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SOMATOTYPE OF MEN SUFFERING FROM ISCHAEMIC HEART DISEASE

SUMMARY

Differences in the distribution of somatotypes are reported in a group of 166 men suffering from IHD, and a group of 159 men without the disease. The modification of Sheldon's classification of somatotypes is described. The somatotype analysis revealed an accentuation of the endomorphic component, and supression of the ectomorphic component in men with IHD. Also the frequency of somatotypes corresponds with these findings: in the group of patients with IHD was recorded significantly more mesomorphic endomorphs ($p < 0.001$), and significantly fewer mesomorphic ectomorphs ($P < 0.01$). Endomesomorphs with IHD do not differ as to the occurrence of risk factors of IHD from ectomesomorphs with IHD — with the exception of obesity. Endomesomorphs have significantly greater robustness of the skeleton, more developed musculature, more frequent the "barrel-shaped" chest, short neck and protruding abdomen, significantly higher occurrence of obesity and increase of body weight in adult age. In endomesomorphs a higher fluid intake was recorded and less frequent feeling of being satiated after a meal and anorexia was rare. Ectomesomorphic patients with IHD have, contrary to endomesomorphic patients with IHD, a higher degree of anxiety, and depression.

INTRODUCTION

During somatoscopic and somatometric examinations of the normal population it is striking that various signs are mutually related. Frequently there is a correlation of morphological, and physiological signs or a relationship between physiological or pathological signs, and somatometric sign. These relationships can be explained by the fact that various signs are conditioned by the same causes (genetic information, impact of the external environment) or by the fact that the presence of one sign makes the development of another sign more probable.

We used these assumptions as a basis when we decided to investigate the relationship between body build, and ischaemic heart disease (IHD) which is the cause of the majority of deaths of the male population in developed industrial countries.

In the literature there are data referring to an association between the occurence of atherosclerosis and IHD, and the endomorphic and mesomorphic habitus, i.e. the type of body build where during ontogenesis a dominant role is played by the entodermal and mesodermal germ layer respectively (Gertler and White 1954, Spain et al. 1963, Seltzer 1966, Rissanen 1975). The aim of our study was to test the relationship between somatotypology and IHD, to make the results available for diagnostic use in preventive epidemiological surveys of the threatened population, and to investigate the incidence of risk factors of IHD in conjunction with the constitutional type accentuated in patient with IHD.

MATERIALS AND METHODS

We made a prospective observation in a group of 166 men suffering from IHD. Ischaemic heart disease was defined as the occurence of definite evidence of myocardial infarction (MI) (Shurtleff 1974). The age of the patients was 33 to 66 years, the mean age was 54 years.

The control group without symptoms of IHD was selected intentionally. Criteria of selection: male sex, age 30 to 65 years, health state: not treated for IHD in the past, at time of examination without any disease, ECG normal. Thus 159 men were selected; mean age 48 years.

For the classification of the somatotype we used modification of Sheldon's method (S h e l d o n 1954). The modification implies a certain objectification of Sheldon's method — it uses three triples of somatometric indices to express the ratio of different components of the somatotype (endomorphy, mesomorphy and ectomorphy).

The *endomorphic* component was characterized by the following indices:

1. facial index: $\frac{\text{morphologic face height}}{\text{bizygomatic breadth}} \times 100$
2. index of the relative abdominal circumference: $\frac{\text{abdominal circumference}}{\text{height}} \times 100$
3. index of breadth of chest: $\frac{\text{transverse diameter of chest}}{\text{trunk lenght}} \times 100$

For the metric expression of the *mesomorphic* component we used:

4. acromiocristal index: $\frac{\text{bi-iliocristal breadth}}{\text{bi-acromial breadth}} \times 100$
5. the development of the skeleton was evaluated by following index: $\frac{\text{width of wrist} + \text{femoral condylar breadth}}{\text{height}} \times 100$
6. for evaluation of the muscularity we elaborated the following index:

$$\times 100 \frac{\left(\frac{\text{upper arm circum.}}{3.14} - \text{triceps skinfold}\right) + \left(\frac{\text{forearm circum.}}{3.14} - \text{skinf. forearm}\right)}{\text{height}}$$

The *ectomorphic* component is characterized by the following three indices:

7. body surface per kg body weight: $\left(\frac{71.84 \times \text{wt.}^{0.425} \times \text{height}^{0.725}}{\text{body weight}}\right)$
8. ponderal index $\left(\frac{\text{height}}{\sqrt[3]{\text{weight}}}\right)$ was used as a simple indicator of body build and physique. Extremely low values indicate dominant endomorphs (S e l t z e r 1966)
9. index of linearity:

$$100 \times \left(\frac{\text{biacromial breadth} + \text{biiliocristal breadth} + \text{transversal diameter of chest}}{\text{height}}\right)$$

For each of these 9 indices the mean value $\bar{x}$, and standard deviation S.D. was calculated. By means of $\bar{x} \pm$ S.D. we assessed for each index the borderlines of three grades of development of the sign — index. The first grade has values smaller than $\bar{x}$ — 1 S.D., the second grade is within the range of $\bar{x} \pm 1$ S.D., and the third grade value is higher than $\bar{x} + 1$ S.D. Only in indices 1., 4. and 9. the order of gradation is reverse: the third grade has values smaller than $\bar{x}$ — 1S.D. etc.

Subsequently every index of every subject was classified according to its value. The values of the grades of each triple of indices (for the endomorphic, mesomorphic and ectomorphic component separately) were then added in every subject and from the resulting value number 2 was subtracted (so that the resulting value of each of the three somatotype components varied between 1 and 7).

The result is that each subject is described by a threedigit code where the first digit with values from 1—7 expresses the development of the endomorphic component, the second digit the development of the mesomorphic component and the third digit the development of the ectomorphic component.

The correct selection of different indices was confirmed by somatoscopy and by correlation analysis: indices characterizing the endomorphic component correlate positively mutually and negatively with indices for the ectomorphic component, etc.

All anthropometric points measured for use in indices were gathered according to the method of M a r t i n and S a l l e r (1957), and the Committee on Nutritional Anthropometry (1956).

Every individual was characterized by six somatoscopic signs: robustness of skeleton, development of musculature, length of neck, shape of regio submentalis, chest and abdomen.

By interview in each proband nutritional characteristics were assessed: appetite before the attack of MI, the feeling of satiety after a meal, preferred food group, number of meals per day, daily fluid intake, consumption of milk, beer, wine, spirits, black coffee, use of artificial sweeteners, consumption of animal fats and carbohydrate consumption.

By psychological tests the degree of anxiety, depression, and type of personality were assessed. Zung's "Subjective Scale of Depression" was used (SDS) (Z u n g et al. 1965) which makes quantification of the depressive symptomatology possible. We used also the "Manifest Anxiety Scale" (MAS) elaborated by A. Taylor (T a y l o r 1953). It is a screening questionnaire used for selection and differentiation of subjects with neurotic, anxious or depressive features. The personality was evaluated by means of Leary's Interpersonal Check List — level I, report on oneself (L e a r y and H a r v e y 1956). On a bi-axial scale dominance — submision (D-score) and aggression — affiliance (L-score) is evaluated.

As to risk factors (RF) of IHD the serum lipid level was assessed (cholesterol and triglycerides) according to Grafnetter (G r a f n e t t e r et al. 1967, G r a f n e t t e r 1973). The criterion of normal lipid levels were cholesterol levels below 260 mg⁰/₀ (6.74 mmol) for men under 40 years, and values below 280 mg⁰/₀ (7.25 mmol) for men above 41 years; triglyceride levels under 160 mg⁰/₀ (1.92

TABLE 1. *Combination of codes in different somatotypes of group without IHD and the group of patients with IHD*

SOMATOTYPE	Group without IHD				Patients with IHD			
	Combination of codes	Mean			Combination of codes	Mean		
		EN	ME	EC		EN	ME	EC
Strong endomorph	521, 531, 621, 731	5.8	2.5	1	531, 633, 732, 734, 743, 744	6.5	3.3	2.8
Medium endomorph	433, 533, 544	4.8	3	3	433, 533, 644, 544	5	3.5	3.5
Mesomorphic endomorph	432, 532, 541, 543, 632, 642, 643, 651	5.4	3.8	2	431, 432, 532, 541, 542, 543, 631, 632, 641, 642, 643, 651, 652, 654, 762	5.5	4	1.9
Mesomorph—endomorph	442, 551, 553, 554, 661	5	5	2	441, 442, 551, 552, 553, 554	4.7	4.7	2.2
Endomorphic mesomorph	353, 451, 453, 463, 562	4	5.4	2.2	342, 451, 453 561, 562	4.2	5.2	1.8
Ectomorph—endomorph	424, 535, 545	4.7	3	4.7	323	3	2	3
Ectomorphic endomorph	524, 534, 645	5.3	3	4.3	523, 534, 634	5.3	2.7	3.7
Endomorphic ectomorph	325, 425, 435	3.7	2.3	5	325, 427, 435, 437, 547	4	2.8	6.2
Medium mesomorph	454	4	5	4	343, 454, 565	4	5	4
Strong mesomorph	464	4	6	4	353, 464	3.5	5.5	3.5
Ectomorphic mesomorph	274, 354	2.5	6	4	254, 354, 364, 465	3	5.5	4.2
Mesomorph—ectomorph	455	4	5	5	255, 355, 455	3	5	5
Mesomorphic ectomorph	167, 235, 236, 245, 246, 247, 256, 257, 345, 346, 356, 357, 456	2.4	4.5	6.1	147, 237, 246, 345, 346, 356, 457	2.5	4.1	6.4
Medium ectomorph	334, 446, 447	3.7	3.7	5.7	445, 446	4	4	5.5
Strong ectomorph	227, 336, 337	2.7	2.7	6.7	335, 336, 337	3	3	6
Balanced	444, 434, 344	3.7	3.7	3.7	444, 443, 434, 344, 555	4	4	4
Total	61 combinations				74 combinations			

mmol) for men under 40 years, and 180 mg% (2.15 mmol) for men above 41 years.

The blood pressure was measured by means of a mercury sphygmomanometer and values above 150/95 mm HG in subjects under 44 years and values above 160/95 mm Hg in subjects above 45 years were classified as hypertension.

Obesity was evaluated by means of Ostrander-Lamphiear's index of adiposity (Ostrander, Lamphiear 1976) for men:

$$0.34 + 226 \left(\frac{\text{weight in kg}}{\text{height in cm}^2}\right) + 0.0074 \times$$

(triceps skinf.—subscapular skinf.)

Values of this index higher than 1.30 indicate obesity.

For statistical processing digit computer Minsk 22 was used according to programmes for correlation analysis and for calculation of $\bar{x}$, S.D., variation coefficient, t-test and chi square test. For each quantitative sign the test of normality distribution was made (in case of a non-Gaussian distribution of a sign, Kolmogorov-Smirnov's test was used).

RESULTS

By means of the above described somatotypological procedure we classified 159 men without IHD. For the group of 166 men with IHD we used the grades of different indices from the group of men without IHD.

In the group of men without IHD we found 61 combinations of codes (i.e. types of body build), in the group of men with IHD there were 74 combinations.

The groups were classified into 16 types (we did not record extreme types on our groups). Every type is characterized by a certain combination of development of the endomorphic, mesomorphic and

TABLE 2.
Expression of somatotype component in the group without IHD and in the group of patients with IHD.

Somatotype component	Men without IHD		Patients with IHD		*t*-test	P
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Endomorphic	3.99	1.04	4.45	1.18	3.726	0.01
Mesomorphic	4.01	1.01	4.02	0.88	0.953	NS
Ectomorphic	4.01	1.44	3.55	1.52	2.798	0.01

TABLE 3.
Frequency of somatotypes in the group without IHD and n the group of patients with IHD

Somatotype	Group without IHD n = 159		Patients with IHD n = 166		chi²	P
	n	%	*n*	%		
Strong mesomorph	4	2.52	7	4.22	0.379	NS
Medium endomorph	10	6.29	16	9.64	1.505	NS
Mesomorphic endomorph	14	8.80	37	22.29	11.261	0.001
Endomorphic mesomorph	8	5.03	5	3.01	0.821	NS
Mesomorph-endomorph	13	8.18	14	8.43	0.009	NS
Ectomorphic endomorph	7	4.40	4	2.41	1.518	NS
Ectomorph-endomorph	4	2.52	1	0.60	2.083	NS
Endomorphic ectomorph	4	2.52	7	4.22	0.379	NS
Strong mesomorph	1	0.63	4	2.41	1.595	NS
Medium mesomorph	11	6.92	11	6.63	0.030	NS
Ectomorphic mesomorph	4	2.52	5	3.01	0.073	NS
Mesomorph-ectomorph	1	0.63	4	2.41	1.595	NS
Mesomorphic ectomorph	26	16.35	11	6.63	7.813	0.01
Medium ectomorph	6	3.77	2	1.20	2.050	NS
Strong ectomorph	3	1.88	5	3.01	0.513	NS
Balanced	43	27.04	33	19.88	2.475	NS

TABLE 4.
Frequency of somatotype groups in the group without IHD and in the group of patients with IHD

Somatotypic group	Group without IHD		Patients with IHD		chi²	P
	n	%	*n*	%		
Endomorphs	14	8.80	23	13.86	1.953	NS
Endomesomorphs	35	22.00	56	33.72	5.512	0.05
Ectoendromorphs	15	9.44	12	7.23	0.657	NS
Mesomorphs	12	7.55	15	9.04	0.162	NS
Ectomesomorphs	31	19.51	20	12.05	3.350	NS
Ectomorphs	9	5.66	7	4.22	0.379	NS
Balanced	43	27.04	33	19.88	2.475	NS

ectomorphic component. This is expressed also by three-digit codes, the combinations of which for each somatotype are given in *table 1.*

When we compared the average representation of different somatotype components in the whole group of patients with IHD, with the corresponding data in the group of men without IHD, we found in the group of patients with IHD a significantly stronger expression of the endomorphic component and a significantly weaker expression of the ectomorphic component. Details are given in *table 2.*

In the group of patients with IHD, as compared with the group without IHD, there are significantly more mesomorphic endomorphs, and significantly fewer mesomorphic ectomorphs. Details are recorded in *table 3* and *fig. 1.*

Mesomorphic endomorph (figs 2 and *3)* has the least developed the ectomorphic component, and the most developed is the endomorphic one. In this somatotype there is, however, also a medium intense influence of the mesoderm (expressivity 3.7 to 4). Persons with this somatotype have a higher body weight, a higher skin-fold thickness, a higher index of adiposity, a greater robustness, and a marked general laterality.

In *mesomorphic ectomorphs (fig. 4)* — a significantly less frequent somatotype in patients with IHD — the influence of ectoderm is strongest, that of entoderm smallest. These individuals are small and slim with a low body weight and little subcutaneous fat, with a narrow pelvis and a mean somatic linearity.

As apparent from table 3, some somatotype groups in our patients and controls are very small. This eliminates these small groups from statistical processing. We grouped therefore the original 16 somatotypes into the following seven somatotype classes:

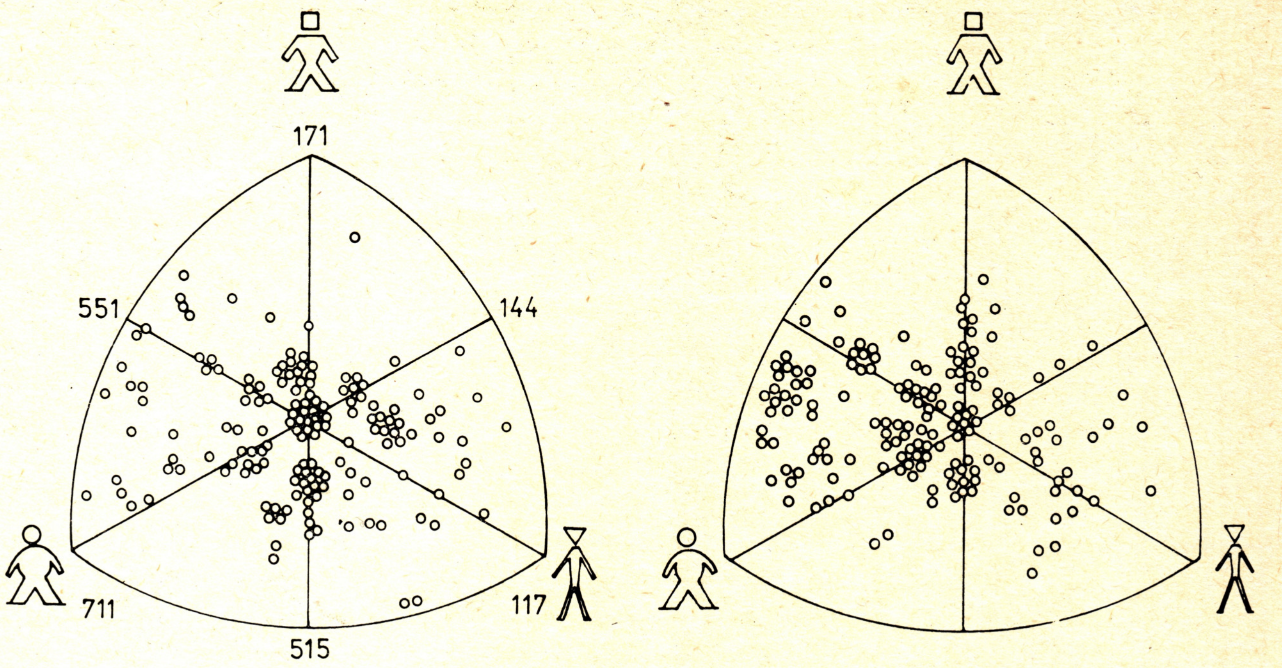

FIG. 1. *Classification of somatotype of 166 men suffering from IHD and 159 men of the control group. (Two-dimensional diagram according to Sheldon)*

1. *endomorphic* group: includes strong and medium endomorphs.
2. *endomesomorphic* group: comprises mesomorphic endomorphs, endomorphic mesomorphs and mesomorphs-endomorphs. It forms a transition beween endomorphy tna mesomorphy.
3. *ectoendomorphic* group: comprises ectomorphic endomorphs, endomorphic ectomorphs and ectomorphs-endomorphs. It consist mainly of individuals with a suppressed mesomorphy.
4. *mesomorphic* group: includes strong and medium mesomorphs.
5. *ectomesomorphic* group: comprises ectomorphic mesomorphs, mesomorphic ectomorphs and mesomorphs-ectomorphs. It is a transition between mesomorphy and ectomorphy.
6. *ectomorphic* group: comprises medium and strong ectomorphs.
7. *balanced* somatotype: forms a special group where all somatotype components have the same expression.

Table 4 records the significance of differences in the frequencies of the seven somatotype groups, formed by us, in the group of patients with IHD and in the group without this disease.

The somatotype class of endomesomorphs is significantly more frequent in men with IHD. The group of ectomesomorphs is more frequent — though only at the borderline of significance — in the group without IHD.

The somatotype group of endomesomorphs and the group of ectomesomorphs differ in some signs. Endomesomorphs when compared with ectomesomorphs have significantly more frequently a short neck, barrel-shaped chest, a protruding abdomen or venter pendulum, doubled regio submentalis and are more frequently obese. Endomesomorphs have significantly less frequently weak muscular development as well as delicacy of structure.

The higher occurence of obesity in endomesomorphs is associated also with some dietary habits: a more frequent increased appetite, a more frequent fluid intake exceeding 2 litres per day, more frequently their daily consumption of food is being taken by two meals only. The more frequent restricted carbohydrate intake reported by endomesomorphs is obviously the result of their efforts to reduce the weight. As compared with ectomesomorphs, endomesomorphs suffer less frequently from anorexia, and they lack significantly more frequently the feeling being satiated after a meal. Endomesomorphs reported also significantly more frequently an increase of body weight in adult age.

The following are on the other hand typical features of ectomesomorphs: a delicacy of stature, an asthenic chest and weak musculature. Venter pendulum, as well as a short neck do not occur. Obesity is also rare, although encountered occasionally. In ectomesomorphs we have found, however, a significantly higher grade of anxiety and depression. As to the type of personality we have not discovered any difference between the two somatotype groups; only an indication of a greater dominance in endomesomorphs. Details are given in the following tables (5.—7.).

We were interested whether the more frequent occurence of endomesomorphs in the group of patients with IHD was the result of a different frequency of the main risk factors of IHD in different somatotypes. We investigated therofore the frequency of the serum lipid level, blood pressure, smoking, obesity and diabetes mellitus in men with

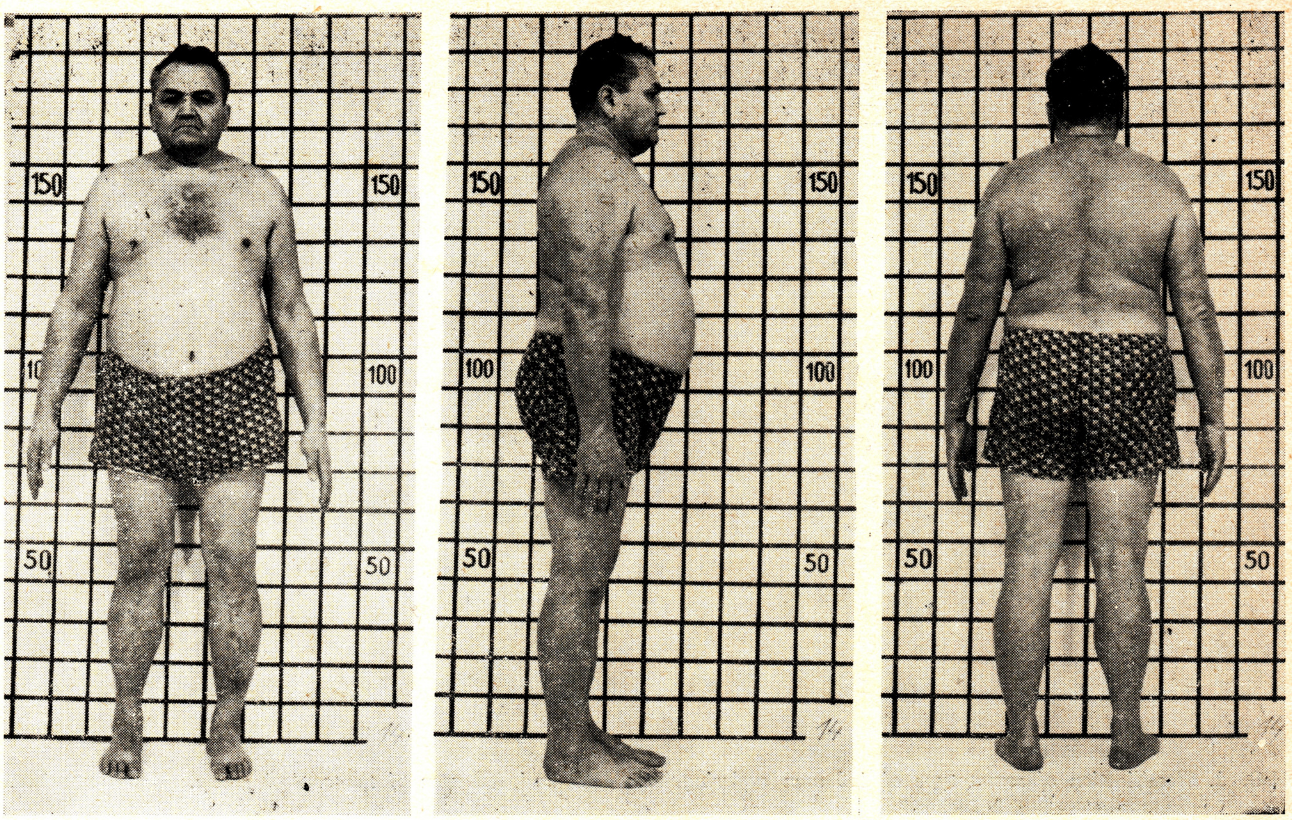

FIG. 2. MESOMORPHIC ENDOMORPH *(631)*
age of MI: 51,
body weight: 110.5 kg,
height: 175.0 cm,
% of fat: 33.5 %.

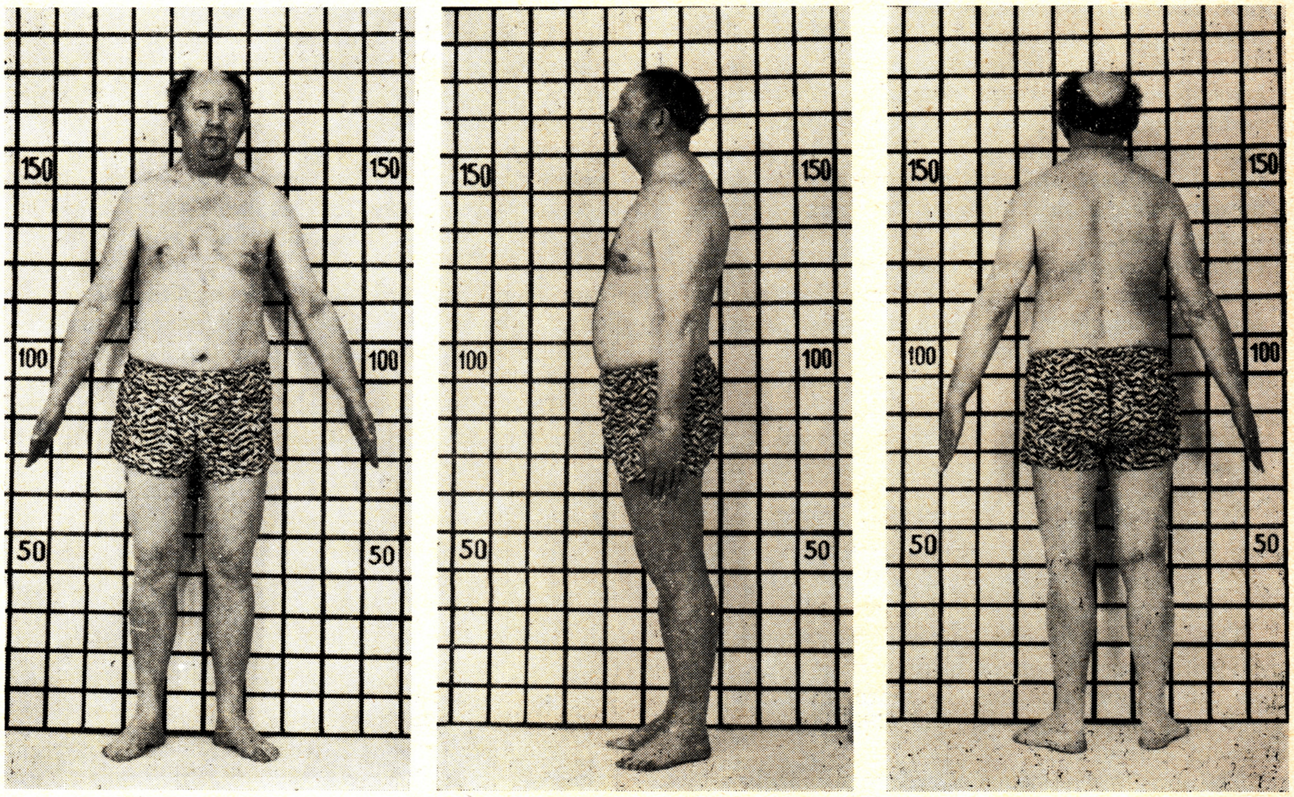

FIG. 3. MESOMORPHIC ENDOMORPH (654)
age of MI: 52,
body weight: 76.5 kg,
height: 168.5 cm,
% of fat: 27.0 %.

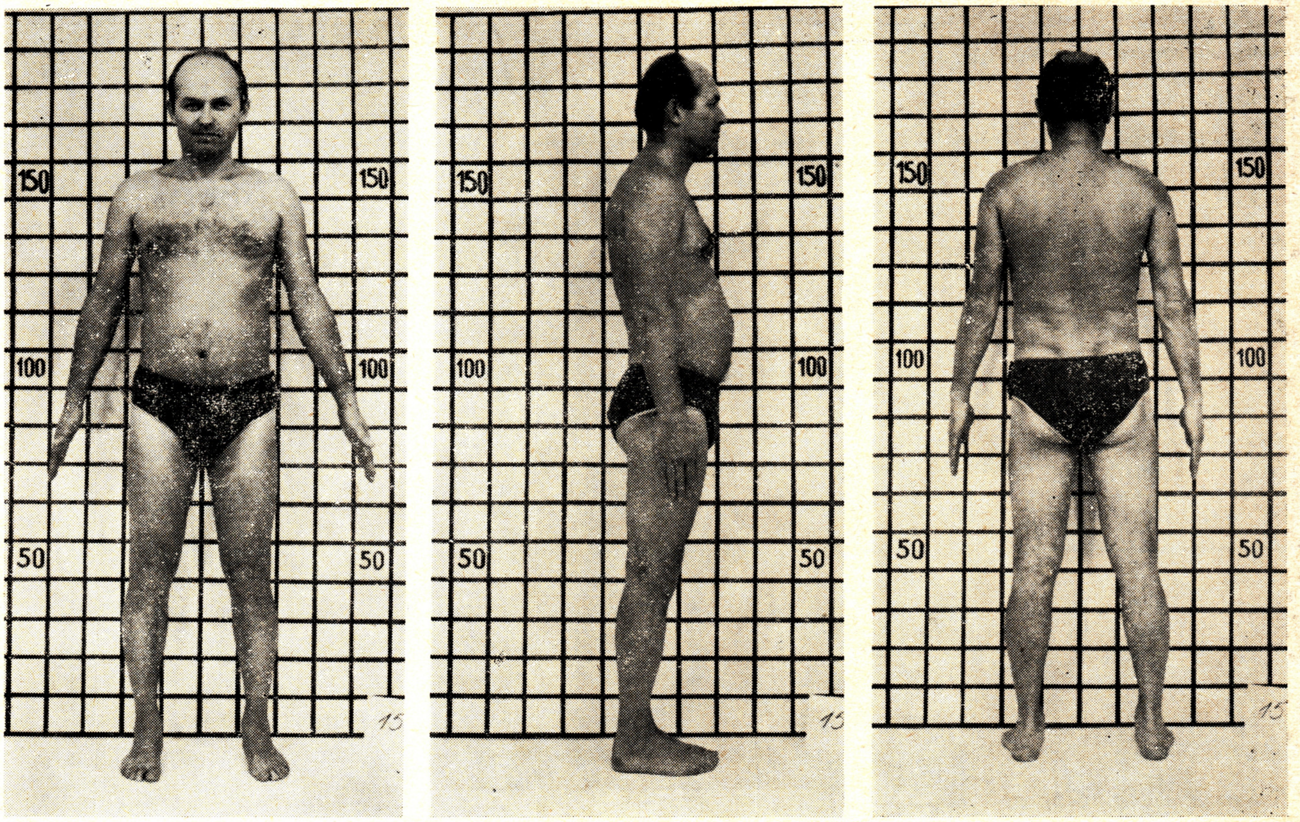

FIG. 4. MESOMORPHIC ECTOMORPH (356)
age of MI: 43,
body weight: 73.5 kg,
height: 174.0 cm,
% of fat: 28.3 %.

TABLE 5.
Somatoscopic differences between endomesomorphs and ectomesomorphs of the group of patients with IHD

Sign	Ectomesomorphs $n = 20$ %	Endo-mesomorphs $n = 56$%	chi^2	P
Skeleton:				
delicacy of structure	50.0	10.8	15.318	0.001
medium	50.0	44.6	0.274	NS
massive	0	44.6	13.377	0.00
Musculature:				
weak	35.0	3.6	17.970	0.001
medium	65.0	89.3	4.004	0.05
good	0	7.1	1.405	NS
Neck:				
long	10.0	0	6.157	0.05
medium	90.0	37.5	17.377	0.001
short	0	62.5	23.068	0.001
Regio submentalis:				
simple	85.0	19.6	29.443	0.001
double	10.0	53.6	10.125	0.01
treble	5.0	21.4	2.765	NS
more	0	5.4	1.137	NS
Chest:				
asthenic	20.0	1.8	11.897	0.001
normal	80.0	50.0	4.500	0.05
barrel-shaped	0	48.2	14.580	0.001
Abdomen:				
hollow	10.0	0	6.157	0.05
straight	65.0	21.4	10.860	0.001
protruding	25.0	73.2	13.877	0.001
venter pendulum	0	5.4	1.137	NS

TABLE 6.
Dietary differences between endomesomorphs and ectomesomorphs in the group of patients with IHD

Characteristics	Ectomesomorphs $n = 20$ %	Endomesomorphs $n = 56$ %	chi²	*P*
Appetite:				
good	70.0	67.9	0.071	NS
increased	10.0	26.7	1.651	NS
reduced	20.0	1.8	8.107	0.01
alternate	0	3.6	0.684	NS
Feeling of satiety:				
after ordinary helping	90.0	69.6	3.257	NS
rarely	5.0	28.6	4.774	0.01
soon	5.0	1.8	0.005	NS
Number of meals per day:				
2	5.0	12.5	0.742	NS
3	40.0	37.5	0.205	NS
4	35.0	41.1	0.283	NS
5	20.0	7.1	2.969	NS
6	0	1.8	0.435	NS
Type of diet:				
mixed	65.0	57.2	0.282	NS
protein	15.0	21.4	0.426	NS
fat	5.0	1.8	0.684	NS
carbohydrate	15.0	19.6	0.434	NS
Fluid intake:				
1 litre/day	20.0	8.9	1.652	NS
1—2 litres/day	55.0	60.7	0.232	NS
more than 2 litres/day	25.0	30.4	2.732	NS
Milk consumption:				
does not drink milk at all	30.0	10.7	4.721	0.05
little (1 litre a month)	30.0	23.2	0.362	NS
average (1 litre a week)	5.0	28.6	4.774	0.05
a lot (1/2 litre day and more)	35.0	37.5	0.073	NS
Beer consumption:				
does not drink beer at all	10.0	8.9	0.081	NS
occasionally (1 litre a week)	35.0	53.6	2.444	NS
1/2 litre a day	30.0	25.0	0.358	NS
1—2 litres a day	15.0	10.7	0.232	NS
more than 2 litres a day	10.0	1.8	2.556	NS
Wine consumption:				
does not drink wine at all	20.0	17.9	0.041	NS
twice a week up to 1/2 litre	70.0	69.6	0.022	NS
daily	10.0	12.5	0.103	NS
Consumption of spirits:				
does not drink	10.0	17.9	0.524	NS
once a month	60.0	58.9	1.241	NS
twice a week or daily	30.0	23.2	0.362	NS
Black coffee:				
does not drink	10.0	8.9	0.081	NS
occasionally (once a week)	5.0	16.0	1.530	NS
once a day	20.0	17.9	0.041	NS
2×/day	35.0	26.8	0.326	NS
3×/day or more	30.0	30.4	0.041	NS
Animal fat consumption:				
restricts fat intake	30.0	33.9	0.092	NS
average intake	25.0	37.5	1.198	NS
fat preference	45.0	28.6	1.769	NS
Carbohydrate consumption:				
restricts CHO intake	15.0	28.6	1.448	NS
average intake	45.0	33.9	1.184	NS
CHO preference	40.0	37.5	0.102	NS

TABLE 7.
Psychological differences between endomesomorphs and ectomesomorphs in group of patients with IHD

Characteristics	Ectomesomorphs n = 10		Endomesomorahs n = 26		t-test	P
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
SDS — degree of depression	44.0	9.60	35.36	9.12	3.113	0.001
MAS — anxiety scale	23.0	5.61	18.40	8.16	2.156	0.05
Type of personality:						
dominance	61.50	8.08	65.67	9.55	1.567	NS
affiliation	52.00	9.50	49.70	9.26	0.826	NS

TABLE 8. *Differences in the occurence of risk factors of IHD in endomesomorphs and ectomesomorphs in the group of patients with IHD*

Risk factors	Ectomesomorphs n = 20			Endomesomorphs n = 56			t-test or chi²	P
	$\bar{x}$	S.D.	%	$\bar{x}$	S.D.	%		
Blood lipids:								
cholesterol mmols.	5.952	1.302		6.264	1 122		1.672	NS
triglycerides mmols.	2.255	1.497		2.819	1.478		1.451	NS
hypercholesterolaemie			0			1.8	0.435	NS
hypertriglyceridaemie			40.0			41.1	0.011	NS
combined hyperlipidaemia			15.0			21.4	0.426	NS
Blood pressure:								
systolic mm Hg	143.8	23.18		148.6	30.56		0.660	NS
diastolic mm Hg	87.2	9.42		90.2	13.50		0.833	NS
hypertonics			35.0			50.0	1.322	NS
Diabetics			5.0			14.3	1.116	NS
Smoking:								
non-smokers			10.0			21.4	1.169	NS
1—10 cigs/day			0			10.8	2.371	NS
11—20 cigs/day			45.0			23.2	2.930	NS
more than 21 cigs/day			45.0			44.6	0.010	NS
Familial occurence of MI:								
nobody in family			50.0			71.4	2.695	NS
parents at age under 65 yrs			35.0			21.4	1.448	NS
siblings			10.0			10.7	0.031	NS
Obesity:								
index of adiposity	0.99	0.10	5.0	1.19	0.11	64.3	6.947	0.001
oceurence of obesity							21.993	0.001

the endomesomorphic type of body build and in men with the ectomorphic somatotype — in the group of patients with IHD.

We have found that the two groups do not differ in any of the investigated risk factors of IHD, only the occurence of obesity is significantly higher in endomesomorphs. Details are given in table 8.

From the table it is apparent that cumulation of risk factors of IHD is not the main cause of differences in the distribution of somatotypes in the group of patients with IHD.

DISCUSSION

Certain correlations of characteristics obviously enhance the liability to develop certain diseases. As early as in 1878 Beneke (1881) who attempted a morphological classification of phenotypic sings of the human body drew attention to the disposition of the constitutional class "large" to adiposity, "atheromatosis" of the arteries and similar diseases.

Chaillon and McAuliffe (1912) mention that the muscular type tends to develop diseases of the joints, bones, heart and skin.

Bauer (1921) who applies the endocrinological aspect as a criterion for constitutional types states that the "hypothyroid constitutional type tends to develop obesity and early atherosclerosis." Mentl (1937) mentions more frequent occurence of myocardial infarction in pycnomorphs. Gertler et al. (1964) mention among sings which strenghten predispositions for the development of IHD among others also mesomorphy. They emphasize the predictive importance of robustness and type of body build for the development of IHD. Kannel et al. (1967) admit that body build is more closely related to the development of IHD than obesity.

To the relationship between the incidence of IHD and body build attention was drawn also by other authors: Gertler and White (1954), Paul et al. (1963 and Spain et al. (1963)

found a lower occurence of IHD in subjects with market ectomorphic component.

Most of our results are consistent with the majority of the result quoted. In men with IHD we found a significantly greater expression of the endomorphic component and a lower expression of the ectomorphic one. With this also the frequency of subjects in somatotype classes is associated: patients with IHD include significantly most frequently mesomorphic endomorphs and significantly fewer mesomorphic ectomorphs (as compared with the group without IHD). We did not find any differences in the rations of the other 14 somatotypes.

Up to now there is no explanation for the cause of higher occurence of endomorphy with patients with IHD. The cardioblast from which the paricardium and heart develop has its origin in the mesoblast similarly as the mesenchyme conditioning the development of connective tissue, circulation system and endothelium. The mesoblast is the determining element of the mesomorphic somatotype component and its more frequent occurence in patients with IHD was manifested only in linking with the endomorphic component. The endomorphic component is, as far as embryonic development is concerned, associated with the development, of the digestive tract from oesophagus to intestines and of accessory digestive glands of the digestive system. The explanation is obviously to be sought rather in the metabolic regulatory system, and not only in the embryology of organs. Probably a certain metabolic deviation is involved which conditions disorder leading to the development of IHD, and which at the same time is more frequent in the somatotype with a predominance of endomorphy.

We must not forget, however, the influence of the environment. The more frequent occurence and possible cumulation of risk factors in some somatotype could be another reason for the higher rate of some somatotype in patients with IHD. Our results have provided evidence that the higher incidence of endomesomorphs in the group of patients with IHD has not been the result of cumulation of the main risk factors of IHD in this somatotype.

The most frequently and most rarely occuring somatotype groups of patients with IHD differ in somatoscopic, nutritional and psychological signs and characteristics. Endomesomorphs have a greater robustness and signs associated with it (development of musculature and skeleton, shape of chest, abdomen and neck). The higher occurence of obesity in endomesomorphs is probably associated also with some nutritional characteristics of this somatotype group: a less frequent feeling of being satiated after a meal, rarely anorexia, a higher fluid intake. Ectomesomorphs suffering from IHD have, however, as compared with endomesomorphs, a higher degree of anxiety and depression. Based on these results we may submit the hypothesis that subjects with an endomorphic somatotype are inclined to develop IHD due to a certain not yet pathological type of metabolic reactions, while the development of this disease by ectomorphs is influenced more by the type of mental reactions.

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TYPE CONSTITUTIONNEL D'HOMMES AFFLIGÉS DE LA CARDIOPATHIE ISCHÉMIQUE.

RÉSUMÉ

Le travail ci-presenté avait pour but de mettre en évidence des différences concernant la répartition de types somatigues dans un groupe de 166 hommes affligés de la cardiopathie ischémique et dans un grope témoin de 159 hommes indemnes de cette maladie. Modifiée par l'auteur, la méthode de classement de Sheldon a permis de répartir en 16 types somatiques les hommes appartenant à ces deux groupes en les classant selon la présence, sur le plan quantitatif, des composantes endomorphe, mésomorphe et ectomorphe. Grâce à l'étude analytique de ces types somatiques, il a pu être démontré qu'il y avait accentuation de la composante endomorphe et suppression de la composante ectomorphe chez les hommes affigés de la cardiopathie ischémique. Les taux de fréquence des types somatiques établis sont conformes à cette notion: dans le groupe de malades affligés de la cardiopathie ischémique, le taux de fréquence de subjets endomésomorphes est significativement élevé (P < 0,001) et celui de sujets ectomésomorphes est significativement obaissé (P < 0,01).

Une étude comparative concernant les hommes du type endomésomorphe, d'une part, et les hommes du type ectonésomprphe, d'autre part, a permis d'obtenir au sein du groupe de malades souffrant de la cardiopathie ischémique les résultats suivants: en ce qui concerne l'incidence des facteurs de risque caractéristiques de catte maladie, aucune différence à ce propos — à la seule exception de l'obésité — n'a été signalée entre les sujets endomésomorphes et les sujets ectomésomorphes. Chez les endomésomorphes, on trouve plus souvent une robustesse apparente du squelette, un développment très marqué des masses musculaires, un thorax en tonneau, un cou court, il y a de l'embonpoint, une fréqunce élevée de l'obésité et une augmentation du poids à l'âge adulte. Chez les endomésomorphes, nous avons en outre signalé une consommation élevée de liquides, une satiété moins fréquente après les repas et une rareté de l'anorexie. Les ectomésomorphes affligés de la cardiopathie ischémique présentent, à la difference des endomésomorphes souffrant de cette même maladie, un degré élevé d'angoisse et de dépression psychiques.

ZUSAMMENFASSUNG

Die Autoren suchten nach den Unterschieden in der Distribution von Somatotypen in zwei Gruppen von je 166 und 159 Männern mit bzw. ohne IHK. Es wird beschrieben eine Modifikation der Sheldon' Somatotypen-Klassifikation, die ermöglichte, die zwei Gruppen nach quantitativer Vertretung der endo-, meso- und ektomorphen Somatotypenkomponente in 16 Somatotypen einzuteilen. Die somatotypische Analyse wies bei Männern mit IHK Akkzentierung der endomorphen Komponente und Unterdrückung der ektomorphen Komponente nach. Diesen Befunden entspricht auch Somatotypenfrequenz: in der IHK-Gruppe wurden signifikant mehr mesomorpher Endomorphe (P < 0,001) und signifikant weniger mesomorpher Ektomorphe (P < 0,01) detekiert.

Ein Vergleich der endomeso- und ektomesomorphen Typen innerhalb der IHK-Gruppe lieferte die folgenden Ergebnisse: die endomeso- und ektomesomorphen Typen von Kranken mit IHK weisen dasselbe Vorkommen von Risiko-Faktoren auf mit Ausnahme von Obesität. Die endomesomorphen Typen haben eine bedeuted höhere Skelettrobustheit, mehr (stärker) entwickelte Muskulatur, öfters einen fassförmigen Brustkorb, kurzen Hals und hervortretenden Bauch, leiden öfters an Obesität und Gewichtzunahme in Mündigkeit. Ferner beobachteten wir bei endomesomorphen Typen einen höheren Flüssigkeitsverbrauch, seltener das Gefühl von Sattheit nach dem Essen und der Appetitlosigkeit. Im Gegensatz zu endomesomorphen Patienten mit IHK leiden die ektomorphen Patienten mit IHK öfters und mehr an Angstgefühle und Depressionen.

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