Blood Groups and Personality Traits

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AMONG APPROACHES to the study of psychological genetics, one of the most rewarding is that which seeks to associate a behavioral trait with a physical feature known to be largely hereditarily determined (Cattell, 1950). The human blood groups, relatively well understood genetically, are examples of somatic traits which are free of environmental modification. For example, it has been demonstrated that there is a significant excess of groups B and AB in nonsmokers or occasional smokers (Cohen and Thomas, 1962). The lack of meaningful and valid personality measurements delayed exploration of relationships, but with the advent of factorial detection of source traits (Cattell, 1957) and the resulting questionnaire and behavior tests for their measurement, it has become worthwhile to experiment.

For the geneticist a very brief sketch of this progress in human personality and temperament measurement may be helpful. It is based on correlation of a large number of objective measures of behavior and questionnaire item responses, followed by factor analysis. When a structurally simple rotational resolution is attained, it is concluded that the factors correspond to natural, functionally unitary "source traits," i.e., to underlying single biological or sociological influences which cause the observed responses to vary together. Cattell and his co-workers (Beloff, Butcher, Coan, Damarin, Eber, Gorsuch, Gruen, Howarth, Hundleby, Pawlik, Peterson, Porter, Saunders, Scheier, Stice, Tsujioka, and Warburton) have published replicating, cross-validating studies pointing to the existence of some 25 factors in questionnaire material, indexed alphabetically, and some 21 in objective tests, indexed U.I. 16 through 36 (U.I. 1 to 15 are abilities). The factors have shown invariance across age and across cultures (Cattell, Pichot, and Rennes, 1961), and they account for a substantial part of the variance of any random set of personality measures or criterion performances, e.g. occupational success, school achievement, and clinical differentiation.

A valuable critical review of the status of this work in personality theory has been given by Hall and Lindzey (1957) and Bischof (1964), while a collation of evidence on the factors has been provided by French (1953) and by Hundleby, Pawlik, and Cattell (1964). The source traits thus isolated and

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rendered measurable with known validity correspond in many instances to concepts familiar but vague in clinical work, e.g., anxiety, ego strength, cyclothyme-schizothyme temperament; but in other instances, the traits are new, e.g., H, parmia pattern (parasympathetic immunity to threat); I, premsia factor (protected emotional sensitivity); etc.

The Harvard Florence Research Project is a research group studying relationships between physical and mental growth and socioeconomic conditions and is particularly interested in bodily and mental changes induced by environmental pressures. It is sponsored by Harvard University School of Public Health and is associated with the Universities of Rome, Florence, and Palermo. The availability of both psychological and physiological data suggested investigation of possible correlations between personality factors and genetic traits.

EXPERIMENTAL METHODS

The design of this experiment has been governed by broader objectives in the Harvard Florence Research Project than would have been considered for this study alone. However, while making the analysis of variance more complex, these have added to the breadth and stability of the conclusions. Four groups of boys of Italian stock were studied. There were 581 in all, aged 11 to 18 (13.96 years average), living in four cities, three in Italy (Rome, Florence, Palermo) and one in Boston. Within these cities they are essentially a normal school sample. This spread of locality, education, and socioeconomic status permits exploration of the persistence of any significant psychological–physiological relation over a wide range of conditions, although it also introduces some risk of confounding. Here we shall report on the blood group associations only, omitting the relations of factor scores to residence, age, social status, national culture, and other recorded variables.

These subjects were tested with the first edition of the High School Personality Questionnaire (HSPQ) (Cattell and Beloff, 1957; Cattell, Beloff, and Coan, 1961). The HSPQ covers 14 of the 25 main personality factors found in questionnaire and behavior rating correlational studies (Cattell, 1957). It is designed for ages 12 through 17 years and has a total of 142 questions on each of the two equivalent forms, A and B. The interform equivalence coefficients vary from .41 to .69; factor validities vary from .73 to .85. For individual diagnosis, both equivalent forms, yielding 20 items per factor, are recommended, but where group differences are under study, it is permissible to use one form only. This was dictated here by time stringency, so that each factor is measured by ten items.

The translation of Form A into Italian was carried out with the same two-way translation precautions as described in the other foreign editions of the HSPQ and the 16 P.F. Test (Cattell, Pichot, and Rennes, 1961). The Italian edition has not yet been factor analyzed independently. However, Professor L. Meschieri has shown that the 16 P.F. Test, which contains the same factors, shows clearly the same main factor patterns in the Italian population. Of

course, this does not mean that the *levels* on each factor will be exactly comparable, since items may change in frequency of checking despite having the same factor meaning. Form A (140 items) of the HSPQ was administered to small groups by a trained psychologist or by an assistant under his supervision. The tests were scored with the standard key and results were expressed as raw scores for analysis.

ABO and Rh blood typing was carried out using dried serum supplied by the Istituto Sieroterapico Milanese. Anti-A and anti-B dried sera were reconstructed by the addition of 0.10 ml citrated physiological saline solution to each pipette. Into the same pipette, 0.01 ml of freely flowing blood from a finger prick was drawn. The suspensions were then rotated rapidly, corked, and laid horizontally at room temperature. Agglutination was usually apparent within five minutes; unagglutinated suspensions were observed up to thirty minutes. Associations with Rh type are not included in the present report.

Analysis of variance was chosen as the statistical method, since our object at this stage was to detect significant relations which could be followed later with respect to magnitude and structure. A four-way design was used, the dimensions being (1) *ABO blood type* (A, B, AB, and O), (2) *city* (Florence, Rome, Palermo, and Boston), (4) *Rh type* (+ or −), (4) *socioeconomic class* (five levels). Age was handled as a covariance variable. The extreme disproportionality of available cell frequencies, due mainly to the usual inequalities in frequencies of blood types, suggested that only one main effect, that for ABO blood group, be tested for signficance. Thus, differences between the four blood types were examined for all 14 HSPQ factors with the influence of age, Rh factor, socioeconomic class, and city of residence being removed from each comparison.

RESULTS

Results of the comparison over all 14 HSPQ factors indicated that only factor I reaches a substantial level of significance (Table 1). Consideration of the adjusted means for the blood group on this factor indicates that highest scores on I are associated with type A, somewhat lower scores with types O and B (in that order), and the lowest scores with type AB.

Just short of significance at the 5% level is Factor J, coasthenia (the common feature of neurasthenia and psychasthenia), the AB type being low on this factor.

DISCUSSION

Only relatively speculative theories have yet been proposed (Cattell, 1957) regarding possible hereditary mechanisms for the broad "reactivity patterns" which we call source traits. Four or five empirical studies on fairly extensive groups have been carried out, both by the twin method and the multiple abstract variance analysis (MAVA) for personality factors, but sampling circumstances prevent precise conclusions. Nature–nurture ratios have been found for objective test factors by Cattell, Stice, and Kristy (1957)

TABLE 1. ANALYSIS OF COVARIANCE: COMPARISON OF BLOOD GROUPING AND SCORES ON PERSONALITY FACTORS

Personality factor and description	Main effect	Sum of squares	Degrees of freedom	Mean square	F ratio	P*
Factor A: Outgoing vs. reserved	Blood type	.3885	3	.1295	.7768	>.05
	error	94.6856	568	.1667		
Factor B: More vs. less intelligent	Blood type	.4365	3	.1455	1.0203	>.05
	error	80.9968	568	.1426		
Factor C: Stable vs. emotional	Blood type	.3858	3	.1286	.7503	>.05
	error	97.3552	568	.1714		
Factor D: Impatient vs. placid	Blood type	.1479	3	.0493	.2891	>.05
	error	96.8440	568	.1705		
Factor E: Assertive vs. humble	Blood type	.2262	3	.0754	.4417	>.05
	error	96.9576	568	.1707		
Factor F: Happy-go-lucky vs. sober	Blood type	.0528	3	.0176	.1007	>.05
	error	99.2296	568	.1747		
Factor G: Conscientious vs. expedient	Blood type	.4323	3	.1441	.8481	>.05
	error	96.5032	568	.1699		
Factor H: Venturesome vs. shy	Blood type	.1851	3	.0617	.3554	>.05
	error	98.6048	568	.1736		
Factor I: Tender-minded vs. tough-minded	Blood type	3.2286	3	1.0762	6.6350	<.01
	error	92.1036	568	.1622		
Factor J: Self-sufficient vs. gregarious	Blood type	1.1502	3	.3834	2.2835	>.05
	error	95.3672	568	.1679		
Factor O: Apprehensive vs. placid	Blood type	.0846	3	.0282	.1720	>.05
	error	93.1520	568	.1640		
Factor Q_2: Self-sufficient vs. group-tied	Blood type	.0303	3	.0101	.0584	>.05
	error	98.2072	568	.1729		
Factor Q_3: Controlled vs. casual	Blood type	.2061	3	.0687	.4034	>.05
	error	96.7304	568	.1703		
Factor Q_4: Tense vs. relaxed	Blood type	.8250	3	.2750	1.6301	>.05
	error	95.8216	568	.1687		

*For significance at the $P < .01$ level, $F \geq 3.83$; for significance at the $P < .05$ level, $F \geq 2.62$.

on about 500 cases and by Eysenck and Prell (1951) on about 40. In the questionnaire measurement of personality factors, with which we are here concerned, Cattell, Blewett, and Beloff (1955) found by the MAVA method appreciable (probably over 50%) hereditary determination of variance for A (cyclothymia–schizothymia), B (intelligence), C (emotional stability), E (dominance), H (parmia), J (coasthenia and borderline), and O (guilt proneness). Loehlin (in press) points out that a better allowance for measurement error would have made E and H largely hereditary. Gottesman (1960), by means of twin studies, found the largest hereditary determination for factors B, E, F, H, J, O and Q_2. The two studies thus suggest B, E, H, J, and O as especially worthy of consideration in genetic studies.

Although the previous research points to substantial hereditary determination for only about half the factors, it seemed desirable to include all in this study. *A priori,* one might not expect the blood groups to determine more than a fraction of the trait variance—else these connections would have been noticed at the clinical level—and that fraction might be the 5% concerned when 95% of the variance of a trait is environmentally determined according to MAVA results. Any previous evidence regarding psychological and temperamental associations to blood groups is scanty. Some indications have been noted by Race and Sanger (1958), while Aird *et al.* (1954), Buckwalter *et al.*

(1956), and others have shown an association of blood group O with duodenal ulcer, which could be psychologically mediated. Recently, more pointed evidence has appeared in the finding of Parker, Theilie, and Spielberger (1961) "that O-type blood occurs more frequently in manic-depressive patients than in either psychoneurotic depressive patients or the general white population." Such findings from the psychiatric field suggest that the primary personality factors might form the roots of these psychiatric associations and, at the least, become a strategic supplement to the pathological approach.

SUMMARY

The High School Personality Questionnaire, Form A (10 items per factor) was given to 581 Italian or Italo-American boys averaging 14 years of age in four different cities. They were also classified for ABO types. Analysis of variance was used to detect asscciations between ABO type and the 13 personality factors and intelligence.

An association beyond the $P < .01$ level was found for I factor, premsia *vs.* harria ("tender-minded *vs.* tough-minded"), A blood type being more premsic, and O, B, and AB more harric, in that order. A relationship which appeared to warrant further investigation was personality factor J, coasthenia, with blood group AB.

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