

## HEREDITARY INFLUENCES ON VOCATIONAL PREFERENCES AS SHOWN BY SCORES OF TWINS ON THE MINNESOTA VOCATIONAL INTEREST INVENTORY<sup>1</sup>

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The Minnesota Vocational Interest Inventory (MVII) scores of 53 fraternal pairs of twins showed greater within-pair variances than did the scores of 71 identical pairs. For 9 of the scores and 4 of the area keys the F test showed a statistically significant increase in within-pair variance for the fraternal twins. This is interpreted as evidence for a hereditary component in interests in occupations requiring no scientific ability. The hereditary influence operates probably through personality variables.

The consensus of investigators in the area of vocational preferences seems to be that interests in occupations develop gradually as the child learns about himself and the world around him and that such interests only begin to take definite shape late in adolescence (Darley & Haganah, 1955; Roe, 1956; Super, 1957). However, the long-neglected finding of Carter (1932) that identical twins show greater similarity in occupational choices than do fraternal twins (as measured by the SVIB) would suggest that vocational preference is not entirely determined by environment. Carter's finding was later confirmed in replication by Vandenberg and Kelly (1964).

The idea that genes may help determine the occupation one prefers may seem rather startling at first thought. It is highly probable, however, that the aptitudes and personality traits disposing one to a particular vocational preference are under genetic influence, and thus the idea of hereditary influences on vocational preference becomes more acceptable.

In the studies of twins by Carter (1932)

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and Vandenberg and Kelly (1964) it was found that hereditary influence was most marked in the group of science-related occupations. To explore whether these hereditary influences could also be detected in vocational interests requiring a minimum of scientific ability, the Minnesota Vocational Interest Inventory (MVII), described by Clark (1961), was administered to 53 fraternal and 71 identical pairs of twins. The MVII measures interest in 20 nonprofessional occupations such as baker, painter, or truck driver. In addition, interests in 9 general areas are measured by homogeneous keys which group occupations requiring similar skills or interests such as office work, outdoor work, etc.

Several methods have been proposed for the assessment of the importance of hereditary components in a variable, such as a heritability index H (Holzinger, 1929), chi-square (Thurstone, Thurstone, & Strandkov, 1953), and analysis of variance (Dahlberg, 1926).

The latter method has been used in this study, following Clark (1956) and Kempthorne and Osborne (1961). The variance of the fraternal (DZ) twins is partitioned in the between-pairs and within-pairs components; similarly for the identical (MZ) twins.

First, one may wish to check that the between-pair variance exceeds the within-pair variance, that is, that the intraclass correlations are positive. Next, one obtains the ratio between the fraternal within-pair vari-

TABLE 1

COMPARISON OF FRATERNAL AND IDENTICAL WITHIN-PAIR VARIANCES ON 30 SCORES ON THE MINNESOTA VOCATIONAL INTEREST INVENTORY

Score	Girls	Boys	All cases
	34 DZ— 40 MZ	19 DZ— 29 MZ	53 DZ— 69 MZ
Baker	1.169	2.680**	1.796*
Carpenter	1.379	1.951*	1.583*
Electrician	1.415	1.395	1.331
Food service man	1.125	1.519	1.266
Hospital attendant	2.340**	2.458**	2.439**
Industrial education teacher	.941	1.031	.978
IBM operator	1.980	2.695**	2.247**
Milk wagon driver	2.204*	1.352	1.624*
Machinist	1.251	1.455	1.313
Painter	1.281	.665	.968
Plasterer	1.127	1.618	1.310
Plumber	.940	1.004	.931
Pressman	1.426	1.355	1.425
Printer	1.167	2.161*	1.513
Retail sales clerk	3.794**	1.994*	2.287**
Radio and TV repairman	1.045	1.852	1.368
Shipping and stock clerk	.849	1.418	1.071
Sheet metal worker	1.402	1.110	1.235
Truck driver	1.306	2.737**	1.820**
Truck mechanic	1.646	1.585	1.531*
Warehouseman	1.237	3.310**	1.935**
H <sub>1</sub> —Machine repairs	3.826**	2.498*	2.503**
H <sub>2</sub> —Medical hospital service	1.567	.991	1.353
H <sub>3</sub> —Office work accounting	1.714*	.787	1.396
H <sub>4</sub> —Radio, etc	1.611	1.231	1.293
H <sub>5</sub> —Food preparation and menu planning	1.107	1.188	1.139
H <sub>6</sub> —Carpentry and furniture making	1.124	.924	1.003
H <sub>7</sub> —Verbal activity aesthetic	1.007	.659	.813
H <sub>8</sub> —Clean hands	1.412	.898	1.111
H <sub>9</sub> —Athletics outdoor masculine	.766	1.090	.898

\*  $p < .05$ .\*\*  $p < .01$ .

ance to the identical within-pair variance

$$F = \frac{\sigma^2 w DZ}{\sigma^2 w MZ}$$

The identical within-pair variance is solely due to environmental influences, because identical twins, who arise from one fertilized

egg, have the same genes, except for a rare somatic mutation here or there. The fraternal within-pair variance is due to similar environmental influences plus differences in genes, because fraternal twins result from two fertilized eggs. They will have, on the average, only 50% the same genes, just like other pairs of siblings not born at the same time. This ratio may be thought of roughly as between variance due to heredity plus environment and variance due to heredity alone. The statistical significance of the departure from 1.00 is evaluated as an  $F$  ratio.

Table 1 shows that significant  $F$  ratios were found more frequently for boys than for girls. With boys and girls combined, significant  $F$  ratios were found for nine occupational interests and four homogeneous vocational areas. Significant beyond the .01 level of probability were: baker, hospital attendant, IBM operator, retail sales clerk, truck driver, and warehouseman. Significant beyond the .05 level of probability were carpenter, milk wagon driver, and truck mechanic.

The  $F$  ratios for the homogeneous area scales reached the .01 level of significance for occupations involving machine repairs (Scale H<sub>1</sub>), and the .05 level of significance for occupations involving general office work (H<sub>3</sub>) and for those involving repair and operation of electrical and electronic devices (Scale H<sub>4</sub>).

### Conclusion

The results seem to indicate that hereditary influences on vocational interests are not necessarily limited to high-level abilities such as those required for scientific and professional occupations, but range over the entire occupational spectrum. It is most likely that the hereditary components influence one's aptitudes and personality traits, which in turn influence vocational preferences.

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