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A SIMPLE ATTEMPT FOR POPULATION COMPARISON BY SOMATOVARIANTS

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Abstract: Based on the means and standard deviations of three body measurements, stature (linearity), weight (muscularity and fat) and biepicondylar width of the humerus (robusticity) from 2 male and 2 female series of European students 5 percentiles were computed. Using these percentiles each variable was classified and the three class-numbers were combined to form a triplet. The advantages of the method were discussed, and also some statistical problems.

Key words: anthropometric comparison, somatovariants, students.

Introduction

It has always been one of the general aims of physical anthropologists to get informations about the affinities and relationships between and within human populations. With respect to body constitution the typological methods elaborated are numerous, generally based on the combination of somatoscopic and of somatometric characters (CARTER 1975, EIBEN—CSÉBFALVI 1977, EIBEN et al. 1976, KNUSSMANN 1961, MARTIN—SALLER 1957, ROSS—WILSON 1974). It is not the purpose of this study to discuss the advantages and disadvantages respectively of one or the other of these methods but to introduce a simple method for the investigation of body dimensions based on three body measurements only. The method is not thought to replace any of the others but could prove useful in those cases where several of the generally required measurements can not be taken because of the problems known to exist in field work.

These three measurements were also chosen under consideration of methodological-technological aspects and with respect to biological reliability (HAUSER et al. 1981). From several basic studies have resulted rather conformingly three to four factors as to body dimensions which also agree well with regard to the loadings of the underlying measurements. Thus stature, weight and biepicondylar width correspond well to the practical claims (easily measurable, not bothering people, small intra- and interindividual measurement differences) and though very roughly represent linearity, muscularity, and fat, and robusticity.

Material and Methods

Stature weight and biepicondylar width (bilaterally) were measured on 117 male and 120 female Viennese as well as those from 78 male and 75 female German (Bremen) students. The age of all the probands (unrelated) ranged from 20—30 years. Care was taken to check interindividual measuring difference which proved to be negligibly small between the three investigators.*

From each of these variables were computed classes separately for males and females by calculating the percentiles for 5%, 15%, 50%, 15%, 5% of a theoretical distribution on the basis of the relative means and standard deviations (Tab. 1). According to these percentiles the variables were subdivided into five classes which could be named very small (I), small (II), medium (III), big (IV) and very big (V). Using these classes the classnumbers of the three variables were combined to triplets; one triplet thus representing one person. Then the frequences of the five cubed commutations, 125 theoretically possible combinations, were computed for each of the four groups separately.

Table 1

Statistical parameters of the three body measurements in the investigated groups

Measurement	$\bar{x}$	s	Range	Curtosis	Skewness
		Viennese male students (N=117)			
Stature (cm)	180.1	6.37	165—198	.99	—.026
Weight (kg)	72.1	8.81	53—99	—.046	.371
Width Humeri (mm)	71.4	3.40	64—78	—.736	.004
		German (Bremen) male students (N=78)			
Stature (cm)	177.0	6.24	163—191	—.378	—.092
Weight (kg)	71.8	8.72	50—99	.470	.125
Width Humeri (mm)	70.3	3.26	63—78	—.059	—.012
		Viennese female students (N=120)			
Stature (cm)	165.5	5.82	151—180	.446	.026
Weight (kg)	58.1	8.26	44— 90	1.221	.938
Width Humeri (mm)	61.0	2.91	55— 68	—.554	.323
		German (Bremen) female students (N=75)			
Stature (cm)	165.1	6.57	148—180	—.062	.039
Weight (kg)	55.8	5.99	40— 71	—.074	.172
Width Humeri (mm)	60.8	3.52	49— 67	.378	—.445

To measure the biepicondylar width of the humerus the spreading caliper was used as the data proved more reliable than with the sliding caliper; for the computation the bigger one of the two measurements was taken.

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Results and Discussion

It was not expected to find all the theoretical triplets realized, yet the fact that only 47 triplets altogether were found in the four series is rather useful in the sense of need for a typological characterisation not to result in too many subdivisions. Of course the frequencies of the triplets shown in Fig. 1 and 2 are to be understood only in the sense of an example as the sample sizes are insufficient for reliable statements. Yet they reveal the usefulness of the method for population comparison as well as for the two sexes, but also for the comparison of specific groups within a population. These triplets not showing up at all or very rarely in the normal population could prove valuable for example in medical research.

With respect to the use of indices these triplets have the advantage of not losing all the information of the actual dimensions of the traits involved.

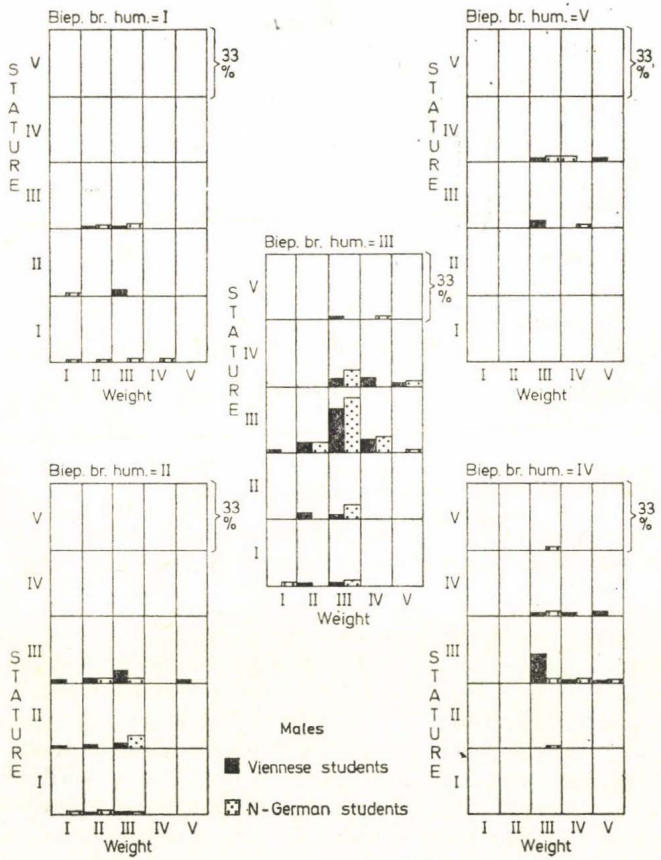

Fig. 1. Body somatovariants of 117 Viennese and 78 Northern-German (Bremen) male students. *Stature:* I—168 cm, II—169—173 cm, III 174—184 cm, IV 185—189 cm, V 190— cm; *Weight:* I —57 kg, II 58—64 kg, III 65—79 kg, IV 80—86 kg, V 87— kg; *Biepicondylar width of the humerus:* I —65 mm, II 66—68 mm, III 69—73 mm, IV 74—76 mm, V 77— mm (i.e. II, III, II means: small dimension for stature, medium for weight and small for biepicondylar width of the humerus)

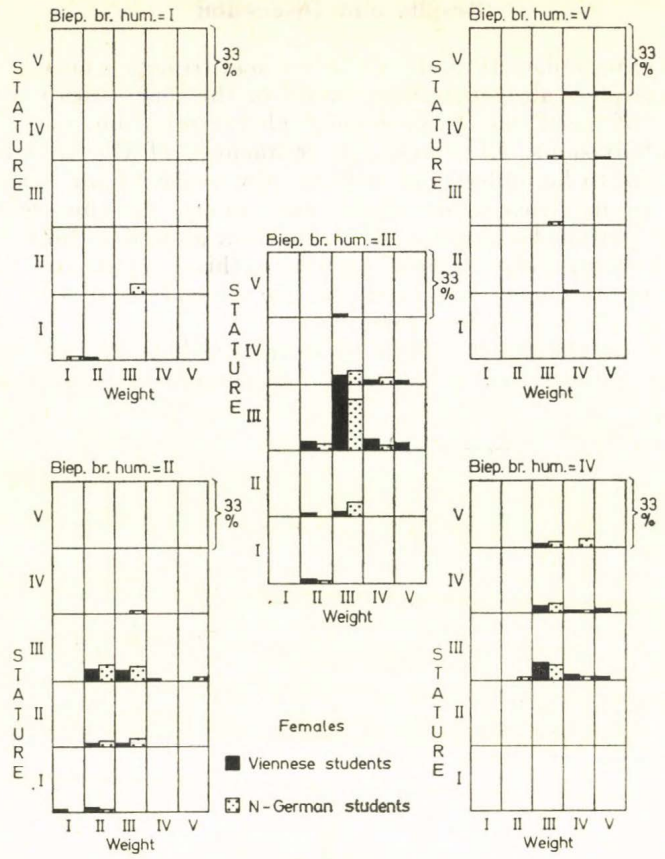

Fig. 2. **Body somatovariants of 120 Viennese and 75 Northern-German (Bremen) female students.** ***Stature:*** **I —154 cm, II 155—159 cm, III 160—170 cm, IV 171—175 cm, V 176— cm;** ***Weight:*** **I —44 kg, II 45—50 kg, III 51—63 kg, IV 64—69 kg, V 70— kg;** ***Biepicondylar width of the humerus:*** **I —55 mm, II 56—58 mm, III 59—63 mm, IV 64—66 mm, V 67— mm (i.e. III, III, III means: medium dimension of all the three characters)**

But also for genetic and growth studies the possibility of comparing different age groups might prove interesting as the classes are always computed with the same percentiles based on the relative means and standard deviations of the group-characters studied.

Yet it should be mentioned that there exist some statistical problems: (1) The requirement for normal distribution is not always fulfilled. (2) Partially the empirical percentiles do not correspond with the theoretically requested ones. Thus instead of an expected value of 15% a higher or smaller one is observed. It is planned to solve this problem by means of smoothing the empirical distribution.

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