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HEIGHT-DEPENDENT DISTRIBUTION OF SOMATOTYPE COMPONENTS IN YOUNG ADULTS

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Abstract: The purpose of the present work was to get some insight into the problem of whether or not somatotype components depended on stature in young adults of an above average level of habitual physical activity. The subjects of the study were 669 females and 710 males who applied for admission to the Budapest University of Physical Education (Magyar Testnevelési Főiskola) between 1977 and 1983 inclusive. Stature strata were selected to include approximately similar numbers of subjects (dissimilar intervals).

Somatotype component distribution in the respective strata of stature was studied by histograms and correlation coefficients. Both criteria evidenced that somatotype components were essentially independent of body height. An additional result of the distribution analysis was that mesomorphy and ectomorphy were distributed approximately normally in every stratum of stature and in both sexes while the distribution of endomorphy in every height stratum was skewed slightly towards the Larger values in this material.

Key words: Height-dependent distribution, Somatotype, Young adults.

Introduction

Stature is recognized to be among the most important dimensions of the body. It is often a basis of reference for derived measures and several of the methods of describing human physique or types of physique use it either on its own or imbedded into complex indices. Somatotyping is no exception to this rule: stature is used as an entry for both the second and third components (Carter and Heath 1971).

The purpose of the present study was to find out whether or not tall and short people could display the same variability of physique, or – in other words – whether the individuals' stature restricted the range of possible somatotypes.

Material and Methods

The young women and men whose data are summarized in Table 1 were students applying for admission to the Testnevelési Főiskola, the Hungarian university of physical education, between the years 1977 and 1983 inclusively. Since data for 1978 were excluded for technical reasons, seven cohorts in all were studied, none of which were statistically different in mean stature, body mass or in the rest of the dimensions used to produce somatotype components. Note, please, that the subpopulation from which this

Table 1. The number of applicants per year

Females	Year	Males
116	1977	95
92	1979	120
121	1980	150
119	1981	118
112	1982	114
109	1983	113
669		710

sample was drawn has been habitually more active physically than the common peer population in Hungary, though relatively few of the applicants have been athletes of really outstanding performance. Most of the investigators were the same.

Methodically, the idea was that by splitting the subject material into strata, or classes, of stature and studying the distribution of the somatotype components class by class, and by looking at the correlations with height, somatotype variability could be assessed. In order to avoid very low class frequencies at either end of the scale, the tallest and the shortest statures were cumulated until acceptable case numbers were achieved. Consequently, the end classes became broader than the intermediate intervals of 2.5 cm. The unorthodox height class boundaries of the males equally served the goal of comparability. Table 2 shows the employed intervals of stature and the respective numbers of subjects.

To see if somatotype components were related to stature, correlations were calculated, both before and after stratifying the material.

Table 2. Frequencies in the height classes

Females				Males
Height (m)	N	Class	N	Height (m)
1.500 .... 1.574	52	1	83	1.596 .... 1.689
1.575 .... 1.599	66	2	81	1.690 .... 1.714
1.600 .... 1.624	92	3	90	1.715 .... 1.739
1.625 .... 1.649	93	4	101	1.740 .... 1.764
1.650 .... 1.674	112	5	108	1.765 .... 1.789
1.675 .... 1.699	100	6	96	1.790 .... 1.814
1.700 .... 1.724	72	7	52	1.815 .... 1.839
1.725 .... 1.819	82	8	99	1.840 .... 1.987

Results and Discussion

The five year long period of sampling ensured against diverse biases, thus the results are believed to be very reliable. Stratification and subsequent histogrammatic appraisal provided a markedly broader base of assessing the relationships with stature than merely correlations. As shown in Table 3, the correlations were nonsignificant in the respective height classes expect for a few. It may be argued that the narrow class intervals of stature contributed to the nonsignificance by restricting variability. The fact, however, that none of the significant coefficients exceeded. 50, either in the respective strata or in the material as a whole, rather supports the opposite.

Table 3. Correlations between somatotype components and stature

Females				Males		
Endo	Meso	Ecto	Height class	Endo	Meso	Ecto
+.36	–.31	n.s.	1	n.s.	n.s.	+.26
n.s.	n.s.	n.s.	2	n.s.	n.s.	n.s.
n.s.	n.s.	n.s.	3	n.s.	–.30	n.s.
n.s.	n.s.	n.s.	4	n.s.	n.s.	+.20
n.s.	n.s.	n.s.	5	n.s.	n.s.	n.s.
n.s.	n.s.	n.s.	6	n.s.	n.s.	n.s.
n.s.	n.s.	n.s.	7	n.s.	n.s.	n.s.
n.s.	n.s.	n.s.	8	n.s.	–.35	+.43
n.s.	–.34	+.39	Total	n.s.	–.32	+.48

Abbreviations: Endo = 1st component; Meso = 2nd component; Ecto = 3rd component; n.s. = non-significant coefficient

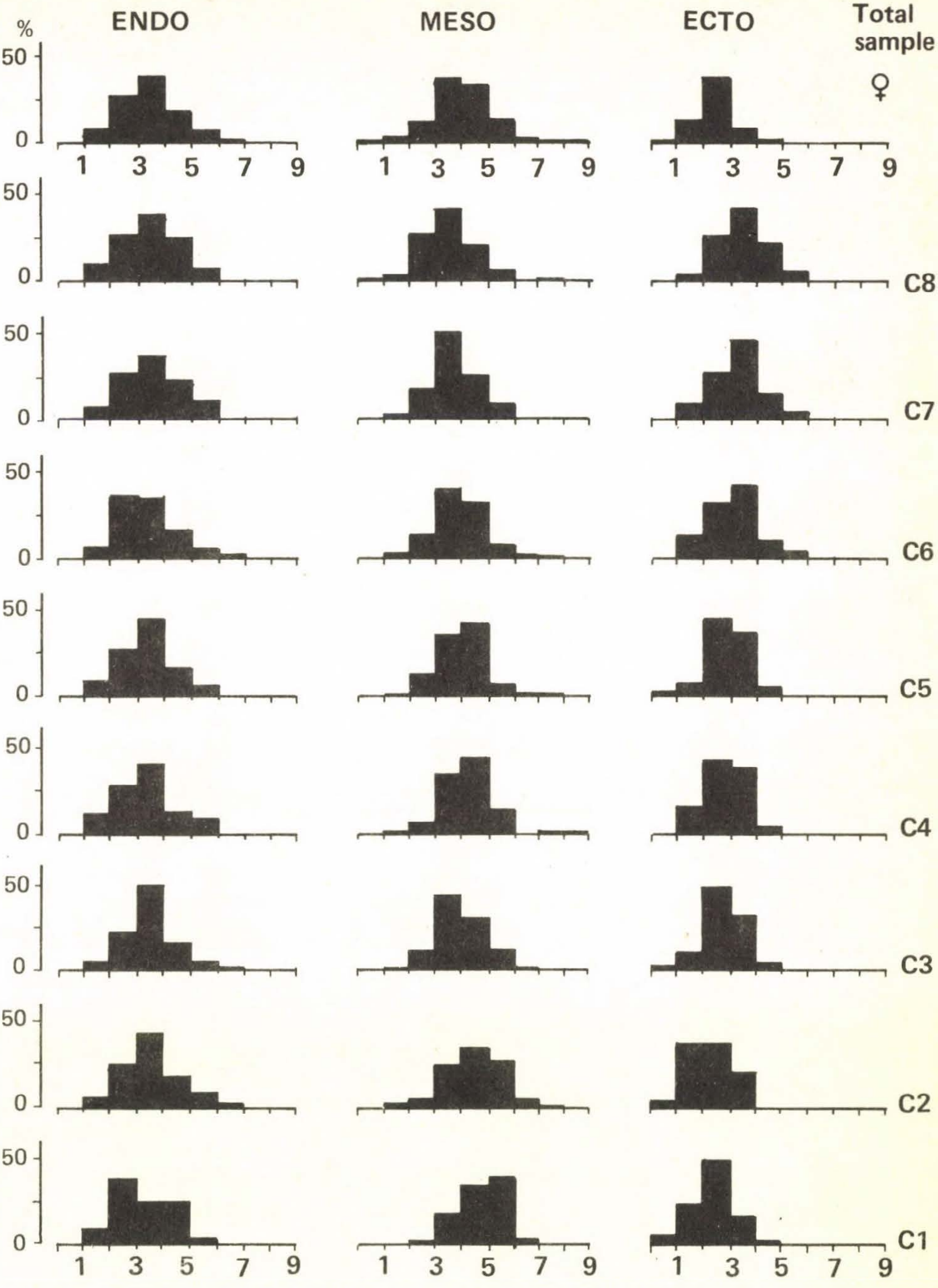

Fig. 1: Height-related histograms of the somatotype components, females. Endo = 1st component, meso = 2nd component, ecto = 3rd component; C1 ... C8 = height classes. Frequencies are shown in per cent for somatoscores rounded to integers.

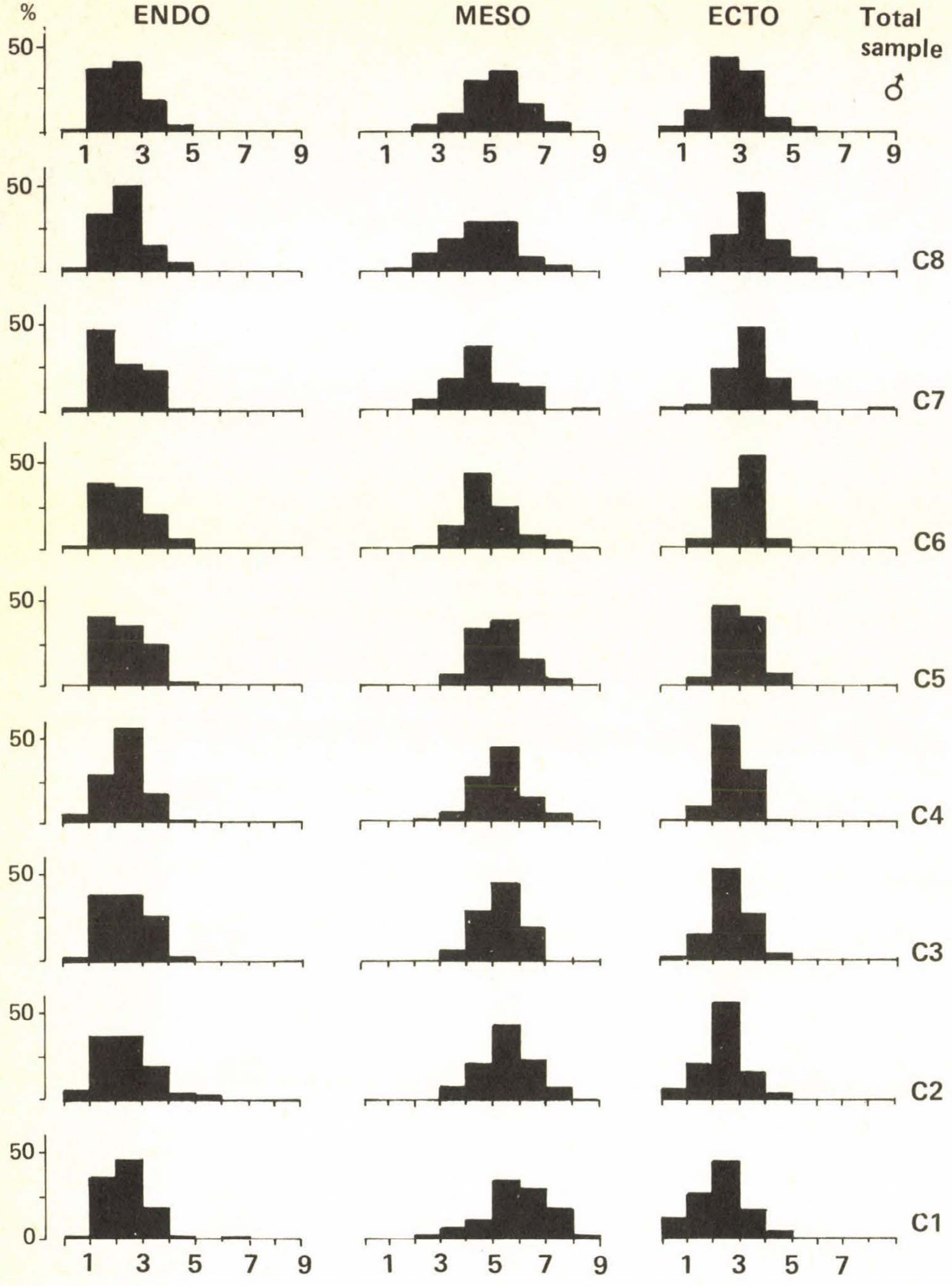

Fig. 2: Height-related histograms of the somatotype components, males. Abbreviations are the same as in Fig. 1.

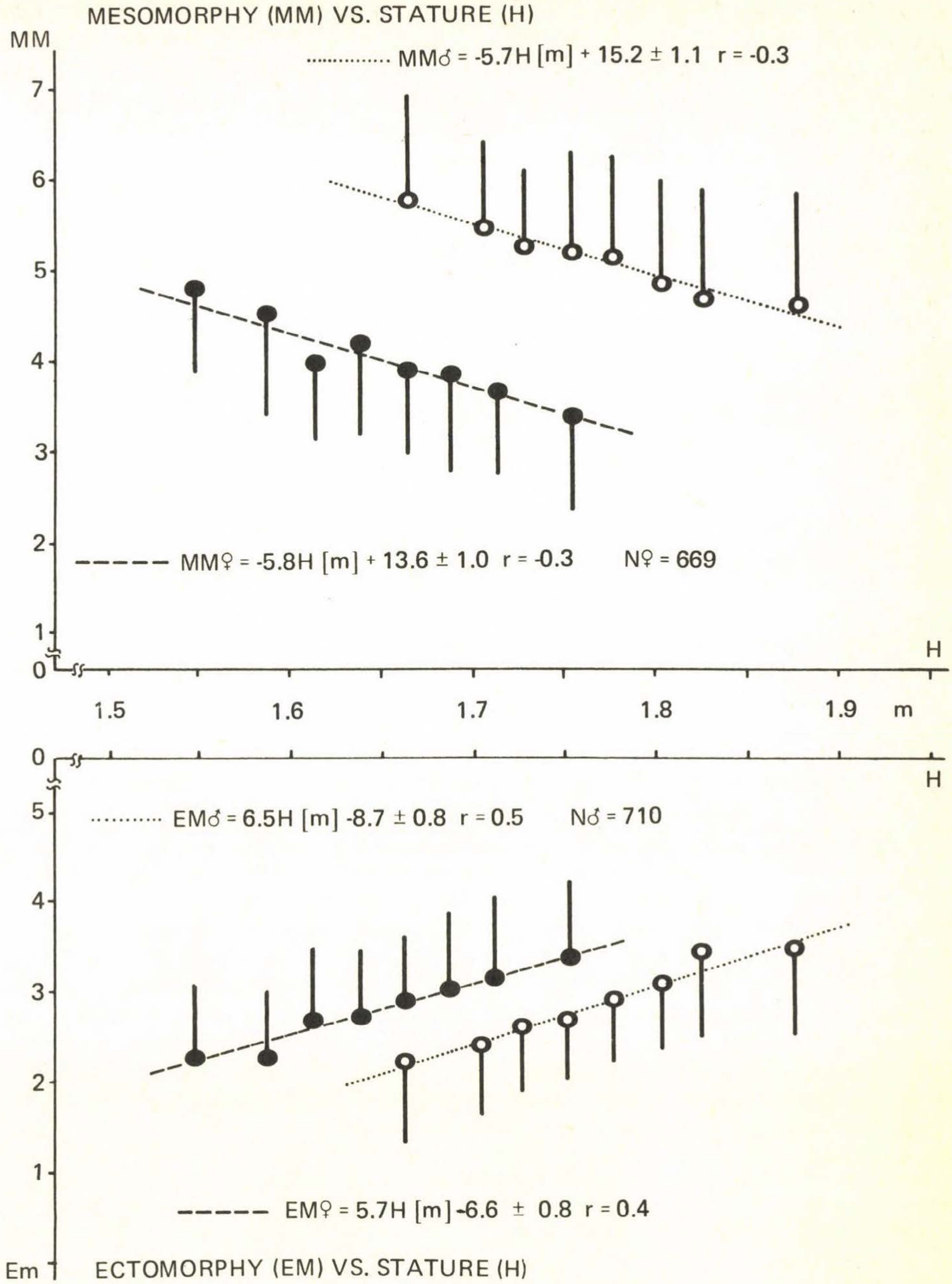

Fig. 3: Top: Regression of mesomorphy (MM) on height (H). Bottom: Regression of ectomorphy (EM) on height. The equations are of the type: b.x + a ± syx. Open circles refer to the males, bold dots refer to the females. Variability shown on the means are standard deviations. Means for the last and first height classes are placed proportionally along the horizontal axis.

The exceptional few of the correlations also aroused our interest, naturally. Thus, endomorphy in the shortest group of the girls was positively related to height, an observation which appeared rather startling at first. Then it was found that it could be attributed to the dominance of skinny gymnasts at the bottom of the scale. In the male and female samples as a whole a low negative coefficient was found for mesomorphy and a slightly greater positive one for ectomorphy.

These tendencies were found in the respective histograms as well, though with greater detail of information (Figs 1 and 2). The classes of height are ordered in increasing order from the bottom to the top. As shown, mesomorphy and ectomorphy were distributed almost symmetrically and normally. The direct comparison of the histogrammatic patterns was made feasible by expressing case frequencies as percentages of the respective sample numbers.

Endomorphy was distributed with a slight positive skewness: even among the females there were fewer above 4 than below 3. This positive skewing was even more marked in the males.

A glimpse at the comprehensive topmost histograms reveals that ectomorphy in these young women was rather subordinate and narrowly distributed. Though the tallest girl was above 181 cm and altogether 82 girls were above 172 cm, the highest score for ectomorphy was below 6. In contrast, five girls were found to be above 6 in mesomorphy, and one was above seven in this material.

In the males, mesomorphy was the dominant trait, as expected. In the shortest group mesomorphy had a slight negative skew, but its range was much broader than in the females. As already mentioned, the skew of endomorphy was more marked.

On the evidence of the histograms it can be stated that the variation of physique in the physically active subjects has approximately the same range independently from the height interval to which the individual belongs. A broader generalization of this observation, namely for the whole of the peer population, needs additional evidence.

The slight but consistent trend in mesomorphy to decrease with stature, and – as shown by the constants – the almost identical trend in ectomorphy to increase with stature is shown in the linear regressions of Fig. 3. Though analysis of variance unambiguously supported the linearity of the trend, the scatter around the means was considerable. This reduces total common variance which can be explained by the slopes, i.e. by the dependence on stature. The inference concerning the problem posed is, then, that in a physically active young population the same variability of body build can be expected in tall and short males and females alike. The negative linear relationship between mesomorphy and stature as well as the positive linear relationship between ectomorphy and stature do exist, but explain a negligible part of the total common variance of somatotype and stature. Even in this small part it is very likely that the role of stature observed in the components of the somatotype is attributable to the part height plays in calculating the component scores rather than to a direct dependence.

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