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FACE DIMENSIONS OF CZECH CHILDREN AGED 0-1.99 YEARS

ABSTRACT: An objective monitoring of the changes of body constitution by means of selected parameters becomes possible under the presumption of existing representative reference standards. These reference data should be kept up to date.

In the years 2001–2004, a cross-sectional study of linear, width, circumference and particularly head dimensions was carried out to achieve a general overview of the physical status of Czech 0–1.99-year-old children as a separate part of the 6th Nationwide Anthropological Survey of children and adolescents, Czech Republic, 2001 (Vignerová et al. 2006). The file consists of 2135 children (1080 boys, 1055 girls). The anthropometric data were collected according to a standardized (Martin-Saller's) method (Martin, Saller, 1957) or its modification. For statistical comparison sorting of the age categories according to the WHO recommendation was made. Our data were compared (Student's t-test, Z-score) with the results of the previous surveys of Czech children.

In our paper we present part of the results – morphological height of the face, width of the face – bizygion distance, minimum width of the forehead, index facialis and relative growth of face dimensions (% of the adult size, % of the birth size).

Comparison of our study and the 6th Nationwide Anthropological Survey of children and adolescents, Czech Republic, 2001 (Vignerová et al., 2006) in selected diameters – recumbent length (0–1.99 y.) and body weight – didn't show statistically significant differences of the mean values in general. Therefore our study could offer useful data on contemporary children 0–1.99 years of age to paediatricians, anthropologists and the general public for their use either in basic research or in the clinical practice.

Comparison of results of our study and previous anthropological surveys which were carried out in the years 1966–67 (Figalová, Šmahel, 1972) and in the years 1983–87 (Krásničanová, 1989) could indicate that increases of the mean values in morphological height of the face are accompanied with decreases of the mean values in bizygion distance and minimum width of the forehead.

KEY WORDS: Face dimensions – reference data – diameters of children – aged 0–1.99 years

INTRODUCTION

Growth tables and charts are an essential component of the paediatric toolkit. For an assessment of well-balanced development, an estimation of a series of parameters is more relevant than comparison of a sole parameter.

In our paper we present a part of the results of a detailed cross-sectional study of physical development of Czech children aged 0–1.99 years – morphological height of the face, width of the face – bizygion distance, minimum width

of the forehead, index facialis and relative growth of face dimensions (% of the adult size, % of the birth size). In addition to our paper, further head dimensions were published (Hrušková 2006).

Comparison of our study and the 6th Nationwide Anthropological Survey of children and adolescents, Czech Republic, 2001 (Vignerová et al. 2006) in selected diameters – recumbent length (0–1.99 y.) and body weight – didn't show statistically significant differences of the mean values in general. Comparison in recumbent length of 0–0.99

month-old children (data collected in years 2001–2004) shows 0.4–0.9 cm benefit for the reference file – the 6th Nation-wide Anthropological Survey (data collected in 2001, Vignerová *et al.* 2006), expressed by Z-scores the mean values differ in 0.2–0.3 S.D. Statistical analysis of our file and the reference file (Vignerová *et al.* 2006) showed higher ratio of children with birth weight close to 2500 g and consequently lower mean values of recumbent length in our file.

MATERIAL AND METHODS

A cross-sectional study of twenty-two linear, width, circumference and particularly head dimensions was carried out in the years 2001–2004 in České Budějovice, Prague, Olomouc and its surroundings by anthropologists. The file consists of 2135 children (1080 boys, 1055 girls). The anthropometric data were collected according to a standardized (Martin-Saller's) method (Martin, Saller 1957) or its modification. Sorting of the age categories according to the recommendation of the WHO was made. Age categories with $N < 30$ were labelled “#” in the tables. Because of a low number of probands aged 0–1 year in some age categories (N below 30) we put their data together (e.g. age category 2.00–3.99 months includes data of children of age categories 2.00–2.99 months and 3.00–3.99 months). Fundamental statistical values (numbers of probands, means

and standard deviations) are presented in tables. *Figure 1* (index facialis) shows fourth degree polynomial curves.

Our data were compared by Student's t-test ($\alpha = 0.05$ signed as “*”, resp. 0.01 signed as “**”) and Z-scores with results of the previous cross-sectional surveys which were carried out in the years 1966–67 (Figalová, Šmahel 1972) abbreviated as S1966 and in the years 1983–87 (Krásničanová 1989) abbreviated as K1983.

Z1-score = (Mean of our file – Mean of S1966) / S.D. of S1966

Z2-score = (Mean of our file – Mean of K1983) / S.D. of K1983

RESULTS AND DISCUSSION

Morphological height of the face (cm)

The mean values of morphological height of the face in boys and girls steeply increase at the beginning of the research period through age category 2.00–3.99 m. (*Table 1*).

Then absolute increments of the mean values decrease markedly and after 1 year of age (1.00–1.24 y.) the increments decrease fluently to the end of the research period.

The mean values of diameter in girls are lower than in boys in all age categories. The differences of the mean values increase gradually until 1 year of age (e.g. for 5d. –1.99-months-olds the difference 0.01 cm; for

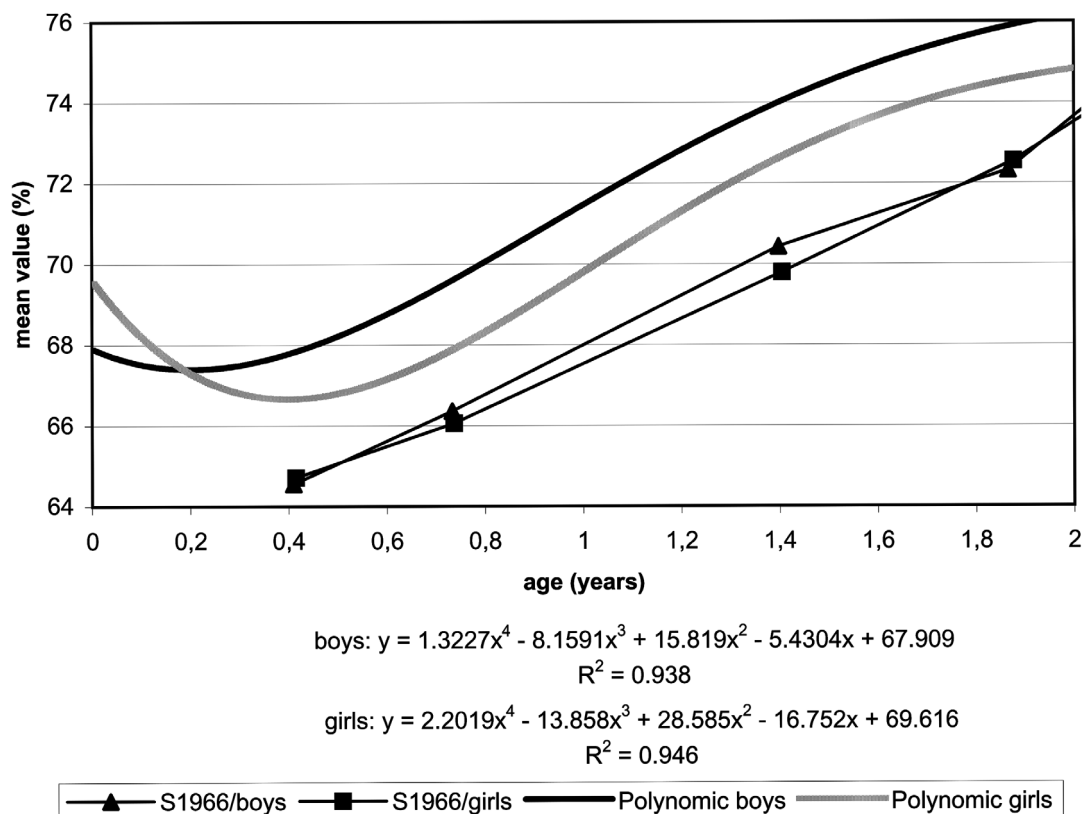


FIGURE 1. Index facialis (%)
Comparison of our file to file S1966 (Figalová, Šmahel, 1972).

Table 1. Morphological height of the face (cm).
Comparison of our file to file S1966 (Figalová, Šmahel, 1972): p1-value, Z1-score
Comparison of our file to file K1983 (Krásničanová, 1989): p2-value, Z2-score

Age Days d., months m.	2001-04						BOYS			GIRLS				
	2001-04		S1966 (Figalová, Šmahel, 1972)		K1983 (Krásničanová, 1989)		S1966 (Figalová, Šmahel, 1972)		K1983 (Krásničanová, 1989)		S1966 (Figalová, Šmahel, 1972)			
	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score
0-4 d.	# 15	5.72	0.30					# 25	5.59	0.34				
5 d. - 1.99 m.	52	5.90	0.57			0.095	0.53	61	5.89	0.51			0.000**	1.39
2.00 - 3.99 m.	63	6.52	0.47			0.069	0.37	55	6.35	0.42			0.018*	0.61
4.00 - 5.99 m.	68	6.73	0.35	0.001**	0.80			58	6.63	0.45	0.000**	0.75		
6.00 - 7.99 m.	43	7.00	0.35					47	6.68	0.40				
8.00 - 9.99 m.	33	7.18	0.52	0.002**	0.70	0.999	0.11	# 26	6.76	0.44	0.199	0.30	0.095	-0.54
10.00 - 11.99 m.	# 22	7.39	0.56					# 27	6.83	0.48				
Years y.														
1.00 - 1.24 y.	# 22	7.29	0.50			0.198	-0.73	# 24	7.04	0.44			0.064	-0.73
1.25 - 1.49 y.	# 14	7.76	0.38	0.047*	0.56			# 26	7.38	0.43	0.288	0.20		
1.50 - 1.74 y.	34	7.81	0.44					# 21	7.64	0.50				
1.75 - 1.99 y.	28	7.95	0.43	0.665	0.20			37	7.72	0.44	1.000	0.07		

10.00–11.99–months-olds the difference 0.56 cm, i.e. 1.0 S.D.), after 1 year of age the differences of the means vary between 0.2 and 0.4 cm.

Comparison of the morphological height of the face of our file and files S1966 and K1983 showed higher mean values in our children in almost the whole research period. Statistically significant differences of the mean values in our file and file S1966 were rated particularly in boys (4.00 m.–1.49 y.); expressed in Z-scores the means vary from 0.6 to 0.8 S.D. The statistically insignificant differences of the means of our file and file K1983 were rated during the research period predominantly.

Bizygion distance (cm)

The mean values steeply increase at the beginning of the research period through the age category 4.00–5.99 m. Then absolute increments of the means decrease markedly and after 1 year of age the diameter increase very slightly (Table 2).

Development of the mean values in boys and girls is almost identical. Mean values of the bizygion distance in girls are slightly lower than in boys in almost all age categories; the differences of the means in boys and girls vary between 0.2 cm and 0.3 cm mainly.

Comparison of the bizygion distance of our file and the reference file S1966 showed lower mean values in our children older than 1 year (statistically significant differences were rated, expressed in Z-scores the means varied from 0.7 to 1.0 S.D.). Comparison of the diameter for our file and file S1966 showed lower mean values during the research period in our file with statistically insignificant differences of the mean values in general. Although statistically significant differences of means of our file and file K1983 were not rated, the mean values of our file were lower during almost the whole research period.

Minimum width of the forehead (cm)

The mean values steeply increase at the beginning of the research period through the age category 6.00–7.99 m. in boys and 4.00–5.99 m. in girls (Table 3). Then absolute increments of the mean values markedly decrease to the end of the research period.

Mean values of the minimum width of the forehead in girls are lower than in boys, the differences of the means vary between 0.2 and 0.5 cm.

Comparison of our file and comparative file S1966 showed lower mean values in our file (except age category 4.00–5.99 m.). Statistically significant differences of the mean values were rated in children aged 1.75–1.99 years. Unfortunately, comparative data of file K1983 are not available.

Index facialis (%)

Mean values of index facialis decrease to the minimum in boys (4.00–5.99 m.) and girls (6.00–7.99 m.) due to the bizygion distance increase dynamics (Table 4, Figure 1). Then the mean values increase to the end of the research period (1.75–1.99 y., 76.2 % in boys, 73.9 % in girls).

TABLE 2. Bizzygion distance – width of the face (cm).
Comparison of our file to file S1966 (Figalová, Šmahel, 1972): p1-value, Z1-score
Comparison of our file to file K1983 (Krásničanová, 1989): p2-value, Z2-score

Age	2001-04				BOYS				GIRLS					
	S1966		K1983		S1966		K1983		S1966		K1983			
	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)		
Days d., months m.	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score
0 - 4 d.	240	8.07	0.57					253	8.10	0.43				
5 d. - 1.99 m.	175	8.41	0.73			0.017*	-0.78	158	8.32	0.68			0.094	-0.45
2.00 - 3.99 m.	139	9.50	0.58			0.070	-0.30	108	9.26	0.52			1.000	-0.09
4.00 - 5.99 m.	121	9.98	0.63	0.124	0.29			116	9.78	0.60	0.185	0.23		
6.00 - 7.99 m.	81	10.17	0.68					86	10.04	0.62				
8.00 - 9.99 m.	73	10.27	0.57	1.000	0.05	1.000	0.07	56	9.83	0.58	0.038*	-0.40	0.592	-0.17
10.00 - 11.99 m.	53	10.23	0.65					57	10.02	0.56				
Years y.														
1.00 - 1.24 y.	52	10.20	0.76			0.620	-0.22	71	9.95	0.69			0.134	-0.37
1.25 - 1.49 y.	37	10.30	0.84	0.038*	-0.72			46	10.06	0.58	0.001**	-0.77		
1.50 - 1.74 y.	67	10.33	0.70					52	10.06	0.68				
1.75 - 1.99 y.	42	10.37	0.60	0.000**	-1.00			52	10.27	0.72	0.004**	-0.77		

TABLE 4. Index facialis (%).
Comparison of our file to file S1966 (Figalová, Šmahel, 1972): p1-value, Z1-score

Age	2001-04				BOYS				GIRLS					
	S1966		K1983		S1966		K1983		S1966		K1983			
	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)	(Figalová, Šmahel, 1972)	(Figalová, Šmahel, 1972)	(Krásničanová, 1989)	(Krásničanová, 1989)		
Days d., months m.	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score	N	Mean	S.D.	p1-value	Z1-score	p2-value	Z2-score
0 - 4 d.	# 17	67.33	4.50					# 21	69.17	4.14				
5 d. - 1.99 m.	45	68.70	6.58					60	68.36	6.36				
2.00 - 3.99 m.	62	67.14	5.46					55	68.24	5.76				
4.00 - 5.99 m.	67	66.83	4.73	0.038*	0.50			57	67.04	5.85	0.048*	0.50		
6.00 - 7.99 m.	40	68.35	4.26					46	66.17	4.92				
8.00 - 9.99 m.	33	70.75	5.44	0.001**	0.43			# 25	68.71	4.77	0.019*	0.58		
10.00 - 11.99 m.	# 21	71.10	6.01					# 27	68.17	5.07				
Years y.														
1.00 - 1.24 y.	# 22	72.49	6.98					# 24	68.98	4.29				
1.25 - 1.49 y.	# 13	71.49	3.02	0.629	0.24			# 26	73.81	5.81	0.002**	0.81		
1.50 - 1.74 y.	33	76.33	6.53					# 21	74.77	6.04				
1.75 - 1.99 y.	# 28	76.18	5.15	0.001**	0.52			36	73.85	4.49	0.143	0.33		

TABLE 3. Minimum width of the forehead (cm).
Comparison of our file to file S1966 (Figalová, Šmahel, 1972): p1-value, Z1-score

Age	2001-04				BOYS		2001-04			GIRLS	
	N	Mean	S.D.		p1-value	Z1-score	N	Mean	S.D.	p1-value	Z1-score
0 - 4 d.	# 24	6.68	0.67				# 27	6.74	0.56		
5 d. - 1.99 m.	68	7.29	0.94				69	6.88	0.77		
2.00 - 3.99 m.	66	7.92	0.85				67	7.56	0.87		
4.00 - 5.99 m.	66	8.21	0.93	1.000	0.05		78	8.22	0.83	0.654	0.22
6.00 - 7.99 m.	53	8.80	0.85				53	8.39	0.76		
8.00 - 9.99 m.	44	8.57	0.99	0.068	-0.58		39	8.31	0.92	0.244	-0.35
10.00 - 11.99 m.	39	8.67	0.95				35	8.51	0.78		
Years y.											
1.00 - 1.24 y.	# 27	8.88	1.03				48	8.35	0.74		
1.25 - 1.49 y.	# 20	9.02	0.80	0.326	-0.37		32	8.69	0.67	0.072	-0.50
1.50 - 1.74 y.	51	8.69	0.82				35	8.57	0.81		
1.75 - 1.99 y.	32	8.73	0.83	0.000**	-1.84		36	8.89	0.63	0.004**	-0.86

TABLE 5. Relative growth of face dimensions (% of the adult size).

Age	BOYS		GIRLS	
	Morphological height of the face	Bizygion distance	Morphological height of the face	Bizygion distance
Days d., months m.				
2.00 - 3.99 m.	56.8	72.7	58.5	72.5
6.00 - 7.99 m.	61.0	77.5	61.5	77.3
8.00 - 9.99 m.	62.6	79.0	62.2	78.1
Years y.				
1.00 - 1.24 y.	63.6	79.2	64.8	79.5
1.75 - 1.99 y.	70.4	79.4	71.4	79.6

TABLE 6. Relative growth of face dimensions (% of the birth size).

Age	BOYS		GIRLS	
	Morphological height of the face	Bizygion distance	Morphological height of the face	Bizygion distance
Days d., months m.				
0-4d.	100.0	100.0	100.0	100.0
2.00 - 3.99 m.	114.0	117.7	113.6	114.3
6.00 - 7.99 m.	122.4	126.0	119.5	120.0
8.00 - 9.99 m.	125.5	127.3	120.9	121.4
Years y.				
1.00 - 1.24 y.	127.5	127.4	125.9	122.8
1.75-1.99 y.	139.0	128.5	138.1	126.8

Comparison of our file and the comparative file S1966 showed higher mean values in our file during the research period. The statistically significant differences of the mean values were rated in almost all compared categories (expressed in Z-scores the means varied from 0.2 to 0.8 S.D.). Comparison of the means of index facialis showed

relatively higher and narrower face in contemporary children aged 0–1.99 years. Moreover, Kobzová and her colleagues (Kobzová *et al.* 2001) published the same results in the index facialis development for Czech 3–14-year-old children.

Relative growth of face dimensions (% of the adult size, % of the birth size)

Relative growth of face dimensions (% of the adult size; Table 5) was counted as a ratio of the mean value of the diameter in selected age category related to the adult mean value (age category 14.00–14.99 y.; Bláha *et al.* 1999) multiplied by one hundred. Differences in ratios at birth and at the end of the research period show superiority in growth of morphological height of the face to bizygion distance. Unfortunately comparative data are not available.

Relative growth of face dimensions (% of the birth size; Table 6) was counted as a ratio of the mean value of the diameter in selected age category related to the mean value at birth (0–4 d.) multiplied by one hundred. Unfortunately comparative data for relative growth of the face dimensions are not available.

CONCLUSION

Detailed cross-sectional study of physical development of Czech children could offer useful data (22 diameters and indexes) on contemporary 0–1.99-year-old children to paediatricians, anthropologists and the general public for their use either in basic research or in the clinical practice.

In our paper we present part of the results – morphological height of the face, width of the face – bizygion distance, minimum width of the forehead, index facialis and relative growth of the selected face dimensions.

Comparison of results of our study and previous anthropological surveys could indicate that increases of the mean values in morphological height of the face are accompanied with decreases of the mean values in bizygion distance and minimum width of the forehead. Comparison of the face diameters showed relatively higher and narrower face in contemporary 0–1.99-year-old children.

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