

Cephalometric characteristics of children from the city of Sofia in beginner school age

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The first results from the cephalometric studies included in the programme "A Longitudinal Anthropological Study on the Physical Development and Sexual Maturation of 7- to 18-year-olds from the city of Sofia" are being presented. 148 boys and 133 girls from three Sofia schools have been investigated. Three age groups, 7-, 8-, and 9-year-old children have been encompassed. Seven cephalometric features - head length, head breadth and height, smallest forehead breadth, bizygomatic breadth, morphological height of face, mandibular width, as well as the ratios between them have been analyzed. Tendencies determining head growth in the three directions - height, length and width have been looked for. The differing rates of the age alteration ones in the development of the cerebral and facial parts of the head have been recorded and the presence of sexual dimorphism has been noted.

Key words: cephalometry, longitudinal study, age alterations, sexual dimorphism.

Child growth and development are of interest to the experts from various fields - pediatricians, endocrinologists, anthropologists, etc. Age changes in the size and proportions of the body, body weight, sexual maturation and constitutional peculiarities are the most common subject of study. In most studies data about cephalometric characteristics are very scarce especially these ones in longitudinal investigations. In some of the large scale explorations of physical development [1, 4] head size changes are discussed only on the basis of earlier transversal studies.

For the first time in our country an in-detail programme for studies of the head has been included in the project for longitudinal investigations on children and adolescents from Sofia. It aims to disclose the tendencies in head growth in the three directions - height, length and width, to follow up the ratios between the separate parts of the cerebral and facial compartments, to record the different rates of the oncoming changes according to age group, as well as to look for alterations in cephaloscopic features.

Material and Methods

148 boys and 133 girls from the three schools in Sofia have been subjected to the study. In the present paper, the first results incorporating three age groups - 7-, 8- and 9-year-olds are being presented, having been obtained in the period 1993-1995 (October-November). The study was carried out after the conventional methods [2]. Seven basic cephalometric features - height, length and width of the head, smallest forehead breadth, bizygomatic breadth, morphological height of face, mandibular width were chosen for completion of the analysis. Seven indexes characterizing the ratios between them have also been calculated.

Results and Discussion

Human brain has been far ahead in its development as compared to other organs beginning since embryonic stage and reaching in the new-born child 25 per cent of its weight in the grown-up individual, nearly 95 % by the age of 10 years [3], and accordingly bone cranium should be reaching its final stage of development much earlier than other skeletal portions.

What do our results show? At the age of 7 head length in the boys represents 94% of its average value in the males from Sofia under study. At the same age the breadth is 90 %. In group of the nine-year-olds it is already 95.5 % while the breadth is 92 %.

Having traced age alterations of the three basic sizes characterising the cerebral portion of the head (length, breadth and height), an even augmentation of their mean values by about 1-2 mm yearly was observed (Table 1). An in-detail intragroup analysis was performed with regard to the absolute values of the head length and breadth. In the group of the 7-year-old boys and girls of the percentage "medium-length" heads is highest (46.6 % and 44.4 % respectively). Among the 9-year-old boys this percent grows still higher - 52.3 %. In the girls of the same age the per cent of the medium sized lengths drops down while the per cent of the "long" heads increases (39.8 %). In the 7-year-old boys and girls the per cent of the "narrow" heads (47.2 % and 52.6 %) is highest. At the age of 9 years "narrow" heads again predominate in both sex groups (55.5 % for the boys and 56.4 % for the girls). It is also of interest that at this age the per cent of the "medium-breadth" heads significantly rises as well - from 14.6 % to 26 % for the boys and from 18 % to 30.8 % for the girls. The per cent of the "wide" heads is more moderately increased - from 0.7 % to 2 % for the boys. In the group of the 7-year-old girls great values for the breadth are not regarded, while the "wide" head percentage for the 9-year-olds is already 3.8 %.

Analysing the mean values of the cephalic index we must point out the stability in all three groups (Table 2). Both boys and girls are mesocephalic with very close mean index values. In the 7-year-old boys meso-brachycephalic forms are prevalent at a dolichocephaly of 22 % which drops down to a meagre 13 % at the age of 9 years. The same tendency towards augmentation of brachycephalization is also observed in the girls group but with a retention of the dolichocephalic per cent.

The index characterizing the height to breadth and the height to length ratios are with close values for both sexes and undergo insignificant changes during the 7 to 9 years period (Table 2). Both boys and girls in the two age groups under study are hypsicephalic (15:1) and metriocephalic (15:3). The markedly low percentage of chamaecephaly is noteworthy in the intragroup analysis. Only 5 % of the boys and

T a b l e 1. Basic sizes of the head in children from Sofia (7-9 years of age)

Feature	Age group	Boys				Girls			
		\bar{x}	S	min	max	\bar{x}	S	min	max
Head length (1)	7	179.28	6.38	161	196	174.43	6.02	158	189
	8	180.37	6.06	161	199	175.49	5.93	160	190
	9	181.95	6.22	165	201	176.62	5.73	165	191
Head breadth (3)	7	141.71	5.18	130	157	136.89	4.37	125	148
	8	143.28	5.35	131	160	138.89	4.26	125	150
	9	144.66	5.22	131	161	140.02	4.47	128	151
Head height (15)	7	118.01	6.49	101	133	113.41	6.32	97	126
	9	121.10	7.29	106	145	115.07	6.82	102	137
Smallest forehead breadth (4)	7	100.63	3.68	90	110	98.62	3.48	92	106
	8	102.21	3.88	90	113	100.34	3.30	92	107
	9	103.43	3.87	94	112	101.40	3.60	92	109
Bizygomatic breadth (6)	7	118.88	4.56	109	134	116.48	4.50	106	128
	8	121.95	4.71	110	137	119.71	4.38	111	134
	9	123.70	4.81	111	137	121.11	4.43	111	133
Mandibular width (8)	7	90.70	4.39	80	101	88.97	4.22	80	102
	8	94.94	4.49	82	105	93.29	4.45	82	102
	9	97.54	4.40	86	107	95.38	4.15	86	103
Morphological height of face (18)	7	101.09	4.71	90	112	98.26	4.03	88	109
	8	101.59	4.56	90	112	99.22	4.21	89	111
	9	102.66	4.53	91	115	99.97	4.59	90	114

T a b l e 2. Head indexes in children from Sofia (7-9 years of age)

Index	Age group	Boys				Girls			
		\bar{x}	S	min	max	\bar{x}	S	min	max
Head (3:1)	7	79.06	3.90	71.28	89.70	78.57	3.68	71.35	89.70
	8	79.54	3.86	71.35	90.42	79.23	3.61	72.83	88.10
	9	79.68	3.97	71.05	92.73	79.35	3.73	72.28	88.24
Height-length (15:1)	7	65.98	3.80	52.78	76.16	65.06	3.68	53.89	73.05
	9	66.68	4.20	55.25	76.27	65.12	3.98	57.61	75.00
Height-breadth (15:3)	7	83.39	4.72	69.34	92.70	82.90	4.84	71.33	97.73
	9	83.81	5.44	69.93	99.29	82.20	5.03	71.43	98.56
Transversal cephalo-facial (6:3)	7	83.97	2.57	79.31	91.78	85.11	2.54	79.17	92.42
	8	85.10	2.56	78.43	92.14	86.21	2.38	80.00	91.85
	9	85.48	2.50	79.73	91.78	86.50	2.38	80.85	92.09
Yygo-frontal (4:6)	7	84.65	2.62	79.03	91.45	84.72	2.64	77.50	90.99
	8	83.83	2.83	77.78	91.07	83.87	2.69	77.50	90.74
	9	83.64	2.60	75.94	90.68	83.77	2.72	77.05	90.68
Yugo-mandibular (8:6)	7	76.33	2.66	71.07	83.90	76.39	2.45	67.80	82.93
	8	77.88	2.68	70.80	85.95	77.96	2.82	67.77	84.30
	9	78.90	2.40	71.07	84.75	78.81	2.52	70.87	84.43
Morphological face (18:6)	7	85.12	4.21	75.63	95.50	84.36	3.55	76.03	94.44
	8	83.38	4.15	73.23	93.96	82.94	3.70	74.16	91.89
	9	83.07	4.16	73.81	94.69	82.64	3.66	74.19	93.10

3 % of the girls are with low heads according to the height-length index. This per cent is greater as to the breadth in both sexes - 17 % of the boys and 21 % of the girls are tapeinocephalic. 37.6 % of the 7-year-old girls are akrocephalic. Heads of "medium height" and the "high" heads remain prevalent also in the second group.

The stability of all three indexes characterizing the cerebral portion of the head features the even growth of its basic sizes (height, length and breadth) during the period between 7 and 9 years of age. In both sexes, the summed-up characteristic presents the cerebral portion of the children skulls of the three age groups as narrow, high and ones of medium length.

Upon comparison of the results from the variation analysis for boys and girls (Table 1) the constant difference of 5 mm in the three successive years of study in all three basic sizes - height, length and breadth of the head is to be noted thus indicating to the presence of sexual dimorphism.

The changes occurring in the face formation are also of special importance. By contrast to the cerebral portion sizes in the facial part reach considerably later the values typical of the adult individuals. Both the zygomatic diameter and mandibular width, as well as the morphological height of the face are of very low values in both sexes. The close follow up of age alteration in face metric characteristics reveals the varying rate at which they are taking place in the its different parts as compared to the cerebral portion.

According to the absolute values and ratios between the basic width and height sizes in the 7- to 9-year period are recorded several clearly outlined tendencies. The changes in the transversal cephalo-facial index (6:3) indicate the faster bizygomatic breadth growth as compared to the greatest breadth of the head. The same tendency but for the smallest forehead breadth is noticed also in the yugo-frontal index (4:6).

Comparing the breadths in the middle and lower parts of the face a considerably faster increase of the mandibular width is found - the yugo-mandibular index (8:6) is visibly augmented. In the first age group under study, the markedly lower absolute values of the mandibular width as compared to the forehead breadth (Table 1) are noteworthy. Both in the boys and in the girls this difference, though decreased from 10 mm to 6 mm is also present in the group of the 9-year-olds.

Much weaker are the changes in the height sizes of the face. Morphological height of the face grows evenly but considerably more slowly (from 0.5 mm to 1 mm) in both sexes. Accordingly, the values of the morphological face index are decreased (18:6).

Summarizing the results obtained, the following conclusions can be drawn:

1. In the 7- to 9-year age period the individual children under study are mesocephalic with a length of medium size and a small breadth of the head.

2. The dimensions of the head cerebral portion at the age of 9 years 92-95 per cent of their values in adult individuals.

3. A tendency for a faster increase of the breadth sizes as opposed to the height ones is clearly revealed in the development of the face portion between 7 and 9 years of age the mandibular breadth increasing most rapidly followed by the increase in the bizygomatic breadth.

4. Sexual dimorphism starting from the age group of the 7-year-olds is observed in all three basic sizes - height, length and breadth of the head.

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