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Harmony concept of craniofacial morphology among the young Serbian population in Kosovo and Metohija

Koncept harmonije kraniofacijalne morfologije mlađe srpske populacije na području Kosova i Metohije

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Abstract

Background/Aim. Analyses of the cephalometric value of profile radiographs are very important for orthodontic diagnosis and planning of therapy. These values differ morphologically depending on ethnic and racial affiliation. The aim of this study was to confirm variations of cephalometric norms and the extent of their value and, according to them, confirm the harmony concept of craniofacial morphology among the young Serbian population in Kosovo and Metohija. **Methods.** This retrospective study comprised 183 profile radiograms of patients from Kosovo and Metohija, Serbia, aged 8–33, from which Class I was ascertained among 82 patients (53 female and 29 male). Five cephalometric angles were measured and analyzed. Pearson's correlation coefficient was used to define the strength of correlation between the five variables. Bivariable linear regression was used to form harmonious combinations of individual values in the insight of craniofacial harmonious form. Multiple regression and standard error were used to form a harmonious schema. **Results.** Linear regression equations were used to define cephalometric floating norms. They helped us form a harmonious box and harmonious schema of craniofacial norms of the participants. The extent of harmonious value for orthognathic profile of our examinees varies for *sella* nasion subspinale (SNA) angle from 78° to 81°, for *sella* nasion supramentale (SNB) angle from 75.1° to 78.1°, for maxillary line – nasion *sella* line (NL-NSL) angle from 11.5° to 5.5°, for nasion *sella* basion (NSBa) angle from 134.7° to 125.8°, and for mandibulary line – nasion *sella* line (ML-NSL) angle from 40.5° to 30.6°. **Conclusion.** Cephalometric floating norms that describe the individual craniofacial pattern among the young Serbian population in Kosovo and Metohija, determined and defined by five cephalometric variables, and presented in the form of a harmonious box and harmonious schema and can accurately determine the craniofacial pattern.

Key words:
cephalometry; ethnicity; radiography; serbia.

Apstrakt

Uvod/Cilj. Analiza kefalometrijskih vrednosti profilnih snimaka veoma je važna za ortodontsku dijagnozu i planiranje terapije. Morfološki se te vrednosti razlikuju u zavisnosti od etničke i rasne pripadnosti. Cilj rada bio je da se utvrde varijacije kefalometrijskih normi i opseg njihovih vrednosti i na osnovu njih utvrdi koncept harmonije kraniofacijalne morfologije mlađeg srpskog stanovištva na području Kosova i Metohije. **Metode.** Retrospektivnom studijom analizirana su 183 profilna telerendgen snimka pacijenata sa područja Kosova i Metohije, uzrasta 8–33 godina od kojih je I klasa utvrđena kod 82 pacijenta (53 ženskog i 29 muškog pola). Ukupno je mereno i analizirano pet kefalometrijskih uglova. Jačina korelacije između pet kefalometrijskih varijabli izračunata je na osnovu *Pearson*-ovog koeficijenta korelacije. Za formiranje harmoničnih kombinacija individualnih vrednosti u vidu harmoničnog kraniofacijalnog obrasca korišćena je bivarijantna linearna regresija. Primenom višestruke regresije i standardne greške napravljena je šema harmoničnih vrednosti. **Rezultati.** Jednačine linearne regresije su primenjene radi definisanja fluktuirajućih kefalometrijskih normi. One su nam omogućile formiranje harmoničnog opsega i harmonične šeme kraniofacijalnih normi ispitanika. Opseg harmoničnih vrednosti za ortognat profil naših ispitanika se kretao za *sella nasion subspinale* (SNA) ugao od 78° do 81°, za *sella nasion supramentale* (SNB) ugao od 75.1° do 78.1°, za *maxillary line – nasion sella line* (NL-NSL) ugao od 11.5° do 5.5°, za *nasion sella basion* (NSBa) ugao od 134.7° do 125.8° i za *mandibulary line – nasion sella line* (ML-NSL) ugao od 40.5°

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do 30.6°. **Zaključak.** Kefalometrijske fluktuirajuće norme koje opisuju individualni kraniofacijalni obrazac kod mlađe srpske populacije na Kosovu i Metohiji, određene i definisane pomoću pet kefalometrijskih varijabli i predstavljene u obliku harmoničnog okvira i harmonične šeme mogu precizno odrediti kraniofacijalni obrazac populacije.

Ključne reči:
kefalometrija; etničke grupe; radiografija; srbija.

Introduction

Cephalometric analysis of craniofacial morphology represents an important item in orthodontic diagnosis and planning of orthodontic therapy. Analysis of profile cephalometric radiographs enables the therapist to define the skeleton's morphology of the patient and establish the degree of correlation between skeletal and dental factors [1]. The importance of cephalometric radiographs in orthodontic diagnosis has long been established. The purpose of profile radiograph analysis is to define the relationship between maxilla and mandible toward the cranial base just among them in sagittal and vertical line, to define the relationship of teeth to the alveolar bone and the significance and influence of teeth on a patient's profile [2, 3].

In 1931, Broadhent [4] and Hofrath [5] simultaneously published methods that were used to achieve standardized commercial profile radiographs of the head. After the publication of these methods, numerous authors dealt with the same and similar research and defined numerous cephalometric analyses with standardized norms [6–9]. In conventional cephalometric analysis, a patient's cephalometric values are compared with already established norms specific to distinctive ethnic and race groups [10–15]. Solow [16] considered that the analyses were incomplete, and their main lack was the absence of mutual dependence on craniofacial parameters. Within his study, Solow [16] showed usage of those parameters in some isolated, individual form and established a high correlation between individual sagittal and vertical variables, which developed the concept of "Craniofacial pattern". Based on Solow's [16] studies, it has been noticed that every patient's cephalometric values overcome the standard deviation of the population's mean values, and those values can be considered acceptable if a correlation between them exists [10].

In his study, Hasund et al. [17] defined and showed combinations of acceptable values for different types of faces. For orthognathic patients, harmonious combination and mean value variables are *sella* nasion subspinale (SNA) angle 82°, *sella* nasion supramentale (SNB) angle 80°, for maxillary line – nasion *sella* line (NL-NSL) angle 8.5°, nasion *sella* basion (NSBa) angle 130°, and mandibulary line – nasion *sella* line (ML-NSL) angle 32° [17]. Segner [18] and Segner and Hasund [19], in their studies among the adult population in Europe, researched individual craniofacial patterns and constructed floating norms to describe the skeleton's sagittal and vertical relationship [20]. The term "floating norms" is applied to describe individual norms that float according to correlated cephalometric measures. The concept of floating norms research is based on the correlation between five craniofacial variables, SNA, SNB, ML-NSL, NL-NSL, and NSBa [18].

Linear correlation coefficient "r" was used to describe the relationship between two variables [19]. The higher the absolute value of "r", the better the linear correlation between the two variables [17]. Linear regression equations were used to construct the harmonious box and harmonious schema. The harmonious box and harmonious schema were constructed and patented by Segner [18] and Segner and Hasund [19] within their studies modeled after Bergen's cephalometric analysis [17] (Figures 1 and 2). The harmonious box, according to Segner and Hasund [21], represents a very important diagnostic tool in orthodontic diagnosis and planning of orthodontic therapy. This concept represents individual skeletal form or pattern, which shows a sagittal and vertical relationship with the application of appropriate floating norms. The harmonious box is constructed so that it consists of three zones – retrognathic, orthognathic, and prognathic [21]. Within the harmonious box, a single horizontal line is illustrated, which connects the mean values of all five cephalometric variables. If the line is flat, it can be concluded that the patient's face is harmonious. The type of patient's face depends on its place in the harmonious box, apropos of the zone in which the patient's value variables are located [10].

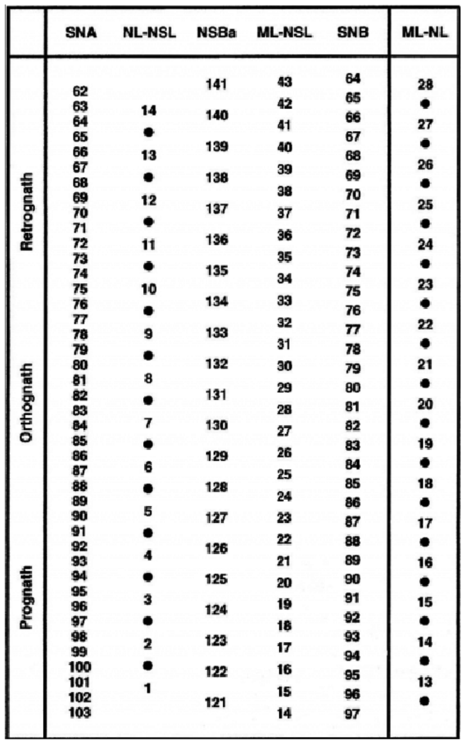


Fig. 1 – Segner-Hasund harmonious box [10]. The harmony box is constructed based on the five cephalometric variables (SNA, SNB, ML-NSL, NL-NSL, and NSBa), which were found to have a certain correlation pattern to one another [18]. For abbreviations, see under Table 1.

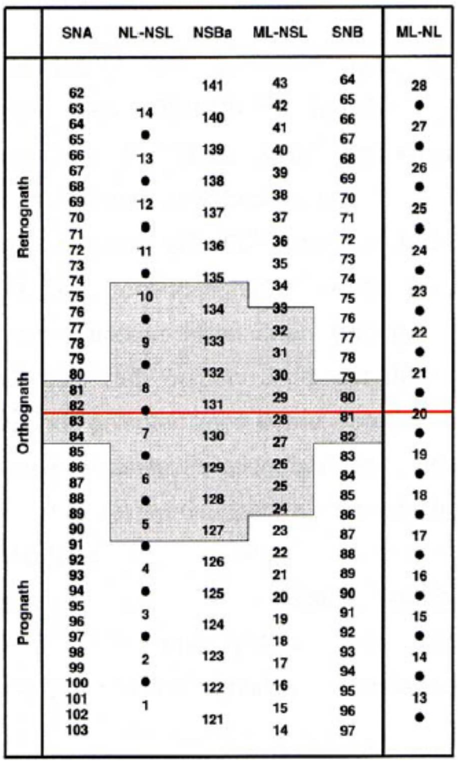


Fig. 2 – Segner-Hasund harmonious schema in the harmonious box [multiple regression analysis, particularly the standard error (SE), was calculated to construct the harmonious schema]. The red horizontal line in the middle of the harmonious schema represents the mean values of the five cephalometric variables. For abbreviations, see under Table 1.

Many researchers wrote and conducted studies on the cephalometric floating norms. Segner [18] was one of the first who defined floating norms for the population of Northern Europe. Other researchers such as Tollaro et al. [22], Franci et al. [20], Ngarmprasertchai [23], and Mahaini [24] researched and defined floating norms for the population of Europe, North America, Thailand, and Syria, respectively. In 2009, Sevilla-Naranjilla and Rudzki-Janson [10] defined and presented floating norms for the population of the Philippines. In 2012, Řeháček et al. [25] defined floating norms for the Czech population.

The aim of our study was to determine and define floating cephalometric norms so as to describe individual cephalometric patterns among the young Serbian population in Kosovo and Metohija, Serbia.

Methods

Within our study, 183 profile cephalometric radiographs of patients, aged 8–33, mean age 16.9, were analyzed. Class I was diagnosed among 82 people (53 female and 29 male). Class I criteria was subspinale nasion supramentale (ANB) angle 2 ± 2°, balanced profile, and without previous orthodontic treatment. This retrospective study was conducted at the Department of Orthodontics, Faculty of Medicine, the University of Priština/Kosovska Mitrovica, Kosovo and Metohija, Serbia.

During the analysis of each profile cephalometric radiograph, five angles were measured, including SNA (maxillary prognathism), SNB (mandibular prognathism), NL-NSL (maxillary inclination), ML-NSL (mandibular inclination), and NSBa (cranial base angle). The mandibular plane – maxillary plane (MP-NP) angle was calculated as the difference between ML-NSL and NL-NSL (Figure 3).

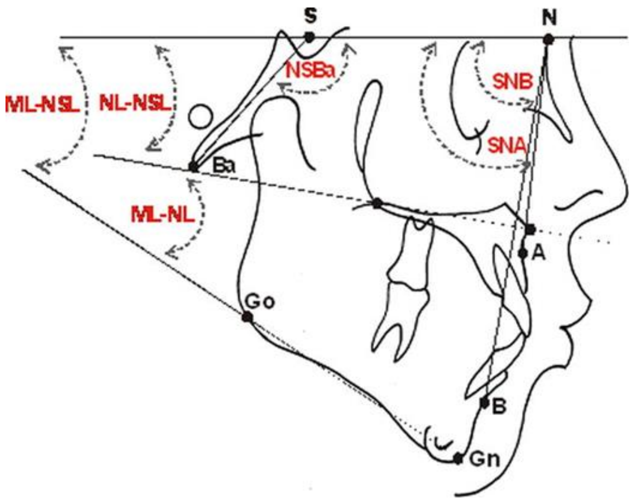


Fig. 3 – Illustration of cephalometric landmarks and correlated angular measurements (SNA, SNB, NSBa, NL-NSL, and ML-NSL) used in this study [10]. For abbreviations, see under Table 1.

Descriptive statistics were calculated for five cephalometric variables. Pearson's coefficient correlation was applied to describe the correlation between five cephalometric variables (SNA, SNB, NSBa, ML-NSL, and NL-NSL) used to form a harmonious box. Bivariable linear regression analysis was used to form and construct a harmonious box. Multiple regression analysis, particularly the statistic error (SE), was used to form the harmonious schema.

A full analysis of data was conducted within the SPSS program, version 21.0.

Results

Descriptive statistics of all five variables are shown in Table 1, which shows mean values among examined parameters.

Table 1

Descriptive statistics (means, SD and ranges) for all five cephalometric variables

Variables	Mean ± SD	Min–Max
SNA	79.50 ± 3.97	70–87
NL-NSL	8.46 ± 3.78	1–17
NSBa	130.24 ± 5.26	119–144
ML-NSL	35.59 ± 6.03	22–49
SNB	76.63 ± 3.94	67–85

SNA – *Sella* nasion subspinale angle; SNB – *Sella* nasion supramentale angle; ML-NSL – mandibular line - nasion *sella* line; NL-NSL – maxillary line - nasion *sella* line; NSBa – nasion *sella* basion angle; SD – standard deviation.

Linear correlation coefficients among SNA, SNB, NL-NSL, ML-NSL, and NSBa variables, apropos of the correlation between prognathism, inclination, and angle of maxilla and mandible, are shown in Table 2. For the maxillary complex, a negative correlation between SNA and NL-NSL variables was found (r = -0.484). This means that a smaller NL-NSL angle is expected with the increase of maxillary prognathism. In the case of the mandible and lower face, a negative correlation between SNB and ML-NSL variables was established (r = -0.496). That means that a mandible's smaller angle of inclination (ML-NSL) follows a bigger mandibular prognathism (SNB). Linear regression equations with appropriate values r^2 and SE are shown in Table 3. They are illustrated in the spectrum of the harmonious box (Figure 4). All five variable combinations are shown, with SNA as an independent variable and the other as dependent variables. Based on the results, the range of analyzed variables for orthognathic, prognathic, and retrognathic zones was obtained. The range of variables for orthognathic zone for SNA was from 78° to 81°, for SNB from 75.1° to 78.1°, for NL-NSL from 11.5° to 5.5°, for NSBa from 134.7° to 125.8°, and for ML-NSL from 40.5° to 30.6°.

Table 2

Linear correlation coefficients (r) between SNA, NL-NSL, NSBa, SNB, and ML-NSL variables (Pearson's correlation coefficients described the high association among variables used in the construction of the harmonious box)

Variables	NL-NSL	NSBa	ML-NSL	SNB
SNA	-0.484*	-0.292*	-0.505*	0.979*
NL-NSL		0.354*	0.342*	-0.517*
NSBa			-0.065 ns	-0.330*
ML-NSL				-0.496*

***$p < 0.01$; ns – no significant.**
For abbreviations, see under Table 1.

Table 3

Linear regressions with corresponding r^2 and standard error (SE) of the estimate for the young Serbian population (the bivariate linear regression equations are used to construct the harmonious box, with SNA as the independent variable and NL-NSL, NSBa, ML-NSL, and SNB each as dependent variable)

Variables	Regression equations	R^2	SE
NL-NSL	45.146–0.461xSNA	0.234	3.33
NSBa	161.010–0.387xSNA	0.085	5.06
ML-NSL	96.557–0.767xSNA	0.255	5.24
SNB	-0.717+0.973xSNA	0.958	0.81
SNA	108.158–0.220xNSBa	0.085	3.82
SNB	108.812–0.247xNSBa	0.109	3.74
ML-NSL	93.649–0.758xSNB	0.246	5.27

For abbreviations, see under Table 1.

Multiple correlation coefficients R, R^2, and SE were calculated with multiple regression analysis and presented in Table 4 and graphically illustrated in Figure 5. Mean values of all five variables (SNA 79.50°, SNB 76.63°, NL-NSL 8.46°, ML-NSL 35.59°, and NSBa 130.24°) among our participants formed the horizontal line within the harmonious schema. However, one of the combinations of the variables represents the curvy line within the harmonious schema (Figure 6). An example of a harmonious combination of a nineteen-year-old girl's face is shown with a curvy line which is a characteristic of the following values of examined parameters – SNA 80°, SNB 78°, NL-NSL 8°, NSBa 133.7°, and ML-NSL 30.6° – disregarding the individually analyzed angles that are incompatible with the mean value of Class I. All values of

	SNA	NL-NSL	NSBa	SNB	ML-NSL	ML-NL
	64	15.6	136.2	61.5	47.4	31.6
	65	15.2	135.8	62.5	46.7	31.3
	66	14.7	135.4	63.5	45.9	31.0
	67	14.2	135.0	64.4	45.1	30.7
	68	13.8	134.7	65.4	44.4	30.5
Retrognathic	69	13.3	134.3	66.4	43.6	30.2
	70	12.8	133.9	67.4	42.8	29.9
	71	12.4	133.5	68.3	42.1	29.6
	72	11.9	133.1	69.3	41.3	29.3
	73	11.5	132.7	70.3	40.5	29.0
	74	11.0	132.3	71.3	39.8	28.7
	75	10.5	131.9	72.2	39.0	28.4
	76	10.1	131.6	73.2	38.2	28.2
	77	9.6	131.2	74.2	37.5	27.9
	78	9.2	130.8	75.1	36.7	27.6
	79	8.7	130.4	76.1	35.9	27.3
	80	8.2	130.0	77.1	35.1	27.0
Orthognathic	81	7.8	129.6	78.1	34.4	26.7
	82	7.3	129.2	79.0	33.6	26.4
	83	6.8	128.8	80.0	32.9	26.1
	84	6.4	128.5	81.0	32.1	25.9
	85	5.9	128.1	81.9	31.3	25.6
	86	5.5	127.7	82.9	30.6	25.3
	87	5.0	127.3	83.9	29.8	25.0
	88	4.5	126.9	84.9	29.0	24.7
	89	4.1	126.5	85.8	28.2	24.4
	90	3.6	126.1	86.8	27.5	24.1
	91	3.2	125.8	87.8	26.7	23.8
Prognathic	92	2.7	125.4	88.8	25.9	23.6
	93	2.2	125.0	89.7	25.2	23.3
	94	1.8	124.6	90.7	24.4	23.0
	95	1.3	124.2	91.7	23.7	22.7
	96	0.9	123.8	92.7	22.9	22.4
	97	0.4	123.4	93.6	22.1	22.1
	98	0	123	94.6	21.4	21.8

Fig. 4 – Harmonious box among the young Serbian population in Kosovo and Metohija, Serbia.
For abbreviations, see under Table 1.

Table 4

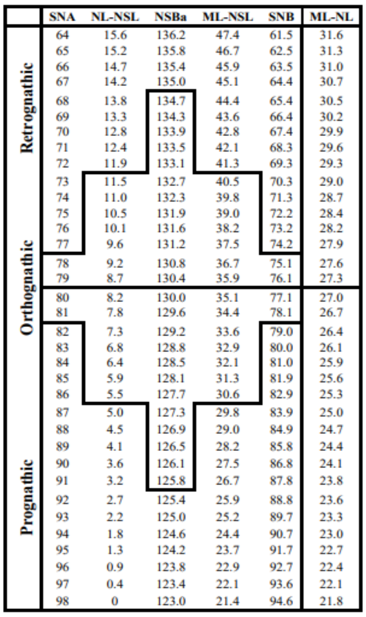
Standard errors (SE) of the estimate when one of the variables SNA, NL-NSL, NSBa, ML-NSL, or SNB is predicted from the other four by means of a multiple regression analysis of the young Serbian population (multiple regression analyses are used to present the degree of variability allowed among the five cephalometric variables in describing a harmonious face)

Variables	R	R^2	SE
SNA	0.979	0.958	0.814
NL-NSL	0.484	0.234	3.159
NSBa	0.501	0.251	4.687
SNB	0.980	0.960	0.789
ML-NSL	0.980	0.960	5.046

For abbreviations, see under Table 1.

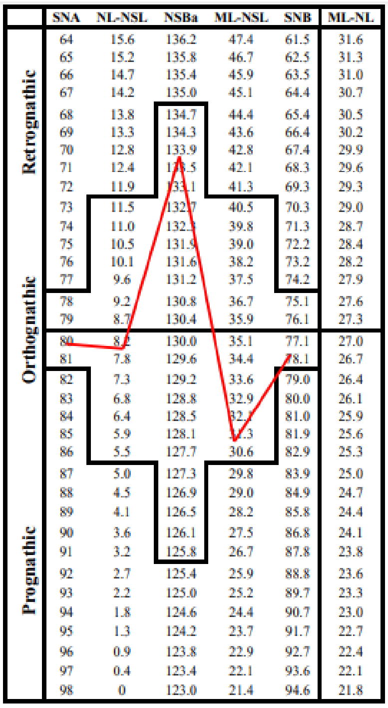
variables are located inside the harmonious schema and orthognathic zone, which indicates that the face is of harmonious and orthognathic type (Figures 6 and 7).

The comparison of our results with those from the studies by Sevilla-Naranjilla and Rudzki-Janson [10] and Řeháček et al. [25] is shown in Figure 8, and variables' mean values of Filipino and Czech populations are drawn in our harmonious box and harmonious schema.



SNA	NL-NSL	NSBa	ML-NSL	SNB	ML-NL
64	15.6	136.2	47.4	61.5	31.6
65	15.2	135.8	46.7	62.5	31.3
66	14.7	135.4	45.9	63.5	31.0
67	14.2	135.0	45.1	64.4	30.7
68	13.8	134.7	44.4	65.4	30.5
69	13.3	134.3	43.6	66.4	30.2
70	12.8	133.9	42.8	67.4	29.9
71	12.4	133.5	42.1	68.3	29.6
72	11.9	133.1	41.3	69.3	29.3
73	11.5	132.7	40.5	70.3	29.0
74	11.0	132.3	39.8	71.3	28.7
75	10.5	131.9	39.0	72.2	28.4
76	10.1	131.6	38.2	73.2	28.2
77	9.6	131.2	37.5	74.2	27.9
78	9.2	130.8	36.7	75.1	27.6
79	8.7	130.4	35.9	76.1	27.3
80	8.2	130.0	35.1	77.1	27.0
81	7.8	129.6	34.4	78.1	26.7
82	7.3	129.2	33.6	79.0	26.4
83	6.8	128.8	32.9	80.0	26.1
84	6.4	128.5	32.1	81.0	25.9
85	5.9	128.1	31.3	81.9	25.6
86	5.5	127.7	30.6	82.9	25.3
87	5.0	127.3	29.8	83.9	25.0
88	4.5	126.9	29.0	84.9	24.7
89	4.1	126.5	28.2	85.8	24.4
90	3.6	126.1	27.5	86.8	24.1
91	3.2	125.8	26.7	87.8	23.8
92	2.7	125.4	25.9	88.8	23.6
93	2.2	125.0	25.2	89.7	23.3
94	1.8	124.6	24.4	90.7	23.0
95	1.3	124.2	23.7	91.7	22.7
96	0.9	123.8	22.9	92.7	22.4
97	0.4	123.4	22.1	93.6	22.1
98	0	123.0	21.4	94.6	21.8

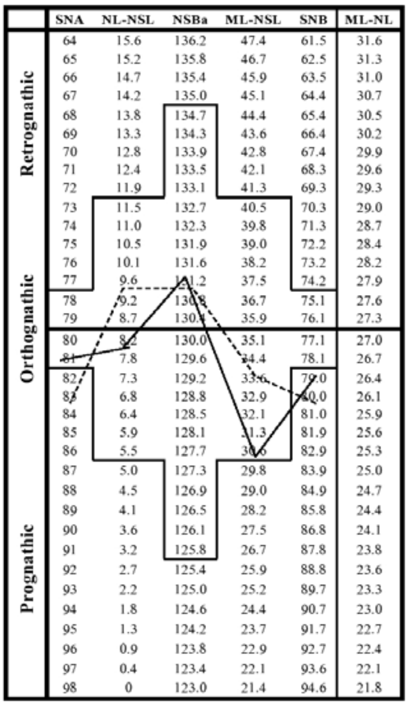
Fig. 5 – Harmonious schema among the young Serbian population in Kosovo and Metohija, Serbia represents the range of variability among the five cephalometric variables in the harmonious box and is represented by the standard error (SE) of the estimate of the multiple regression analysis. The horizontal line in the middle of the harmonious schema represents the mean values of the five cephalometric variables.
For abbreviations, see under Table 1.



SNA	NL-NSL	NSBa	ML-NSL	SNB	ML-NL
64	15.6	136.2	47.4	61.5	31.6
65	15.2	135.8	46.7	62.5	31.3
66	14.7	135.4	45.9	63.5	31.0
67	14.2	135.0	45.1	64.4	30.7
68	13.8	134.7	44.4	65.4	30.5
69	13.3	134.3	43.6	66.4	30.2
70	12.8	133.9	42.8	67.4	29.9
71	12.4	133.5	42.1	68.3	29.6
72	11.9	133.1	41.3	69.3	29.3
73	11.5	132.7	40.5	70.3	29.0
74	11.0	132.3	39.8	71.3	28.7
75	10.5	131.9	39.0	72.2	28.4
76	10.1	131.6	38.2	73.2	28.2
77	9.6	131.2	37.5	74.2	27.9
78	9.2	130.8	36.7	75.1	27.6
79	8.7	130.4	35.9	76.1	27.3
80	8.2	130.0	35.1	77.1	27.0
81	7.8	129.6	34.4	78.1	26.7
82	7.3	129.2	33.6	79.0	26.4
83	6.8	128.8	32.9	80.0	26.1
84	6.4	128.5	32.1	81.0	25.9
85	5.9	128.1	31.3	81.9	25.6
86	5.5	127.7	30.6	82.9	25.3
87	5.0	127.3	29.8	83.9	25.0
88	4.5	126.9	29.0	84.9	24.7
89	4.1	126.5	28.2	85.8	24.4
90	3.6	126.1	27.5	86.8	24.1
91	3.2	125.8	26.7	87.8	23.8
92	2.7	125.4	25.9	88.8	23.6
93	2.2	125.0	25.2	89.7	23.3
94	1.8	124.6	24.4	90.7	23.0
95	1.3	124.2	23.7	91.7	22.7
96	0.9	123.8	22.9	92.7	22.4
97	0.4	123.4	22.1	93.6	22.1
98	0	123.0	21.4	94.6	21.8

Fig. 6 – An example of harmonious combinations (red connected line) presented in a harmonious box and harmonious schema. All values of the patient lie inside the harmonious schema and are described as orthognathic and harmonious profiles.
For abbreviations, see under Table 1.

Fig. 7 – Lateral cephalometric radiograph of the patient with a harmonious combination.



SNA	NL-NSL	NSBa	ML-NSL	SNB	ML-NL
64	15.6	136.2	47.4	61.5	31.6
65	15.2	135.8	46.7	62.5	31.3
66	14.7	135.4	45.9	63.5	31.0
67	14.2	135.0	45.1	64.4	30.7
68	13.8	134.7	44.4	65.4	30.5
69	13.3	134.3	43.6	66.4	30.2
70	12.8	133.9	42.8	67.4	29.9
71	12.4	133.5	42.1	68.3	29.6
72	11.9	133.1	41.3	69.3	29.3
73	11.5	132.7	40.5	70.3	29.0
74	11.0	132.3	39.8	71.3	28.7
75	10.5	131.9	39.0	72.2	28.4
76	10.1	131.6	38.2	73.2	28.2
77	9.6	131.2	37.5	74.2	27.9
78	9.2	130.8	36.7	75.1	27.6
79	8.7	130.4	35.9	76.1	27.3
80	8.2	130.0	35.1	77.1	27.0
81	7.8	129.6	34.4	78.1	26.7
82	7.3	129.2	33.6	79.0	26.4
83	6.8	128.8	32.9	80.0	26.1
84	6.4	128.5	32.1	81.0	25.9
85	5.9	128.1	31.3	81.9	25.6
86	5.5	127.7	30.6	82.9	25.3
87	5.0	127.3	29.8	83.9	25.0
88	4.5	126.9	29.0	84.9	24.7
89	4.1	126.5	28.2	85.8	24.4
90	3.6	126.1	27.5	86.8	24.1
91	3.2	125.8	26.7	87.8	23.8
92	2.7	125.4	25.9	88.8	23.6
93	2.2	125.0	25.2	89.7	23.3
94	1.8	124.6	24.4	90.7	23.0
95	1.3	124.2	23.7	91.7	22.7
96	0.9	123.8	22.9	92.7	22.4
97	0.4	123.4	22.1	93.6	22.1
98	0	123.0	21.4	94.6	21.8

Fig. 8 – Comparison of our results (horizontal line) with Czech [25] (connected line) and Filipinos [10] (dashed line).
For abbreviations, see under Table 1.

Discussion

In conventional cephalometric analyses, patients' cephalometric values are compared with already established norms specific to designated ethnic and racial groups. Unlike conventional cephalometric analyses, cephalometric analyses, using floating norms, are defined based upon correlation patterns between the five variables, SNA, SNB, NL-NSL, ML-NSL, and NSBa. Regarding the cephalometric floating norms, it can be said that they are part of initial orthodontic diagnosis and have a significant role in establishing the diagnosis, therapy planning, and estimating the effect of therapy [20, 26, 27]. In our study, the floating norms among the young population in Serbia have been established, and the individual craniofacial pattern has been defined. Patients' skeletal patterns can be considered harmonious as long as a correlation between sagittal and vertical cephalometric values exists and as long as the above-mentioned values lie within the harmonious schema [10].

According to Segner and Hasund [21], a harmonious box represents an important diagnostic tool for diagnosing craniofacial anomalies in orthodontics. It is already mentioned how a harmonious box is formed based on the linear regression, where SNA is represented as an independent variable, while SNB, NL-NSL, ML-NSL, and NSBa as dependent variables. In the upper part of the harmonious box, defined as the retrognathic zone, sagittal values are smaller than mean values. Patients whose values are located in this zone have a retrognathic type of face. Regarding the vertical plane, the type of face is determined based on the inclinations degree of the mandible against the cranial base, ML-NSL angle. Within our study, it was noticed that values of ML-NSL, NL-NSL, and NSBa variables are higher in the retrognathic zone of the harmonious box.

In the middle part of the harmonious box, variable values match with the mean values, and the type of face is represented as orthognathic. In the lower part of the harmonious box, sagittal values are higher than mean values, and the type of face is presented as a prognathic type of face. Vertical values such as ML-NSL, NL-NSL, and NSBa variables are reduced within the prognathic zone of the harmonious box. Among the participants whose SNA angle is enlarged and NL-NSL is reduced, the NSBa is too reduced. Generally, the smaller the cranial angle, the more prognathic and converse the face is [17]. The above-mentioned results are confirmed in our and other studies [10, 25]. If the five variables follow one of the harmonious combinations, the patient’s face is considered harmonious and orthognathic. Based on everything mentioned, it can be concluded that the face can be represented as orthognathic and harmonious, then retrognathic and harmonious, and prognathic and harmonious. When the values of some of the five variables are located outside the harmonious schema, the face is considered disharmonious.

Cephalometric analysis should diagnose and locate regions of the skeletal anomaly [28]. The harmonious schema was formed by calculating SE when one of the variables gathered was based upon the rest of the four variables with the help of multiple regression analysis. In our study, multiple regression analysis showed that values of SNA and SNB variables had much higher correlation and fewer standard errors compared to NL-NSL, ML-NSL, and NSBa variables. That means the higher the SE in regression, the higher the variability degree of NL-NSL, ML-NSL, and NSBa variables. On the other hand, sagittal variables such as SNA and SNB have a significantly lower degree of variability. Thus, among harmonious combinations, it is unnecessary that variables' values lie exclusively on the flat horizontal line within the harmonious schema and harmonious box because certain deviations of NL-NSL, ML-NSL, and NSBa variables can be tolerated. The same results are presented by Segner [18] and Sevilla-Naranjilla and Rudzki-Janson [10] in their respective studies. The harmonious schema represents the degree of allowed change between five correlating cephalometric values to describe a harmonious face. The patient whose cephalometric variable values are located within the harmonious schema has a harmonious skeletal pattern [18]. The face is considered harmonious in cases when the patient’s value is located within the retrognathic or prognathic zone of the harmonious box [18].

Comparing our results, our harmonious schema, and the harmonious schema of Segner and Hasund [21], we have noticed that they are similar in the aspect of two variables, NL-NSL and NSBa. The NL-NSL variables harmonious box ranges from 11.5° to 5.5°, while in Segner and Hasund [21] study, it ranges from 10.5° to 4.5°. When considering the NSBa variable, it varies from 134.7° to 125.8° among our participants, and from 135° to 127°, within the study by Segner and Hasund [21]. Other variables such as SNA, SNB, and ML-NSL show a smaller degree of variability among our participants compared to SNA, SNB, and ML-NSL in the study by Segner and Hasund [21]. In the study by Segner and Hasund [21], SNA variable values range from 80.5° to 84°, SNB from 79° to 82.5°, and ML-NSL from 33° to 24°. Among our study results, these variables are not showing such a degree of variability; therefore, the values of SNA range from 78° to 81°, SNB from 75.1° to 78.1°, and ML-NSL from 40.5° to 30.6°.

In addition, comparing our results with those from the studies by Sevilla-Naranjilla and Rudzki-Janson [10] and Řeháček et al. [25], the mean value of the variables among Filipinos and Czechs are drawn in our harmonious box and schema. It is concluded that similarities between Filipinos and our participants do not exist because the variables' sagittal values of Filipinos are located outside the harmonious schema. In the case of the Czechs, mainly all the values of the variables are located within the orthognathic zone of the harmonious box. The exception is the SNB angle, whose values are within the prognathic zone of the harmonious box. That means that the problem is sagittal and Czechs show mandibular prognathism.

Graphic illustration of cephalometric values in the form of a harmonious box and schema needs to enable the therapist to diagnose the type of face much easier and establish whether the relationship between the bones is harmonious and balanced.

Furthermore, the therapist with this concept's help needs to be in the state to define which angle values differ the most from harmonious combinations and harmonious boxes and in which direction orthodontic therapy should be implemented [18].

Conclusion

Analysis of individual craniofacial patterns using cephalometric floating norms enables the forming of the concept of harmonious values of determined parameters for a particular population. Cephalometric floating norms of the young population of Serbia, based on five cephalometric variables, determine the harmonious box values and the craniofacial's pattern of this population more precisely. Such an analysis can ease the diagnosis by defining the parameters more responsible for skeletal disharmony. In this way, it can assist in planning orthodontic therapy and assessing therapeutic effects.

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