

**A BIOMETRICAL INVESTIGATION ON THE THREE
ANTHROPOMETRIC CHARACTERS AND THEIR
CHANGES ACCORDING TO THE SOCIO-
ECONOMIC GROUPS IN TURKEY***

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Introduction

In our investigation, we have examined whether height, cephalic index and chest circumference of individuals vary according to the socio-economic groups to which these individuals belong. Our main goal was to compare the anthropometric measurements of the individuals from the three socio-economic groups, and we also had in mind to search for the regional factors consecutively.

The effect of socio-economic factors upon height have been studied and accepted by many investigators from other countries (Walter, 1953; Chamla, et. al., 1959; Suzuki, 1968; Dzierzykray-Rogalski, 1968; Prokopec, 1968; Rea, 1971; Goldstein, 1971). In our country, C. O. Binbaşoğlu (1950) investigated 317 elementary school children from Ankara and found that the heights of Yenisehir children, who are from higher socio-economic groups, are greater than the heights of Cebeci children, who are from lower socio-economic groups, but he did not investigate whether or not the differences in height are statistically significant.

So far as the cephalic index is concerned, Chamla, et al. (1959) have come to the conclusion that there is not a regular increase or decrease in the cephalic indexes of subjects as we move from lower socio-

* Having made the same investigation before, submitted as a dissertation in April, 1970, this article is rewritten from a different point of view.

economic groups to higher socio-economic groups. Boas (1908), Pessler (1940) and Fischer (1960) have discussed the probable effects of environment upon cephalic index; but this subject is still controversial.

No doubt the relations between an individual and his environment are more powerful than they seem superficially and a person cannot be considered apart from his environment from the point of view of the social values he owns and his attitudes in relation to these values. In other words the independence of an individual is limited. It is very easy to understand these principles with respect to social actions, but it is usually hard either to accept the individual-environment relations or to get them accepted when this problem is handled from the point of view of a person's physical structure. The anthropometric measures of a person also are physical in quality. The role of heredity in these qualities is dominant. But it is impossible to handle heredity by considering it apart from environment. That is, the socio-economic qualities of a person appear as a social inheritance. We can state various examples of these: the ancestors of at least 90 out of 100 people who are dealing with agriculture in the rural regions of South-East Anatolia today had been dealing with agriculture for 3-4 generations too. It cannot be said that there are investigations directly on the subject of social inheritance in Turkey. However, we can mention the existence of a social inheritance for the Turkish community without making investigations of this kind, and only by examining the social structure and institutional formations. The direction of change in social structure is not at such a rate as to level off the existence of this social inheritance. Even in cities developing rapidly because of the foundation of heavy industry, there is evidence maintaining the traces of social inheritance (Kıray, 1964). Because social inheritance means the continuation of environmental conditions for a long period, from generation to generation, it can have effects on anthropometric measurements of a person as well as his biological inheritance. In our investigation, the hypothesis that height, cephalic index and chest circumference of individuals vary according to the socio-economic groups to which these individuals belong has formed our starting point.

Subjects And Methods

We carried out our survey between 1966-1968 on 568 men and 556 women, whom we had drawn by quota sampling. The socio-economic groups we handled were: I- University graduates, II- Skilled workers, III- Unskilled workers. We defined the regional characteristics of an individual as being not only the geographical region in which he lives at the time of this research, but also the region in which he was born and completed his growth span.

The nineteen sixty Census Records have been used in assigning our quotas. For dividing Turkey into the regions, the present geographical division was adopted. Since it was impossible to carry out this research in the whole area of each region as a single researcher and with very limited financial possibilities, a town from each region was chosen as being representative of that region. This choice was made arbitrarily according to the characteristics they have. So far as this is concerned, one might think that these towns could have been chosen according to the rules of probability; but the necessity of carrying out our research within the main socio-economic groups prevented us from such a sampling. For instance had Sinop, Kastamonu, Rize etc., been drawn, the samples would not have been sufficiently representative of some of the socio-economic groups. This situation obliged us to choose towns in which all three socio-economic groups have been represented with all their characteristics. Consequently we have chosen the following towns as representative of their regions: Zonguldak from the Black Sea Region, Istanbul from the Marmara Region, Izmir from the Aegean Region, Antalya from the Mediterranean Region, Ankara from the Central Anatolia Region, Diyarbakır from the South East Anatolia Region, and Erzurum from the East Anatolia Region. Most of these towns have been mode towns of the regions they belong to with respect to their populations between the ages 20 - 45. Exceptions were made in choosing Antalya instead of Adana, Zonguldak instead of Samsun, Diyarbakır instead of Gaziantep, because they are more typical of the main characteristics to be searched for in the regions they belong to.

After having chosen the towns, we firstly established male and female quotas for each region (Tables I, II-A) and then divided them into the three socio-economic groups (Table II-B), supposing the dist-

tribution of each socio-economic groups to be independent from each other (Table II-B).

Our choice for the individuals, within the quotas was severely limited. We were to find the individuals who were between the ages 20-45, who belonged to one of the three socio-economic groups, who were not only born but also grew up in one of the geographical regions in which they have been living at the time of this research, and who at the same time, allowed us to measure them. The number of the individuals to be measured in each region was determined by the quotas.

If allowance is made for the controls mentioned above, on the investigator's personal choice, one would think that the biases, due to this choice in a quota sampling, were minimized. Apart from this, our data, consisting of the measurements of the individuals, have not been subject to the disadvantages of the quota sampling in behavioural research.

We obtained measurements from the members of the three groups by Martin Methods in the places where they worked, during the summers of 1967 and 1968. Subjects were in minimum clothes when measured. They took their shoes off for the height measurements. Height was measured with Martin anthropometer, maximum head length and maximum head breadth were measured with a spreading caliper, and chest circumference was measured with a flexible steel tape. The principles of measurement technique are described in a detailed manner by Martin (1957, p. 323-324, 339-340, 362-363).

Results and Discussion

Socio-economic factors

We found the averages for each of the anthropometric measurements, studied these averages (see Table III) and came to the following conclusions:

- i- The average heights decrease regularly from the first socio-economic group to the third both in women and men.
- ii- For chest circumference, the averages from groups I to III show a decrease in men while increasing in women.

- iii- As to cephalic index, the averages indicate an increase even though it is slight, from groups I to III in men. But there is no steady increase or decrease in women.

Then we estimated variation coefficients ($V = \frac{s}{\bar{x}}$) for each of

the anthropometric measurements separately, first of all by sex and socio-economic groups, but not on a regional basis. [Our research has been done for the whole of Turkey; but in order to investigate the regional differences, even though superficially, four regions were selected and covered in detail. Istanbul was the town chosen in our sample to represent the first region. The complexity of its nature in respect to socio-economic classes and racial characteristics, also reflects the other big towns such as Izmir (representative of the Aegean Region) and Ankara (which was representative of the Middle Anatolia Region). We excluded Antalya from this rather limited examination, because it did not offer any considerable differences with respect to socio-economic groups]. Secondly, we found the respective coefficients within the socio-economic groups by the geographical regions, and finally, without regard for the socio-economic groups, but by the geographical regions alone (Tables IV, V, VI, VII, VIII, IX). Although these seemed to suggest that our sample results were statistically reliable, we further established whether the differences among the averages were significant

by means of the test of hypothesis by "z" coefficients ($z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$).

Having examined these coefficients, we can comment on our results as follows:

- i- The differences in the mean heights among the groups are all significant both for men and women (Table X). The differences in significance between groups II and III are less than those between I and III, and I and II. This result assumes more validity if we take into account the fact that groups II and III are not so definitely differentiated from each other socio-economically as groups I and II, and I and III are. It is interesting, further-

more that the differences in significance are present to the highest degree between the groups which are furthest removed socio-economically from one another (1st and 3rd groups) (Table X).

Therefore, in demonstrating statistically, the effects of socio-economic factors upon the height of men, we came to a conclusion which supports the other studies made on this subject in our country (Binbaşıoğlu, 1950), and in other countries (Walter, 1953; Chamla et al., 1959; Suzuki, 1968; Dzierzykay-Rogalski, 1968; Prokopec, 1968; Rea, 1971; Goldstein, 1971).

- ii- For the mean cephalic indexes, none of the differences among the groups is significant, except for the differences between groups II and III for women, where the difference is significant although only to a limited extent (see Table X). If the "z" coefficients are examined, however, disregarding the limits of significance levels, on the part of males one can see that, the coefficients found for the cephalic index are parallel to the coefficients found for the height. It is evident that it is necessary to base a study on a very large size sample in order to test the significance of very small differences as are those of our differences for mean cephalic indexes. But the possibilities open to a single researcher did not permit us to cover such a large sample. Just such a sample, however, could in future provide a basis for a detailed and more comprehensive investigation of the question posed here. From this point of view and taking into account that the figures by which the difference for the mean cephalic indexes expressed are very small, we should not infer here, from the fact that the differences among groups are not significant, that socio-economic factors have no effect upon the cephalic index.
- iii- All the differences in chest circumferences which occur among the socio-economic groups are significant, apart from the differences between groups II-III for men and groups I-II for women. In the matter of insignificance of the difference between the male II-III groups, we may repeat

what we have already said when interpreting the degrees of significance of the differences of mean height between the male II-III groups. As for the insignificance of the difference between the female groups I-II, this can be explained as being due to the common use of brassieres by the individuals of both groups, which has to some degree caused standardization in chest measurements. Despite the fact that maximum care has been taken to prevent the probable biases while measuring, it is obvious that the habit of using brassieres from an early age affects the chest circumference. This effect can also be seen from the examinations of the variation coefficients from groups I to III: $V_1 = 0.07346$, $V_2 = 0.08722$, $V_3 = 0.09719$.

On the other hand, on the male side, one can see that, as with the significance coefficients for the cephalic index, the coefficients found for the chest circumference are parallel to the height coefficients. This suggests the following question: Are the differences in cephalic index or chest circumference observed among the three groups which we have examined, due to the socio-economic variables or were they simply correlated with height?

Thus it seemed advisable to find correlation and regression coefficients for height-cepahalic index and height-chest circumference.

Regional factors

"z" coefficients were calculated for both the differences in height among the regions within the socio-economic groups, and the general regional differences in height disregarding the socio-economic groups for both male and female. Nevertheless almost all were insignificant (Table XI-XII). The only significant z value (-2.137) was that of the difference in the heights of the 3rd group of males between the Black Sea Region and the South East Anatolia Region, and a z value of 1.94 which is very close to 1.96 was obtained again for the difference in the heights of the 3rd group of males between the Black Sea Region and the Marmara Region. If we take into account the fact that the mine workers were in a majority in the 3rd group of the Black Sea Region, we would think that these values reflect the effect of the working conditions on height in the male group III rather than the geographical

differences. When z values for the general regional differences are examined, the only significant value was that of the difference in the males' height between the Black Sea Region and the Marmara Region. Although it is worth remembering that the sample sizes for these regions were larger than the others' as required by the quotas, we can suggest that this value offers the effect of the different socio-economic conditions on height in males, considering the differences in these conditions in these two regions, and also the insignificant z coefficient which is obtained for women of the same regions despite the same sample sizes as those of men for these regions. However, as it is known it is necessary to study with a large sample size to test the significance of the small differences. For that reason, considering only the insignificance of our z values, we do not suggest that there is not any effect of geographical conditions on height. So, we did not look any further into the other measurements. It is our hope that a further study with a larger sample would justify the regional effects.

A study of the probable correlations between height and cephalic index, and between height and chest circumference

For reasons already mentioned, we have calculated the correlation and regression coefficients by means of the formula

$$r = \frac{\sum (x_1 - \bar{x}_1)(x_2 - \bar{x}_2)}{n \cdot \sigma_1 \cdot \sigma_2} \text{ and the regression equations: } x_2 = a + bx_1,$$

and the residual variation: $s = \sqrt{\frac{\sum (x_2 - x'_2)^2}{n}}$ in each socio-economic

group between height and cephalic index and between height and chest circumference respectively (Table XIII). Then we estimated these coefficients without regard to the socio-economic groups (see Graphs) and came to the following conclusions:

- i- There is a negative correlation between height and cephalic index in males ($r = -0.299$, $b = -0.24$, $s = 2.233$), although it is of low degree. The interesting fact is the existence of the positive correlation between the same measurements for women ($r = 0.425$, $b = 0.142$, $s = 1.864$), which varied inversely to that for men. It is even more interesting when r coefficients are compared with respect to their degrees

between males and females within the socio-economic groups (Table XIII). We note here that the mean heights varied from group I to III in a decreasing direction for males and females significantly. Cephalic index indicates a variation from group I to III in an increasing direction for males. As to the females, neither mean values, nor z values present any certain variation for head index. We can explain this, as with the controversy in correlation coefficients between males and females, as follows: The women of the three groups have not been differentiated so sharply from each other as men have been. It is evident that many factors are associated with the working conditions of women. There is e. g., the fact that women, for centuries have been involved only remotely in intellectual activities in Turkey; thus her socio-economic level appeared as a function of her husband's living standard (for instance, the living standard of a nurse whose husband is a doctor would be in accordance with that of doctors rather than that of nurses), and her earning has formed only an addition to the family income.

- ii- In males, although the correlation coefficients do not offer any correlation between height and chest circumference within the socio-economic groups except for the coefficient for group III (Table XIII); when the correlation coefficient is calculated without regard to the socio-economic groups, a positive correlation becomes apparent ($r = 0.56$). The regression coefficient (0.455 with a residual variation of 1.684) supports this judgement. As to females the r coefficient for the group II indicates a negative correlation between height and chest circumference, while the r coefficient for group III suggests a positive one between the same measurements; and for group I, r coefficient although positive, is not significant. When r and b coefficients are calculated without regard to the socio-economic groups the three inconsistent coefficients were reduced to a lower degree ($r = -0.109$, $b = -0.114$, $s = 2.716$) which does not present any considerable correlation and the residual variation is high. Therefore the correlation coefficients which were calculated without regard to the socio-economic groups for females are less consistent with that

for males than when compared the r coefficients which were calculated with regard to the groups. When the mean chest circumferences (Table III) and the z coefficient (Table X) obtained for the differences in this measurement are considered at the same time, the effect of the socio-economic factors is clear.

What I have tried to do throughout this study was to establish the best positive bridge between the goal and the methods. The starting point of my strategy was to find a design which would include the hypothesis that I wanted to analyse, which would lead to the goal, and would suffice for the maximum utilization of the limited resources. So the design which was outlined was obtained. I think it has enabled me to analyse several aspects of my hypothesis. I came to the conclusion that the three anthropometric measurements of Turkish people varied according to the socio-economic groups to which they belong.

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TABLE I (TABLE I)
 THE DISTRIBUTION OF THE TOTAL TURKISH POPULATION BETWEEN THE AGES 20-45 BY SEX AND THE
 GEOGRAPHICAL REGIONS
 (20-45 YAŞLARI ARASINDAKİ NÜFUSUN COĞRAFI BÖLGELERE GÖRE DAĞILIMI)

Geographical Regions (Coğrafi Bölgeler)	Men (Erkek)	Women (Kadın)	Total (Toplam)	M % (% E)	W % (% K)	T % (% T)
Black Sea Region (Karadeniz Bölgesi)	785,282	911,253	1,696,535	8.60	9.97	18.57
Marmara Region (Marmara Bölgesi)	1,045,410	848,719	1,894,129	11.44	9.29	20.73
Aegean Region (Ege Bölgesi)	668,934	644,380	1,313,314	7.82	7.00	14.37
Mediterranean Region (Akdeniz Bölgesi)	453,080	443,428	896,508	4.96	4.85	9.81
Central Anatolia Region (İç Anadolu Bölgesi)	848,608	834,265	1,702,873	9.29	9.35	18.64
East Anatolia Region (Doğu Anadolu Bölgesi)	493,714	489,059	982,773	5.40	5.36	10.76
South East Anatolia Region (Güney Doğu Anadolu Bölgesi)	315,461	331,939	650,400	3.45	5.67	7.12
	4,610,509	4,526,043	9,136,552	50.46	49.54	100.00

TABLE II-A (TABLO II-A)
 THE DISTRIBUTION OF THE SAMPLE BY SEX AND GEOGRAPHICAL REGIONS, AGE 20-45 YEARS
 (20-45 YAŞLARI ARASINDAKİ ÖRNEKLERİN COĞRAFI BÖLGELERE GÖRE DAĞILIMI)

Regions (Bölgeler)	Men (Erkek)	Women (Kadın)	Total (Toplam)	M % (% E)	W % (% K)	T % (% T)
Black Sea Region (Karadeniz Bölgesi)	97	112	209	8.60	9.97	18.57
Marmara Region (Marmara Bölgesi)	129	105	234	11.44	9.29	20.73
Aegean Region (Ege Bölgesi)	82	79	161	7.32	7.05	14.37
Mediterranean Region (Akdeniz Bölgesi)	56	54	110	4.96	4.85	9.81
Central Anatolia Region (İç Anadolu Bölgesi)	104	106	210	9.26	9.85	18.64
East Anatolia Region (Doğu Anadolu Bölgesi)	61	60	121	5.40	5.36	10.76
South-east Anatolia Region (Güney Doğu Anadolu Bölgesi)	39	40	79	3.45	3.67	7.12
	568	556	1124	50.46	49.54	100

TABLE II-B (TABLO II-B)

THE DISTRIBUTION OF THE SAMPLE BY THE SOCIO-ECONOMIC GROUPS WITHIN EACH SEX AND GEOGRAPHICAL REGION, AGE 20-45 YEARS
(20-45 YAŞ ARASINDAKİ ÖRNEKLERİN COĞRAFI BÖLGELERE GÖRE SOSYO-EKONOMİK GRUPLAR İÇERSİNDEKİ DAĞILIMI)

Regions (Bölgeler)	Men (Erkek)			Women (Kadın)			Total (Toplam)
	I.	II.	III.	I.	II.	III.	
Black Sea Region (Karadeniz Bölgesi)	32	32	35	37	37	38	209
Marmara Region (Marmara Bölgesi)	43	43	43	35	34	35	234
Aegean Region (Ege Bölgesi)	27	27	28	26	26	27	161
Mediterranean Region (Akdeniz Bölgesi)	18	19	19	18	18	18	110
Central Anatolia Region (İç Anadolu Bölgesi)	34	35	35	35	35	36	210
East Anatolia Region (Doğu Anadolu Bölgesi)	20	20	21	20	20	20	121
South-east Anatolia Region (Güney-Doğu Anadolu Böl.)	13	13	13	12	14	14	79
	187	189	192	185	185	188	1124

TABLE III-A (TABLO III-A)

MEAN VALUES FOR THE THREE ANTHROPOMETRIC MEASUREMENTS BY SEX AND THE SOCIO-ECONOMIC GROUPS (in cm)
(SOSYO-EKONOMİK GRUPLARA GÖRE ÜÇ ANTROPOMETRİK ÖLÇÜYE DEĞİN ORTALAMALAR) (cm olarak)

	Men (Erkek)			Women (Kadın)		
	I	II	III	I	II	III
Height (Boy)	170.4	167.9	165.7	157.9	154.4	153.2
Cephalic Index (Baş endisi)	85.1	85.4	85.7	85.5	85.7	84.8
Chest Circumference (Göğüs Çevresi)	93.8	91.3	91.1	88.5	88.2	90.5

TABLE III-B (TABLO III-B)
 THE DISTRIBUTION OF THE MEAN HEIGHTS BY SEX AND SOCIO-ECONOMIC GROUPS IN GEOGRAPHICAL REGIONS (in cm)
 (SOSYO-EKONOMİK GURUPLAR İÇERSİNDE KADIN VE ERKEK BOY ORTALAMALARININ BÖLGELERE GÖRE DAĞILIMI (cm olarak))

Regions (Bölgeler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Marmara Region (Marmara Bölgesi) (İstanbul)	170.8	169.4	165.8	157.4	155.5	152.8
Black Sea Region (Karadeniz Bölgesi) (Zonguldak)	170.1	166.9	162.3	158.3	155.4	153.1
East Anatolia Region (Doğu Anadolu Bölgesi) (Erzurum)	169.5	168.5	164.4	157.1	153.8	153.3
South-East Anatolia Region (Güney Doğu Anadolu Bölgesi) (Diyarbakır)	168.9	167.0	167.9	155.3	155.6	152.5

TABLE IV (TABLO IV)
 VARIATION COEFFICIENTS FOR THE THREE ANTHROPOMETRIC MEASUREMENTS BY THE SOCIO-ECONOMIC GROUPS
 (SOSYO-EKONOMİK GURUPLARA GÖRE ÜÇ ANTROPOMETRİK ÖLÇÜYE DEĞİN DEĞİŞİM KATSAYILARI)

Anthropometric Measurements (Antropometrik Ölçüler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Height (Boy)	0.035	0.034	0.036	0.034	0.046	0.026
Cephalic Index (Baş Endisi)	0.050	0.055	0.055	0.044	0.046	0.056
Chest circumference (Göğüs Çevresi)	0.065	0.072	0.065	0.075	0.067	0.097

TABLE V (TABLO V)

VARIATION COEFFICIENTS FOR HEIGHT BY THE SOCIO-ECONOMIC GROUPS AND THE GEOGRAPHICAL REGIONS

(BÖLGELERE VE SOSYO-EKONOMİK GURUPLARA GÖRE BOYA DEĞİN DEĞİŞİM KATSAYILARI)

Regions (Bölgeler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Marmara Region (Marmara Bölgesi) (İstanbul)	0.051	0.043	0.046	0.042	0.033	0.031
Black sea Region (Karadeniz Bölgesi) (Zonguldak)	0.045	0.032	0.048	0.033	0.033	0.033
East Anatolia Region (Doğu Anadolu Bölgesi) (Erzurum)	0.059	0.039	0.049	0.020	0.041	0.044
South-east Anatolia Region (Güney Doğu Anadolu Bölgesi) (Diyarbakır)	0.054	0.026	0.048	0.041	0.036	0.045

TABLE VI (TABLO VI)

VARIATION COEFFICIENTS FOR CEPHALIC INDEX BY THE SOCIO-ECONOMIC GROUPS AND THE GEOGRAPHICAL REGIONS

(BÖLGELERE VE SOSYO-EKONOMİK GURUPLARA GÖRE BAŞ ENDİSİNE DEĞİN DEĞİŞİM KATSAYILARI)

Regions (Bölgeler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Marmara Region (Marmara Bölgesi) (İstanbul)	0.048	0.040	0.050	0.050	0.032	0.040
Black sea Region (Karadeniz Bölgesi) (Zonguldak)	0.056	0.045	0.052	0.041	0.042	0.037
East Anatolia Region (Doğu Anadolu Bölgesi) (Erzurum)	0.047	0.043	0.044	0.048	0.041	0.054
South-east Region (Güney Doğu Anadolu Bölgesi) (Diyarbakır)	0.060	0.068	0.049	0.034	0.040	0.074

TABLE VII (TABLO VII)

VARIATION COEFFICIENTS FOR CHEST CIRCUMFERENCE BY THE SOCIO-ECONOMIC GROUPS AND THE GEOGRAPHICAL REGIONS
(BÖLGELERE VE SOSYO-EKONOMİK GURUPLARA GÖRE GÖĞÜS ÇEVRESİNE DEĞİN DEĞİŞİM KATSAYILARI)

Regions (Bölgeler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Marmara Region (Marmara Bölgesi) (İzmitli)	0.065	0.066	0.082	0.078	0.110	0.116
Black Sea Region (Karadeniz Bölgesi) (Zonguldak)	0.074	0.065	0.051	0.076	0.109	0.108
East Anatolia Region (Doğu Anadolu Bölgesi) (Erzurum)	0.088	0.053	0.058	0.062	0.062	0.051
South-east Region (Güney Doğu Anadolu Bölgesi) (Diyarbakır)	0.065	0.068	0.053	0.010	0.059	0.088

TABLE VIII (TABLO VIII)

VARIATION COEFFICIENTS FOR THE THREE ANTHROPOMETRIC MEASUREMENTS OF MEN BY THE GEOGRAPHICAL REGIONS
(BÖLGELERE GÖRE ERKEKLERE DEĞİN ÖLÇÜLERİN DEĞİŞİM KATSAYILARI)

Regions (Bölgeler)	Height (Boy)	Cephalic Index (Boş Evidisi)	Chest circumference (Göğüs Çevresi)
Marmara Region (Marmara Bölgesi) (İzmitli)	0.044	0.047	0.078
Black sea Region (Karadeniz Bölgesi) (Zonguldak)	0.044	0.053	0.071
East Anatolia Region (Doğu Anadolu Bölgesi) (Erzurum)	0.046	0.044	0.065
South East Anatolia Region (Güney Doğu Anadolu Bölgesi) (Diyarbakır)	0.048	0.059	0.056

TABLE IX (TABLO IX)
 VARIATION COEFFICIENTS FOR THE THREE ANTHROPOMETRIC
 MEASUREMENTS OF WOMEN BY THE GEOGRAPHICAL REGIONS
 (BÖLGELERE GÖRE KADINLARA DEĞGİN ÖLÇÜLERİN DEĞİŞİM
 KATSAYILARI)

Regions (Bölgeler)	Height (Boy)	Cephalic Index (Baş endisi)	Chest circumference (Göğüs çevresi)
Marmara Region (İzmitli) (Marmara Bölgesi)	0.053	0.047	0.104
Black sea Region (Zeytinli) (Karadeniz Bölgesi)	0.049	0.042	0.105
East Anatolia Region (Erzurum) (Doğu Anadolu Bölgesi)	0.043	0.053	0.061
South-east Anatolia Region (Diyarbakır) (Güney Doğu Anadolu Bölgesi)	0.044	0.055	0.092

TABLE X (TABLO X)
 "z" VALUES FOR THE DIFFERENCES IN THE THREE ANTHROPOMETRIC
 MEASUREMENTS AMONG THE SOCIO-ECONOMIC GROUPS BY SEX*
 (ÜÇ ANTRPOMETRİK ÖLÇÜ YÖNÜNDEN SOSYO-EKONOMİK GRUPLAR
 ARASINDA GÖRÜLEN FARKLILIKLARA DEĞGİN "Z" DEĞERLERİ**)

	Men (Erkek)			Women (Kadın)		
	I-II	I-III	II-III	I-II	I-III	II-III
Height (Boy)	3.063	7.490	3.516	5.143	8.556	1.981
Cephalic Index (Baş endisi)	-0.667	-1.275	-0.581	-0.578	1.597	1.995
Chest circumference (Göğüs çevresi)	3.795	4.297	0.292	0.350	-2.553	-2.701

* If z value is lower than -1.96 or higher than 1.96, then it is significant.

** z değeri -1.96 dan küçük ya da 1.96 dan büyük ise anlamlıdır.

TABLE XI (TABLO XI)

" χ " VALUES FOR THE DIFFERENCES IN HEIGHT AMONG THE GEOGRAPHICAL REGIONS WITHIN EACH SOCIO-ECONOMIC GROUP (SOSYO-EKONOMİK GURUPLAR İÇERSİNDE KADIN VE ERKEK BOY ORTALAMALARININ BÖLGELERE GÖRE GÖSTERDİĞİ FARKLILIKLARA DEĞİN " χ " DEĞERLERİ)

The Regions Compared (Karşılaştırılan Bölgeler)	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Marmara R.-Black sea R. (İzmitli-Zonguldak) (Marmara B.-Karadeniz B.)	0.368	1.712	1.944	-0.634	-0.890	-0.251
Marmara R.-East Anatolia R. (İzmitli-Erzurum) (Marmara B.-Doğu Anadolu B.)	0.646	0.494	0.654	0.224	-0.194	-0.292
Marmara R.-South-East Anatolia R. (İzmitli-Diyarbakır) (Marmara B.-Güney Doğu Anadolu B.)	0.666	1.445	-0.835	0.972	-0.871	0.155
Black sea R.-East Anatolia R. (Zonguldak-Erzurum) (Karadeniz B.-Doğu Anadolu B.)	0.297	-0.919	-0.935	1.062	0.930	-0.116
Black sea R.-South-East Anatolia R. (Zonguldak-Diyarbakır) (Karadeniz B.-Güney Doğu Anadolu B.)	0.419	-0.064	-2.137	1.470	-0.110	0.310
East Anatolia R.-South-East Anatolia R. (Erzurum-Diyarbakır) (Doğu Anadolu B.-Güney Doğu Anadolu B.)	0.204	0.785	-1.223	0.909	-0.865	0.346

TABLE XII (TABLO XII)

"x" VALUES FOR THE DIFFERENCES IN HEIGHT AMONG THE
GEOGRAPHICAL REGIONS

(COĞRAFİ BÖLGELER ARASINDA BOY ORTALAMALARI YÖNÜNDE GÖRÜ-
LEN FARKLILIKLARA DEĞİN "x" DEĞERLERİ)

The Regions Compared (Karşılaştırılan Bölgeler)	Men (Erkek)	Women (Kadın)
Marmara R.-Black Sea Region (İstanbul-Zonguldak) (Marmara B.-Karadeniz B.)	2.291	-0.366
Marmara R.-East Anatolia Region (İstanbul-Erzurum) (Marmara B.-Doğu Anadolu B.)	1.068	-0.163
Marmara R.-South East Anatolia Region (İstanbul-Diyarbakır) (Marmara B.-Güney Doğu Anadolu B.)	0.553	0.072
Black-Sea R.-East Anatolia Region (Zonguldak-Erzurum) (Karadeniz B.-Doğu Anadolu B.)	0.797	0.714
Black Sea R.-South-East Anatolia Region (Zonguldak-Diyarbakır) (Karadeniz B.-Güney Doğu Anadolu B.)	-1.601	0.348
East Anatolia R.-South-East Anatolia Region (Erzurum-Diyarbakır) (Doğu Anadolu B.-Güney Doğu Anadolu B.)	-0.306	0.217

TABLE XIII (TABLO XIII)

CORRELATION COEFFICIENTS BY SEX WITHIN THE SOCIO-ECONOMIC
GROUPS

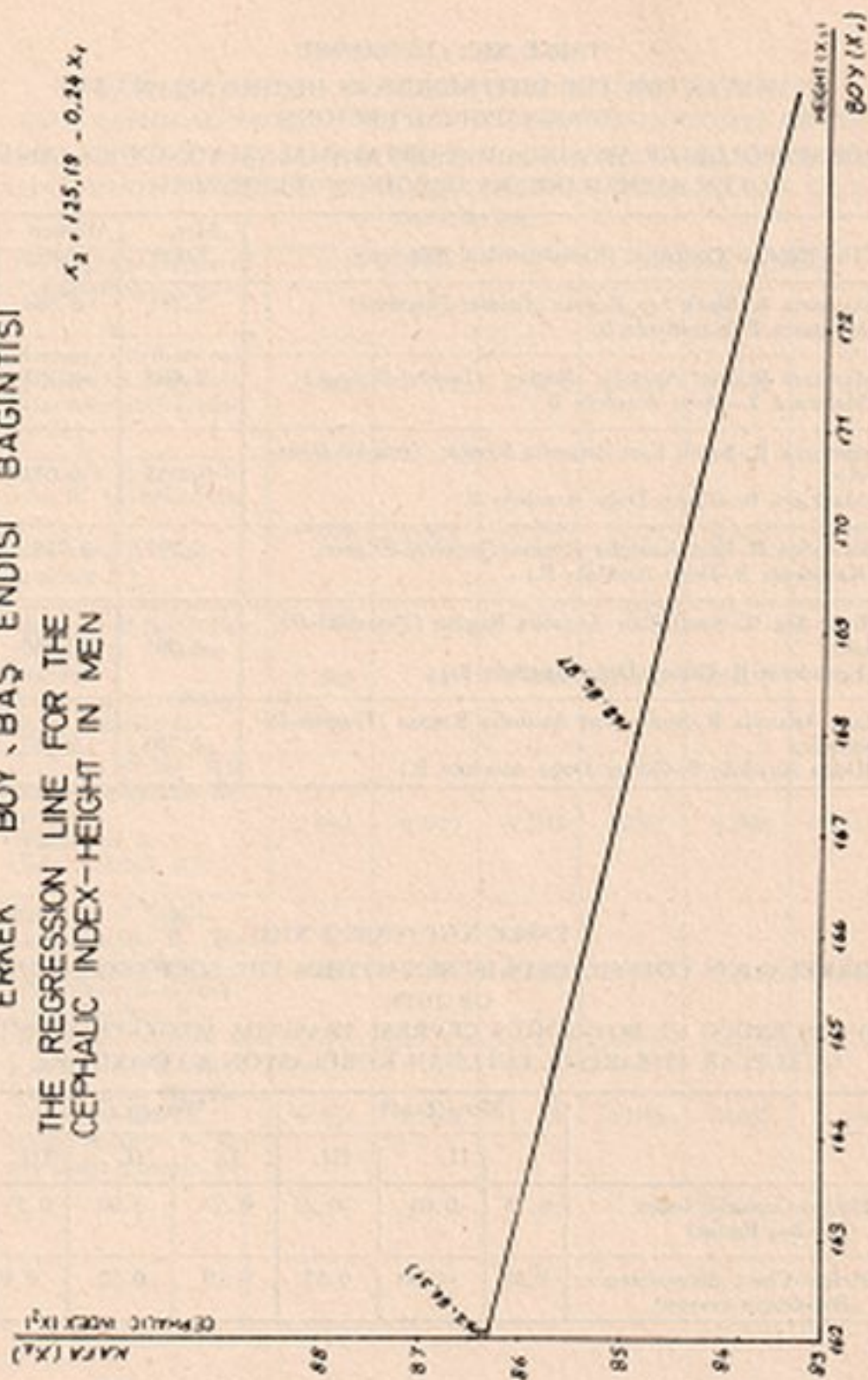
BOY-BAŞ ENDİSİ VE BOY-GÖĞÜS ÇEVRESİ ARASINDA SOSYO-EKONOMİK
GURUPLAR İTİBARIYLA BULUNAN KORELASYON KATSAYILARI

	Men (Erkek)			Women (Kadın)		
	I.	II.	III.	I.	II.	III.
Height-Cephalic Index (Boy-Baş Endisi)	0.43	-0.68	-0.25	0.57	0.09	0.25
Height-Chest circumference (Boy-Göğüs çevresi)	0.52	-0.69	0.53	0.19	-0.52	0.49

ERKEK BOY - BAŞ ENDİSİ BAĞINTISI

THE REGRESSION LINE FOR THE
CEPHALIC INDEX-HEIGHT IN MEN

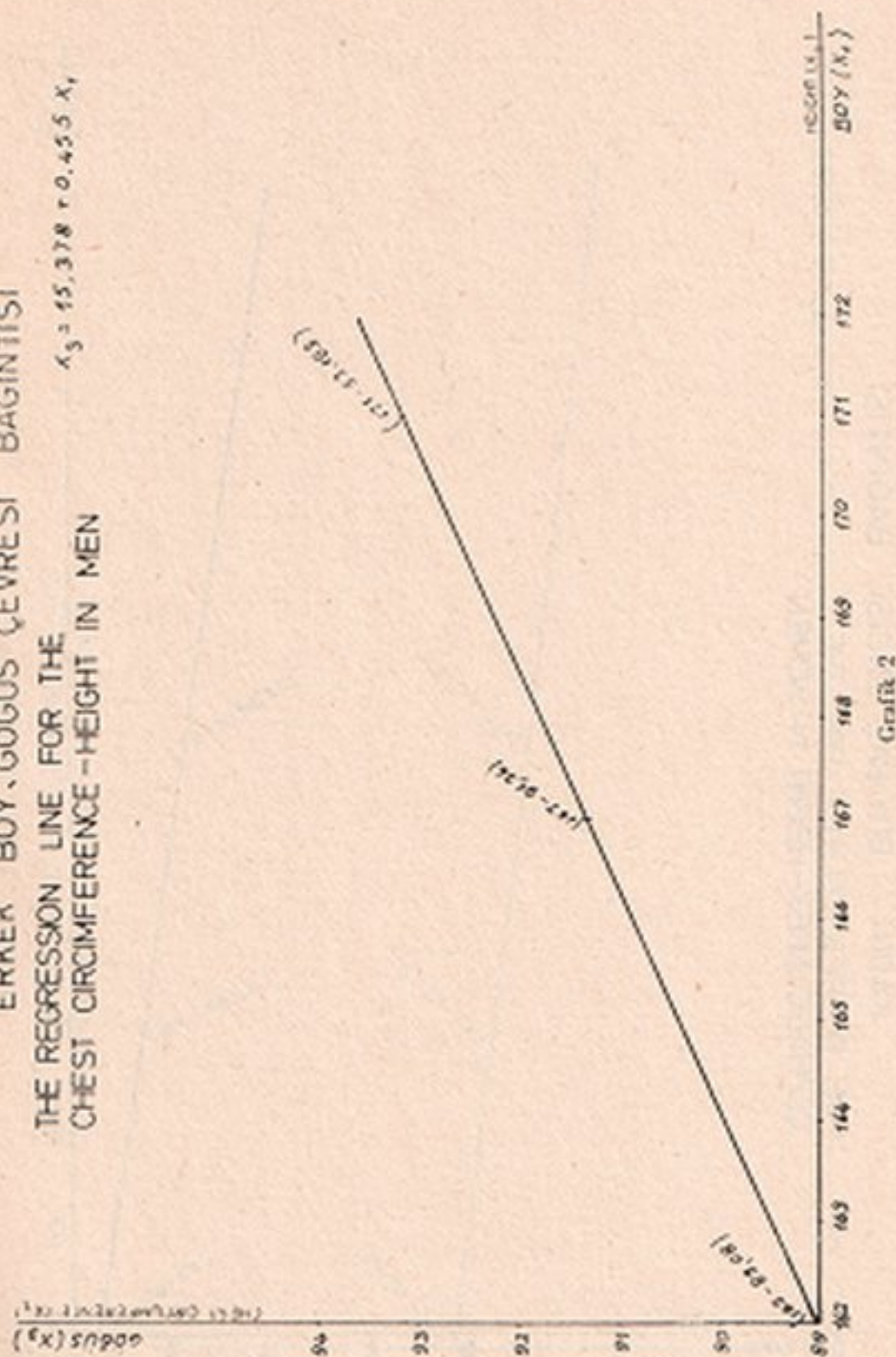
$$x_2 = 125,19 - 0,24 x_1$$



Grafik 1

ERKEK BOY, GÖĞÜS ÇEVRESİ BAĞINTISI
 THE REGRESSION LINE FOR THE
 CHEST CIRCUMFERENCE - HEIGHT IN MEN

$$X_3 = 15,378 + 0,455 X_1$$

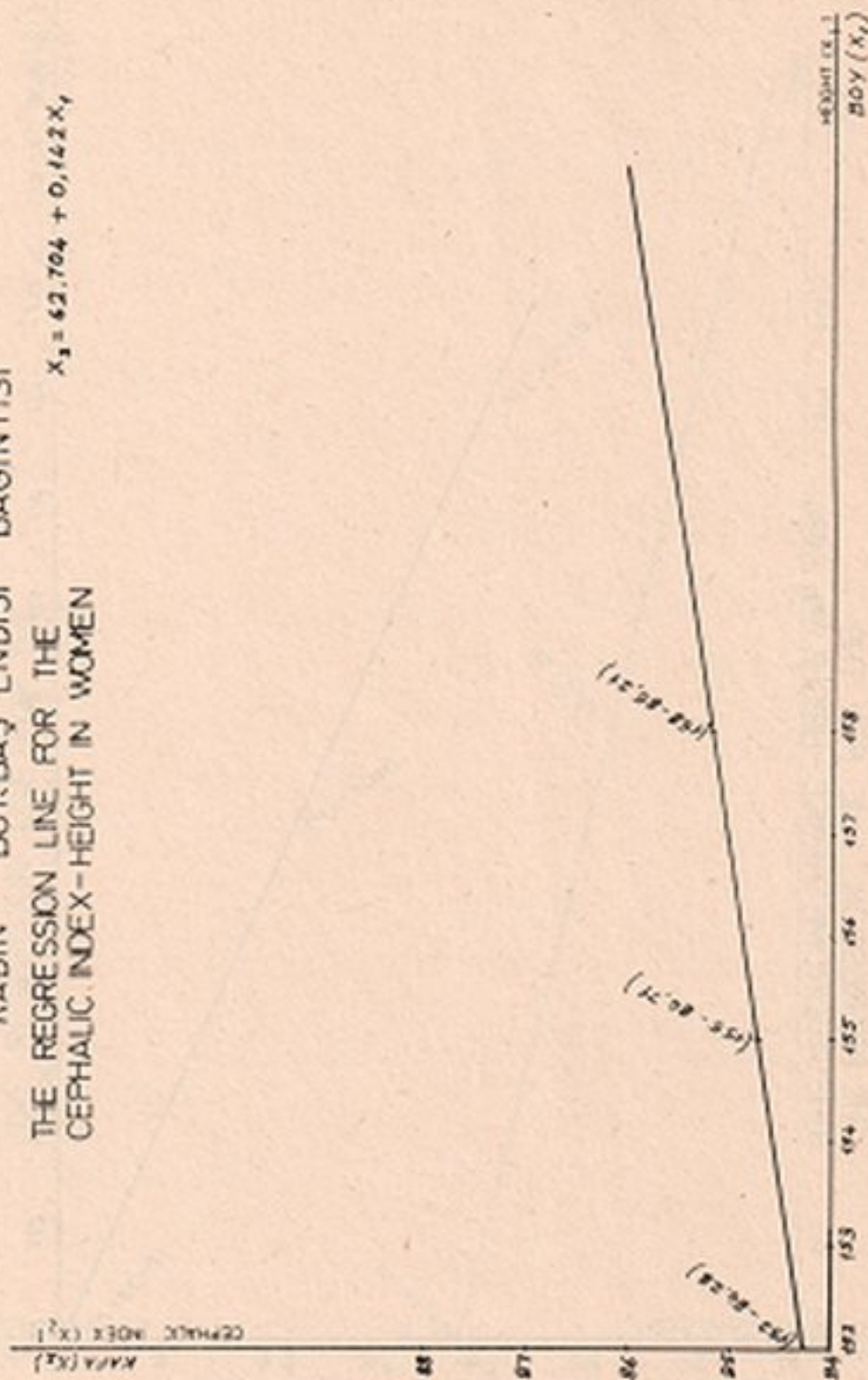


Grafik 2

KADIN BOY-BAŞ ENDİSİ BAĞINTISI

THE REGRESSION LINE FOR THE
CEPHALIC INDEX-HEIGHT IN WOMEN

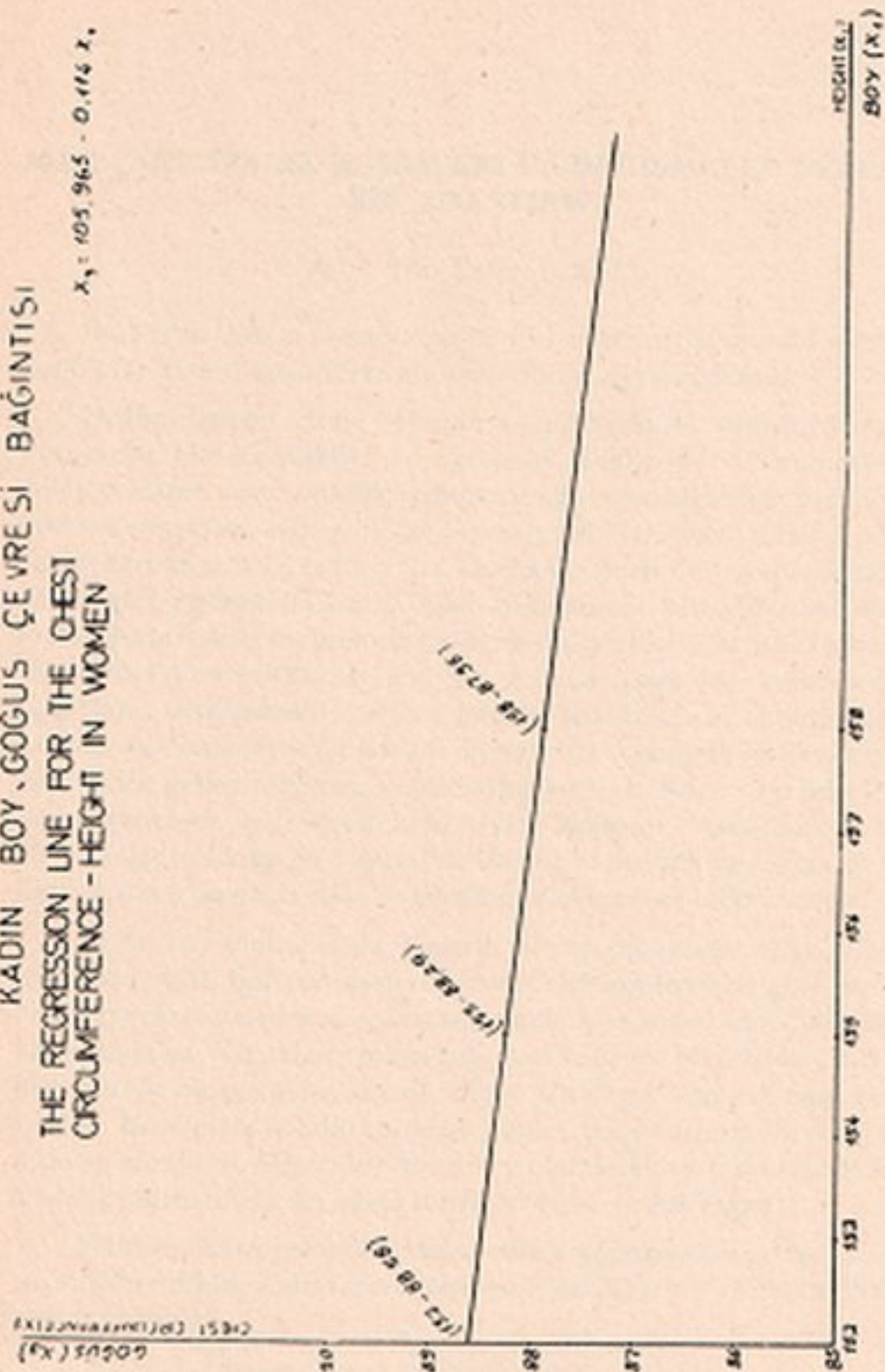
$$X_2 = 62.704 + 0.142 X_1$$



Grafik 3

KADIN BOY, GÖĞÜS ÇEVRESİ BAĞINTISI
 THE REGRESSION LINE FOR THE CHEST
 CIRCUMFERENCE - HEIGHT IN WOMEN

$$x_1 = 105.965 - 0.116 x_2$$



Grafik 4