BIRTH ORDER INFLUENCE ON THE ANTHROPOMETRIC PROPERTIES OF THE BOYS FROM TUZLA REGION (BOSNIA AND HERZEGOVINA)

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ABSTRACT

Birth order and its effect on growth and development of children and youths have rarely been studied so far. The objective of this research was an analysis of the birth order effects on some anthropometric properties of the boys 11-16 years old. The sample consisted of 748 boys from the Tuzla region. As the sample included very few boys born as the third, forth, or fifth child, we decided to consider only the differences in the mean values for some anthropometric parameters between the groups of the first- and the second-born. Measurements were taken according to IBP and the following parameters were investigated: body height, body mass, chest circumference, upper arm circumference, upper leg circumference, sitting height, arm length, leg length, pelvis width, shoulders width, length and width of head. We established that in most generations the firstborn boys have larger mean values for most anthropometric variables in comparison to the second-born.

Key words: growth and development, birth order, anthropometric parameters, ontogenesis

INTRODUCTION

Growth and development are influenced by endogenous (genetic, hormonal, and neurological) as well as exogenous (climatic-ecological, nutritional, socio-economic and sanitary-hygienic) factors. But, some factors are in correlation with this phase of ontogenetic development and due to their nature they can be classified in both groups. Those factors are: birth order, father's age, mother's age, propagational mobility.

Birth order is the factor that affects anthropological properties in all the growth phases of children and youngsters. Earlier investigations in this factor are mainly focused on body height and body mass registered at birth. So, Radmanović[1] found that the firstborn child is "smaller" and "lighter" than the second- and the third-born, and that male newborns are somewhat "heavier" and "longer" than the females. Prokopec[2] studied the influence of this factor on boys and girls, 6 to 8 years old, (sample of 55000 boys, 55000 girls) and found that the mean body length of the firstborn and the second-born is larger than the same parameter in the third-born (both sexes). The same author established that the mean value in the general population corresponds to the mean body length of the second-born. Data on influence of birth order as the factor affecting anthropologic characteristics of children and youngsters are sparse .

The influence of exogenous factors on growth and development studied by quantitative variation was a subject of research by Hadžiselimović, Terzić and Berberović[3]; Hadžiselimović[4]; Hadžiselimović and Zovko[5]; Hadžiselimović[6]; Novaković[7]; Berberović; Hadžiselimović and Dizdarević[8]; Adžaib[9]; Terzić Novaković and Vuković[10]; Švob and Bravo[11]; Švob T, Švob M and Novaković[12]; Hadžiselimović i Lelo[13] i Hadžihalilović[14].

OBJECTIVES

To examine correlation between the birth order and some anthropometric parameters in the sample of 748 boys, 11 to 16 years of age, in Tuzla Region.

MATERIAL AND METHODS

The data collection was performed on the territory of Tuzla Region, during 1996/97 school year. The data were gathered in two elementary and four secondary schools. Cross sectional method was used in the research. Anthropometric measurements were performed according to IBP regulations that assure consistent methodology in measurements and uniformity of data obtained using the standard anthropological methods (Hadžiselimović and Lelo, 1998) as well as standardized instruments constructed according to criteria of Martin's anthropological instruments.

The following twelve anthropological parameters were tested: 1. body height; 2. body weight 3. mean chest circumference; 4. upper arm circumference; 5. upper leg

circumference; 6. sitting height; 7.arm length; 8. leg length; 9. head length; 10.head width; 11.pelvis width and 12. shoulders width.

The sample was randomly chosen and stratified according to the tested subjects' age and birth order. The sample was divided into groups according to decimal age calculated from the gathered data based on the day, month and year of birth of each tested individual as follows: boys 10,6 -11,5 years old made the 11years group ; 11,6-12,5 made 12 years group; 12,6-13,5 made 13 years group; 13,6-14,5 made 14 years group; 14,6-15,5 made 15 years group; 15,6-16,5 made 16 years group. The total sample (N = 748) consisted of 610 domiciles, the rest (138) were expatriates mainly from North-East Bosnia. They were sorted according to the age and birth order. As the total sample consisted of very small number of the forth-born, fifth-born, sixth-born.....eight-born, mean values of their anthropological indexes could not be considered (Table 1). Therefore we compared the values (t-test for independent samples) between the firstborn and the second-born mutually, and between the first & second-born and the third-born boys.

RESULTS

The Table 2 shows that the sample consists of 51,87% of the firstborns, 39,17% of the second-born and 8,95% of the third-born in all age categories. In comparison with the second-born and the third-born, firstborn boys have higher mean values for most anthropometric variables. The second-born have higher average values in comparison with the thrird-born. Statistically significant differences in the compared parameters are most frequent in the age groups of 11 and 16 years, before and after the adolescent jump.

In the group of 11 years old boys, the firstborns have significantly higher mean values in comparison with the second-born for almost all parameters. Exceptions are pelvis width and mean chest circumference whose values are also higher, but not significantly.

Twelve years old firstborn boys have significantly higher mean values for body mass, upper arm circumference, mean chest circumference and upper leg circumference than the second-born. For the other parameters they have insignificantly higher mean values.

The firstborn 13 years old boys have insignificantly higher mean values of the tested parameters than the second-born.

The firstborn 14 and 15 years old boys have significantly higher values of head length than the second-born.

The firstborn 16 years old boys have higher average values for all the parameters (except for the head width and arm length) than the second-born. Differences are often statistically significant (Table 2).

CONCLUSION

Applicable analysis of growth and development of male children and youngsters in Tuzla Region in relation to birth order enabled an insight into correlation between birth order and anthropological properties.

1. Birth order significantly affects the examined parameters in boys in pre-puberty (age of 11 and 12 years) and post-puberty (16 years); the firstborns had statistically higher mean values in relation to the second-born boys of the same age.
2. Also, in puberty (13, 14 and 15 years), the firstborns had higher average values for almost all anthropometric variables, but not statistically significant.
3. Comparison of the first- and the third-born, as well as the second- and the third-born often shows the differences in favor of the first- and the second-born.
4. General conclusion is that the birth order is negatively correlated with most of anthropometric variables, which means that:

- the firstborns have higher mean values for the tested parameters than the second-born and the third-born;
- the second-born have lower average values than the firstborns, but higher than the third-born;
- the third-born most often have lower mean values than the same age first- and the second-born.

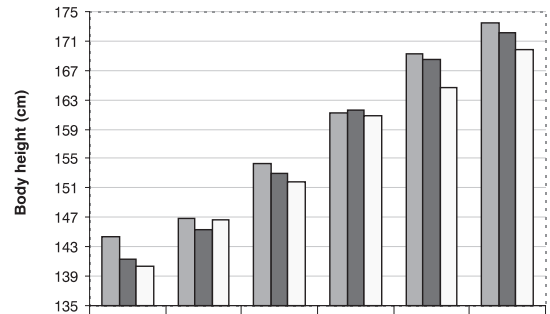
In comparison between the firstborns with the third-born, and the second-born with the third-born, we have to take into consideration that the sub-sample of the third-born is very small for this kind of research. Therefore, the results pertaining to the third-born measures should be taken with caution.

Table 1. Structure of the sample according to the age and birth order

AGE	11	12	13	14	15	16	TOTAL :
N (THE FIRSTBORN)	66	72	74	79	53	44	388
N (THE SECOND - BORN)	47	52	57	48	46	43	293
N (THE THIRD - BORN)	12	11	11	5	10	18	67
TOTAL :	**125**	**135**	**142**	**132**	**106**	**105**	**748**

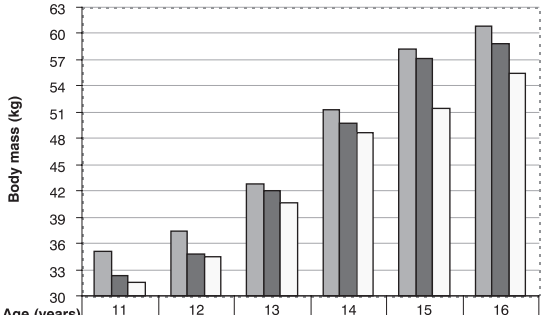
Table 2. Birth order and anthropometrics parameters

	BIRTH ORDER								
	1 ST	2 ND	3 RD	1 ST	2 ND	3 RD	1 ST	2 ND	3 RD
	X	X	X	X	X	X	X	X	X
AGE	Body height (cm)			Body mass (kg)			Mean chest circumference (cm)		
11	144,36*	141,31*	140,4	35,12*	32,33*	31,5	69,54	67,79	67,33
12	146,9	145,41	146,6	37,36*	34,75*	34,42	70,55*	68,69*	70,61
13	154,35	153,05	151,8	42,75	42,05	40,62	74,13	73,62	73,52
14	161,14	161,56	160,8	51,23	49,67	48,67	79,59	78,23	77,63
15	169,33	168,53	164,6	58,21	57,09	51,5	84,07*	82,61	79,69*
16	173,48*	172,17	169,81*	60,8*	58,77	55,38*	85,98*	85,5	83,19*
	Upper leg circumference (cm)			Upper arm circumference (cm)			Sitting height (cm)		
11	43,66*	41,45*	41,08	19,81*	18,83*	18,54	74,74*	73,03*	73,17
12	43,38*	41,43*	43,5	19,97*	19,15*	20,03*	75,33	74,14	75,22
13	45,53	45,68	44,5	21,13	20,51	20,08	78,1	78,39	76,95
14	49,25	48,56	48,15	22,5	22,29	21,92	81,56	81,35	81,04
15	51,22	50,92	48,4	23,84	23,43	22,49	85,99	84,29	83,93
16	51,93*	50,95	49,44*	24,38*	24,28	23,06*	88,07*	87,12	86,78*
	Arm length (cm)			Leg length (cm)			Pelvis width (cm)		
11	63,66*	62,14*	61,04	84,99*	82,88*	81,52	21,85	21,27	20,87
12	64,05	64,01	63,5	86,68	86,51	84,37	22,08	21,88	22,45
13	69,39	68,86	68,16	92,57	91,73	91,77	23,64	23,27	23,42
14	71,2	70,8	70,44	97	96,63	96,14	24,97	24,54	24,56
15	74,78	74,27	72,1	100,5	100,09	97,63	26,04	25,84	25,81
16	75,76	75,73	75,09	102,9	102,2	100,57	27,06	26,87	27,48
	Shoulders width (cm)			Length of head (cm)			Width of head (cm)		
11	32*	31,31*	30,98	17,88	17,86	17,72	15,03	14,84	14,9
12	32,52	32,05	32,19	18,12	18,07	18,11	15,14	14,97	15,01
13	33,75	33,62	33,81	18,33	18,11	18,41	15,1	15,19	15,2
14	35,52	35,14	34,92	18,3*	18,42*	18,56	15,19	15,2	15,21
15	37,96	37,5	36,94	18,54	18,61	18,13	15,37	15,18	15,31
16	39*	38,35*	37,62*	18,81*	18,43*	18,74	15,63	15,72	15,46



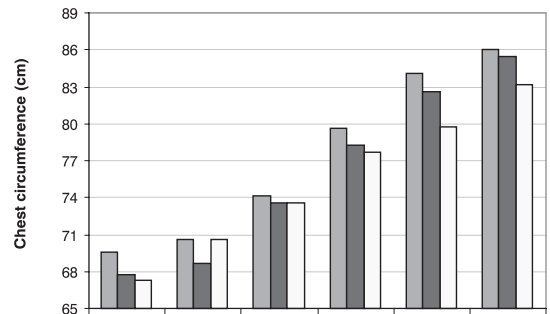
Age (years)	11	12	13	14	15	16
1 st	144,36	146,9	154,35	161,14	169,33	173,48
2 nd	141,31	145,41	153,05	161,56	168,53	172,17
3 rd	140,4	146,63	151,78	160,79	164,59	169,81

Fig.1. Birth order and body height



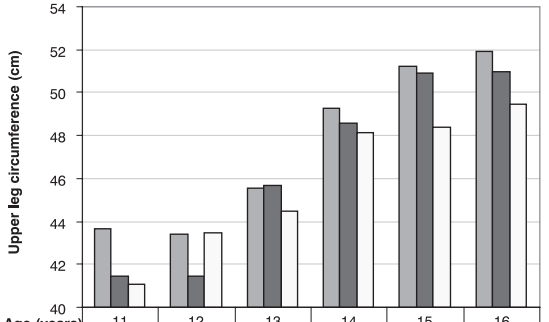
Age (years)	11	12	13	14	15	16
1 st	35,12	37,36	42,75	51,23	58,21	60,8
2 nd	32,33	34,75	42,05	49,67	57,09	58,77
3 rd	31,5	34,42	40,62	48,67	51,5	55,38

Fig.2. Birth order and body mass



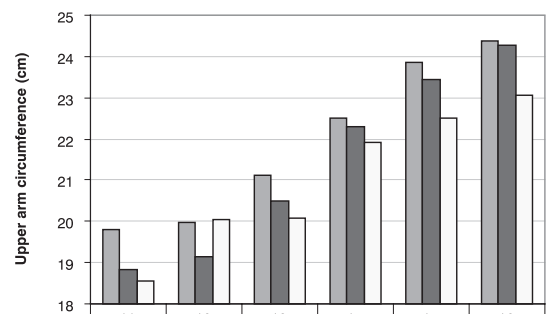
Age (years)	11	12	13	14	15	16
1 st	69,54	70,55	74,13	79,59	84,07	85,98
2 nd	67,79	68,69	73,62	78,23	82,61	85,5
3 rd	67,33	70,61	73,52	77,63	79,69	83,19

Fig.3. Birth order and chest circumference



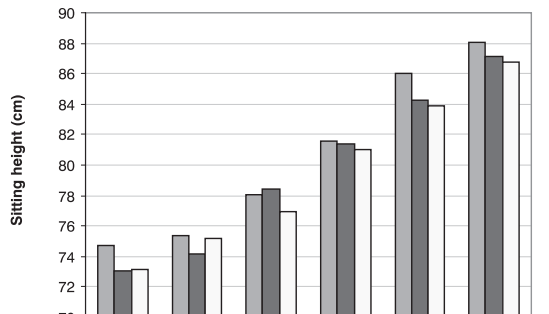
Age (years)	11	12	13	14	15	16
1 st	43,66	43,38	45,53	49,25	51,22	51,93
2 nd	41,45	41,43	45,68	48,56	50,92	50,95
3 rd	41,08	43,5	44,5	48,15	48,4	49,44

Fig.4. Birth order and upper leg circumference



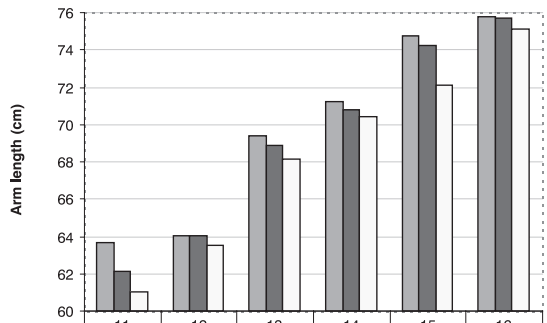
Age (years)	11	12	13	14	15	16
1 st	19,81	19,97	21,13	22,5	23,84	24,38
2 nd	18,83	19,15	20,51	22,29	23,43	24,28
3 rd	18,54	20,03	20,08	21,92	22,49	23,06

Fig. 5. Birth order and upper arm circumference



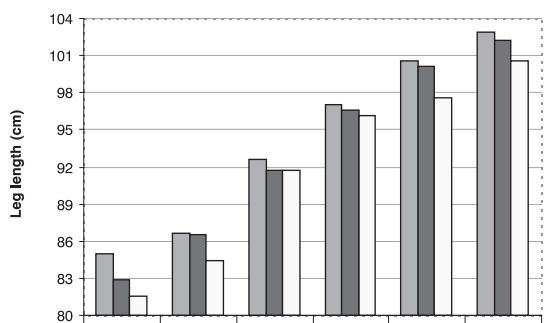
Age (years)	11	12	13	14	15	16
1 st	74,74	75,33	78,1	81,56	85,99	88,07
2 nd	73,03	74,14	78,39	81,35	84,29	87,12
3 rd	73,17	75,22	76,95	81,04	83,93	86,78

Fig.6. Birth order and sitting height



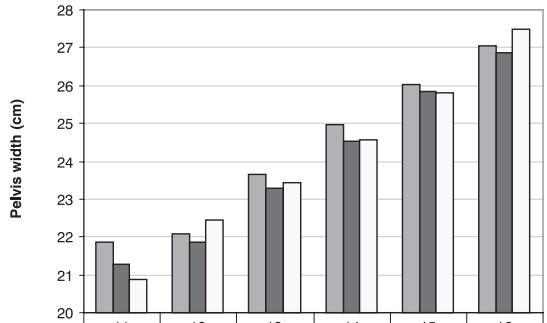
Age (years)	11	12	13	14	15	16
1 st	63,66	64,05	69,39	71,2	74,78	75,76
2 nd	62,14	64,01	68,86	70,8	74,27	75,73
3 rd	61,04	63,5	68,16	70,44	72,1	75,09

Fig.7. Birth order and arm length



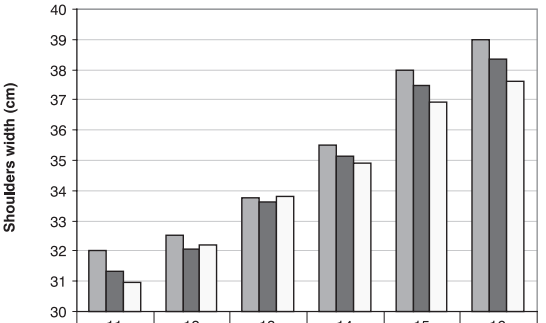
Age (years)	11	12	13	14	15	16
1 st	84,99	86,68	92,57	97	100,52	102,85
2 nd	82,88	86,51	91,73	96,63	100,09	102,2
3 rd	81,52	84,37	91,77	96,14	97,63	100,57

Fig.8. Birth order and leg length



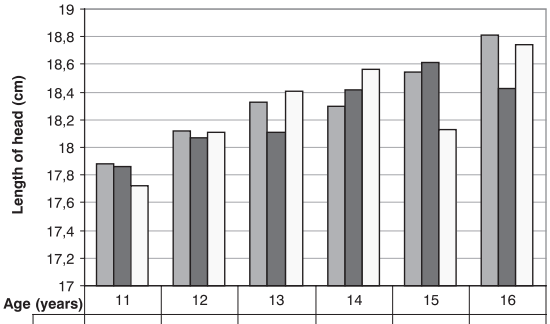
Age (years)	11	12	13	14	15	16
1 st	21,85	22,08	23,64	24,97	26,04	27,06
2 nd	21,27	21,88	23,27	24,54	25,84	26,87
3 rd	20,87	22,45	23,42	24,56	25,81	27,48

Fig. 9. Birth order and pelvis width



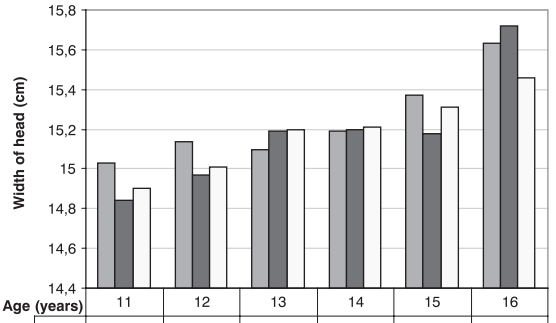
Age (years)	11	12	13	14	15	16
1 st	32	32,52	33,75	35,52	37,96	39
2 nd	31,31	32,05	33,62	35,14	37,5	38,35
3 rd	30,98	32,19	33,81	34,92	36,94	37,62

Fig.10. Birth order and shoulders width



Age (years)	11	12	13	14	15	16
1 st	17,88	18,12	18,33	18,3	18,54	18,81
2 nd	17,86	18,07	18,11	18,42	18,61	18,43
3 rd	17,72	18,11	18,41	18,56	18,13	18,74

Fig.11. Birth order and length of head



Age (years)	11	12	13	14	15	16
1 st	15,03	15,14	15,1	15,19	15,37	15,63
2 nd	14,84	14,97	15,19	15,2	15,18	15,72
3 rd	14,9	15,01	15,2	15,21	15,31	15,46

Fig.12. Birth order and width of head

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