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FOTOGRAMETRIJSKI PARAMETRI LICA KAO POKAZATELJI LEPOTE

FACIAL PHOTOGRAMMETRIC MEASUREMENTS AS BEAUTY LANDMARKS

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Sažetak

Uvod: Lepota i atraktivnost ljudskih karakteristika lica veoma su subjektivne i na njih mogu uticati mnogi faktori – kulturološki, društveni i lični faktori, na primer. Zahvaljujući kompleksnim neuronskim mehanizmima, omogućeno nam je da opažamo sve, kao i da odlučimo da li nešto smatramo atraktivnim ili ne. Najčešći i najznačajniji faktori povezani sa dobrom estetikom lica jesu simetrija i proporcije lica. Važno je pomenuti da one mogu biti detaljno analizirane pomoću fotogrametrije, neinvazivne tehnike koja koristi fotografije ili 3D metode snimanja da zabeleži i analizira kraniofacijalne strukture i karakteristike, u svrhe dijagnostike, planiranja tretmana, monitoringa, ali i istraživanja. Parametri od velikog značaja u fotogrametriji jesu angularni parametri – takvi su nazofrontalni ugao, nazolabijalni ugao, mentolabijalni ugao i ugao profila lica – i linearni parametri: odnos širine i visine lica, širina nosa, distanca između očiju i zenica, dužina filtruma, visina brade i čela.

Cilj: Autori su ovim istraživanjem želeli utvrditi da li su navedeni parametri dovoljni za determinaciju lepote i atraktivnosti lica ako se koriste pojedinačno.

Zaključak: Fotogrametrija lica, zahvaljujući korišćenju angularnih i linearnih parametara, ima široku primenu u poljima medicine, naročito u dermatologiji, u ortopediji vilica, u maksilofacijalnoj i plastičnoj hirurgiji, kao i u mnogim drugim poljima. Zbog brojnih prilagodavanja i napredaka, postala je veoma precizna i pristupačna, a dala je i značajan doprinos dijagnostici, negovanju pacijenata, tretmanima i ishodima mnogih slučajeva u medicini i stomatologiji.

Ključne reči: lepota, estetika, fotogrametrija, angularni parametri, linearni parametri

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Abstract

Introduction: Beauty and attractiveness of a person's facial features are very subjective and also influenced by many factors, such as cultural, social, and personal. It is due to many complex neural mechanisms, that we are able to perceive everything, and also decide if something is attractive or not. The most common and the most significant factors associated with good facial aesthetics are symmetry and proportions of the face. It is important to note that they can be thoroughly analysed using photogrammetry, which represents a non-invasive technique that involves using photographs or 3D imaging methods to capture and analyze the craniofacial structures and features for diagnostic, treatment planning, monitoring and research purposes. When it comes to photogrammetry, angular parameters such as nasofrontal, nasolabial, mentolabial and facial profile angle and linear parameters such as facial width to height ratio, nasal width, interocular and interpupillary distance, philtrum length, chin and forehead height of the face are of great importance.

Aim: In this literature survey authors wanted to highlight if these measurements and parameters were enough for determining the beauty and attractiveness of a face if used on their own.

Conclusion: Facial photogrammetry has several applications in the field of medicine, particularly in areas such as dermatology, orthodontics, maxillofacial and plastic surgery, due to the usage of angular and linear parameters, as well as other purposes. With many advancements and adjustments, it has become accurate and accessible and has also significantly improved diagnostics, patient care, treatments and outcomes in various cases in medicine and dentistry.

Key words: beauty, aesthetics, photogrammetry, angular parameters, linear measurements

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Šta je lepota?

Estetika ljudskog lica odnosi se na subjektivno opažanje lepote i atraktivnosti određenih karakteristika lica. Naučnici su došli do napretka u razumevanju neuronskih mehanizama koji se nalaze u osnovi opažanja lepote. Može se reći da fuziformna regija lica u temporalnom režnju i primarna vidna kora u okcipitalnom režnju imaju bitnu ulogu u opažanju kako lepote, tako i boja, oblika, karakteristika, ekspresija i atraktivnosti ljudskog lica¹. Važnu ulogu, osim gorenavedenih struktura, ima i limbički sistem, koji je uključen u emocionalni aspekt doživljavanja estetike². Mnogi standardi lepote, kao i načini opažanja estetike lica, mogu u velikoj meri varirati, u zavisnosti od kulture ili pojedinca. Ono što jedna osoba smatra atraktivnim na licu može biti suprotno iz perspektive druge osobe. Važno je istaći da su lepota i atraktivnost ljudskih karakteristika lica veoma subjektivne i da na njih mogu uticati mnogi faktori, kakvi su npr. kulturološki, društveni i lični faktori. Percepcija lepote takođe se može promeniti u različitim starosnim dobima. Ono što osoba smatra lepim i atraktivnim u mladosti može se razlikovati od onoga što osoba smatra atraktivnim i lepim u starosti. Na ova opažanja takođe mogu uticati emotivna povezanost, lična iskustva i, uopšte, prisustvo i osobine ličnosti pojedinca. Česti faktori i karakteristike koji su usko povezani sa dobrom estetikom lica i generalno dobrim zdravljem jesu simetrija, proporcije lica, čista koža, crte lica, oblik i boja očiju, oblik i punoća usana, facijalne ekspresije, kosa itd³.

Fotogrametrija može, kada je reč o simetriji i proporcijama, poslužiti kao vrlo koristan alat pri merenju i analizi karakteristika lica. Fotogrametrija lica ima široku primenu u poljima medicine, naročito u dermatologiji, u ortopediji vilica, u maksilofacijalnoj i plastičnoj hirurgiji i u medicinskom imidžingu. Predstavlja neinvazivnu tehniku koja podrazumeva korišćenje fotografija ili 3D metode snimanja za beleženje i analiziranje kraniofacijalnih struktura i karakteristika, i to u svrhe dijagnostike, planiranja tretmana, monitoringa, ali i u svrhe istraživanja⁴. Zahvaljujući prilagođavanjima i napredovanju digitalnih imidžing tehnologija i softvera, fotogrametrija je postala preciznija i pristupačnija; takođe, značajno je doprinela negovanju pacijenata i ishodima lečenja u brojnim medicinskim poljima. Neki od ključnih faktora u fotogrametriji jesu estetski uglovi i linearni parametri lica⁵.

What is beauty?

The aesthetic of the human face refers to the subjective perception of beauty and attractiveness in a person's facial features. Researchers have made progress in understanding the neural mechanisms underlying the perception of beauty. It is safe to say that the fusiform face area in the temporal lobe, and the primary visual cortex in the occipital lobe play a key role when perceiving beauty in human faces, as well as colours, shapes, facial features, expressions and attractiveness (Kanwisher, Yovel 2006). Besides these structures, the limbic system also has a significant role, as it is involved in the emotional aspect of aesthetic experiences (Kirsch, Urgesi, Cross 2016). Many beauty standards and perceptions of facial aesthetics can vary significantly between cultures and individuals. What one person finds attractive in a face may be different from someone else's preferences and perspectives. It is important to mention that perceptions of facial aesthetics are highly subjective and influenced by many factors, such as cultural, social, and personal. The perception of beauty can be changed with age. What is considered attractive in youth may differ from what is considered attractive or beautiful when it comes to an older age. That perception can also be influenced by the emotional connections, personal experiences and the overall presence and personality of the individual. Common factors and features that are often associated with good facial aesthetics and good overall health are symmetry, proportions, clear skin, facial features, eye shape and colour, lip shape and fullness, facial expressions, hair etc³.

When it comes to symmetry and proportions, facial photogrammetry can be a very useful tool in measuring facial features. Facial photogrammetry has several applications in the field of medicine, particularly in areas such as dermatology, orthodontics, maxillofacial surgery, plastic surgery and medical imaging. It represents a non-invasive technique that involves using photographs or 3D imaging methods to capture and analyse the craniofacial structures and features for diagnostic, treatment planning, monitoring and research purposes⁴. It has become increasingly accessible and accurate with adjustments and advancements in digital imaging technology and software and has also significantly improved patient care and outcomes in various medical fields. Some of the key factors in photogrammetry are aesthetic angles and linear parameters of the face⁵.

Angularni parametri

Estetski uglovi ukazuju na specifične parametre i proporcije koje se često smatraju atraktivnim ili lepim kada je u pitanju estetika lica. Ovi uglovi mogu pomoći ne samo plastičnim hirurzima i profesionalcima u kozmetologiji nego i pojedincima da procene balans i harmoniju ljudskog lica. Važno je pomenuti da ovi estetski uglovi nisu čvrsti standardi lepote; pre su smernice koje mogu varirati usled kulturoloških preferenci i individualnih karakteristika. Standardi lepote mogu se znatno razlikovati u različitim kulturama i vremenskim periodima, a ono što se smatra atraktivnim može biti i veoma subjektivno. Među najvažnijim uglovima lica izdvajaju se nazofrontalni, nazolabijalni, mentolabijalni ugao, kao i ugao profila lica⁶.

Nazofrontalni ugao (Slika 1A) jeste ugao koji se formira na preseku između dveju linija: linije koja ide duž dorzuma nosa i linije koja ide duž čela. Dobro izbalansirani nazofrontalni ugao obično iznosi između 115 stepeni i 135 stepeni, a njegov značaj je višestruk. U poljima plastične hirurgije i estetike lica, nazofrontalni ugao koristi se za procenu harmonije i balansa lica. Hirurzi i kozmetički praktičari mogu uzeti ovaj ugao u obzir prilikom planiranja procedura poput rinoplastike i operacije podizanja obrva kako bi postigli jači estetski efekat i izbalansiran izgled lica⁷. Abnormalne vrednosti ovog ugla mogu poslužiti i kao pokazatelj određenih kraniofacijalnih ili genetskih poremećaja i sindroma koji za posledicu imaju kraniosinostoze. Ovi poremećaji i sindromi, kao što su Crouzonov, Pfeifferov i Apertov sindrom, karakterišu se prevremenim spajanjem jednog kranijalnog šava ili više kranijalnih šavova, što može rezultirati brojnim abnormalnostima. Mogu se javiti zaravnjen profil lica, zaravnjen koren nosa, ispupčeno čelo i plitke očne duplje⁸. U medicinskoj dijagnostici, merenja ovog ugla mogu biti deo šire evaluacije prilikom otkrivanja navedenih stanja.

Specijalisti ortopedije vilica takođe mogu koristiti nazofrontalni ugao kao deo procene facijalnih i zubnih struktura prilikom planiranja ortodontske terapije. Razumevanje i poznavanje veze između čela i nosa važno je za postizanje optimalnih rezultata u slučajevima loših pozicija zuba, odnosno malokluzija. Antropolozi uglavnom koriste nazofrontalni ugao za poređenje i proučavanje karakteristika lica u različitim populacijama, ali i za razumevanje evolucije čoveka i moguće varijacije. Ovaj ugao može pružiti uvid u morfološke različitosti etničkih grupa.

Angular measurements

The aesthetic angles of the face refer to specific measurements and proportions that are often considered attractive or beautiful in facial aesthetics. These angles can help plastic surgeons, cosmetic professionals, and individuals to assess facial harmony and balance. It is important to highlight that these aesthetic angles are not rigid standards for beauty but rather guidelines that can vary based on cultural preferences and individual features. Beauty standards can differ greatly across different cultures and time periods, and what is considered attractive can be highly subjective. Some of the most important aesthetic angles of the face include nasofrontal, nasolabial, and mentolabial angle, as well as facial profile angle⁶.

The nasofrontal angle (Figure 1A) is an angle formed by the intersection of two lines: the line along the nasal dorsum and the line along the forehead. A well-balanced nasofrontal angle is typically between 115 and 135 degrees. It has great significance for several reasons. In the field of plastic surgery and facial aesthetics, the nasofrontal angle is used to assess facial harmony and balance. Surgeons and cosmetic practitioners may consider this angle when planning procedures like rhinoplasty or brow lift surgery to achieve a more aesthetically pleasing and balanced facial appearance⁷. Abnormal or deviated nasofrontal angle could also be an indicator of certain craniofacial abnormalities or genetic disorders and syndromes that result in craniosynostoses. These disorders and syndromes, such as Crouzon, Pfeiffer and Apert syndrome, are characterized by the premature fusion of one or more cranial sutures that can result in many abnormalities. These might include a flattened facial profile, flat nasal bridge, prominent forehead and shallow eye sockets⁸. In medical diagnostics, the measurements of this angle can be a part of a broader evaluation to identify such conditions.

Orthodontists may also use the nasofrontal angle as a part of their assessment of facial and dental structures when planning orthodontic treatment. Understanding and knowing the relationship between the forehead and the nose is important in achieving optimal results in cases of teeth misalignment i.e. malocclusions. Anthropologists usually use the nasofrontal angle to compare and study facial features across different populations, and to understand human evolution and variations.

Naučnici koji proučavaju morfologiju i razvoj lica često koriste nazofrontalni ugao kao jedan od parametara kada procenjuju kakav efekat određeni faktori, poput uticaja sredine i genetike, imaju na strukturu lica. U forenzičkoj antropologiji, mera poput nazofrontalnog ugla može biti upotrebljena za procenu porekla neidentifikovanih ljudskih ostataka, čime se doprinosi samom procesu identifikacije. Stomatolozi, oralni i maksilofacijalni hirurzi mogu koristiti nazofrontalni ugao pri planiranju ortognatskih operacija kako bi ispravili teže slučajeve neslaganja gornjih i donjih vilica, budući da pruža informacije o vezi između nosa i čela⁷.

Nazolabijalni ugao (Slika 1B) formira se na preseku između dveju linija: linije koja ide duž gornje usne i linije koja ide duž kolumele nosa; često se smatra atraktivnim kada se njegove vrednosti nađu u rangu između 90 stepeni i 110 stepeni⁹.

Profesionalci i plastični hirurzi mogu koristiti ovaj ugao kao jedan od mnogih faktora prilikom planiranja i izvođenja procedura za korekciju stečenih ili urođenih deformiteta nosa i usana i u cilju poboljšanja estetike lica. Ako je ovaj ugao oštar, tj. ima manje od 90 stepeni, može dati izgled kratkog nosa, što se može videti kod određenih naslednih poremećaja ili nakon rinoplastike. Ako je ovaj ugao tup, odnosno veći od 120 stepeni, može rezultirati izduženim izgledom nosa, a to može biti povezano sa ubrzanim starenjem ili sa ostalim medicinskim stanjima⁹.

Ugao profila lica (Slika 1C), koji procenjuje vezu između čela, nosa i brade, opisuje se crtanjem jedne linije, koja polazi od čela i ide do vrha nosa, i crtanjem druge linije, koja ide od vrha nosa do brade. Balansirani ugao profila lica karakteriše se blagim koveksitetom. Neophodan je za procenu estetike lica, dijagnostiku i planiranje tretmana kod različitih medicinskih i stomatoloških stanja, sprovođenje antropoloških istraživanja, a pomaže i u forenzičkoj identifikaciji. Služi kao korisno sredstvo za razumevanje i unapređivanje funkcije i forme lica¹⁰.

Mentolabijalni ugao (Slika 1D) nastaje na preseku između dveju linija: linije koja ide duž donje usne i linije koja ide duž brade. Dobro definisani i najatraktivniji mentolabijalni ugao jeste onaj koji ima između 107 stepeni i 120 stepeni. Oštar mentolabijalni ugao rezultuje retrudovanim izgledom brade, dok tupi mentolabijalni ugao rezultuje protrudovanim izgledom brade.

This angle can provide insights into the morphological diversity among different ethnic groups. Researchers who are studying facial morphology and development often use the nasofrontal angle as one of the parameters to assess how certain factors, such as environmental influences or genetics can impact facial structure. In forensic anthropology, measurements like the nasofrontal angle can be used to estimate the ancestry of unidentified human remains, contributing to the identification process. Dentists, oral and maxillofacial surgeons may use the nasofrontal angle when planning orthognathic surgery to correct severe cases of jaw discrepancies, as it provides information about the relationship between the nose and the forehead⁷.

The nasolabial angle (Figure 1B) is formed by the intersection of two lines: the line along the upper lip and the line along the columella of the nose and is often considered attractive when it falls within the range of 90 to 110 degrees⁹.

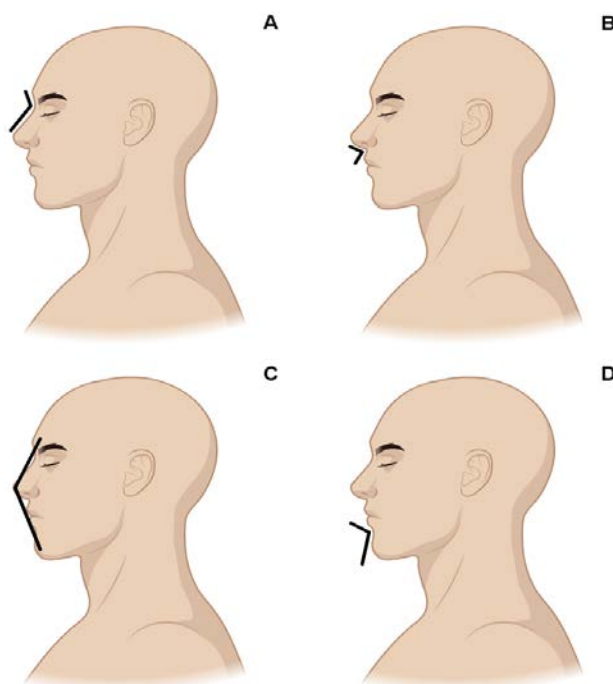
Professionals and plastic surgeons may use this angle as one of many factors when planning and performing procedures to correct acquired or congenital lip and nasal deformities and enhance facial aesthetics. If the angle is acute, which means less than 90 degrees, it can give the appearance of a short nose, which can be seen in certain congenital disorders or after rhinoplasty. If it is an obtuse angle or greater than 120 degrees, it can result in an elongated appearance of the nose, and that can be associated with faster ageing or other medical conditions⁹.

The facial profile angle (Figure 1C), which assesses the relationship between the forehead, nose, and chin, is evaluated by drawing a line from the forehead to the tip of the nose and another line from the tip of the nose to the chin. A balanced profile angle is often characterized by a slight convexity. It is important for assessing facial aesthetics, diagnosing and planning treatment for various medical and dental conditions, conducting anthropological research, and aiding in forensic identification. It serves as a valuable tool for understanding and improving facial function and form¹⁰.

The mentolabial angle is formed by the intersection of two lines: the line along the lower lip and the line along the chin. A well-defined and the most attractive mentolabial angle falls between 107 and 120 degrees.

Mentolabijalni ugao takođe se koristi kao referentna tačka prilikom planiranja različitih procedura, uključujući operacije augmentacije i redukcije veličine brade, ortognatske operacije i mnoge procedure na usnama¹¹.

An acute mentolabial angle results in a retruded chin appearance, and an obtuse mentolabial angle results in a protruded chin appearance. The mentolabial angle is also used as a reference point when planning various procedures, including augmentation or reduction surgery of the chin, orthognathic surgery and many lip procedures¹¹.



Slika 1. Važni angularni parametri estetike lica

Figure 1. Significant angular aesthetic parameters of the face

Linearni parametri

Linearni parametri estetike lica predstavljaju specifične mere i rastojanja koja se često upotrebljavaju za procenu estetike i proporcija lica. Ovi parametri mogu biti od pomoći i u evaluaciji balansa i harmonije karakteristika lica. Treba imati na umu da estetika lica može varirati u zavisnosti od kulturoloških i individualnih preferenci; stoga, ni ove mere nisu čvrsti standardi lepote, već mogu poslužiti samo kao smernice. U najčešće korišćene linearne parametre estetike lica spadaju: odnos širine i visine lica, širina nosa, rastojanje između očiju, rastojanje između zenica, dužina filtruma, visina brade i visina čela¹².

Odnos širine i visine lica (FWHR) (Slika 2A) predstavlja širinu lica (merenu između jagodica) podeljenu sa visinom lica (merenom od gornje usne do vrha čela).

Linear measurements

Linear aesthetic parameters of the face refer to specific measurements or distances that are often used to assess facial aesthetics and proportions. These parameters help evaluate the balance and harmony of facial features. We need to keep in mind that facial aesthetics can vary based on cultural and individual preferences, so these measurements are not rigid standards for beauty. They can only serve as guidelines. Most common linear aesthetic parameters of the face include facial width-to-height ratio, nasal width, interocular distance, interpupillary distance, philtrum length, chin height and forehead height¹².

Facial width-to-height ratio (FWHR), which measures the width of the face (measured across the cheekbones) divided by the height of the face (measured from the upper lip to the top of the forehead).

Studija je pokazala da se pojedinci sa određenim vrednostima ovog odnosa posmatraju kao dominantniji i atraktivniji ukoliko vrednost tog odnosa iznosi oko 1,7, što znači da je širina lica 1,7 puta veća od njegove visine¹³.

Veće vrednosti ovog odnosa povezuju se sa većom dominantnosti, agresivnosti, muževnosti i fizičkom snagom, dok su niže vrednosti ovog odnosa odlika osoba veće pouzdanosti i ženstvenosti¹⁴. Studija je pokazala da među osobama muškog i ženskog pola ima razlika u ovim odnosima – više vrednosti ovog odnosa zastupljenije su kod muškaraca nego kod žena. Ova se razlika pripisuje polnom dimorfizmu, s obzirom na to da muškarci uglavnom imaju šira lica od žena. Iako odnos širine i visine lica može pružiti uvid u određena društvena i psihološka razmatranja, treba naglasiti da on predstavlja samo jedan od mnogobrojnih faktora koji doprinose proceni atraktivnosti lica¹⁵.

Širina nosa (Slika 2B) jeste linearni parametar koji se meri između spoljašnjih ivica nozdruva. Ima važnu ulogu u formiranju balansa i harmonije lica. Pri estetskim evaluacijama, nos koji je proporcionalan ostalim crtama lica često se smatra atraktivnijim. Prekomerna širina nosa ili nos koji nije proporcionalan može narušiti harmoniju lica i biti uzrok brige za pojedince. U idealnim situacijama, atraktivna širina nosa bila bi slična ili jednaka srednjoj petini lica¹⁶.

Rastojanje između očiju (Slika 2C), koje pokazuje distancu između centara obaju oka, takođe se može koristiti u proceni proporcija lica¹⁷. Rastojanje između zenica, odnosno distanca između obeju zenica igra važnu ulogu u stomatološkoj protetici i oftalmologiji; smatraju se estetski zadovoljavajućim ukoliko su jednake ili makar slične širini jednog oka. Isto se može reći i za interkantarno rastojanje (distanca između unutrašnjih uglova obaju oka)¹⁸.

Dužina filtruma (Slika 2D), koji predstavlja žleb između gornje usne i baze nosa, može se uzeti u obzir kada je posredi estetika lica, ali nije od tolikog značaja kao prethodno opisani parametri. Prema istraživanju, idealna dužina filtruma iznosi oko 12 milimetara kod osoba ženskog pola, a nekoliko milimetara više kod osoba muškog pola¹⁹.

Visina brade (Slika 2E) predstavlja rastojanje između donje usne i brade i važan je parametar u evaluaciji proporcija lica. Dobro definisana brada može doprineti simetriji lica, što se često smatra znakom lepote. Pol i godine života takođe mogu imati uticaj na izgled brade.

Research has suggested that individuals with certain FWHRs may be perceived as more dominant or attractive if their facial width-to-height ratio is around 1.7, meaning that the face is 1.7 times wider than it is tall¹³. However, higher FWHR values have been associated with perceptions of greater dominance, aggression, masculinity, and physical strength. On the contrary, lower FWHR values have been associated with perceptions of greater trustworthiness and femininity¹⁴. Research has indicated that there can be sex-related differences in FWHR, with males tending to have higher values of FWHR when compared to females. This difference is attributed to sexual dimorphism, where males typically have broader faces than females. While FWHR can provide insights into certain social and psychological perceptions, it is very important to mention that it is just one of too many factors contributing to facial attractiveness and perception¹⁵.

The width of the nose or nasal width (Figure 2B) is a linear parameter measured between the outer edges of the nostrils. It plays a significant role in the overall balance and harmony of the face. In aesthetic evaluations, a nose that is proportionate to the rest of the facial features is often considered more attractive. Excessive nasal width or a disproportionately wide nose can disrupt facial harmony and may be a concern for some individuals. Ideally, an attractive nose would be approximately or equal to the middle fifth of the face¹⁶.

Interocular distance (Figure 2C), which measures the distance between the centres of the eyes, can also be used to assess facial proportions¹⁷. Interpupillary distance, the distance between the pupils of the eyes, plays an important role in prosthodontics and ophthalmology. It is considered as aesthetically pleasing if it is roughly equal or similar to the width of one eye. The same things can be said for the intercanthal distance (distance between the inner corners of the eyes)¹⁸.

Philtrum length (Figure 2D), which is the groove between the upper lip and the base of the nose, can be considered in facial aesthetics, but it is not as significant as the parameters that have been previously mentioned. According to the research, the ideal length of the philtrum is roughly 12 millimetres for women, and a couple of millimetres longer for men¹⁹.

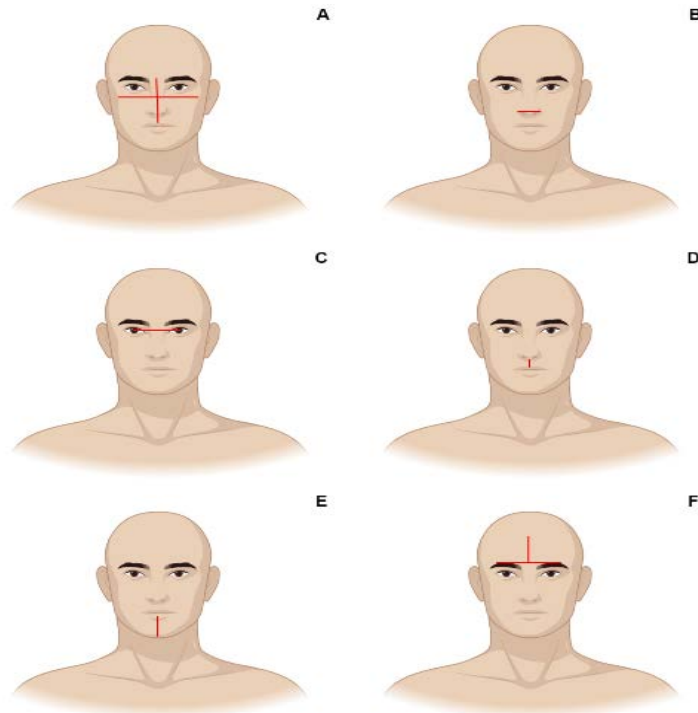
Chin height (Figure 2E), the distance between the lower lip and the chin, is an important parameter in evaluating facial proportions.

Kratka i zaobljena brada smatra se ženstvenom, a duža i više uglasta brada uglavnom se povezuje sa muževnijim izgledom²⁰. Punija brada često se može zapaziti kod mlađih osoba. Sa starenjem može doći do postepenog gubitka mekih tkiva, što može dovesti i do gubitka visine brade. U određenim slučajevima, pojedinci sa gubitkom ili sa već slabom bradom mogu se osetiti nesigurno u vezi sa svojim izgledom, te posegnuti za kozmetičkim procedurama. Visina brade takođe može imati uticaj na funkcije žvakanja i govora. U slučajevima ekstremnih abnormalnosti brade, neslaganja između vilica i ostalih odstupanja mogu se javiti i smetnje u funkciji, pa zato korektivne operacije, poput preoblikovanja kosti i ortognatske operacije, mogu biti neophodne za poboljšanje ovih funkcija, kao i za povratak harmonije lica. Idealna visina brade iznosila bi između 13 milimetara i 23 milimetara kod muškaraca, odnosno između 10 milimetara i 20 milimetara kod žena²⁰.

Visina čela (Slika 2F), koja se meri od linije kose do najviše tačke obrva, može generalno doprineti proporcijama lica. Standardi lepote mogu u velikoj meri varirati; tako se kod pojedinih naroda određena visina čela može smatrati atraktivnijom ili poželjnijom, što dovodi do toga da ih pojedinci cene manje ili više. Visoko i više vertikalno orijentisano čelo mahom se smatra ženstvenim, dok se kraće i više horizontalno orijentisano čelo može smatrati muževnijim²¹. Varijacije kod linije kose takođe mogu imati uticaj na izgled čela, što može biti izvor brige za određene pojedince. Prema istraživanju, idealna visina čela nalazi se u rasponu između pet centimetara i osam centimetara²¹.

A well-defined chin can contribute to facial symmetry, which is often considered a sign of beauty. Gender and age can also have an impact on the chin. A shorter and rounded chin is considered feminine, while a taller and more angular chin is usually associated with a more masculine look²⁰. Plump chin is often found in young people. However, as people age, they might experience a gradual loss of soft tissue, and that can lead to a decrease in its height. In some cases, individuals with a receding or weak chin may feel insecure about their profile and may consider cosmetic procedures. Chin height can also affect bite function and speech. In cases of extreme chin abnormalities, jaw misalignments, and other discrepancies, functional issues may arise, and corrective surgeries, such as bone reshaping and orthognatic surgery, may be necessary to improve these functions, and also to restore overall facial harmony. The ideal chin length would be between 13 and 23 millimetres for men, and between 10 and 20 millimetres for women²⁰.

Forehead height (Figure 2F), which is measured from the hairline to the highest point of the eyebrows, can contribute to overall facial proportions. Standards of beauty can vary significantly. In some cultures, a certain forehead height may be considered more attractive or desirable, leading individuals to value it more or less. A taller and more vertically oriented forehead is usually considered feminine, while a shorter and more horizontally oriented forehead may be considered more masculine (Salinas, Liu, Sharaf 2023). Hairline variations can also have an impact on the forehead, and they may be a source of concern for some individuals. According to the research, the ideal height is within the range between 5 and 8 centimetres²¹.



Slika 2. Značajni linearni parametri lica
Figure 2. Significant linear parameters of the face

Zaključak

Fotogrametrija lica, zahvaljujući korišćenju angularnih i linearnih parametara, ima široku primenu u poljima medicine, naročito u dermatologiji, u ortopediji vilica, u maksilofacijalnoj i plastičnoj hirurgiji, kao i u mnogim drugim poljima. Zbog brojnih prilagođavanja i napredaka, postala je veoma precizna i pristupačna, a dala je i značajan doprinos dijagnostici, negovanju pacijenata, tretmanima i ishodima mnogih slučajeva u medicini i stomatologiji. Uprkos činjenici da je fotogrametrija veoma korisna u brojnim medicinskim granama i specijalnostima, linearni ili angularni parametri, nažalost, ne mogu definitivno determinisati lepotu i atraktivnost lica ukoliko se koriste zasebno, s obzirom na to da na njih utiče složeni splet faktora, vezan isključivo za pojedinca.

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Conclusion

Facial photogrammetry has several applications in the field of medicine, particularly in areas such as dermatology, orthodontics, maxillofacial and plastic surgery, due to the usage of angular and linear parameters, as well as other purposes. With many advancements and adjustments, it has become accurate and accessible and has also significantly improved diagnostics, patient care, treatments and outcomes in various cases in medicine and dentistry. Despite being useful in numerous medical specialties and branches, unfortunately, linear or angular parameters cannot definitively determine the beauty or attractiveness of a face on their own, because they are influenced by a complex interplay of factors which almost solely lie in the individual.

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