelle et al., 2005; Soto et al., 2008).

## 2. Subjects and methods

The study was cross-sectional and the sample included 249 subjects (60% female) aged 12–39 (median 20, interquartile range 16–22 years). Participants were pupils and students from local schools and University in Rijeka, invited to participate on a voluntary basis, and subjects visiting the University Dental Clinic in Rijeka, Croatia for an annual dental check-up, consultation or any kind of dental treatment. The group comprised 83 adolescents (under 18) and 166 adults (over 18).

The sample size was calculated under the presumption that the differences in dimensions of self-perceived aesthetics impairment between those with significant and nonsignificant deviations from neoclassical canons would not be great and would amount to 2 scalar points with high dispersal of data, i.e. standard deviation of 5 scalar points in both groups. The power of 80% and significance level 0.05, and the presumption of equal group sizes led to a minimum of 198 examinees (99 per group). Given the ratio of groups sizes is 1:2, the required number of examinees would be 222 (74 and 184 per group). Taking into account a drop-out rate of 20%, 270 examinees were recruited. These calculations were performed in the statistical software MedCalc 14.8.1 (MedCalc Software bvba, Ostend, Belgium), and based on previously published data (Cunningham et al., 2002).

Facial photographs of each subject, en face at rest and profile view, were taken in Natural Head Position (NHP) with a calibration gauge. Photogrammetric analysis evaluated presence of 9 neoclassical canons defined 5 centuries ago; relations in proportions between eyes, nose, lips and face widths, ear and nose heights and height of head portions and facial portions (Torsello et al., 2010) (Figs. 1 and 2).

Canons that were analysed are listed below:

1. Orbitonasal canon: endocanthion – endocanthion (en – en) = alare – alare (al – al)
- 2a. Orbital canon: endocanthion – endocanthion (en – en) = right exocanthion – right endocanthion (ex R – en R)
- 2b. en – en = ex L – en L

3. Naso-oral canon: cheilion – cheilion (ch – ch) = 1.5 × alare – alare (al – al)
4. Nose to face canon: alare – alare (al – al) = 4 × zygion – zygion (zy – zy)
5. Lower face in 3 equal portions canon: subnasale – stomion (sn – stom) = stomion – mentolabial sulcus (stom – mls) = mentolabial sulcus – menton (mls – me)
- 5a. sn – stom to sn – me ratio
- 5b. stom – mls to sn – me ratio
- 5c. mls-me to sn – me ratio
6. Two portion facial profile canon: vertex – endocanthion (v – en) = endocanthion – gnathion (en – gn)
7. Three portion facial profile canon: trichion – nasion (tr – n) = nasion – subnasale (n – sn) = subnasale – gnathion (sn – gn)
- 7a. tr – n to tr – gn ratio
- 7b. n – sn to tr – gn ratio
- 7c. sn – gn to tr – gn ratio
8. Four portion facial profile canon: vertex – trichion (v – tr) = trichion – glabella (tr – gl) = glabella – subnasale (gl – sn) = sn – gn (subnasale – gnathion)
- 8a. v – tr to v – gn ratio
- 8b. tr – gl to v – gn ratio
- 8c. gl – sn to v – gn ratio
- 8d. sn – gn to v – gn ratio
9. Naso-aural canon: nasion – subnasale (n – sn) = supra-aurale – subaurale (sa – sba)

All analyses were performed in the software AudaxCeph (Audax, Ljubljana, Slovenia).

Orthognathic Quality of Life Questionnaire (OQoLQ) domains; Social Aspect of Dentofacial Aesthetics, Facial Aesthetics Concern and Awareness of Dentofacial Aesthetics were used for the assessment of self-perceived impairment of QoL in relation to altered facial aesthetics (Cunningham et al., 2002). OQoLQ had not been used in Croatia previously, therefore a forward–backward translation was done by four experts, Croatian dentists and students of English language, proficient in both Croatian and English (two of them independently performed the forward translation and other two the backward), one of which had had experience using Quality of Life (QoL) instruments. A panel of four dental experts checked the meaning of the original, translated and back-translated items and made consensus of the Croatian version. Internal consistency of domains was verified by average inter-item correlations and Cronbach alpha. The questionnaire was supplemented with two questions: “How satisfied are you with the appearance of your face?” (5 point Likert scale with cut-off points 0 = not at all, 4 = very much) and “Do you think you need some intervention to change the appearance of your face?” (0 = not at all, 4 = very much).

Validated Croatian versions of the Rosenberg Self-Esteem scale and the Big Five Inventory were employed (Schmitt et al., 2007; Rammstedt and John, 2007).

Big Five personality traits include openness, agreeableness, conscientiousness, extraversion and neuroticism.

In order to classify examinees into two groups (one group with significant deviations from theoretical concepts of neoclassical canons and one group with examinees close to theoretical concept) z values of deviations were calculated for each examinee according to formula:

$$z = [\text{personal } (r - \phi) - \text{mean of the sample } (r - \phi)] / \text{SD of the sample}$$
 where r was the ratio of particular canon in an examinee,  $\phi$  theoretical concept of canons of facial aesthetics, and SD standard deviation. Then the z-scores were dichotomised to reduce the effect of outliers and to classify proportions into 2 groups based on the

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