

Secular trend in body dimensions in boys from Tuzla region in period 1980 –1996

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Abstract. Within 16 year-period secular trend in seven measurements of physical growth of male children and youth from Tuzla Region, was researched by corresponding analysis of the sample that involved 1329 researched subjects. Our data were compared with the results of research from 1980 in the sample of 1349 boys. Nine successive generations in 1980 and 1996, from Tuzla region, were involved in this research. Analysis of the data obtained is based primarily on scientific elaboration of the situation registered in 1996 in the tested part of the broader population, after an unnatural and extremely unfavorable period for physical growth of the large majority of that population. The aim of this research was to establish secular trend (negative or positive) for the seven measurements of physical growth of male children and youth comparing our results from 1996 to corresponding research results on growth and development from 1980, the sample of about same population (nearly same number of investigated persons). Although the unfavorable war living conditions negatively affected ontogenesis of the researched subjects, body dimensions of male children and youth were established as harmonious, in the limits of average European standards. However, it seems the unfavorable living conditions caused temporary slowdown in body dimensions, so, for these generations (11 to 19 years old), we could not find any increase of mean values (for certain number) of the researched parameters in comparison with the sample from 1980 year. So, 16 year-acceleration trend for most parameters was established and it is particularly evident in postpubertal period.

Key words: secular trend, boys' growth and development

Introduction

In the last century, nearly in all the world population, gradual acceleration of different increased measures of physical growth was noticed. This occurrence was marked as acceleration of growth (sec-

ular trend), and it means faster growth (shortened growth cycle) faster achievement of sexual maturity and increase in body height and weight. Children are »higher« and »heavier« in all ages than the children of the same age 100, 50, even 20 years ago. The term acceleration in broader sense means increase in body dimensions, prolonged reproductive period, longer human lifetime, faster growth of fetus, changes in psychic development, then increased dimensions of certain organs, as well as maturation of their functions (NIKOLIĆ & DOVAT 1978).

Most significant factors causing this occurrence are: improvement of general living conditions (among them nutrition is most important), children get sick more rarely, increased possibility of new combination of genes is present due to more frequent migrations (NIKOLIĆ & DOVAT 1978), occurrence of increased number of heterozygotes for the genes that prevailing to a certain extent direct growing. There is no direct evidence that it is a causal mechanism, so environmental factors might be main cause of secular changes (SUSANNE 1985, MALINA 1979).

However, secular change of growth is a reversible biological process, so, if socio-economic and growth-hygienic conditions would aggravate to the level they were on a few centuries ago, we could expect come-back of growth type that used to exist in Europe (WIERINGEN 1979). The same author concludes that secular changes may be positive and negative. He relied upon the time of investigation and upon geographic varieties among population (WIERINGEN 1986). This author researched secular changes in Holland, related to the body height, within the period 1850 -1978, and found (1979) strong connection between the secular changes and general socio-economic impacts, nutrition, health conditions, and demographic parameters. In his opinion there are no indications of certain changes (as a result of selection) in genotype of the Dutch population that could be the cause of that connection. Heterosis did not play a significant role in it, either.

For Belgian population the data for the period 1830-1980 show the average height and weight significantly increased, particularly in the course of the growing period, and to a lower extent, in the adulthood. These data are in accordance to European and North American data on secular trend for the period 1880 -1980, and they are as follows: 1,5 cm/decade in childhood, 2,5 cm/decade in adolescence, and about 1 cm/decade in adulthood. Increase in body dimensions of adults in the recent decades has varied between 0,3 & 3,0 cm/decade (HAUSPIE & AL 1997).

Secular tendency toward a higher growth and earlier maturity are predominantly connected to better nutrition and general health conditions of the population (HISAFUMI & AL 1999).

In the last two or three decades in our country 18-years old boys are every year approximately higher for about 0,2 mm, heavier to 0,3 kg (BERBEROVIĆ & HADŽISELIMOVIĆ 1982).

This increase is expected to be followed by improvement of socio-economic conditions and vice versa, and it decreases during crises and wartime periods. Some indications show that this rate has decreased since 1980, or even stopped in these countries (BIELICKI & WALISKO 1991; SANNA, FLORIS & COSSEDU 1993). These indications in industrialized countries show that environmental living conditions enabled reaching their maximal genetic potentials, or their social conditions ceased improving (WEBER & AL 1995). Secular tendency in the achieved growth and growth rate are usually more frequent in children of lower socio-economic status.

Secular trend in growth rate slowed down in some populations, but in the others it is going on, or it may decrease in future. Lots of researches in the world show that secular tendency in adults' height has been getting slow in most countries during recent 10 to 20 years (HAUSPIE & AL 1996).

The lowest increase in growth of the adults was noticed in Sweden and Norway, what indicates that adults' growth nearly reached its peak in these countries in recent decades. Western countries like Belgium, England, The Netherlands, show secular tendency between the values of 1,0 - 1,3 cm/decade. The highest increase in the adults' height (3,0 cm/decade was found (in women) in Czech Republic and (in men) in Japan (1950 - 1960; HAUSPIE & AL 1996).

Many countries worldwide have publications with referential data on children and youth's body development, and on secular trend in certain populational measures. In former Yugoslavia secular trend in growth and development was researched by KOVAČ (1973), BRODAR (1961), DOVEČAR

(1978), TOMAZO-RAVNIK (1988, 1999), ŠTEFANČIĆ ET AL. (1996), GAVRILOVIĆ (1972, 1974), PREBEG (1978, 1995, 1997), and IVANOVIĆ (1985).

The tables and centile diagrams (obtained in such researches) are used directly as tables of norms in pediatrics, school medicine, in anthropologic sport institutes (because they deal with normal physical growth of children and youth).

Basic biological factors of secular tendencies are not completely cleared up. However, most of researchers dealing with this phenomenon have been explaining it by genetic factors and factors of external environment.

These data on acceleration of individual physical growth seriously put the question: Will the period required for reaching the boys & girls' sexual maturity keep shortening childhood and will a human being be of a giantic stature in future? However, if the suppositions on heterosis (as a result of increased migrations) and improved socio-economic situation in the world population are the main factors of this acceleration, then it is difficult to believe in such prognoses. In addition to this, possibility of increasing heterozygosity in stimulation of quantitative features (potentially similar genotypes) is naturally limited, the topic that has been discussed about much recently, (HADŽISELIMOVIĆ 1988). HIERNAUX (1975) set a hypothesis that our descendants would probably be higher than we are today, but they should not be giants.

Basic demographic, economic and climate features of the researched Region

Tuzla is a powerful economic, cultural, educational and administrative center, not only in the Region itself, but on all B&H territory. This city is characterized by relatively fast socio-economic development after World War II, what resulted in a hasty increase of inhabitants number, primarily by means of mechanical increase in population (migrations). So, the census from 1971 year established the number of 107 293 inhabitants in Tuzla, out of which 37,08% were immigrants. The biggest increase in inhabitants number was registered between 1955 and 1965. This factor influenced bioanthropologic heterogeneity of the researched sample of the Tuzla's population, as well.

From the time of the researches in Tuzla community (NOVAKOVIĆ 1980) and the researches of ours, number of inhabitants increased for 47 092 more. For the time of 16 years (including the war results, as well), demographic picture of Tuzla changed considerably. In the course of the four year- war (1992-1996), the number of inhabitants in this region increased rapidly due to forced migrations, banishments, so, in 1996 it amounted 154 384; 38.566 (24,98% of expatriates, and 115 818 (75,03%) domiciles (FEDERAL BUREAU OF STATISTICS SARAJEVO 1998). Mixture of the population of different local origin with domiciles before the war, as well as expatriates presence and displaced people during and after the war in the Region of Tuzla affected (and will do it in the future) the changes of genetic structure of the population.

According to the Federal Bureau of Statistics Sarajevo (1998) there were 31 097 (20,14%) employed people. And 16 years ago the number of employed people was 34 885 (32,50%) in 1980 (NOVAKOVIĆ 1980).

According to the same source, an average salary for December 1996 was 253,10 KM or 126,55 Eura. From the data offered it can be concluded that Tuzla's populaton is mainly consisted of workers, what naturally affects socio-economic status of a family and the population in general. The war and migrations changed the national structure of the researched Region.

Speaking about climate, Tuzla has moderate-continental climate. In this Region, summers are warm, winters are cold. The mean year air temperature is relatively high, it ranges from 10,2 to 11,4 °C, with clearly distinguished seasons. Summer and spring temperatures are changeable (KULENOVIĆ 1980).

Objectives

To analyze 16 year-secular trend in growth dynamic changes by comparison the obtained results with corresponding data from 1980.

To create necessary data – base for research of temporal differences, including four-year aggression on Bosnia and Herzegovina, taking into consideration the fact that all the researched subjects lived one period of physical growth in extremely unfavorable war conditions.

Material and methods

Researches that are a source of data collected in this study, were carried out in Tuzla Region in autumn 1996/97. Anthropological measurements were carried out in four primary and two secondary schools. Cross-sectional method was used. The measurement involved 1321 male pupils, age 11 to 19 years. The sample was randomly chosen and stratified according to subjects' decimal age: pupils age 10 years and six months to the 11 years and 5 months made the group of the age 11 years; 16,6 to 12,5 made the group of the age 12 years (Table 1).

Table 1: Age structure of the researched sample

Age (years)	1980	1996	1996	Total:
	N	N	N	
	Domiciles		Refugees	
11	113	107	32	139
12	149	117	26	143
13	143	132	33	165
14	188	146	38	184
15	140	115	41	156
16	187	75	58	133
17	138	89	57	146
18	192	86	69	155
19	69	54	46	100
Total:	1349	921	400	1321

Seven anthropometric parameters were used in this research: 1. stature 2. body weight 3. mean chest circumference 4. upper arm circumference; 5. total arm length; 6. biacromial breadth and 7. biiliocrystal breadth.

All measurements were carried out according to IBP (International Biologic Program), (HADŽISELIMOVIĆ & LELO 1998).

Descriptive statistics and t-tests were done in the Program Statistics for Windows, Copyright Stat Soft, Inc.1993. Statistical analysis primarily involved evaluation of the central tendency measurements. Statistical significance of differences between the results of our research and the researches from 1980 was evaluated, as well (t-test).

Results and discussion

Stature (body height) is one of the most stable parameters of physical growth, that reflects complex processes in organism. Comparison of the results from 1996 (series II) with those from 1980 (series I) reveals significantly lower mean values of body height in series II than in series I (age 11 to 15 years). This difference in mean values is statistically significant, that is shown in t-test results (Table 2).

Table 2: Stature of the boys of Tuzla Region (1980 & 1996)

Age	N ₁ 1980.	N ₂ 1996.	X ₁ (cm)	X ₂ (cm)	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
							1	2	
11	113	139	145,36	142,77	5,98	6,54	-	-	3,28* *
12	149	143	150,07	146,30	7,06	6,55	3,24	2,47	4,74* **
13	143	165	156,02	153,47	8,36	8,40	3,96	4,90	2,66*
14	188	184	163,05	161,13	9,20	8,29	4,50	4,99	2,12*
15	170	156	169,98	168,18	8,03	8,56	4,25	4,37	1,95
16	187	133	170,90	172,44	7,61	6,56	0,54	2,53	1,94
17	138	146	174,07	175,14	6,55	6,99	1,85	1,56	1,33
18	192	155	176,76	177,92	7,16	7,21	1,54	1,59	1,50
19	69	100	176,17	178,87	6,78	6,79	0,99	0,53	2,54*

Boys from series II over 15 year age have higher mean body height than in series I, due to 16 year – accelerating trend. So, for example, 18 years old boy from series II is approximately higher for 1,16 cm than the same boy from series I, so, acceleration trend for that generation is 0,73 cm/decade. Secular trend for the generations from 11 to 15 years, is negative (Fig.1) (due to already mentioned reasons), but for the postadolescent growth (age 16, 17, 18 and 19 years) is evident and amounts 1,01 cm/decade.

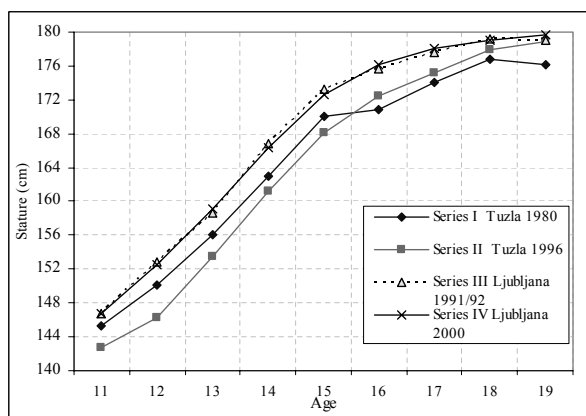


Fig.1. Comparative diagram of stature of Tuzla's male children and youth: 1980 and 1996, and the youth from Ljubljana 1991/92 and 2000

These data correspond to decade diapason of secular trend for Europe and North America, that show secular trend in growth between 1880 and 1980 was 1,5 cm/decade in childhood, 2,5 cm/decade in adolescence, and about 1,0 cm/decade in adulthood (MALINA 1990).

This temporary slowdown in body height increase in boys from series II in prepuberty and puberty is probably due to higher child's sensitivity to negative impact of external factors. Namely, all the external factors that more or less affect physical growth and development, were led to the values that strongly affected children and youth in the mentioned period due to four year-agression.

Results on body height in Ljubljana's boys (Slovenia) from 1991/92, series III (ŠTEFANČIĆ & AL 1996), and from 2000 year – series IV (STREL & AL 2001) show secular trend in that area to stagnate (Fig.1). Figure 1 shows boys from series III and IV approximately »higher« than boys from series II. Those differences in average body height are supposed to be result of genetic potential difference.

Those differences might have been a bit smaller if the boys from series II had not stagnated in growth due to already mentioned reasons.

Examples of negative and stagnating secular trend were found in many countries in a lot of studies including those from wartime and economic crises (TANNER 1968, WALKER & AL 1988, KUH AND WADSWORTH 1989).

Body weight. In addition to body height, body weight is most important parameter in bioanthropology for research and monitoring physical growth and development. Unlike height, weight is labile factor, changable by impact of various endo- and exogenous factors. Body weight increase coincides with body height increase, so most intensive increase in body weight in series II was registered in age of 14 years (Fig. 2). Negative or stagnating secular trend was registered in series II in age of 11, 12, 13, 17, and 18 years in comparison to series I.

Comparison of results from series II and series I shows boys from series II, aged 11 to 13 years have significantly lower average body weight, than in series I (Table 3, Fig. 2).

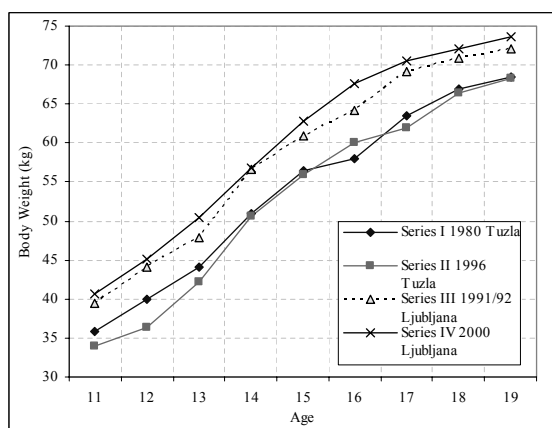


Fig.2. Comparative diagram of body weight of Tuzla's male children and youth: 1980 and 1996, and the youth from Ljubljana 1991/92 and 2000

Temporary stagnation in body weight increase in series II could be explained before all, by incorrect diet (hunger, lack of vitamins and proteins), bad socio-healthy and hygienic conditions our domicile and banished population experinced in the course of the last agression on Bosnia and Herzegovina. Comparison of the results from series II on average body weight and series III and IV (considering time distance between publishd reseraches in Ljubljana and Tuzla) shows differences that are an outcome of already mentioned differences in average body height (Table 3, Fig. 2).

Table 3. Body weight of the boys of Tuzla Region (1980 & 1996)

Age	N ₁ 1980.	N ₂ 1996.	X ₁	X ₂	SD ₁	SD ₂	Relative Increase (%)		t-test p<0.05
							1	2	
11	113	139	35,92	33,92	6,09	6,07	-	-	2,60*
12	149	143	40,02	36,44	8,38	6,57	11,41	7,43	4,07***
13	143	165	44,13	42,28	9,80	10,76	10,26	16,02	1,58
14	188	184	50,98	50,53	0,09	12,30	15,52	19,53	0,5
15	170	156	56,40	55,87	9,46	11,77	10,63	10,56	0,45
16	187	133	58,05	59,98	9,86	9,08	2,92	7,35	1,81
17	138	146	63,50	61,96	8,21	8,79	9,38	3,31	1,53
18	192	155	67,00	66,34	8,72	8,78	5,51	7,06	0,70
19	69	100	68,42	68,35	7,54	9,52	2,11	3,03	0,05



Mean chest circumference. Mean chest circumference represents a few parameters of body dimensions characteristic for growth. Chest circumference is sufficient if it amounts a half of body height, and insufficient if it is under a half of that measure. Comparison of the results from series II with series I, shows acceleration increase of this parameter (1,78 cm/dec) particularly apparent in post-14 years of life (Table 4). Boys from series II have in all age categories higher average values for mean chest circumference than their age boys 16 years ago (series I). At age 15 to 19 years, the established differences between average values are statistically significant (Table 4). Boys from series II have lower value of chest circumference than in series III in all periods of growth (Fig. 3).

Table 4. Mean chest circumference of the boys of Tuzla Region (1980 & 1996)

Age	N ₁	N ₂	X _{1(cm)}	X _{2(cm)}	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
	1980.	1996.					1	2	
11	113	139	67,37	68,66	4,15	4,81	-	-	2,29*
12	149	143	69,64	70,11	5,12	5,05	3,37	2,10	0,80
13	143	165	72,45	73,80	6,19	6,72	4,04	5,27	1,83
14	188	184	78,74	79,14	4,53	8,22	8,68	7,24	0,58
15	170	156	79,70	82,48	5,42	7,98	1,22	4,21	3,65**
16	187	133	79,76	85,79	4,72	5,65	0,08	4,02	10,07***
17	138	146	84,11	86,97	4,57	5,77	5,45	1,37	4,64***
18	192	155	86,03	89,74	4,58	5,29	2,28	3,19	6,90***
19	69	100	87,49	91,05	4,02	5,48	1,70	1,46	4,86***

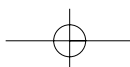
Upper arm circumference. Increase in upper arm circumference in series II is highest in adolescent shock (age 14 years), but it is most intensive between age 17 and 18 years, as well, (Table 5). The first maximum in relation to intensive general growth and development in puberty, the second one is likely in relation to muscle growth, when maximal sport and physical efforts start. Secular trend in boys from series II is found in puberty, while it stagnates in prepuberty and postpuberty (Fig. 4).

Table 5. Upper arm circumference of the boys of Tuzla Region (1980 & 1996)

Age	N ₁	N ₂	X _{1(cm)}	X _{2(cm)}	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
	1980.	1996.					1	2	
11	113	139	19,23	19,41	1,96	1,99	-	-	0,72
12	149	143	20,07	19,80	2,42	2,02	2,02	4,36	1,04
13	143	165	20,48	20,76	2,36	2,85	4,84	2,04	0,94
14	188	184	21,81	22,39	2,39	2,98	7,86	6,49	2,08*
15	170	156	22,80	23,26	2,21	2,70	3,87	4,53	1,67
16	187	133	23,30	24,27	2,31	2,25	4,32	2,19	3,77**
17	138	146	24,74	24,37	2,11	2,15	0,41	6,18	1,46
18	192	155	25,29	25,39	2,04	2,13	4,18	2,22	0,44
19	69	100	25,92	25,78	2,01	2,24	1,56	2,49	0,43

Total arm length. Results of analysis on the arm length are shown in Tab 6 and Figure 5. Mean values for the arm length are significantly lower (Tab. 6) in series II in relation to series of all ages, except in 18 years old boys. Negative secular trend is happening here until 19 years age, when mean value in series II came close to values in series I.

Biacromial breadth. Is a good indicator for growth of trunk, skeleton and musculature. Fig.6 shows that shoulder growth in width is happening in the course of puberty. Most intensive growth is in 15 year age, then it slowdowns until 19 year age. The boys from series II of all ages have significantly higher values (Tab. 7) in relation to series I. Tuzla's boys (series II) have around same shoulder width as well as their age boys from Ljubljana (series III) in all ages from 11 to 15 years, and after that period Tuzla's boys have higher values of shoulder width than their age boys from Ljubljana (Fig. 6). Acceleration increase for this parameter is overt in all age categories and it is 1,74 cm/decade.



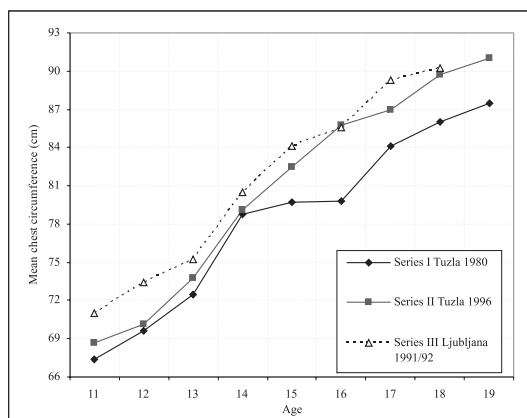


Fig.3. Comparative diagram of mean chest circumference of Tuzla's male children and youth: 1980 and 1996, and the youth from Ljubljana 1991/92

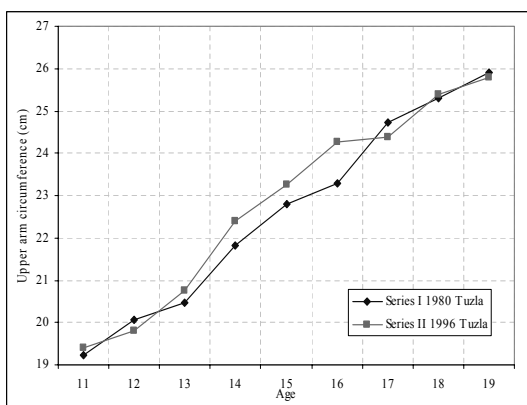


Fig.4. Comparative diagram of upper arm circumference of Tuzla's male children and youth: 1980 and 1996

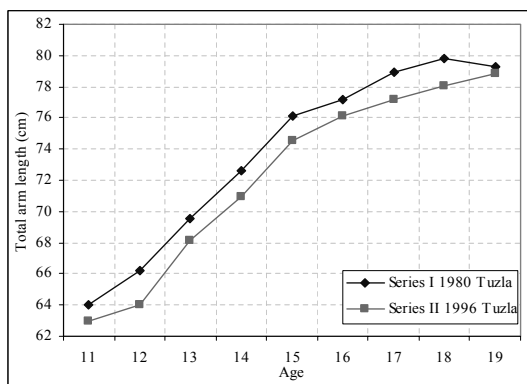


Fig.5. Comparative diagram of total arm length of Tuzla's male children and youth: 1980 and 1996

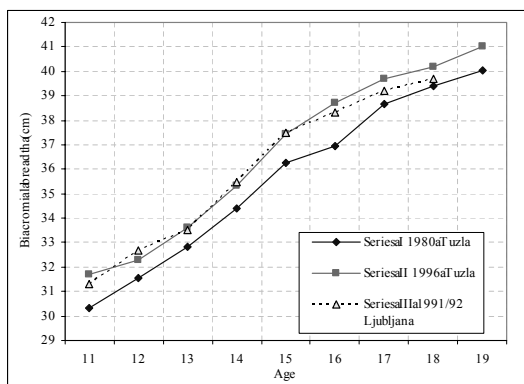


Fig.6. Comparative diagram of biacromial breadth of Tuzla's male children and youth: 1980 and 1996, with the youth from Ljubljana 1991/92

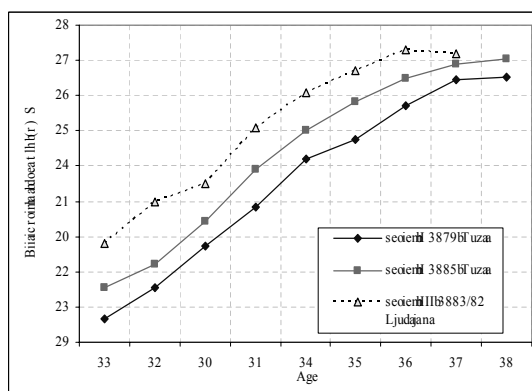


Fig.7. Comparative diagram of biiliocrystal breadth of Tuzla's male children and youth: 1980 and 1996, with the youth from Ljubljana 1991/92

Table 6. Total arm length of the boys of Tuzla Region (1980 & 1996)

Age	N ₁ 1980.	N ₂ 1996.	X _{1(cm)}	X _{2(cm)}	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
							1	2	
11	113	139	64,04	62,93	3,06	3,52	-	-	2,68*
12	149	143	66,25	64,02	3,64	3,29	3,45	1,73	5,49***
13	143	165	69,52	68,13	4,31	4,15	4,93	6,42	2,87*
14	188	184	72,65	70,98	4,88	4,14	4,50	4,19	3,56**
15	170	156	76,15	74,51	4,32	4,23	4,81	4,97	3,46**
16	187	133	77,14	76,08	3,95	3,63	1,30	2,11	2,48*
17	138	146	78,92	77,21	3,65	3,60	2,30	1,48	3,98**
18	192	155	79,79	78,08	3,59	4,17	1,10	1,13	4,04***
19	69	100	79,25	78,81	3,66	3,74	0,70	0,93	0,76



Table 7. Biacromial breadth of the boys of Tuzla Region (1980 & 1996)

Age	N ₁ 1980.	N ₂ 1996.	X _{1(cm)}	X _{2(cm)}	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
							1	2	
11	113	139	30,31	31,70	1,72	1,78	-	-	9,17***
12	149	143	31,57	32,30	1,68	1,82	4,15	1,60	3,56**
13	143	165	32,82	33,60	2,43	2,29	3,95	4,02	2,89*
14	188	184	34,39	35,32	2,40	2,66	4,78	4,11	3,54**
15	170	156	36,24	37,42	2,54	2,98	5,37	5,95	3,83**
16	187	133	36,97	38,69	2,40	2,28	2,01	3,38	6,52***
17	138	146	38,68	39,67	2,15	2,42	4,49	2,52	3,67**
18	192	155	39,41	40,19	2,19	2,21	2,01	1,31	3,29**
19	69	100	40,05	41,03	1,97	2,19	1,62	2,11	3,04**

Biiliocrystal breadth. Yearly relative increase in average width of pelvis is highest between 13 and 14 years age (series II; Tab. 8). Pelvis growth completes in 18 years age. Fig.7 shows presence of growth acceleration for this parameter (after 16 years age) in all ages (1,86 cm/decade). Mean values for the pelvis width are significantly higher in series II in relation to series I (confirmed by t-test; Tab. 8). Boys from series II have significantly narrower pelvis than boys from series III in all ages, except for 18 years age, when those values are about equal in both series.

Table 8. Biiliocrystal breadth of the boys of Tuzla Region (1980 & 1996)

Age	N ₁ 1980.	N ₂ 1996.	X _{1(cm)}	X _{2(cm)}	SD ₁	SD ₂	Relative Increase (%)		t-test p<0,05
							1	2	
11	113	139	20,65	21,56	1,54	1,91	-	-	4,19***
12	149	143	21,55	22,20	1,63	1,97	4,35	2,96	3,07**
13	143	165	22,74	23,44	1,87	1,74	5,52	5,59	3,42**
14	188	184	23,82	24,90	2,09	2,03	4,74	6,22	5,09***
15	170	156	25,19	26,01	2,01	2,01	5,75	4,45	3,66**
16	187	133	25,76	26,82	1,79	1,74	2,26	3,14	5,30***
17	138	146	26,71	27,48	1,71	1,65	3,68	2,44	3,85**
18	192	155	27,45	27,90	1,74	1,61	2,77	1,52	2,47*
19	69	100	27,53	28,04	1,56	1,64	0,29	0,52	2,05*

Bad living conditions due to the last war did not effect much the width parameters, as they effected body height and circumferences.

Conclusions

Comparison of our results (series II) and corresponding results (from 16 years ago – series I) shows that boys from series II in prepuberty and puberty for some parameters have same or even lower mean values in relation to the boys from series I (negative acceleration trend). This a direct result of negative effect of exogenous factors that caused temporary growth stagnation in all age groups. In postpuberty that stagnation is relatively fast compensated, so a mild secular trend is present for all parameters observed for that growth and developmental period.

All the boys from series II spent one or two intensive periods of heght growth in prewar, wartime and postwar period, so malnutrition, comprehensive indigence and other war misfortunes significantly slowdowned growth and development in both periods. That’s why the most intensive growth was prolonged for one year more, as well, in relation to the expected one.



Ten year-secular trend for body height for the boys from series III and IV (Ljubljana) was slow-downed, while 16 year trend for this parameter (series I and II) is evident in postpuberty.

Comparison of our results and those of ŠTEFANČIĆ & AL (1996) and of STREL & AL (2001) revealed larger mean values for almost all tested parameters in Ljubljana's male youth of all tested generations. However, those differences slowly decrease in postadolescent period. We assume those differences occurred due to different ecologic factors, living standard, as well as specific genetic features characteristic for all populations.

We suppose the population of the researched area has not come close to full expression of genetic material for the investigated features.

Sažetak

Šesnaestogodišnji trend sedam pokazatelja fizičkog rasta i razvoja muške djece i omladine proučavan je odgovarajućom analizom uzorka, koji je 1996. godine obuhvatio 1329 ispitanika. Naši podaci komparirani su odgovarajućim rezultatima istraživanja iz 1980. godine u uzorku od 1349 dječaka. U ovu studiju uključeno je 9 sukcesivnih generacija iz 1980. i 1996. godine sa područja Tuzle. Provedena analiza prikupljenih podataka primarno počiva na naučnoj elaboraciji registriranog stanja iz 1996. godine u proučavanom dijelu šire populacije, nakon jednog neprirodnog i ekstremno nepovoljnog perioda u procesu rasta i razvoja ogromne većine njihovih pripadnika. Cilj ovog rada je bio utvrditi sekularni trend (negativan ili pozitivan) za 7 antropometrijskih pokazatelja rasta i razvoja muške djece i omladine, komparirajući naše rezultate iz 1996. godine sa odgovarajućim podacima rasta i razvoja na uzorku približno iste veličine (iste populacije) iz 1980. godine. Unatoč tome što su nepovoljni (ratni) životni uvjeti negativno djelovali na ontogenezu ispitanika, utvrđeno je da se rast i razvoj muške djece i omladine na proučavanom području odvija skladno te da se nalazi u granicama prosječnih evropskih standarda. Ipak, nepovoljni životni uvjeti izazvali su privremeni zastoj u rastu i razvoju, pa se u pogođenim uzrasnim kategorijama (od 11 do 15 godina života) nije moglo uočiti povećanje srednjih vrijednosti (za jedan broj) izučavanih parametara u poređenju sa uzorkom iz 1980. godine. Šesnaestogodišnji akceleracijski trend za većinu parametara je utvrđen i naročito uočljiv u postpubertetu.

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