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THE SOMATIC DEVELOPMENT OF ROMANY AND NON-ROMANY PRESCHOOL AGED CHILDREN

ABSTRACT: In this study the physical parameters of 3–6-year-old children from eastern Slovakia were compared. The aim of the work was to evaluate the differences between age categories of Romany and non-Romany children. The evaluated dataset consisted of 211 children – 104 non-Romany and 107 Romany. Anthropometric measurements included body weight and height and head and chest circumferences. The analysis of the obtained data showed that for non-Romany children the parameters of body height and head and chest circumferences were higher than those of Romany children. Body weight was not higher for all non-Romany children.

KEY WORDS: Romany children – Non-Romany children – Preschool age – Anthropometric parameters

INTRODUCTION

The monitoring of child development and growth is very important and is included in comprehensive child healthcare programs. Several problems, coupled with feeding difficulties, chronic illness, social deprivation and poor weight gain, can be detected early through such screening (UNICEF 1990). Therefore, growth reference charts are essential components of the pediatric toolkit for monitoring child growth and development (Kato *et al.* 2014, Bong *et al.* 2015, Cheng *et al.* 2019).

Anthropometric measurements based on height and weight is usually used for evaluating the general nutritional status of a population (Veldhuis *et al.* 2013, Hassapidou *et al.* 2015). A comparison of these measurements for an individual with those of the reference population offers an indication of normal or abnormal growth (Cole 2006, Kato *et al.* 2014, Bong *et al.* 2015). Individuals with unusual measurements may have normal health, but such anthropometric data can help diagnose or detect preliminary growth-related disorders. Therefore, regular assessment of growth patterns among children is a major preventive tool in

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detecting underweight individuals from low socio-economic groups as well as overweight or obese individuals from higher socio-economic groups (WHO 1978).

Anthropometric studies have been carried out in all age categories, but studies that deal with preschool age are of more importance, because body changes are very dynamic during this period of life (Vignerová 2006, Malina *et al.* 2011, Karlsson *et al.* 2013, Zong, Li 2014, Ramcharitar-Bourne1 *et al.* 2014, Ejlerskov *et al.* 2014, Sacco *et al.* 2015) and are also related to sex (Marceau *et al.* 2011)

All the mentioned studies confirmed that data obtained in this type of research are necessary in order to evaluate the variability of somatic traits. The obtained data are processed and compared with the aim of finding differences between physical traits. Finally, they also serve for monitoring and evaluating the healthy development and growth of children (Koupilová *et al.* 2001, Kokaisl 2007).

These findings are important, because by comparing them with older studies we can observe changes in development and in growth rates. Development and growth are influenced by exogenous factors, such as climate, diet, race and environment, which can influence the overall growth rate. Kaushik (2007) showed that unfavorable conditions lead to deterioration and growth retardation.

Many different life factors, such as better hygienic conditions, better diet, the environment, health care and also education of parents, support the proper growth and nutrition of children and promote the health of children and other household members. These are particularly important during the period of growth acceleration (Alderman *et al.* 2003). Yeasmin and Yeasmin (2018) confirmed that insufficient food intake and poor living conditions lead to a worsening of health condition along with a decrease in somatic parameters.

The aim of this study was to create and compare representative growth reference charts for Slovak Romany and non-Romany children from 3 to 6 years old.

MATERIAL AND METHODS

The anthropometric research was conducted from May 2017 to June 2018 in kindergartens in eastern Slovakia. Only children with signed informed consent from their parents were counted in the evaluation. In total, we obtained data from 211 children, 104 of whom are non-Romany (56 boys and 48 girls) and 107 of whom are Romany (53 boys and 54 girls). For age categories of 3–6-year-olds the following measurements were taken: body height (M1), body weight (M71), head circumference (M45) and chest circumference (M 61) by recommendation (Kopecký *et al.* 2013, 2019). All traits were measured using anthropometric instruments. Basic descriptive parameters, such as mean values, standard deviation (SD), confidence interval 95% (95%CI) and coefficient of variation (V), were calculated for the obtained values. We investigated morphometric variability using the unpaired Mann-Whitney test. We also used a two-way ANOVA with age and ethnicity as factors to test their interaction and evaluate the variability. All descriptive analyses were evaluated using the statistical analysis system GraphPad Prism version 5.01 (GraphPad Software, Inc., San Diego, California, USA), and the two-way ANOVA were done using the Statistical Software OriginPro8.6 (Microral Software Inc., Northamptom, USA).

RESULTS

The values for the body height of the preschool children are shown in (*Table 1*). All mean height values for Romany children were lower than those of non-Romany children. Similarly, boys had higher values than girls regardless of ethnicity. We also recorded statistically significant differences between Romany and non-Romany children. For both sexes, higher values were shown for non-Romany.

For body weight (*Table 2*), boys were confirmed to be heavier than girls for non-Romany children, but different results were obtained for 3- and 4-year-old Romany children. Similarly, the comparison between ethnic groups confirmed statistically significant differences, with higher values for non-Romany children.

The head circumference values for 3–6-year-old children are presented in *Table 3*. The values confirmed that boys had higher values than girls, regardless of ethnicity. The Mann-Whitney test confirmed that non-Romany children had higher values than Romany children.

The average values of chest circumference (*Table 4*) showed statistically significant higher values for non-Romany children, with the exception of the group of 6-year-old Romany girls. Overall, boys had higher values than girls, regardless of ethnicity.

Moreover, the two-way ANOVA confirmed the existence of significant differences in measures

TABLE 1: Mean body height of non-Romany and Romany children in preschool age. M, boys; F, girls; N, number; SD, standard deviation; SEM, standard error of mean, 95% Confidence Interval (Lower, Upper); V – coefficient of variation in %; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

Height (M 1)														
non-Romany children														
Age	**N**		**Mean**		**SD**		**SEM**		**95% Cl**				**V (%)**	
									Lower		**Upper**			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
3	13	12	100.80^{ns}	100.20**	2.60	1.89	0.72	0.54	99.39	98.98	102.50	101.40	3.34	1.85
4	15	12	108.60***	105.00**	4.43	3.71	1.14	0.75	106.10	103.40	111.00	106.60	1.21	2.27
5	14	11	120.00***	114.20**	4.87	5.42	1.30	1.63	117.20	100.70	122.80	118.00	4.43	6.50
6	14	13	123.40**	116.10***	4.06	2.49	1.08	0.69	121.00	114.60	125.70	117.60	4.50	1.64
Romany children														
3	14	16	100.70	93.87	3.75	4.95	1.00	1.24	98.51	91.23	102.80	96.51	3.12	1.67
4	12	12	101.90	103.10	2.12	3.97	0.61	1.14	100.50	100.50	103.20	105.60	1.15	2.19
5	12	12	111.80	107.70	3.65	3.28	1.05	0.94	109.50	105.60	114.10	109.80	4.36	6.20
6	15	14	117.70	110.90	3.61	3.91	0.93	1.04	115.70	108.60	119.70	113.20	3.91	1.42

TABLE 2: Mean body weight of non-Romany and Romany children in preschool age. M, boys; F, girls; N, number; SD, standard deviation; SEM, standard error of mean, 95% Confidence Interval (Lower, Upper); V – coefficient of variation in %; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

Weight (M 71)														
non-Romany children														
Age	**N**		**Mean**		**SD**		**SEM**		**95% Cl**				**V (%)**	
									Lower		**Upper**			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
3	13	12	17.71^{ns}	16.73^{ns}	2.26	0.40	0.62	0.11	16.34	16.45	19.04	16.99	6.36	7.41
4	15	12	19.11**	18.46^{ns}	1.23	2.45	0.34	0.70	18.36	16.90	19.86	20.02	7.29	10.35
5	14	11	22.86**	21.84***	2.50	1.89	0.67	0.57	21.42	20.57	24.31	23.11	11.07	9.54
6	14	13	23.01^{ns}	21.48^{ns}	2.14	2.11	0.58	0.57	22.77	20.21	25.25	22.76	14.35	4.62
Romany children														
3	14	16	17.60	18.10	2.08	2.50	0.55	0.63	16.56	16.76	16.56	16.76	6.75	8.35
4	12	12	17.63	19.63	1.75	2.80	0.50	0.81	16.51	17.85	16.51	17.85	5.38	4.75
5	12	12	19.61	18.12	1.82	1.44	0.52	0.41	18.45	17.20	18.45	17.20	8.69	5.76
6	15	14	23.37	19.71	2.50	1.65	0.64	0.44	21.99	18.75	21.99	18.75	13.50	6.28

depending on two factors, i.e. age and ethnicity (*Tables 5, 6*).

DISCUSSION

Anthropometrical studies of ethnic groups provide important research material that offers information about the health status and development of the population and also serves for analyzing individual groups living in different living conditions.

These studies deal with anthropometric comparisons of preschool age children; the studies on children from India were conducted by Khopkar *et al.* (2014); Yeasemin and Yeasemin (2018) and Khadilkara *et al.* (2019); for Malaysia by Bong *et al.*

TABLE 3: Mean head circumference of non-Romany and Romany children in preschool age. M, boys; F, girls; N, number; SD, standard deviation; SEM, standard error of mean, 95% Confidence Interval (Lower, Upper); V – coefficient of variation in %; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

Head circumference (M 45)														
non-Romany children														
Age	**N**		**Mean**		**SD**		**SEM**		**95% CI**				**V (%)**	
									Lower		**Upper**			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
3	13	12	51.88**	51.58***	1.02	1.25	0.28	0.36	51.27	50.78	52.50	52.38	2.63	3.05
4	15	12	52.03^{ns}	51.08^{ns}	1.04	1.24	0.26	0.35	51.46	50.30	52.61	51.87	2.46	1.87
5	14	11	52.98***	52.41*	1.98	1.15	0.53	0.34	51.78	51.63	54.08	53.19	4.12	3.62
6	14	13	53.37 ^{ns}	52.42*	2.71	0.94	0.62	0.22	52.06	51.95	54.68	52.89	4.25	2.89
Romany children														
3	14	16	50.38	49.70	2.48	0.77	0.66	0.19	49.39	49.31	52.26	50.13	1.53	1.62
4	12	12	51.92	50.54	1.24	1.67	0.35	0.48	51.13	49.48	52.70	51.60	2.32	2.04
5	12	12	50.50	51.38	0.92	1.02	0.26	0.29	49.91	50.72	51.04	52.03	1.65	1.41
6	15	14	52.10	51.47	1.13	1.00	0.25	0.23	51.57	50.99	52.63	51.96	3.26	2.05

TABLE 4: Mean chest circumference of non-Romany and Romany children in preschool age. M, boys; F, girls; N, number; SD, standard deviation; SEM, standard error of mean, 95% Confidence Interval (Lower, Upper); V – coefficient of variation in %; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

Chest circumference (M 61)														
non-Romany children														
Age	**N**		**Mean**		**SD**		**SEM**		**95% CI**				**V (%)**	
									Lower		**Upper**			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
3	13	12	55.50 *	55.54***	0.86	0.81	0.24	0.23	54.98	55.03	56.02	56.06	1.73	1.32
4	15	12	57.61^{ns}	57.63 *	2.85	3.32	0.73	0.95	56.03	55.51	59.19	59.74	4.80	4.69
5	14	11	61.04^{ns}	60.79***	4.68	3.59	1.25	1.08	58.33	58.38	63.74	63.21	3.25	3.18
6	14	13	55.50**	51.50 ^{ns}	0.86	0.41	0.24	1.24	54.25	53.98	56.02	56.41	1.44	1.58
Romany children														
3	14	16	53.99	51.76	1.64	1.48	0.43	0.37	53.04	50.96	54.94	52.54	1.55	1.15
4	12	12	55.42	54.54	1.83	2.36	0.52	0.68	54.25	53.04	56.58	56.05	1.23	1.10
5	12	12	58.80	57.61	2.89	0.54	0.83	0.54	56.96	55.85	60.64	58.23	7.44	4.71
6	15	14	53.99	51.75	1.64	1.48	0.43	0.37	53.04	50.96	54.94	52.54	2.08	1.68

(2014); for Ireland by Murin *et al.* (2012); for Taiwan by Cheng *et al.* (2018); for Japan by Kato *et al.* (2014) and Mastuda *et al.* (2017); for Turkey by Hatipoglu (2013); for Canada by Twells and Newhook (2011); for the Netherlands by Veldhuis *et al.* (2013); and for Ethiopia by Exmir (2009).

In comparison with our results on the non-Romany population, the values of the measured traits obtained by the aforementioned authors were generally smaller. We showed that Romany children had lower traits than non-Romany children, with exception of the group of 5-year-old Romany girls, whose weight was higher than that of non-Romany girls.

Similarly, chest and head circumferences were most often measured by other authors (Hatipoglu *et al.* 2013, Hassapidou *et al.* 2009, Veldhuis *et al.* 2013, Kato *et al.*

TABLE 5: Results of two-way ANOVA measured body parameters – preschool age boys. BP, body parametrs; M1, height; M 71, weight; M 61, chest circumference; M 45, head circumference; df, degree of freedom; SSq, Sum of square; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

BP	Faktror	df	SSq	f	P	
M 1	Age	3	8593.88	37.56	2.22E-16	***
	Ethnicity	1	408.54	5.36	0.02267	*
	Age x Ethnicity	7	9305.51	17.43	5.77E-15	***
M 71	Age	3	632.92	48.05	0	***
	Ethnicity	1	48.03	10.94	0.00131	**
	Age x Ethnicity	7	716.59	23.31	0	***
M 61	Age	3	1034.29	39.27	1.11E-16	***
	Ethnicity	1	165.59	18.86	3.35E-05	***
	Age x Ethnicity	7	1213.18	19.74	2.22E-16	***
M 45	Age	3	1429.12	34.89	1.44E-15	***
	Ethnicity	1	155.48	11.39	0.00105	***
	Age x Ethnicity	7	1635.93	17.12	9.44E-15	***

TABLE 6: Results of two-way ANOVA measured body parameters – preschool age girls. BP, body parametrs; M1, height; M 71, weight; M 61, chest circumference; M 45, head circumference; df, degree of freedom; SSq, Sum of square; Significant variables are shown with the significant levels: *p<0.05. **p<0.01. ***p<0.001., p – statistic significant.

BP	Factor	df	SSq	f	p	
M 1	Age	3	3213.02	10.16	7.36E-06	***
	Ethnicity	1	1345.92	12.77	5.58E-04	***
	Age x Ethnicity	7	5031.48	6.82	1.51E-06	***
M 71	Age	3	154.51	12.20	8.25E-07	***
	Ethnicity	1	13.68	3.24	0.07513	ns
	Age x Ethnicity	7	263.68	8.92	2.18E-08	***
M 61	Age	3	603.16	9.49	8.33E-05	***
	Ethnicity	1	243.48	11.49	8.90E-06	***
	Age x Ethnicity	7	1074.53	7.24	1.75E-07	***
M 45	Age	3	1169.14	44.27	0	***
	Ethnicity	1	203.71	23.14	5.72E-06	***
	Age x Ethnicity	7	1568.40	25.45	0	***

2014, Vignerová *et al.* 2006, Cheng *et al.* 2018). For these studies, it was characteristic that children were evaluated regardless of the conditions in which they live.

The results showed differences between studies. Non-Romany children from our study had higher values for head and chest circumferences. In contrast, Romany children had lower values of head and chest circumferences than non-Romany children.

Khopkar *et al.* (2014) studied anthropometric characteristics and nutritional status of adolescents from urban slums of India and study the factors affecting it. They also evaluated nutritional status as determined by height-for- age and BMI-for-age of adolescents from urban slums of Maharashtra with low per capita income. Their status was also compared with the WHO and Indian reference populations by age and sex. Moreover, they account socioeconomic factors such as mother's education, family income, and diet. All these factors are known to affect the nutritional status (stunting and thinness) of school children.

They showed that prevalence of stunting and thinness was lower using the Indian reference population compared to that of WHO. Stunting was more prevalent than thinness in the study of children where boys suffered more than girls. Boys with a higher prevalence of stunting compared to girls might had suffered from high levels of chronic undernutrition e.i. less consumption of required nutrients and partly from untreated infections. Therefore, the growing boys need their nutritional requirement according to age.

They confirmed the effect of age on stunting which was different among boys than girls. The very important for these differences between both sexes was mainly a mother's education. It was very important that house hold size and income were significantly associated with the nutritional status of girls. Therefore, authors suggested that educating mothers about the nutritional needs of adolescents may help to improve adolescents' anthropometric profile and future health.

Findings of this study are very interesting because they copy the conditions in which a part of the Romany population in Slovakia lives. Moreover, their findings were very similar to the results of the Romany children in Slovakia. For Romany we confirmed smaller dimensions compared to non-Romany. And among the Romany population there were girl's smaller values than boys.

CONCLUSION

The main focus of this research was children of preschool age, whose body profile reflects both internal and external influences. We confirmed that children living in poor living conditions (mainly Romany children) had on average lower body measures. A long-time studies looking at anthropometry and dietary intake data in non-Romany as well Romany population from Slovakia would be needed in future for planning of a proper nutritional intervention to overcome the problem of thinness or overweight.

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