

PHYSICAL GROWTH MEASUREMENTS OF PRIMARY SCHOOL CHILDREN LIVING IN TRABZON*

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Weight and height measurements are the best criteria for monitoring the growth of children¹⁻³. For the assessment of the height and weight of an individual child we need to know the standards of that population. Few countries have established their developmental norms so far^{4,5}. For this reason, countries which do not have their own growth standards have to use the standards of other countries. Owing to the genetic and environmental differences between different populations, assessment of physical growth according to the standards of other countries is not an appropriate procedure^{1,6}.

In Turkey several studies have been carried out to assess the development of Turkish children^{7,8,9}. A study by Yalaz and Epir⁸ gives the developmental norms of children between 0-6 years of age. Neyzi et al⁹ have given a report on the weight and height measurements of children aged 0-18 years living in İstanbul. Although these valuable reports do reflect the development of Turkish children, social and environmental differences between the various parts of Turkey can influence developmental measurements.

It is the purpose of this study to establish the local standards for urban Turkish children between six and eleven years of age and also to see whether there is a significant difference between children living in Trabzon and other parts of Turkey and also in other countries such as the USA and Britain.

Material and Methods

This study was carried out in 1984 on 3600 children in primary schools located in the city. Height and weight measurements were obtained for 300 girls and 300

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boys at each age from six to eleven. Children with chronic diseases and orthopedic deformities were excluded from the study as were children whose ages were doubtful.

The socioeconomic status of the children was established by consultation with the teachers and also from the school files. The parents' educational levels and occupations were used as a marker for the socioeconomic status of the families. Only children whose mothers and fathers were at least high school graduates were selected.

The measurements were obtained by two consultant pediatricians and two residents. Heights and weights were measured on standard equipment available at clinics where the children were measured. When weight measurements were taken, the children were wearing only their underclothes and height measurements were taken in a standing position.

Means and standard deviations were calculated for each group, and for each age group 3, 10, 25, 50, 75, 90 and 97th percentile values were obtained. 1st, 2nd, 3rd degree polynomial regression analyses were used to obtain growth curves for both boys and girls.

Results

The mean and standard deviations of the height and weight measurements of boys and girls for each age group are shown in Tables I and II. The percentile values of height and weight measurements for each age group are shown in Tables III-VI.

TABLE I
**The Mean and Standard Deviation of Height and Weight for
6-11-Year-Old Girls**

Age	Weight (kg)		Height (cm)	
	Mean	SD	Mean	SD
6	20.8	2.2	113.9	4.5
7	22.9	2.9	119.1	4.4
8	25.7	4.0	124.6	5.1
9	28.1	3.6	129.6	5.0
10	31.6	4.9	135.3	6.2
11	35.5	6.1	141.0	6.2

TABLE II
The Mean and Standard Deviation of Height and Weight for
6-11-Year-Old Boys

<u>Age</u>	<u>Weight (kg)</u>		<u>Height (cm)</u>	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
6	21.76	2.4	115.3	5.0
7	23.5	2.7	120.0	4.7
8	26.1	3.0	125.0	4.7
9	29.4	4.1	131.1	5.5
10	31.6	4.4	134.8	5.5
11	33.8	4.8	139.4	6.04

TABLE III
Weight Percentile Values of Girls

<u>Age</u>	<u>3rd</u>	<u>10th</u>	<u>25th</u>	<u>50th</u>	<u>75th</u>	<u>90th</u>	<u>97th</u>
6	16,63	17,96	19,37	20,53	22,14	23,53	26,08
7	18,64	20,09	21,16	22,86	24,35	26,40	29,38
8	20,66	21,97	23,22	25,21	27,14	29,81	33,28
9	22,67	23,88	25,55	27,85	30,50	33,75	37,78
10	24,68	26,11	28,15	31,02	34,42	38,23	42,88
11	26,70	28,96	31,01	35,00	38,92	43,25	48,58

TABLE IV
Weight Percentile Values of Boys

<u>Age</u>	<u>3rd</u>	<u>10th</u>	<u>25th</u>	<u>50th</u>	<u>75th</u>	<u>90th</u>	<u>97th</u>
6	17,72	18,98	19,90	21,51	22,98	25,01	27,07
7	19,75	20,55	21,92	23,84	25,03	26,88	28,74
8	21,67	22,43	24,05	26,16	28,04	30,37	33,41
9	23,47	24,53	26,27	28,49	31,31	34,41	39,04
10	25,15	26,75	28,59	30,82	34,17	37,94	43,56
11	26,72	28,99	31,00	33,15	35,94	39,87	44,90

TABLE V
Height Percentile Values of Girls

Age	3rd	10th	25th	50th	75th	90th	97th
6	100,65	108,89	111,00	114,10	116,96	119,02	123,56
7	110,30	114,30	116,00	118,96	122,20	124,98	128,54
8	116,06	118,76	121,00	124,07	127,62	130,93	134,01
9	119,93	122,87	127,00	129,43	133,22	136,89	139,98
10	123,94	127,22	131,00	135,03	139,00	142,85	146,45
11	130,09	132,42	136,00	140,88	144,96	148,81	153,42

TABLE VI
Height Percentile Values of Boys

Age	3rd	10th	25th	50th	75th	90th	97th
6	106,54	108,97	111,85	114,92	118,95	120,96	124,38
7	111,16	114,71	117,28	120,15	123,83	126,52	129,89
8	115,77	119,76	122,28	125,52	128,72	132,18	135,40
9	120,39	124,10	126,86	130,69	133,61	137,67	140,92
10	125,00	127,74	131,00	135,27	138,49	142,69	146,43
11	129,62	130,69	134,71	138,92	143,38	146,95	151,95

Height and weight curves are shown in Figures 1-4. The comparisons of our children with American¹ and British⁴ ones, and also with children living in Istanbul⁹ and Gemlik⁷, are shown in Figures 5-8 (with 50th percentile values) and the results of statistical comparison are given in Tables VII and VIII.

TABLE VII
Statistical Comparison of Weight and Height of 6-11-Year-Old Boys Living in Trabzon with Children Living in Istanbul, Gemlik, the USA and England

Age groups	Height						Weight					
	6	7	8	9	10	11	6	7	8	9	10	11
Istanbul	NS*	S	S	NS	S	S	S	NS	NS	NS	NS	S
Gemlik	NS	NS	S	NS	NS	NS	S	S	S	S	S	NS
USA	NS	S	S	S	S	S	S	S	S	S	NS	S
England	NS	NS	S	NS	S	S	S	S	S	S	S	NS

*S: significant $p < 0.05$
NS: not significant $p > 0.05$

TABLE VIII

Statistical Comparison of Weight and Height of 6-11-Year-Old Girls Living in Trabzon with Children Living in Istanbul, Gemlik, the USA and England

Age groups	Height						Weight					
	6	7	8	9	10	11	6	7	8	9	10	11
Istanbul	NS*	NS	NS	NS	NS	S	NS	NS	NS	NS	S	S
Gemlik	NS	NS	NS	NS	NS	NS	S	S	S	S	S	S
USA	NS	S	S	S	S	S	S	S	S	NS	S	S
England	NS	S	NS	S	NS	NS	NS	NS	NS	NS	NS	NS

*S: significant $p < 0.05$

NS: not significant $p > 0.05$

Discussion

The developmental norms are very valuable in assessing the physical growth of an individual child. Every country should have its own developmental norm, since factors such as race, genetics, nutrition and environment may considerably affect development^{1,6}.

WHO¹ suggests the following criteria be considered while establishing reference norms.

1. The children selected for the study must be chosen from among well-nourished urban children.
2. The sample must involve at least 200 children from every sex and age.
3. The measurements must be made by experienced personnel and with standard equipment.
4. The research must be cross-sectional, since it will be used for comparisons of a cross-sectional nature.

Our study was carried out on a sufficient number of children and the measurement techniques and equipment were in keeping with WHO's standards.

The selected children were all well-nourished. In classifying a population according to its socioeconomic level, then the paternal profession, salary, residential circumstances, and the number of individuals in a family can all be used as criteria^{8,10}. In addition to these, it has also been suggested that the educational level of the mother and father is another useful criterion for the evaluation of the socioeconomic level of a family living in Turkey^{8,11}.

In populations where the incidence of malnutrition is high, the growth standards have to be obtained from well-nourished children^{5,12}, otherwise the values which are obtained will be lower than the real values. In some studies done in

developing countries, the reason for the lower standard norms is the selection of children belonging to a lower socioeconomic level¹³. These data were collected in 1984 and therefore should be relevant for a few more years. In a country changing as rapidly as Turkey such standard norms have to be updated frequently^{8,9}. It is suggested that the study groups to be selected should belong to families living in an urban area with a higher socioeconomic level⁹. This concept is also highly recommended in the reports published by the International Committee of the Science of Nutrition¹⁴. Our results can thus be regarded as providing a reliable standard for the eastern Black Sea region.

In certain groups, the differences between children living in Trabzon and children living in other parts of Turkey and also in other countries such as the USA and Britain, were found to be significant (Tables VII, VIII). Although international developmental norms are widely used even in the developing countries, our results suggest that every country must have its own developmental norm, and even in the same country, because of the social and environmental differences, several separate developmental norms can be used for the assessment of the growth of children living in the different parts of a country.

We think our results can be used in the evaluation of all children, 6-11 years old, living in the eastern Black Sea region and that they can also be used to contribute to the assessment of standard norms for Turkish children as a whole.

Summary

Height and weight measurements were obtained for 3600 children aged 6-11 years. The sample included only healthy children and represented a high socioeconomic level in the city of Trabzon. The results of the various groups were compared. In certain groups significant differences were found between children living in Trabzon and children living in Istanbul, Gemlik, the USA and Britain. These results suggest the importance of using local developmental norms for the evaluation of children.

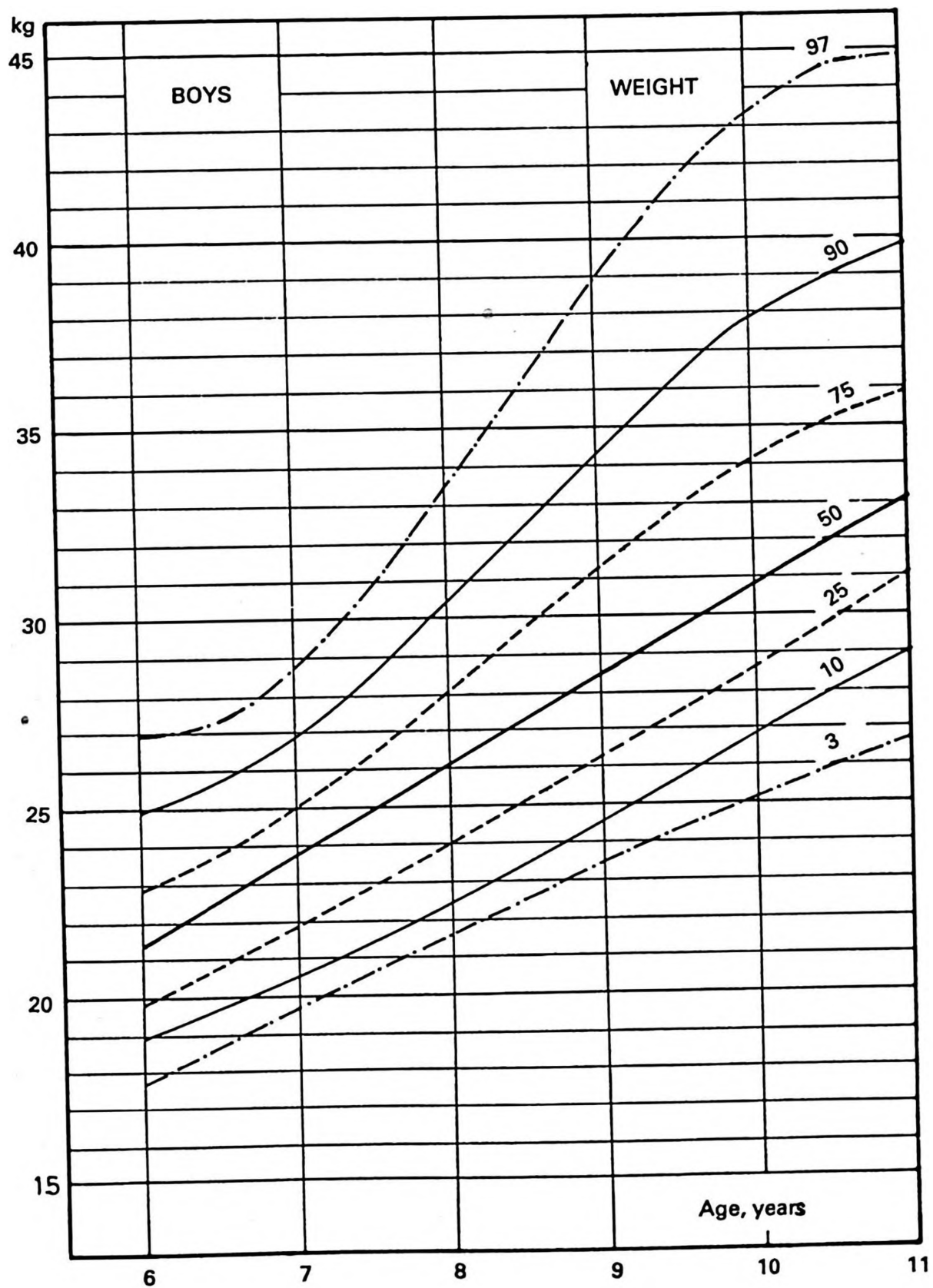


Figure 1
Weight percentiles for boys

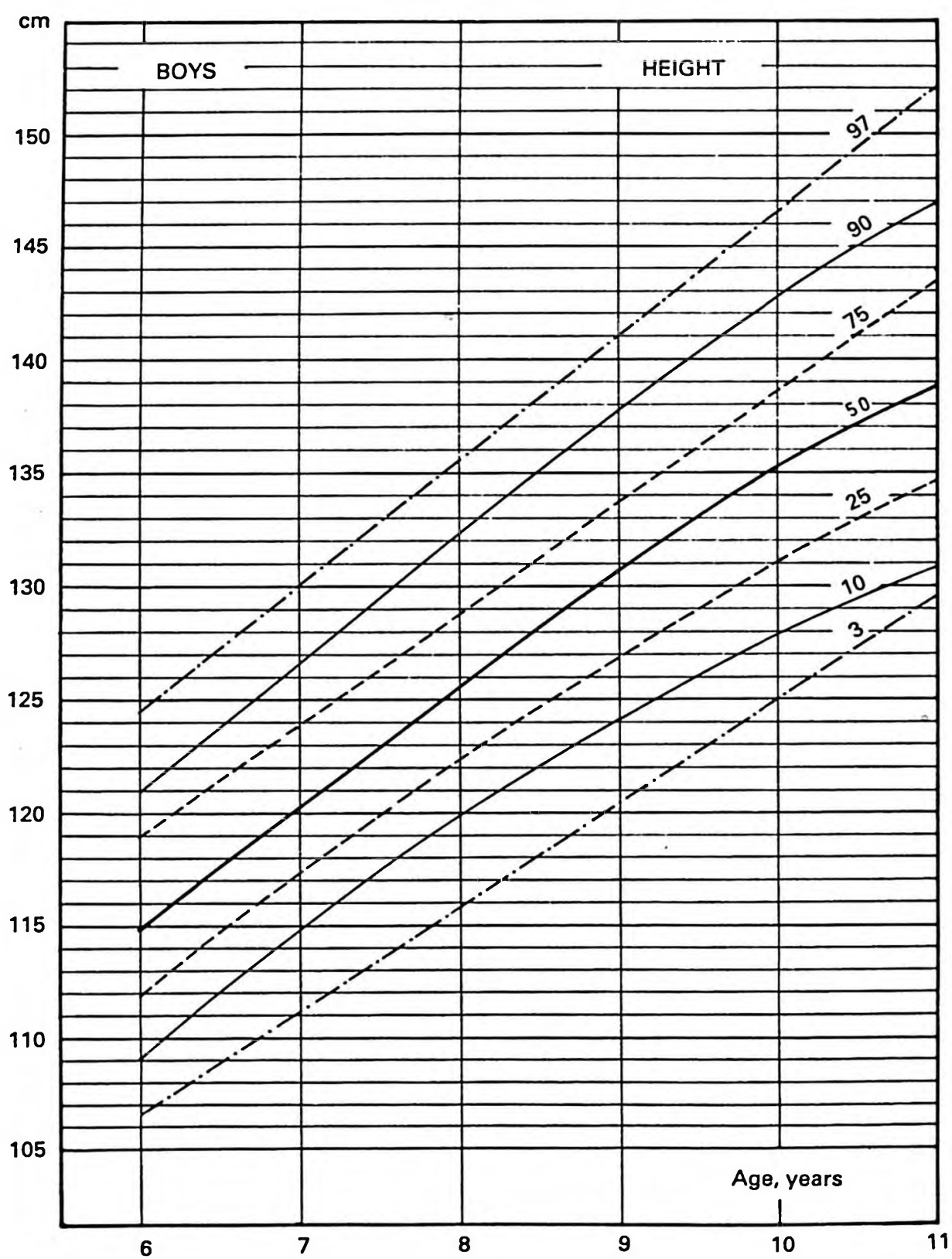


Figure 2
Height percentiles for boys

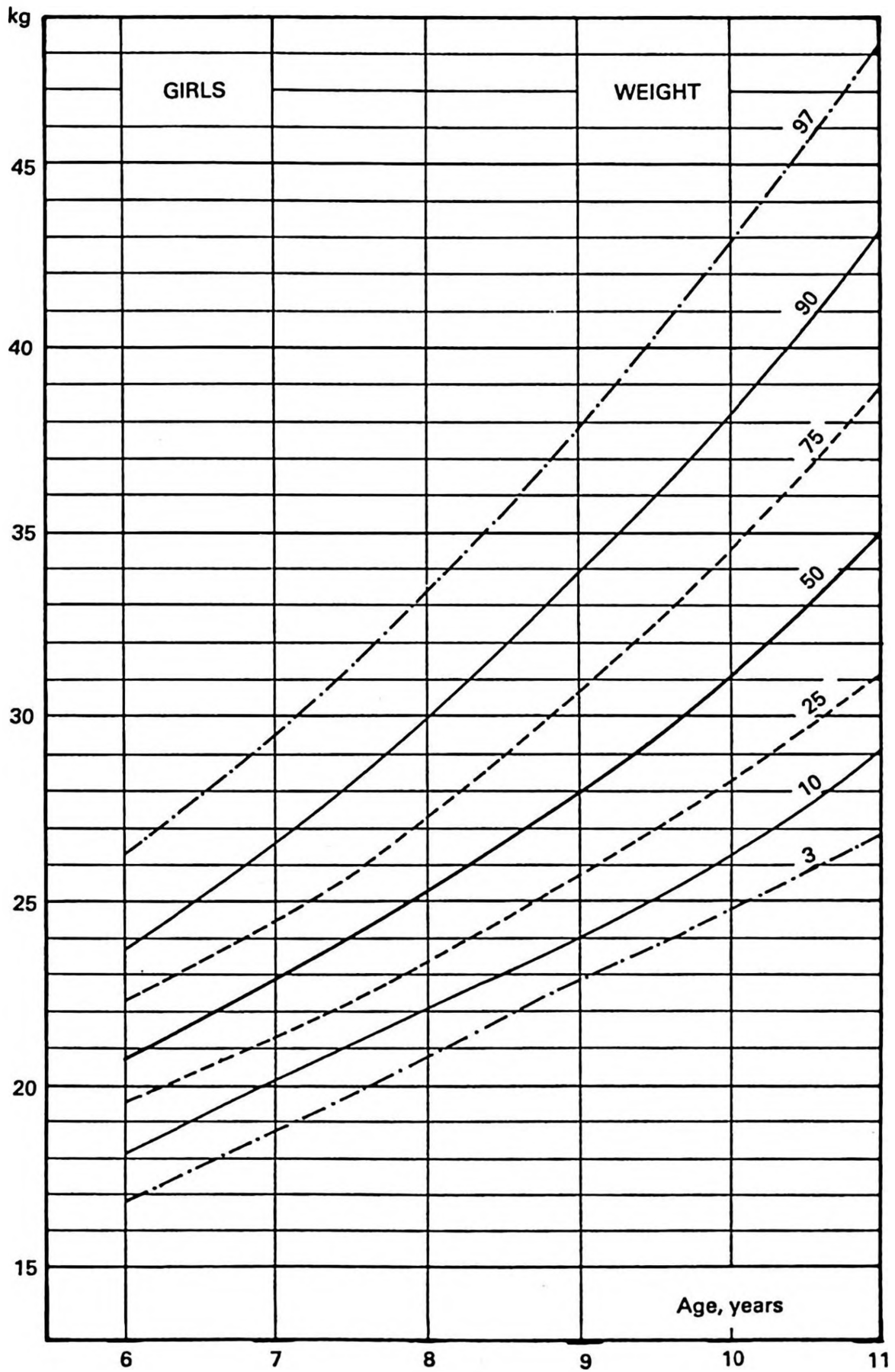


Figure 3

Weight percentiles for girls

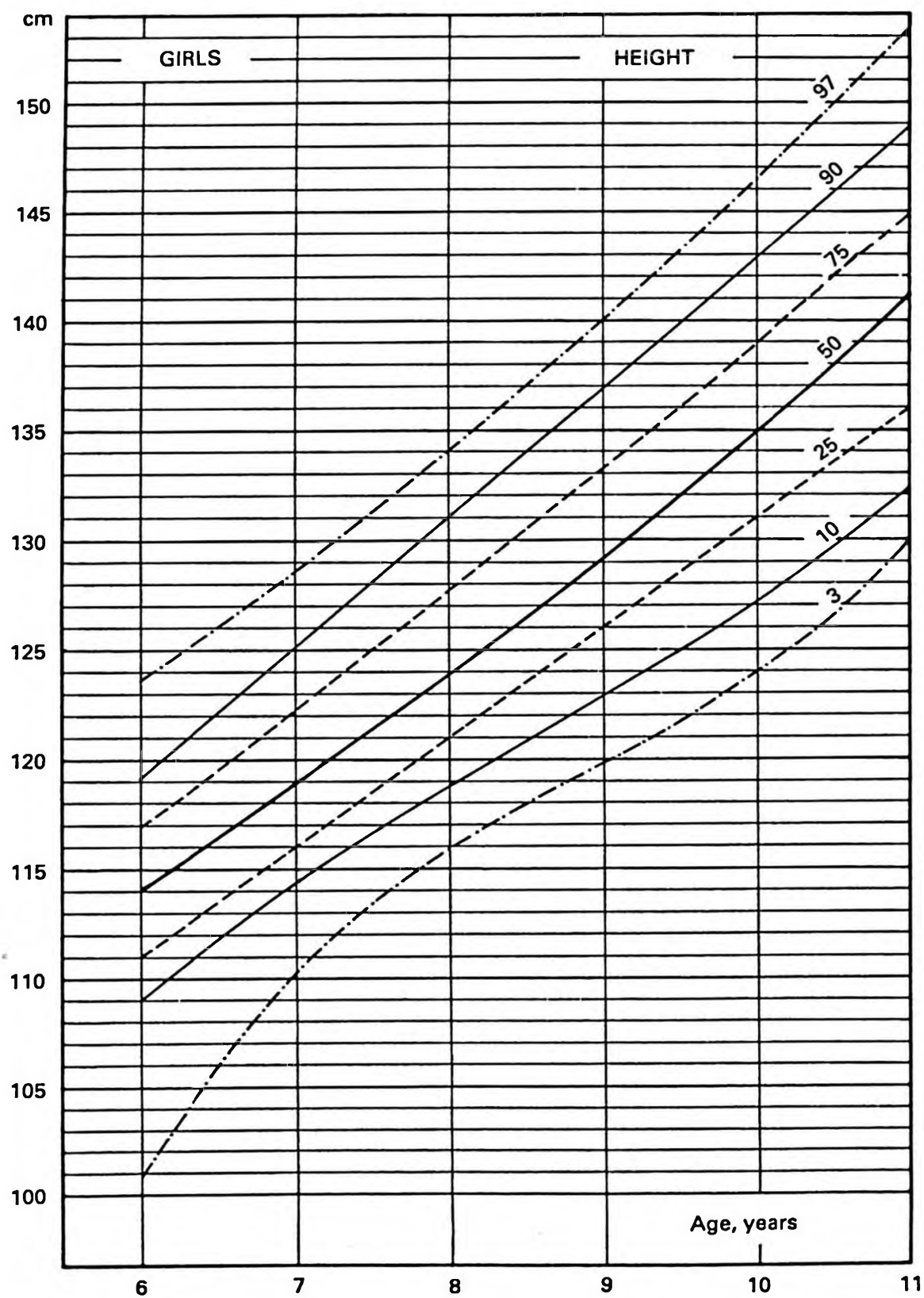


Figure 4
Height percentiles for girls

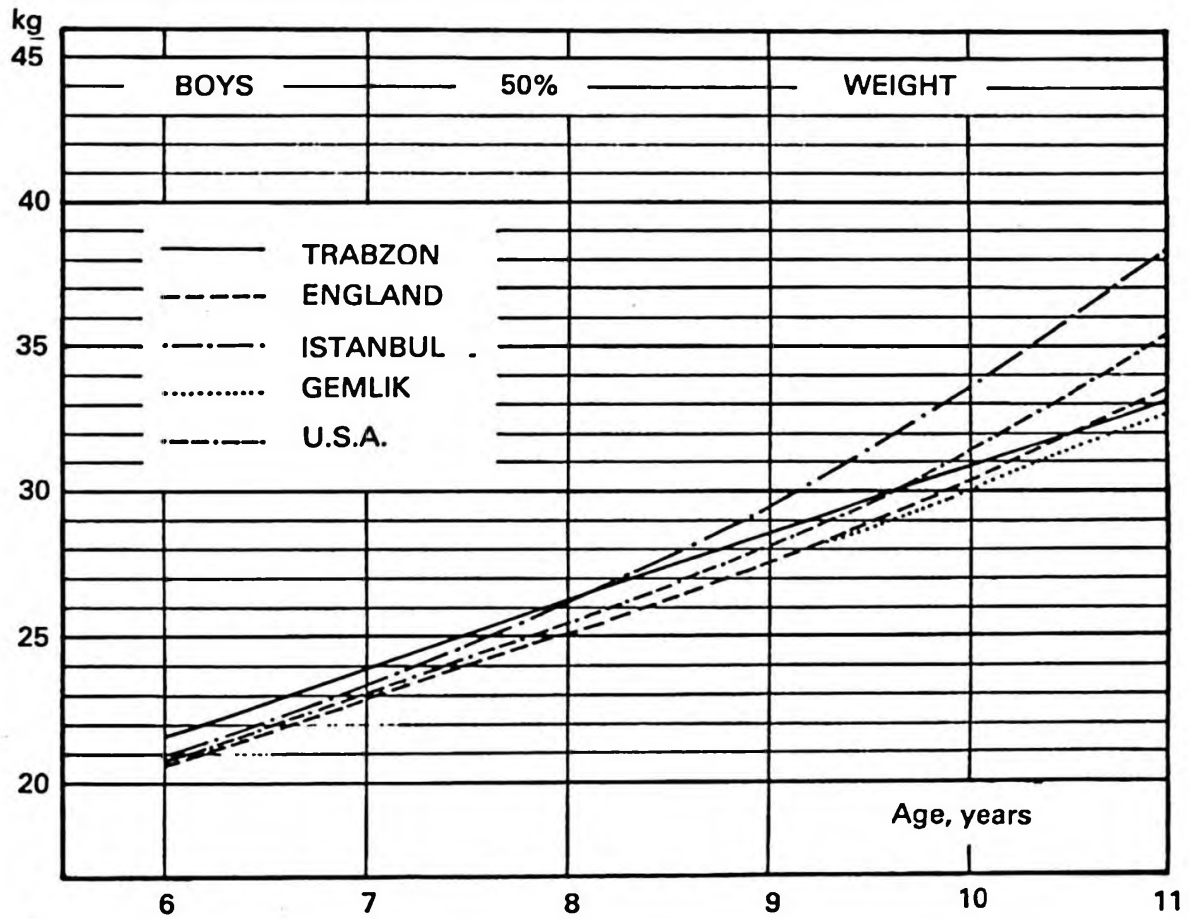


Figure 5

The comparison of weight percentiles (50%) of 6-11-year-old boys with different study groups

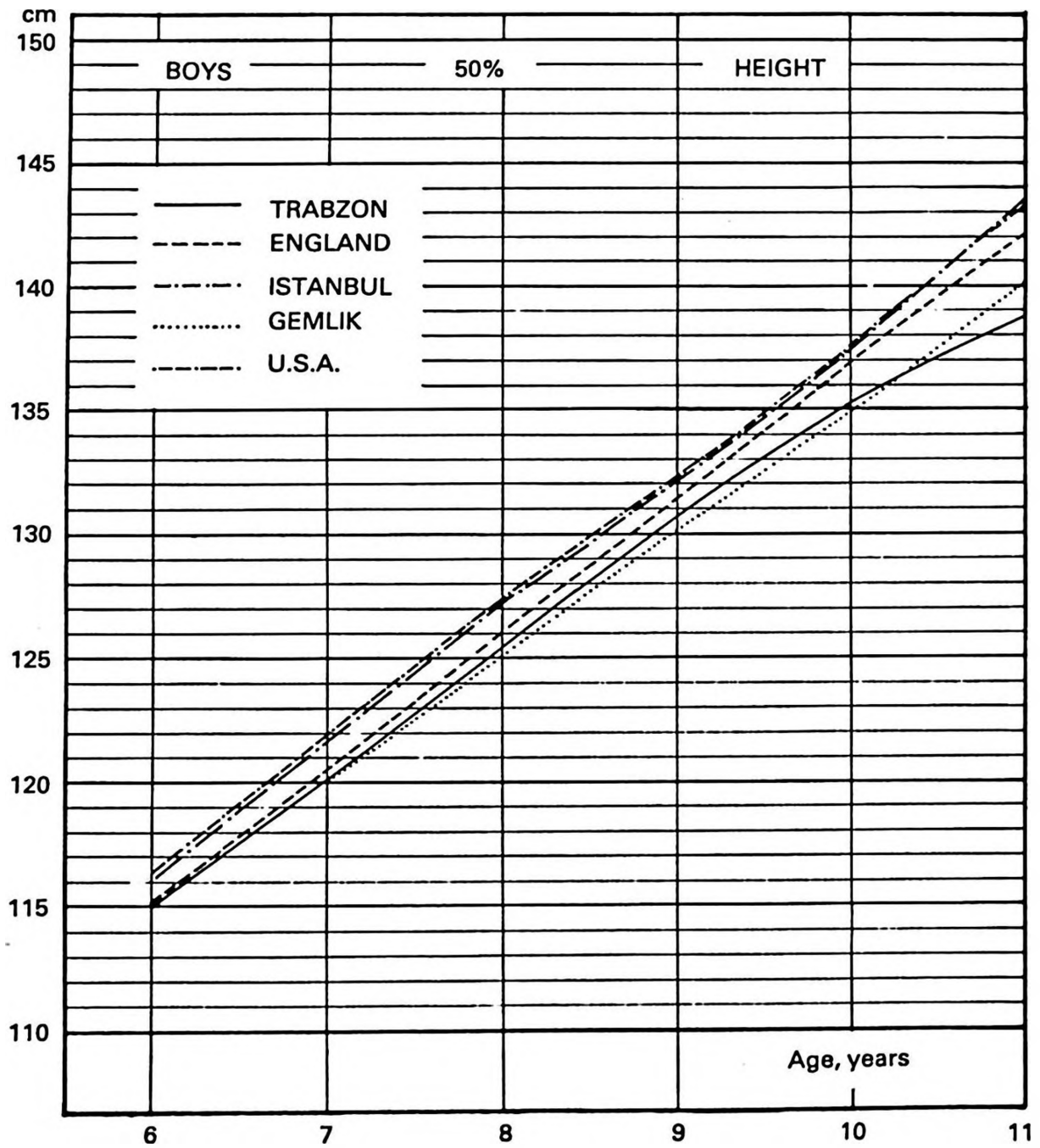


Figure 6

The comparison of height percentiles (50%) of 6-11-year old-boys with different study groups

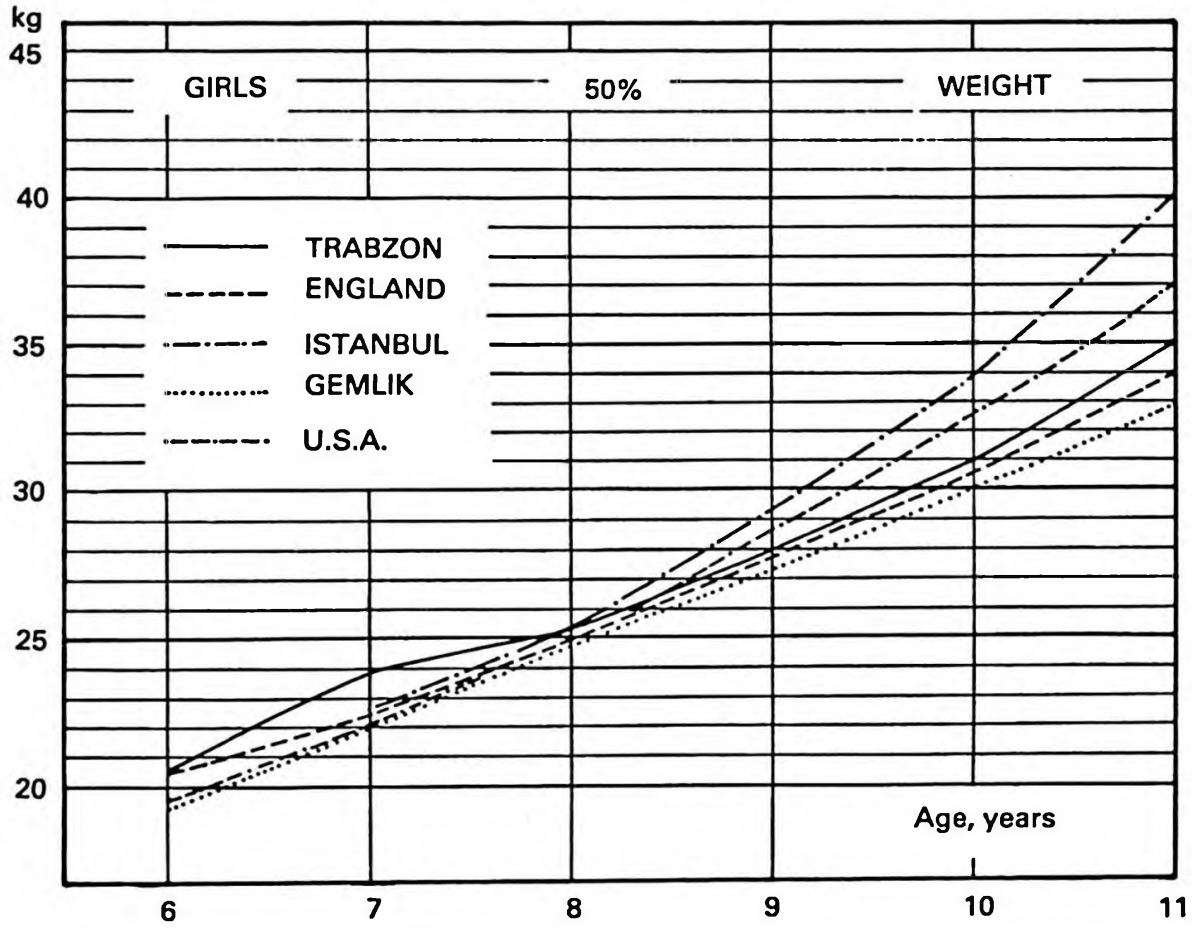


Figure 7
The comparison of weight percentiles (50%) of
6-11-year-old girls with different study groups

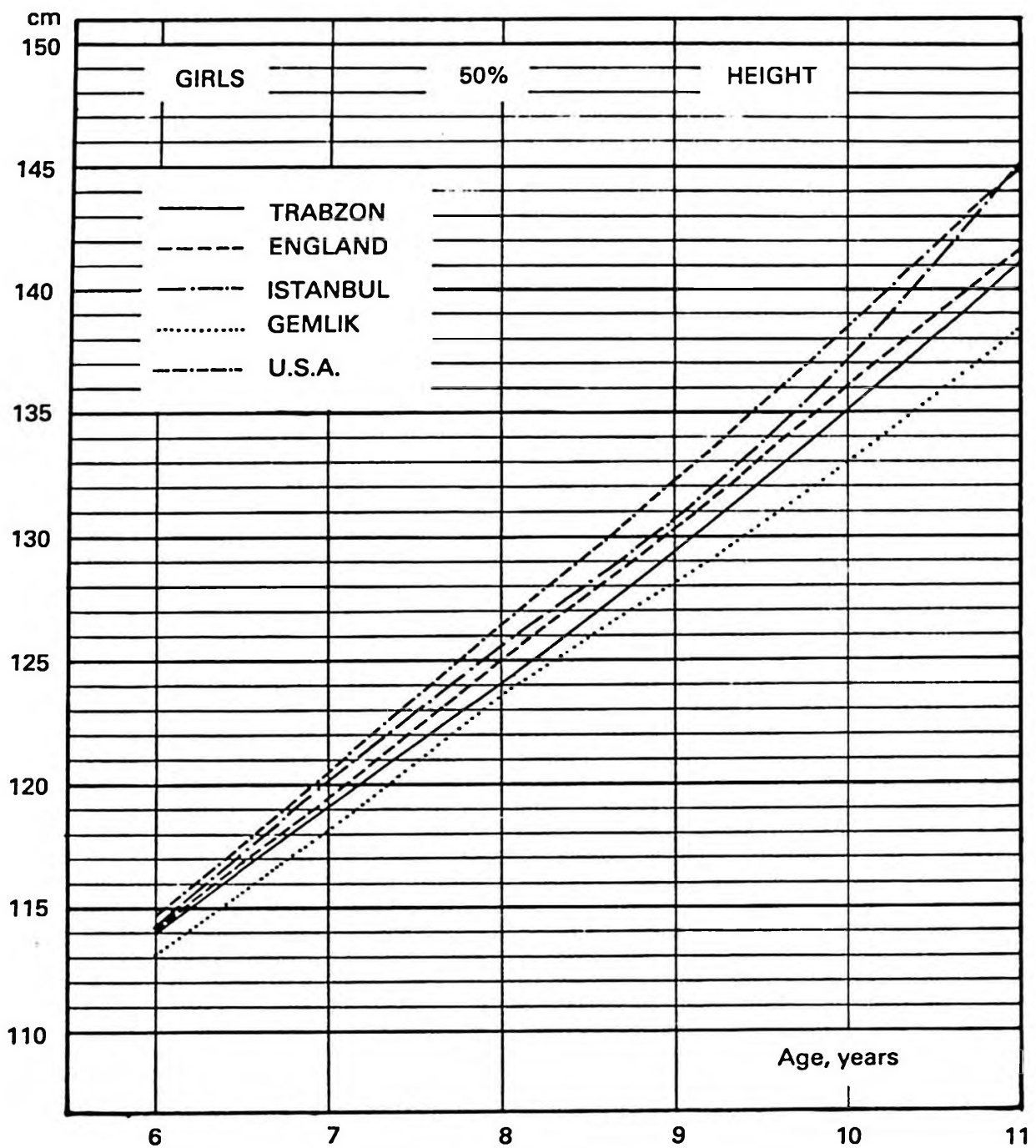


Figure 8

The comparison of height percentiles (50%) of 6-11-year-old girls with different study groups

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