

# Data on the biological development of Kaposvár (South-West Hungary) children (preliminary study)

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## ABSTRACT

Suskovics C, Ilics KB, Nagyvárad K, Németh-Tóth O, Kocsis C, Horváth R, Kertész A, Krizonits I, Reidl R, Tóth Z, Tóth G. Data on the biological development of Kaposvár (South-West Hungary) children (preliminary study). *J. Hum. Sport Exerc.* Vol. 8, No. Proc2, pp. S36-S46, 2013. It was planned to involve 35% (3000 children) of the 6-15-year-old Kaposvár (South-West Hungary) children in the investigation. In the case of the present survey there is data of 459 10-14 year-old children (201 boys and 258 girls). The aim of this study was to analyse directions and velocities of secular growth changes from 1928 to 2012 in 10-14 year-olds. In 2012 the anthropometric programme involved 28 body measurements according to the Martin technique, with regard to the recommendations of the International Biological Programme, but this paper focused on the changes in height and weight. Positive secular changes have been observed in Kaposvár in the last more than eighty years, which can be explained by changes of economical, social factors of environment. **Key words:** GROWTH STUDY, SECULAR CHANGES, BODY HEIGHT, BODY WEIGHT.

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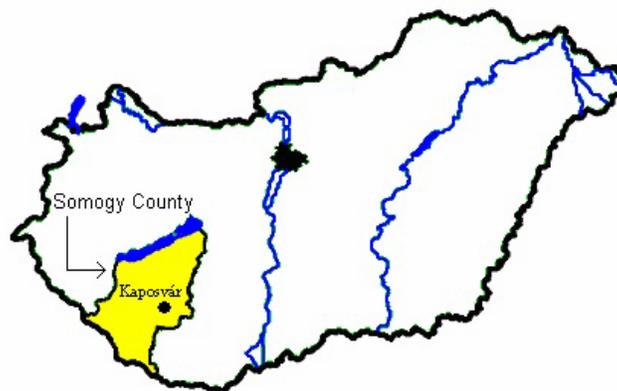
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## INTRODUCTION

Development of children, like growth and maturation, is a sensitive index of health and nutritional status. It is very important because hence an index mirroring the welfare of a population as well (Claessens et al, 2008; Eiben, 1998; Tóth & Eiben, 2004). In Hungary we are lucky because there are lots of investigations for children's development from the end of 18<sup>th</sup> century up to the present. The secular growth changes, the sub-phenomena, direction, emergence of the secular trend can be concluded from these studies. According to Eiben's (1988) definition - he was a well known anthropologist in the world – the secular trend is a world-wide famous phenomenon, which manifests itself in long-term systematic changes of wide variation of anthropometric traits on consecutive generations living in a given geographical region. In Hungary, there are some significance growth studies that provide repeated data on the development of children living in different regions of the country over a longer period to allow a quantitative estimation of secular change in this respect. One of these important studies refers to Kaposvár (see below), and the other survey is the Körmend Growth Study (Eiben, 1988, 2002; Eiben & Tóth, 2000; Suskovics & Tóth, 2009; Tóth et al., 2011, 2012a, b, c). Besides these studies there are some examinations repeated in the same locality several times as well, but they show a shorter period of secular changes (Érd, Székesfehérvár, Makó, Jászság). Kaposvár can have a great importance in the research of secular trend characteristics as there have been growth studies since the 1920s. This town is situated 40 km towards south from Lake Balaton, in the south-western region of Hungary and it is the seat of Somogy County (Figure 1).



**Figure 1.** Map of Hungary, geographic situation of Somogy County and Kaposvár.

The first observations are connected to the year 1928 (Véli, 1936), so you can follow the secular trend changes of more than eighty years. After the World War II, in 1947-48 he analysed the effects of the war on the biological development of children (Véli, 1948). In 1962, he studied girls' body measurements and the age at menarche (Véli, 1968). He wrote several papers on the growth and maturation and analysed the secular changes of Kaposvár children (Véli, 1967, 1968). He proposed that, instead of acceleration, it would be better to speak about the elimination of the earlier retardation. Bodzsár and Véli (1980) recorded the body sizes of children in 1975, after that, Környei et al. (1980, 1983) examined the body sizes of children in 1978 and 1981. At the end of the 20<sup>th</sup> century, in 1997 the development of girls and boys was investigated again (Suskovics, 1997, 2000, 2003a, b, 2004; Suskovics & Eiben, 2002; Zsoffay et al., 2009).

The last study took place in 2012. This latter study is not completed yet, so we have only preliminary data from the region. The aim is the examination of secular changes in biological development of children between 10 and 14 years with the help of the former growth studies in Kaposvár. According to our hypothesis, the positive secular trend is still present in this region, so the body measurements show greater values than before.

## MATERIAL AND METHODS

The investigation was conducted in Kaposvár (South-West part of Hungary) in 2012. It was planned to involve 35% of the 6-15-year-old children (3000 persons) in the examination. In the case of the present survey there is data of 459 10-14 year-old children (201 boys and 258 girls) from this. The applied research methods consist of five parts, but only the anthropometric part was used for this study. The methods and the techniques of the anthropometric investigations were in accordance with internationally accepted standards described by Martin and Saller (1957). The recommendations of the International Biological Programme, Human Adaptability section, were also taken into consideration (Weiner & Lourie, 1969). 28 body measurements were examined. In the former period, mainly height and weight data were published from Kaposvár, so these two informative body sizes were used also by us. Véli (1936) followed the children's body development just up to age of 12 in 1928-31. In 1962, he gathered information only about girls, so there are not any records of boys from this period (Véli, 1968). The data processing happened with descriptive statistics. The means were plotted on the diagrams of percentile curves of 2<sup>nd</sup> Hungarian National Growth Study (HNGS-2), which was organized by Bodzsár between 2003 and 2006 (Bodzsár & Zsákai, 2007, 2012). The percentile curves were used for the demonstration of the secular trend, as well. A regression curve, a trend line was put onto the point lines which were going to be analysed for studying the tendency. With this method the speed of the rhythm of the change was indicated besides the direction of the change. Statistical analyses were made by the Excel programme and the SPSS programme-pocket.

## RESULTS

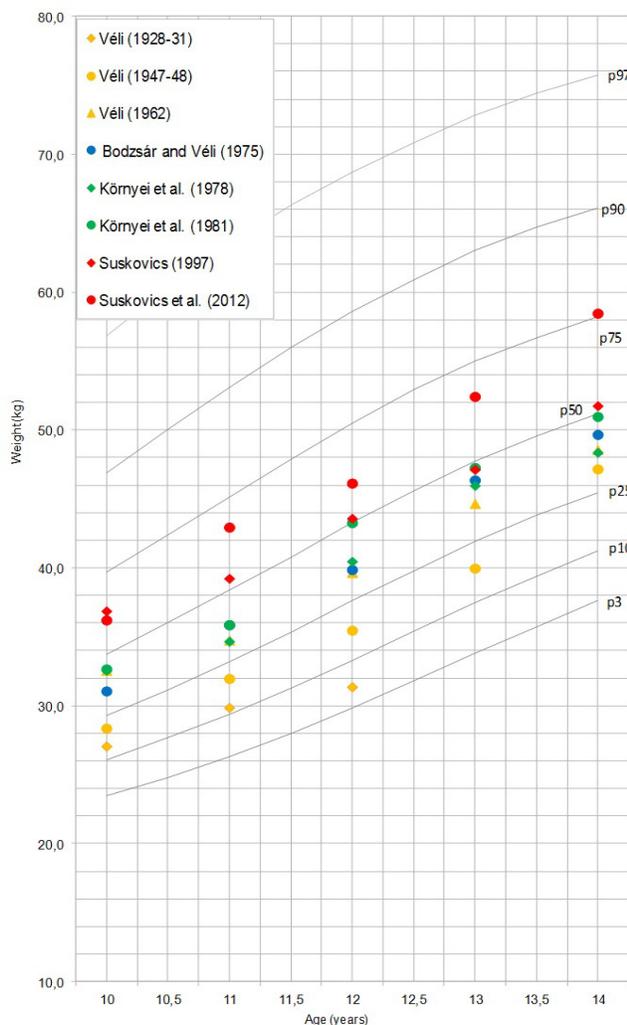
In the past more than eighty years, changes of the girls' body mass and height values show a positive secular trend (Table 1).

**Table 1.** Changes in body weight and height of the Kaposvár girls.

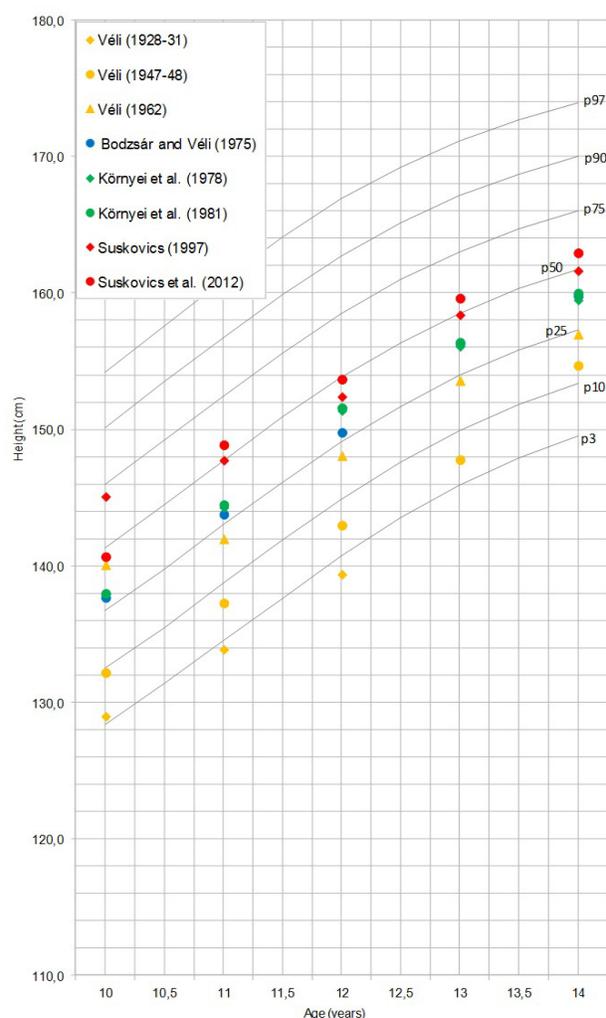
	Age (year)				
	10	11	12	13	14
	<b>Weight (kg)</b>				
Véli (1928-31)	27.10	29.90	31.40		
Véli (1947-48)	28.40	32.00	35.50	40.00	47.20
Véli (1962)	32.60	34.80	39.70	44.70	48.60
Bodzsár and Véli (1975)	31.10	35.90	39.90	46.40	49.70
Környei et al. (1978)	32.60	34.70	40.50	46.00	48.40
Környei et al. (1981)	32.70	35.90	43.30	47.30	51.00
Suskovics (1997)	36.90	39.27	43.62	47.16	51.78
Suskovics et al. (2012)	36.24	42.98	46.17	52.46	58.49

	Height (cm)				
Véli (1928-31)	129.00	133.90	139.40		
Véli (1947-48)	132.20	137.30	143.00	147.80	154.70
Véli (1962)	140.10	142.00	148.10	153.60	157.00
Bodzsár and Véli (1975)	137.70	143.80	149.80	156.30	159.80
Környei et al. (1978)	138.00	144.30	151.40	156.10	159.50
Környei et al. (1981)	138.00	144.50	151.60	156.40	160.00
Suskovics (1997)	145.10	147.75	152.42	158.41	161.64
Suskovics et al. (2012)	140.70	148.89	153.70	159.63	162.95

According to Véli's (1936) research in 1928-31, the body mass means move from the 10<sup>th</sup> percentile to the 3<sup>rd</sup> percentile on the diagram of the HNGS-2 (Figure 2). Their height curve is a little bit above the 3<sup>rd</sup> percentile in the case of 10-year-olds, and they are below in 11-12 year-olds (Figure 3).



**Figure 2.** Means of weight in Kaposvár girls, plotted on the 2nd HNGS percentile curves (Bodzsár et al., 2007).



**Figure 3.** Means of height in Kaposvár girls, plotted on the 2nd HNGS percentile curves (Bodzsár et al. 2007)

The data from 1947-48 show an increase: the body mass values are between the 10<sup>th</sup> and the 25<sup>th</sup> percentile, while the height values are between the 3<sup>rd</sup> and the 10 percentile (Véli, 1948). The girls' body mass curve is between the 25<sup>th</sup> and the 50<sup>th</sup> percentile in 1962 (Véli, 1968). Their height curve is around the 25<sup>th</sup> percentile. The results of the research conducted in 1975, 1978 and 1981 are similar to each other (Bodzsár and Véli, 1980, Környei et al, 1980, 1983). The curves are between the 25<sup>th</sup> and the 50<sup>th</sup> percentile in both measurements. At the end of the 1990s the mean of body mass and height is mainly on the 50<sup>th</sup> percentile. The values from 2012 are between the 50<sup>th</sup> and the 75<sup>th</sup> percentile in the case of body mass and they are around the 50<sup>th</sup> percentile in the case of height.

The velocity of changes was estimated by linear regression. The hypothesis analysis aiming at the existence of linear regression was significant in all age groups (Figure 4 and 5).

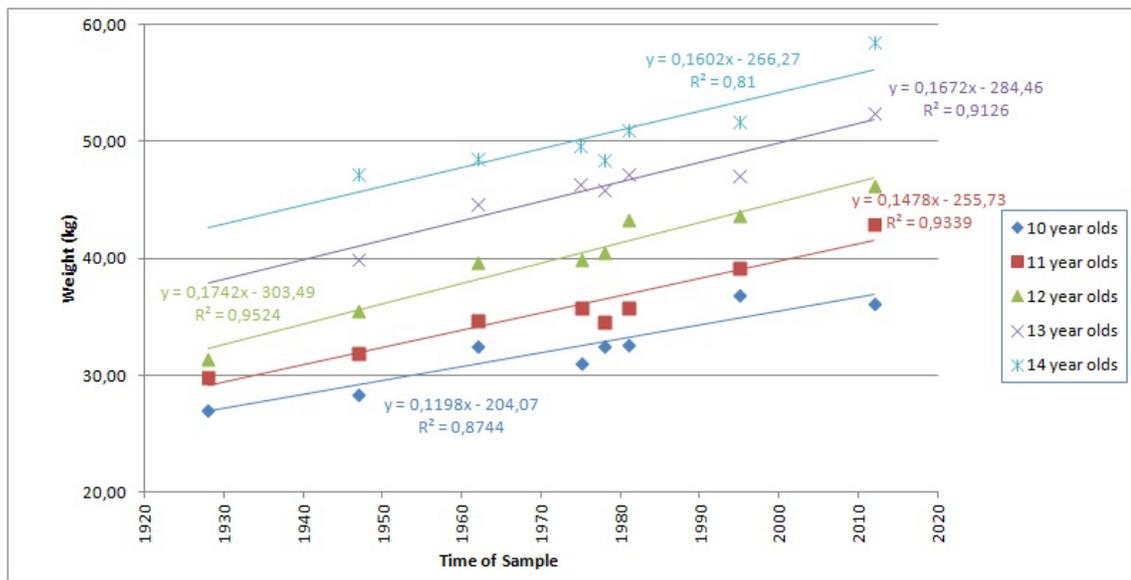


Figure 4. Linear regression equations and trend lines for weight in Kaposvár girls.

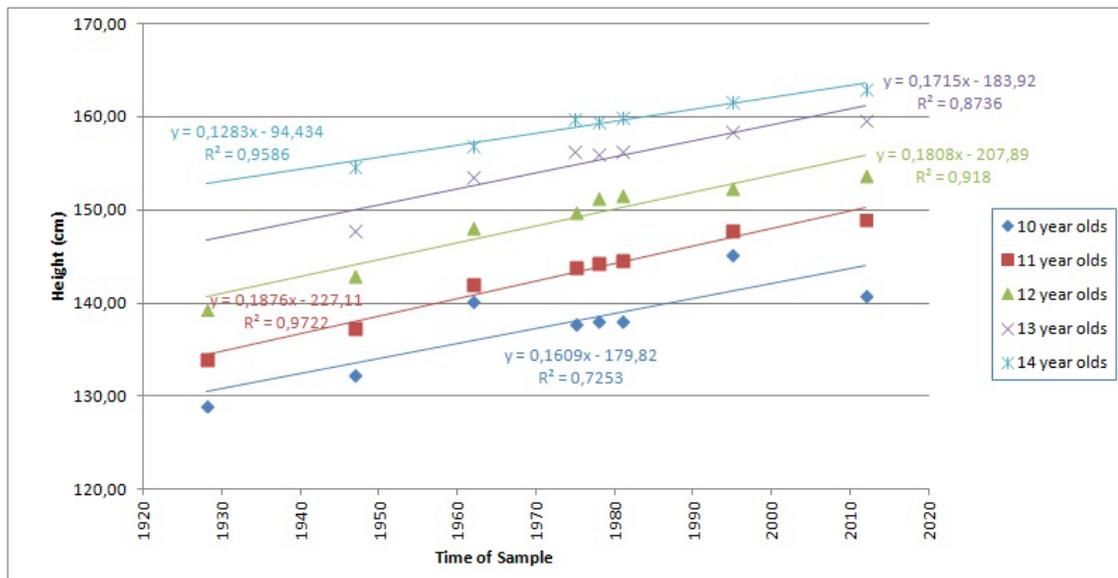
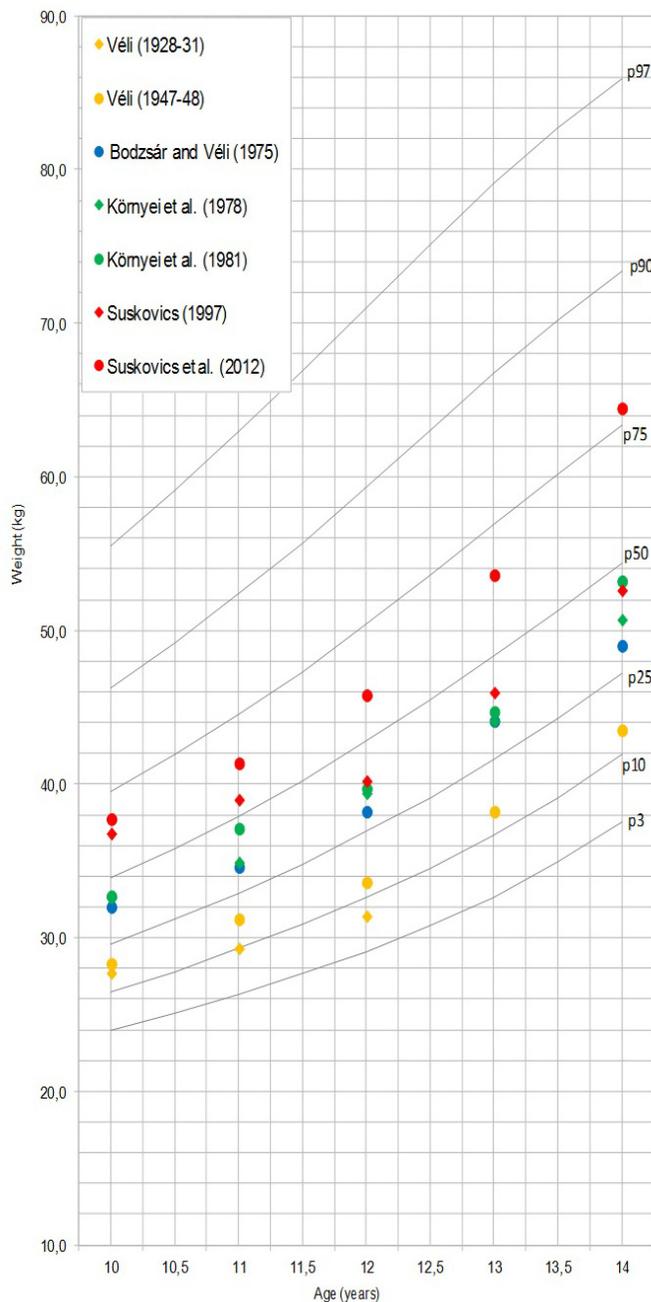


Figure 5. Linear regression equations and trend lines for height in Kaposvár girls.

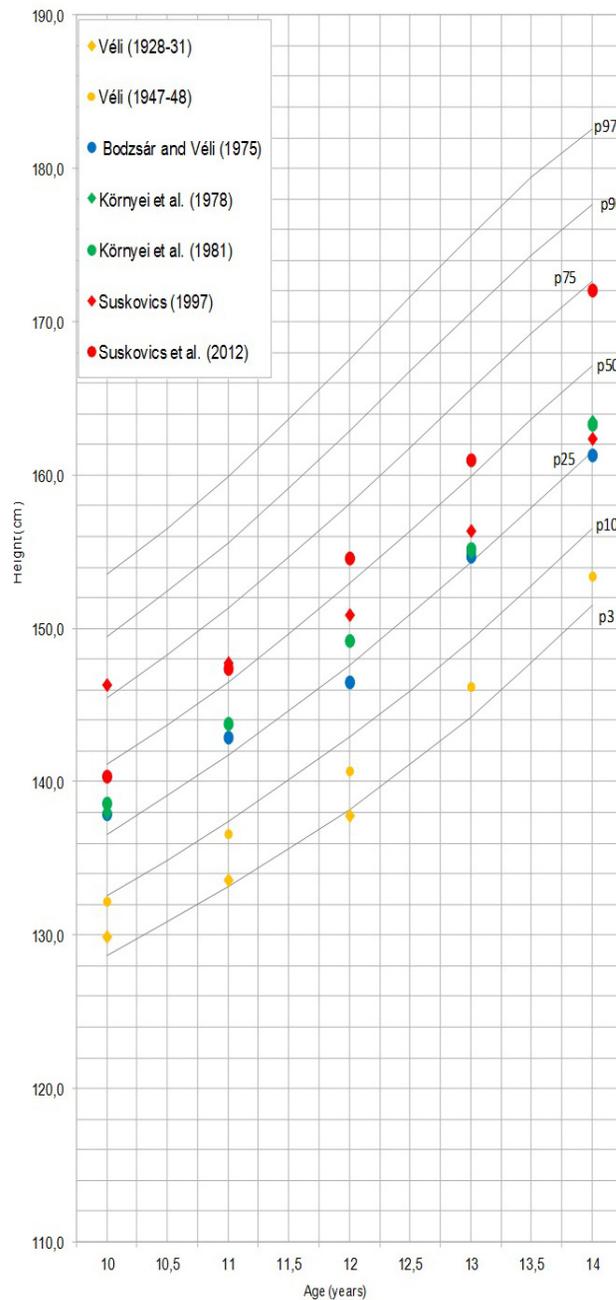
The change of boys' mean values shows a similar tendency to the girls' ones, so their means are around the same percentile than in the case of girls (Table 2, Figure 6 and 7).

**Table 2.** Changes in body weight and height of the Kaposvár boys.

	Age (year)				
	10	11	12	13	14
	<b>Weight (kg)</b>				
Véli (1928-31)	27.70	29.30	31.40	--	--
Véli (1947-48)	28.30	31.20	33.60	38.20	43.50
Bodzsár and Véli (1975)	32.00	34.60	38.20	44.10	49.00
Környei et al. (1978)	32.60	34.90	39.40	44.10	50.70
Környei et al. (1981)	32.70	37.10	39.70	44.70	53.20
Suskovics (1997)	36.78	38.98	40.20	45.95	52.61
Suskovics et al. (2012)	37.72	41.35	45.78	53.60	64.46
	<b>Height (cm)</b>				
Véli (1928-31)	129.90	133.60	137.80		
Véli (1947-48)	132.20	136.60	140.70	146.20	153.40
Bodzsár and Véli (1975)	137.90	142.90	146.50	154.70	161.30
Környei et al. (1978)	138.00	143.70	149.20	155.00	163.50
Környei et al. (1981)	138.60	143.80	149.20	155.20	163.30
Suskovics (1997)	146.33	147.75	150.89	156.37	162.38
Suskovics et al. (2012)	140.35	147.38	154.58	160.99	172.06



**Figure 6.** Means of weight in Kaposvár boys, plotted on the 2nd HNGS percentile curves (Bodzsár et al., 2007).



**Figure 7.** Means of height in Kaposvár boys, plotted on the 2nd HNGS percentile curves (Bodzsár et al., 2007).

The conclusions drawn with the help of the linear regression confirm the existence of the positive secular trend (Figure 8 and 9).

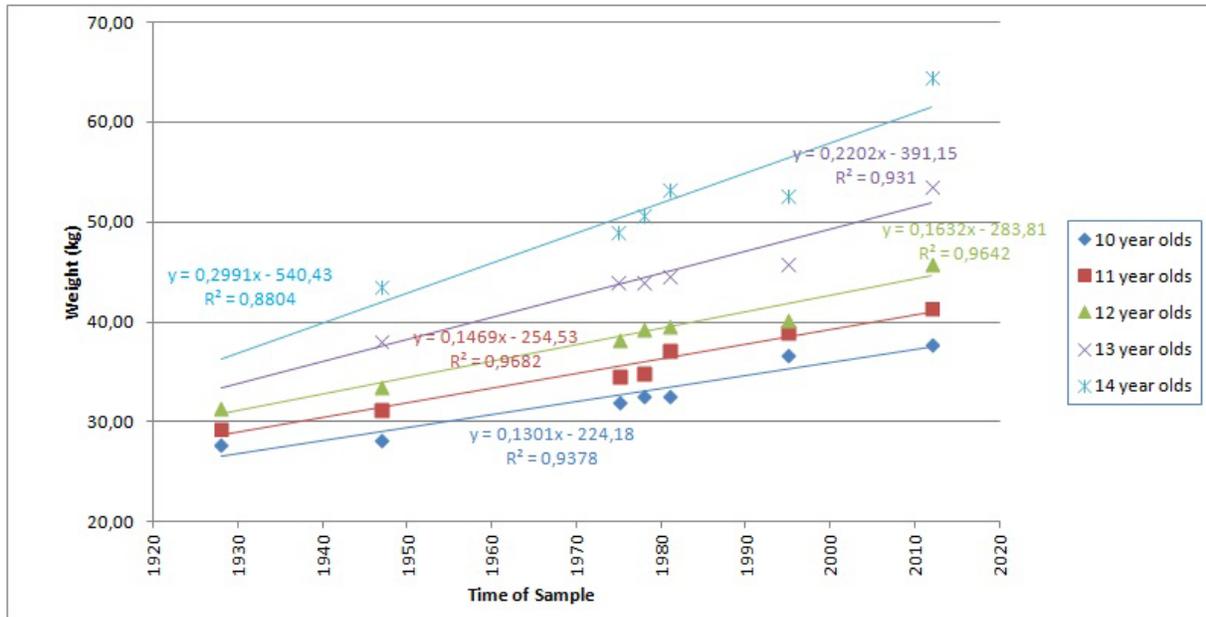


Figure 8. Linear regression equations and trend lines for weight in Kaposvár boys.

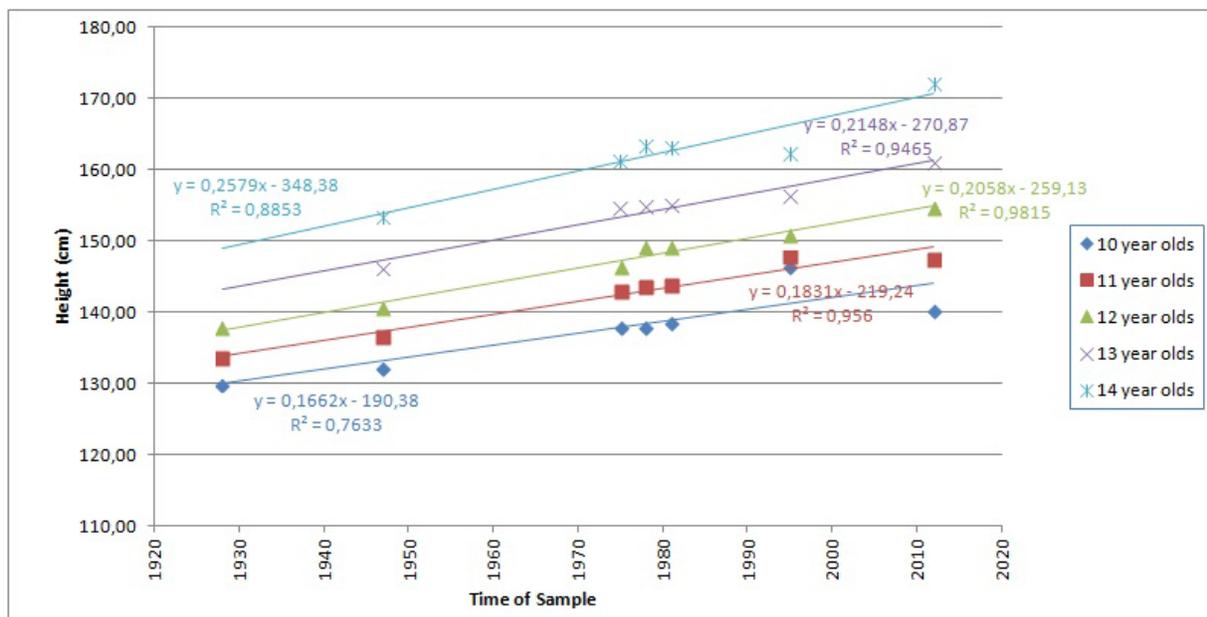


Figure 9. Linear regression equations and trend lines for height in Kaposvár boys.

## DISCUSSION

The secular trends are strongly influenced by the different environmental factors. This effect increased in an accelerated general development of the 20<sup>th</sup> and 21<sup>st</sup> century. Kaposvár became a trade centre with the help of the railway line built at the end of the 19<sup>th</sup> century and later on, it had a better possibility for industrialisation. In the first half of the 20<sup>th</sup> century a lot of people came to the town hoping for better living conditions. Migration with heterosis effect could strengthen the positive secular trend. Between the two world wars due to the economic crisis, emigration also increased, but in spite of this, immigration still had a greater part. After the World War II, the population of the town decreased temporarily. But the newly built factories and industrial units attracted the people with their new workplaces and urbanization went on in Kaposvár within a couple of years. By the 1960s there had not been any food shortage problems in the country, so there was not any compulsory delivery by then in the country, and there was a larger scale industrialization in the 1950s in Kaposvár. Urbanization increased, and as its consequence the population grew with its third during the next 15 years. Conditions became better in health care and education. These circumstances had a positive effect on the somatic development of children and secular trend. Practically, there was not any growth change in body mass at the end of the 1970s and at the beginning of the 1980s, but growth in height accelerates. The possible reason for accelerated increase is hyperplasia (Rietz, 1906) accelerated growth and development of children living in better economic, social and welfare conditions (so-called SES) compared to those ones of the same age living in disadvantageous circumstances. The secular changes in Kaposvár over the whole 20<sup>th</sup> century proceeded towards a positive direction, and the present research signifies further growth in body size. It seems that start of puberty shifted to an earlier age in Kaposvár.

## CONCLUSIONS

The first growth study took place in Kaposvár more than eighty years ago. Most of the examinations concerned body mass and height. Following the secular changes it can be proved that both the body mass and the height values increased during the later examinations in both sexes. The measurements laid down after the World War II are no exception to this. The secular changes in Kaposvár over the whole 20<sup>th</sup> century and the beginning of the 21<sup>st</sup> century proceeded towards a positive direction.

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