

HEIGHT AND WEIGHT STANDARDS OF 0-14 YEAR-OLD BUDAPEST CHILDREN BASED ON A LONGITUDINAL GROWTH STUDY

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Abstract: In 1970 a growth study was started, covering the overwhelming majority of children born in Budapest in the period between 15 October 1969 and 15 October 1970. After the first cross-sectional investigation (1970) 25 percent of children was randomly selected for the longitudinal growth study. Sixteen body measurements of about 4000 children were taken once a year, and data were collected concerning their health and sociodemographic status.

The authors present the standards of Budapest children from 0 to 14 years of age for height and weight. They also deal with some methodological problems emerged connected with the data processing.

Key words: Budapest Longitudinal Growth Study, Height, Weight, Growth Standards.

Introduction

Since the last decades growth studies have been living their „golden age”, however, the overwhelming majority of them are cross-sectional. Longitudinal studies are laborious and timeconsuming, but they give outmost important information about the growth process. It is worth mentioning some world-famous longitudinal growth studies, e.g. the Harpenden Growth Study, the Fels Growth Study, the Solna Growth Study, etc. In Hungary there were two longitudinal growth studies carried out at Hajdusámson, East-Hungary (Rajkai 1967, 1970) and at Szombathely West-Hungary (Eiben 1970) as well as a mixed longitudinal one (Bakonyi et al. 1969).

In 1970 we brought a longitudinal growth study into action in Budapest. The main purposes of this study were:

- (1) to establish the characteristics of somatic development of Budapest infants and children,
- (2) to elaborate growth standards of Budapest children, and
- (3) to study the environmental (first of all the sociodemographic) factors influencing their growth process.

Material and Methods

The research programme was started in 1970 with a complex cross-sectional growth study in almost all of the Budapest infants aged 0-1 year of age, than it was followed by a longitudinal investigation on 25 per cent of the entire original sample, gained by a selection with a representative (random) method. A regular registration concerning the socio-demographic conditions, circumstances of care and rearing, morbidity and other selected health data of children was included in the study series. In this way it was possible to be acquainted with the growth and development of children belonging to different social

strata, taking into consideration the weight at birth, the socio-economic and cultural background of the parents, their educational level, characteristics of care and mode of life in the families.

Table 1. Number of children investigated and measurements taken in frame of the Budapest Longitudinal Growth Study

Year of investigation	Number of children investigated	Number of body measurements	Number measurements taken	Children dropped-out	
				N	%
1970	18670	8	149.360	—	—
1971	4047	7	28.259	—	—
1972	3797	13	49.361	240	5.9
1973	3573	10	35.730	224	5.9
1974	3344	10	33.440	229	6.4
1975	3189	11	35.079	155	4.6
1976	3118	12	37.416	71	2.2
1977	3010	12	36.120	108	3.5
1978	2898	15	43.470	112	3.7
1979	2825	15	42.375	73	2.5
1980	2750	15	41.250	75	2.7
1981	2697	19	51.243	53	1.9
1982	2667	19	50.673	30	1.1
1983	2630	19	49.970	37	1.4
1984	2532	19	48.108	98	3.7
1985	2385	19	45.315	147	5.8
Sum total	64122		777.169	1652	40.9

During the fifteen years of the study the number of children decreased from 4037 to 2385, i.e. today we have the 59.1% of the original sample (Table 1). In 1984 the children completed their study in general schools, and they changed their school or started their employed career, and this is the reason for the remarkable decrease of pupils in the sample. (We intend to follow this study till the 18th year of age of the children.)

The co-operation of several institutes and departments permitted the realization of the envisaged programme (the Heim Pál Children's Hospital, the Demographic Research Institute of the Hungarian Central Statistical Office, the Department of Anthropology of the Eötvös Loránd University, the Section of Biometry of the Hungarian Academy of Sciences, the Centre of Infants' Homes of the Capital, etc.).

The members of the multidisciplinary working group (pediatricians, health visitors, anthropologists, statisticians, experts in demography and biometrics, etc.) took upon the task to prepare the detailed programme of the study, determine the methods to be chosen, compile the documentation as well as to evaluate the data obtained.

The first, practically cross-sectional anthropometric investigation containing eight body measurements was carried out in 1970. Later the 25 per cent longitudinal sample was investigated every year in the same period (between middle October and late November). The anthropometric programme became wider from year to year, and by the pre-puberty (by 1981) it was completed with scoring the secondary sexual characteristics (Table 2). Once the height and weight of the parents were also measured. The anthropometric investigatory methods and techniques were in accordance with internationally-accepted standards, described by Martin and Sauer (1957), and Tanner et al. (1969).

Besides the anthropometric programme, carried out in each year, detailed data collections were organized in 1970, 1972, 1975, 1982 concerning health, sociodemographic

status and mode of life. So we got information about the childrens' health status, micro-environment, and living conditions. In 1976, when they reached the schooling age our study was completed with investigations regarding the maturation level for schooling of the children.

Table 2. Body measurements taken and secondary sexual characteristics scored in frame of the Budapest Longitudinal Growth Study

Weight

Length measurements

in infants:

Supine length
Trunk length
Length of the upper extremity
Length of the lower extremity

in children:

Height
Sitting height
Height of the acromion
Height of the daktylion
Length of the upper extremity
Height of anterior superior iliac spine
Length of the lower extremity

Width measurements

Biacromial diameter
Biiliocristal diameter
Bicondylar humerus
Bidondylar femur

Girth measurements

Head circumference
Chest circumference
Upper arm circumference (relaxed)
Calf circumference

Skinfold thicknesses

Over triceps
Subscapular
Supra-iliac
Medial calf

Secondary sexual characteristics

in both sexes: Pubic hair
Axillary hair
in boys: Male genital development
Age at oigarche
in girls: Mamma
Age at menarche

The data were elaborated and analyzed with computer and we published several publications about certain parts of the study (Vargáné Teghze-Gerber – Gombosiné Gárdos 1976, Sárkány (szerk.) 1977; Eiben – Óry – Vargáné Teghze-Gerber 1981; B. Lukács – Óry 1981; Eiben et al. 1982).

In the course of the elaboration of the anthropometric data we took into consideration the following viewpoints:

– The data of children suffering from serious anomalies or congenital defects and those who were born with a smaller weight than 2500 g were excluded. Although we examined the individual growth curves of these children while calculating the reference values we did not take into consideration these data.

– During the data elaboration the usual mathematical-statistical parameters were calculated. In order to gain the reference values we present the percentile values. This is especially needed in the case of those body measurements which are not of normal distribution for example the body weight. In this case the incidence frequency is shifted towards the „heavy” side.

– The percentile values of the different age groups were corrected with the help of algebraic („moving averaging”) and graphical („curve smoothing with quadratic curve fitting”) methods.

Results and Discussion

In the present study we bring to light only the percentile values of height and weight and compare the body measurements of children living in Budapest now and earlier. The complex elaboration of the whole investigation will be finished later.

The percentile values of body length or body height and that of the body weight of Budapest boys and girls are shown in Figures 1, 2, 3, and 4.

It is worth mentioning that in the early childhood the girls' height is slightly smaller than that of the boys, moreover in certain cases they are equal. In the case of the girls the puberal growth spurt appears at the age of 10 and from that point they are taller than the boys of the same age. The boys are taller than the girls only after 14 years of age (Figures 1 and 2).

In the case of the weight there is no remarkable difference between the two sexes in the early childhood, but the boys are somewhat heavier. The weight values show the puberal growth spurt of the girls one year earlier than the height values. After 9 years of age the girls are a bit heavier than the same aged boys and this tendency changes at the age of 14 when the boys begin to be heavier (Figures 3 and 4).

The means and the 50th percentile values of body weight were compared. The differences are shown in Fig. 5.

The data of our longitudinal growth study were compared to the results of two large cross-sectional growth studies, carried out in Budapest after the 2nd world war. In 1951 the School-Medical-Service of Budapest (M. Viola 1952), and in 1968/69 Eiben and co-workers (Eiben et al. 1971) realized these studies.

The difficulties of the comparison are obvious. The schoolchildren investigated in 1951 were born before or under the 2nd world war, the nursery-school children were born after the war. All of them were suffering from the consequences of the war like economical crisis, malnutrition, etc. After world war II the socioeconomic changes in Hungary resulted a positive turn in the life of the majority of the children. The children investigated in 1968/69 were born between 1950 and 1965. The migration is worth mentioning among the factors having some influence on their growth process. In this periode of time migration modified the population genetic (relative) balance and the living standards which were slowly getting better.

The comparison of the means of the three investigations are presented in Figures 6 and 7. The Budapest boys and girls investigated at the end of the 1960s were taller and heavier than those investigated almost two decades earlier. The differences are: in the case of the boys: 1.0–5.4 cm and 0.1–5.1 kg, and in the case of girls: 1.4–3.9 cm and 0.2–3.6 kg. The means of the longitudinal study show a rising tendency.

The results of these studies show that the secular trend is detectable in Budapest in the last four decades. We are convinced that as a consequence of the improvement of the factors influencing the growth and development process the Budapest children will be able to realize step by step their optimal growth patterns.

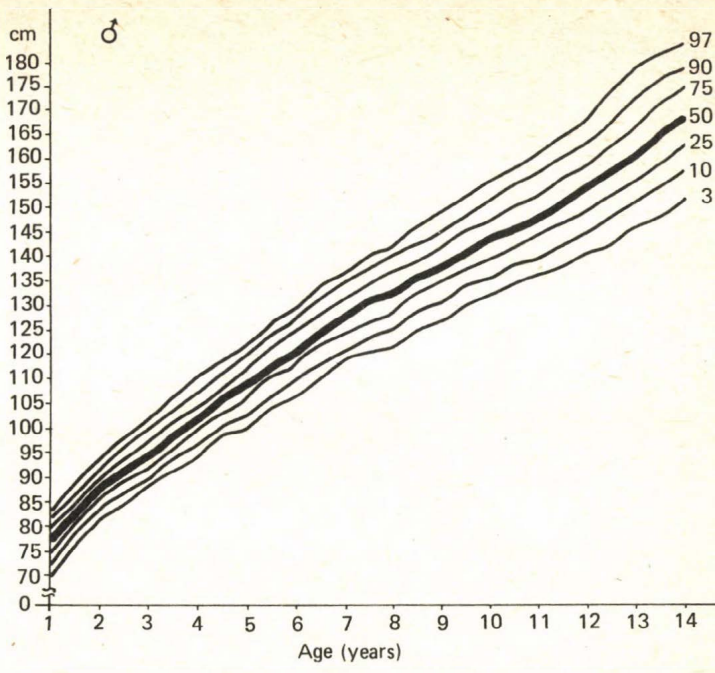


Fig. 1: Height standards of Budapest boys

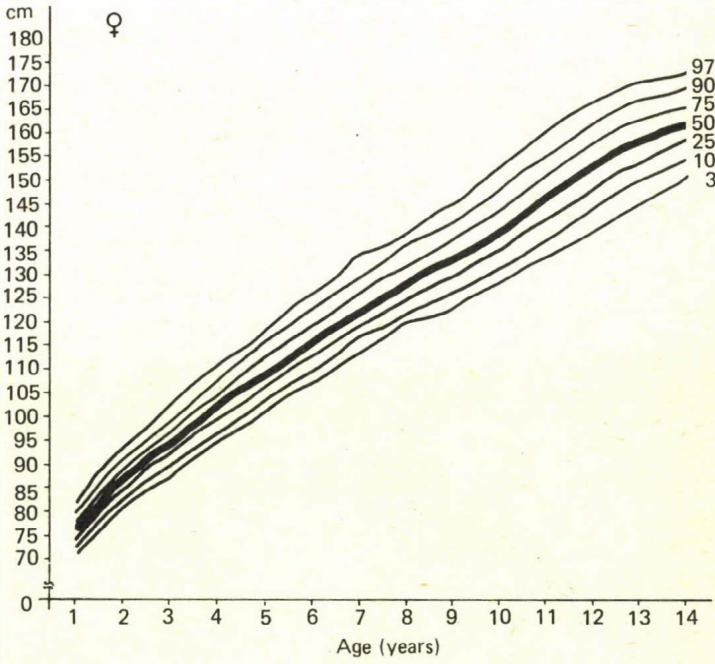


Fig. 2: Height standards of Budapest girls

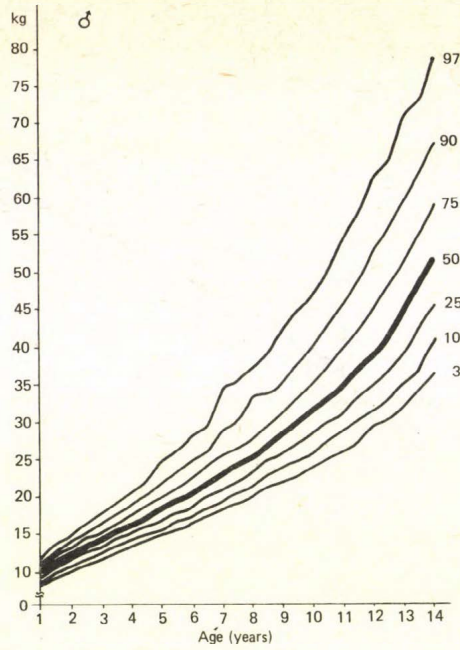


Fig. 3: Weight standards of Budapest boys

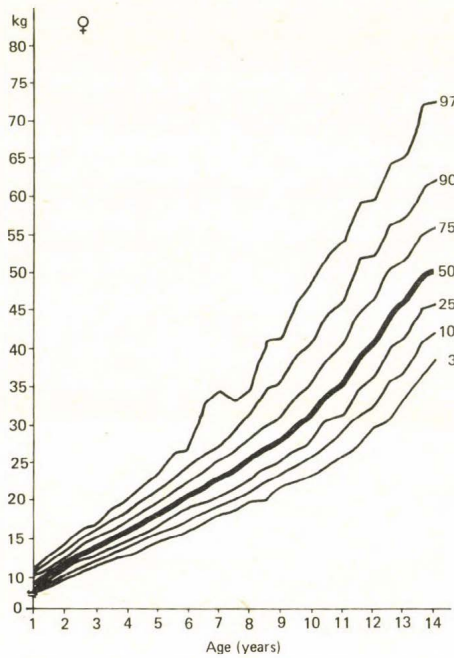
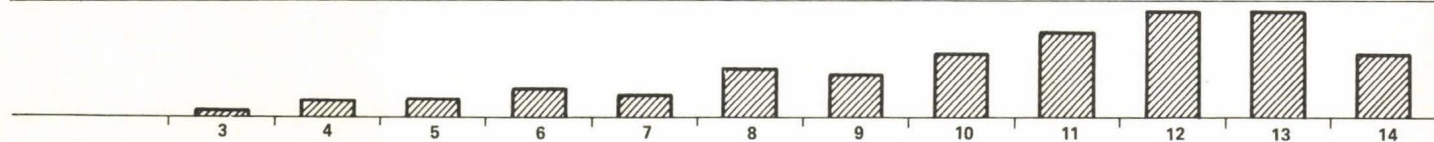


Fig. 4: Weight standards of Budapest girls

Boys ♂

Mean	14.3	16.3	18.6	20.9	23.8	26.1	29.2	32.5	36.4	40.9	46.5	53.2
50th percentile	14.2	16.0	18.3	20.4	23.4	25.2	28.4	31.3	34.8	38.9	44.5	52.0
Difference	-0.1	-0.3	-0.3	-0.5	-0.4	-0.9	-0.8	-1.2	-1.6	-2.0	-2.0	-1.2



Girls ♀

Mean	13.9	16.1	18.3	21.0	23.5	26.0	29.5	33.1	37.6	42.8	48.0	52.5
50th percentile	13.8	15.9	18.1	20.8	23.3	25.3	27.9	31.5	33.5	41.0	46.6	50.8
Difference	-0.1	-0.2	-0.2	-0.2	-0.3	-0.7	-1.6	-1.6	-2.1	-1.8	-1.4	-1.7

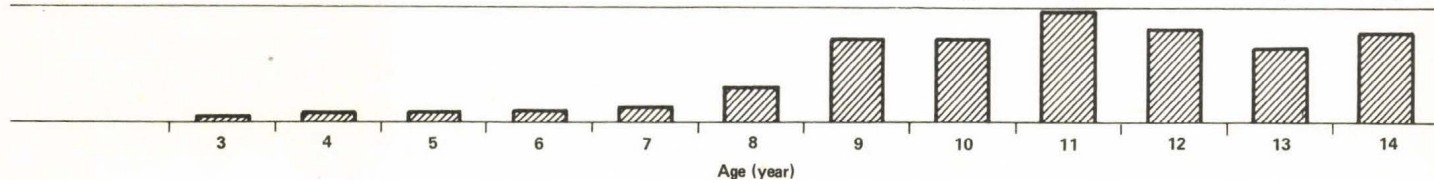


Fig. 5: A comparison of means and 50th percentile values of weight in Budapest children

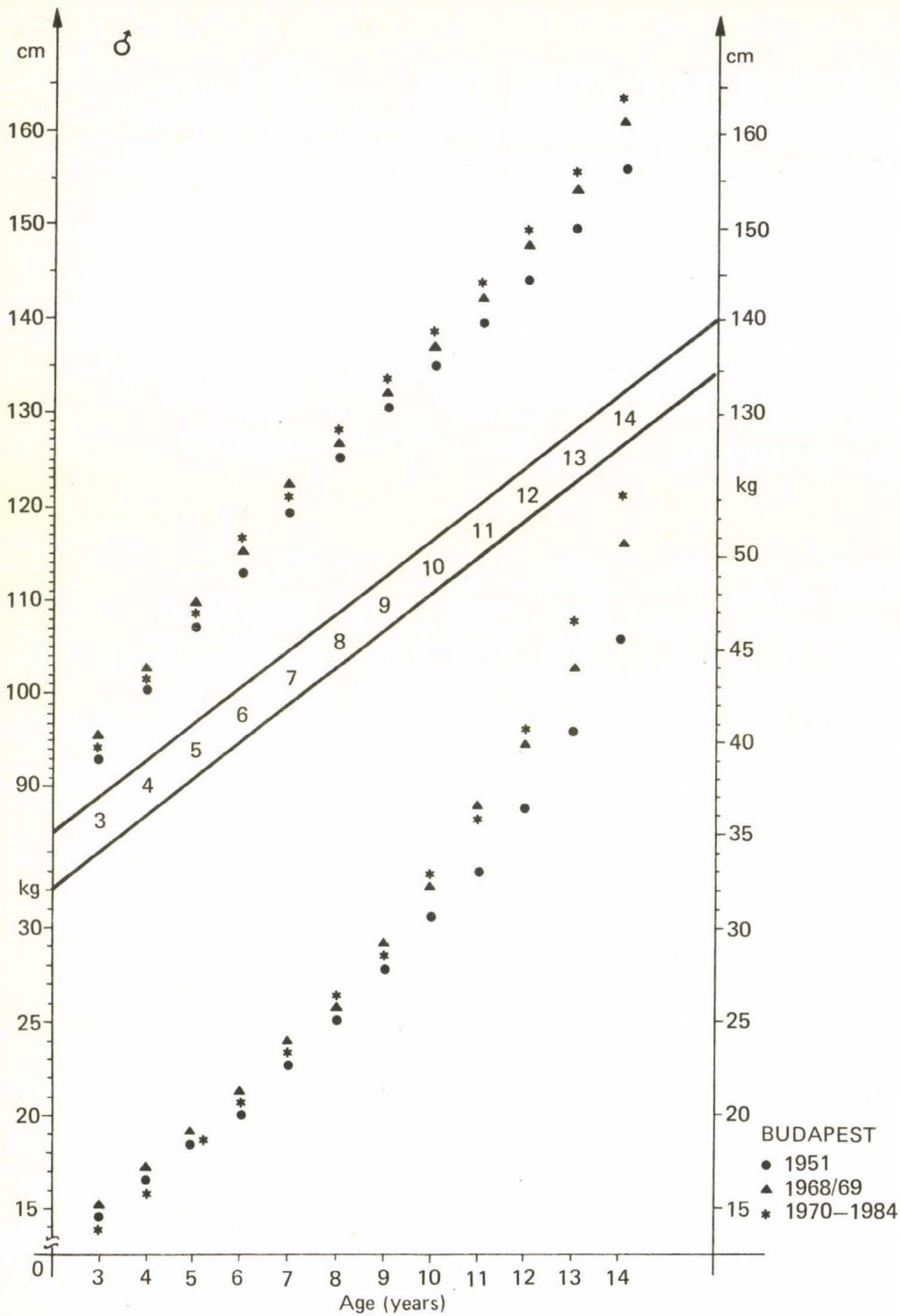


Fig. 6: Changes of height and weight in Budapest boys during the last decades

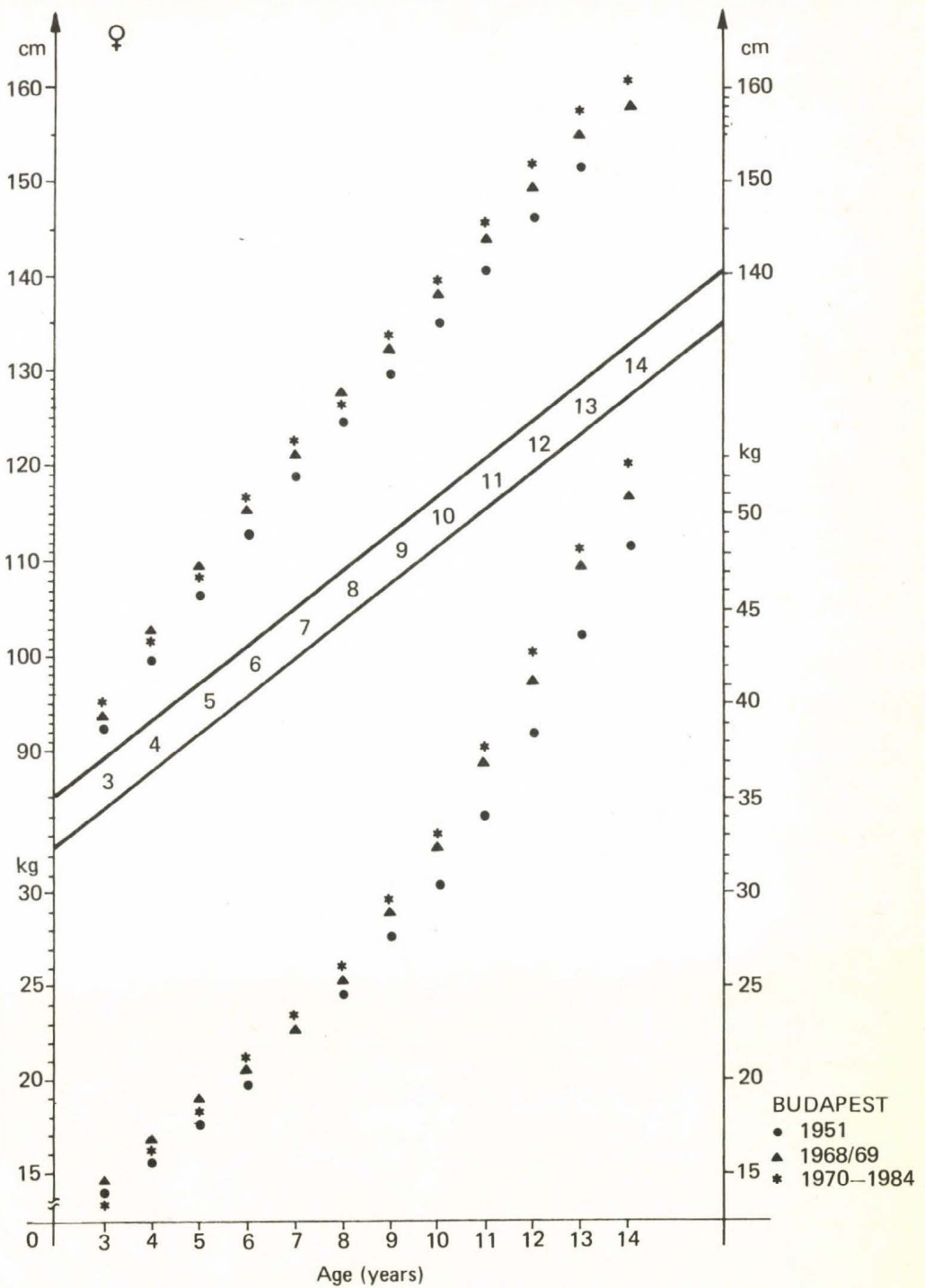


Fig. 7: Changes of height and weight in Budapest girls during the last decades

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