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SOME RESULTS OF THE SOMATOMETRIC EXAMINATION OF TWINS

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One of the problems human genetics deals with is the study of heredity of somatic characters. The extent the genotype and peristasis make themselves felt in their manifestation is not known in most of these characters. In order to solve this problem, we have chosen one of the methods of genetic research, i.e. the study of twins as valuable and most easily available material for the study of heredity. For the solution of genetic problems, monozygotic twins possessing the same genetic outfit are the most suitable objects. That is why we have examined only twins of the same sex supposed to be monozygotic. For comparison, we have used anthropometric data in twins of the same sex proved clearly as dizygotic. We are aware of the fact that some of the pairs, determined by us to be monozygotic, may be dizygotic, because the range of hereditary signs is not fully determined, and the possibility is not excluded that they may differ genotypically in some or other additional undetermined signs.

The criterion for the determination of zygotic characters was an examination of the blood and serum signs which are hereditary in complete penetration and are used in top expert opinions in forensic medicine. There are altogether 26 signs (ABO including the subgroups, Rh-genotypes, MN, Ss, Kk, Fy^a, Gm^{axb}, Inv^1, Hp, and the excretion of ABH group specific substances in saliva). In certain cases the examination has been completed by 9 other signs not introduced commonly into our practice due to the fact that it is difficult to obtain the antiserums (Gc, Jk^{ab}, Le and Lu) (Kout, Májský, Herzog, 1964). In a part of the material the ability of tasting phenylthiocarbamide (PTC) has been examined, which is equally a genetically conditioned quality, and whose heredity has been elucidated in the world literature and is also confirmed by our results (Kubíčková, Dvořáková, 1967).

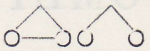
Concurrently with performed research, genealogical documentation is carried on (at least the 3rd complete generation), case histories are studied, anthropological examinations (pigmentation, colour-sense, dermatoglyphs, somatoscopic and somatometric evaluation) with photodocumentation, orthodontic examinations, skiascopic determination of bone age (in children up to 15 years), and the like are performed. The parents of the examined, if alive, are tested for blood and serum groups, tasting PTC, colour-sense, and in certain cases, for dermatoglyphs on the same scale. Brothers and sisters of certain persons examined are also tested.

In this study we present some results of somatometric examinations, because we assume that the study of body characters in one-sexed twins could, from the viewpoint of anthropology, supply the key to the determination of heredity of certain body characters. We perform complete somatometric examinations as a part of the evaluation of similarity in form of the various parts of the body in the pairs under study.

When treating the obtained material, we have put the question, whether and in what metrical signs are the differences between individuals of monozygotic and dizygotic pairs statistically significant or whether the difference in the determined absolute values of metrical signs is statistically significantly higher among individuals of dizygotic pairs than among those of monozygotic pairs. It is very difficult to obtain a satisfactorily large set of mono- and dizygotic twins of the same sex and age. We have succeeded in obtaining and treating 71 pairs of one-sexed twins in the age between 7 and 30 years, out of whom 22 were males and 18 females, both monozygotic, and 13 males and 18 females, both dizygotic.

To evaluate statistically the metrical signs studied in the set heterogeneous as to age, we could not use methods commonly employed in anthropology. We, therefore, chose the co-variance analysis method which allows to eliminate the influence of the controlled undesirable factor (in this case it was age) on the data observed (Roth, Josífko, Malý, 1962). By means of this method we evaluated the statistical importance in the extent of the differences between monozygotic and dizygotic pairs, as concerns body height, weight, mesosternal circumference of the thorax, circumference of the calva, the length (g—op) and breadth (eu—eu) of the calva, the minimum breadth of the forehead (ft—ft), the maximum breadth of the face (zy—zy), the lower jaw angle distance (go—go), the breadth of the nose (al—al), the breadth of rima oris (ch—ch), the morphological height of the face (n—gn), the height of the upper

Test criterion of importance (Snedocor's F) of the interpair differences between monozygotic and dizygotic twins (differences in mm, weight in kg)

				
n	22	13	18	18

Dimension	Mean interpair difference		F	Mean interpair difference		F
Body height	16.50	46.15	11.53**	17.94	51.70	7.08*
Body weight	2.19	4.57	7.23*	2.38	7.50	7.54*
Circumference of thorax	20.72	32.23	13.63**	25.94	49.35	9.71**
Circumference of calva	3.72	12.07	11.91**	7.27	14.72	9.99**
g—op	3.00	4.70	4.58+	2.77	4.77	5.85*
eu—eu	3.25	6.00	12.40**	3.77	5.11	2.39
ft—ft	2.05	2.84	2.45	2.22	4.55	4.79+
zy—zy	2.15	3.53	5.03+	2.33	3.66	1.93
go—go	2.30	3.76	2.82	2.94	3.66	0.45
al—al	0.80	1.61	9.07**	1.66	2.05	0.52
ch—ch	2.10	3.69	9.95**	2.33	2.50	0.07
n—gn	3.25	4.00	1.58	3.38	4.61	2.02
n—sto	1.95	3.00	5.64*	1.88	3.33	3.84
n—sn	1.85	2.30	2.33	1.66	2.00	0.70

P = 0.01 F > 7.56**
P = 0.025 F > 5.56*
P = 0.05 F > 4.17+
] for n = 30

 monozygotic male twins

 dizygotic male twins

 monozygotic female twins

 dizygotic female twins

n number of cases
F test criterion (Snedecor's criterion)

face (n—sto), and the height of the nose (n—sn) (Martin, Saller, 1957).

When treating the respective metrical characters, we always compared the absolute values obtained in either individual of the respective pair. The determined inter-pair differences thus formed the basis for verifying the hypothesis saying that the extent of these differences is statistically significant and varying in monozygotic and dizygotic pairs. The critical values of the test criterion (Snedecor's F) calculated from the data in the co-variance analysis table are presented in the table for the respective number of cases at a 1 percent, 2.5 percent, and 5 percent level of importance (Hajnišová, Fišerová, Kubíčková, Dvořáková, Boháčová, in press). To verify whether the extent of the difference between the individuals of the respective pair is not influenced by their age, we availed ourselves of the F test criterion, determined by means of the co-variance analysis method. We found no dependence of the extent of the difference on age in any of the dimensions.

We thought that the body weight was a somatic character dependent more on the environment and way of life (food, number of pregnancies, occupation, diseases, and the like) than on genetic factors. That is why we determined the interpair differences even in twins above the given age limit, but even in these older individuals we were not able to detect an essential difference in the body weight of monozygotic individuals.

From the presented results, according to the values of the F test criterion, it follows that among individuals of monozygotic pairs of either sex there are, on the average, statistically markedly lower interpair differences in body height, weight, mesosternal circumference of thorax and circumference of calva than among those of dizygotic pairs. Thus there exists a far higher similarity in the above given somatic characters among individuals of monozygotic than among those of dizygotic pairs. The variability of these characters within the framework of the same genetic basis is statistically markedly lower ($P < 0.025$ and 0.01) in monozygotic than in dizygotic twins. That is why we can assume genetic participation in the manifestation of these somatic characters. Owing to the fact that the values of F are approximately the same for both men and women, it is impossible to assume here a bound or sex-influenced heredity.

Of the other head dimensions there is a statistically markedly lower difference among the male individuals of monozygotic pairs, i.e. in the breadth of the calva, nose and rime oris ($P < 0.01$), in the height of the upper face ($P < 0.025$), in the length of the calva and the maximum breadth of the face ($P < 0.05$). As for the female sex, there is a statistically markedly lower difference only in the length of the calva ($P < 0.025$) and in the minimum breadth of the forehead ($P < 0.05$). Thus women exhibit a far lower dependence of the difference in head dimensions on whether they come from mono or dizygotic pairs.

The differences in the studied somatic characters between mono- and dizygotic individuals of either sex are not dependent on age. Should this kind of dependence exist, its growth is equal in both groups, this factor thus being eliminated.

SUMMARY

The authors studied 14 somatometric characters in 71 pairs of monozygotic and dizygotic twins. They found that the extent of the differences between individuals of the respective pair is statistically significant and varying in both mono- and dizygotic pairs of either sex, as concerns the body height, weight, the circumference of the thorax and the calva, when the co-variance analysis method was used. The employed method eliminates the influence of age on the somatic characters under study.

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