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A Comparison of Heritability Estimates of US Negro and White High School Students

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As you all know, there is a growing concern with the Negro problem in America. I will look at one small aspect of that problem today: the possible hereditary difference in ability between Negro and White.

Fig. 1 is just one of many examples that could be chosen. It shows the extent of such differences in ability for different years, for male and female separately, between Negro and White students admitted to the University of Georgia, as reported by Hills (cf. Stanley and Porter, 1967). Ability was measured by the verbal score on the Scholastic Aptitude Test — a test widely used by college admission officers in the USA for selection of students.

Fig. 2 shows a comparison of the fertility of Negroes and Whites, indicating that less able Negroes have the highest fertility, while more able ones have lower fertility (Bogue, 1969).

Should the combined effect of these two factors (i.e., lower IQ's and greater fertility of low IQ Negroes) lead us to worry about a gradual decline of the national level of intelligence in the USA? I believe not, and I will present some evidence which supports the thesis that the observed lower intelligence in US Negroes is due to an interaction between innate potential and unfavorable environmental conditions. If, as I believe, social conditions for the Negro are improving and if their greater fertility will level off as social conditions improve, we will not need to be concerned about a national decline in ability.

First, I want to review a model of heredity-environment interaction advanced by Jensen (1968). He proposed a ratio between genotypic potentiality and the phenotypic realization of this potential. Parenthetically a better formulation would be in terms of a technical concept from genetics, i. e., " reaction range ", referring to the fact that a given genotype can display a wide range of phenotypes, depending on the interaction between that genotype and varying environmental conditions. Nevertheless, if we keep in mind the fact that it is impossible to determine the genotypic potential directly and realize that it is only an abstraction, Jensen's model may still have some utility. As shown in Fig. 3, he expressed the phenotypic realization as measured by scores on test A or B, as a percentage of the genotypic poten-

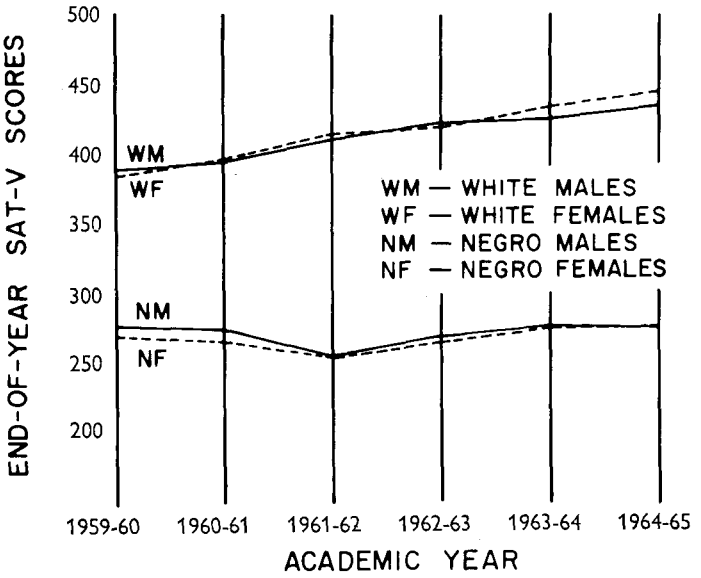

Fig. 1. Scholastic Aptitude Test scores of Negro and White males and females for six years.

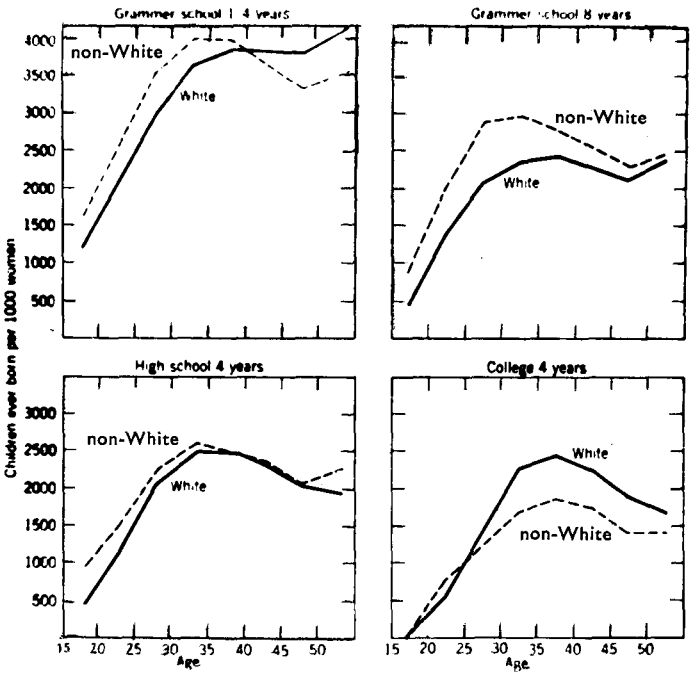

Fig. 2. Number of children born to White and non-White women from four educational levels by age. From 1960 census.

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tial, running from a low to a high fulfillment. Test B is more sensitive to restrictive or deprived environment than test A. Jensen assumed that nobody realizes his full potential and this is indicated by the fact that the asymptote does not reach the value of 1.00. From left to right, we have environmental conditions starting with unfavorable, " deprived " conditions through moderately favorable ones, up to (on the right) the most promising environments.

Now we could ask, what will happen if we study two groups of twins from rather widely contrasting environments? Before we do so, we need to take another step.

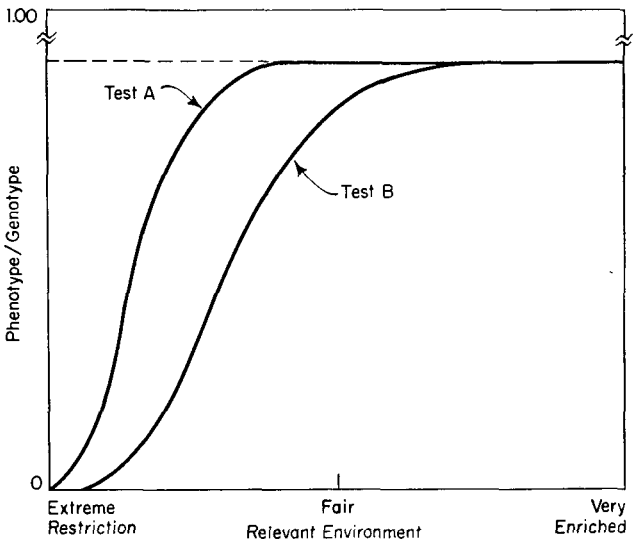

Fig. 3. Hypothetical scores on test A and B under extreme restriction (deprivation) to very enriched environmental conditions.

Fig. 4 shows the theoretical distributions of Negro and White children raised under conditions varying from severe cultural deprivation to stimulating or enriched environments. Here it is assumed that the majority of Negro children today have been raised under moderately deprived conditions, while the majority of White children have been raised under fair to comparatively enriched conditions. If this is correct, one would expect Negro children to have, on the average, lower phenotype : genotype ratios than White children, and this lowering of average realized potential would then lead to less evidence for an hereditary factor in ability in a study of Negro twins than in a study of White twins.

Twins were studied in Kentucky and Georgia, in their own schools, with a large battery of ability tests already described (Vandenberg, 1969). Zygosity was determined by determining a number of blood groups described elsewhere (Vandenberg et al, 1968). If there was any difference, the pair was regarded as DZ; if there was no difference, the prob-

ability of dizygosity was calculated: the latter being generally less than 0.05, these pairs were regarded MZ.

Data were available for 31 MZ and 14 DZ Negro twin pairs, and 130 MZ and 90 DZ White twin pairs.

The within-pair variances of MZ and DZ pairs was compared by the F test, where $F = \frac{\Sigma \text{ diff}^2}{N_{DZ}} \Big/ \frac{\Sigma \text{ diff}^2}{N_{MZ}}$. The MZ within-pair variance can only be due to environmental factors, which of course include prenatal and perinatal, as well as postnatal factors. The DZ within-pair variance is due to both environmental and hereditary factors. The F test comparison between these two variances allows us a statistical evaluation of the significance of the increased DZ within-pair variance due to hereditary differences between DZ twins, and to conclude whether the genetic component is significantly different from zero.

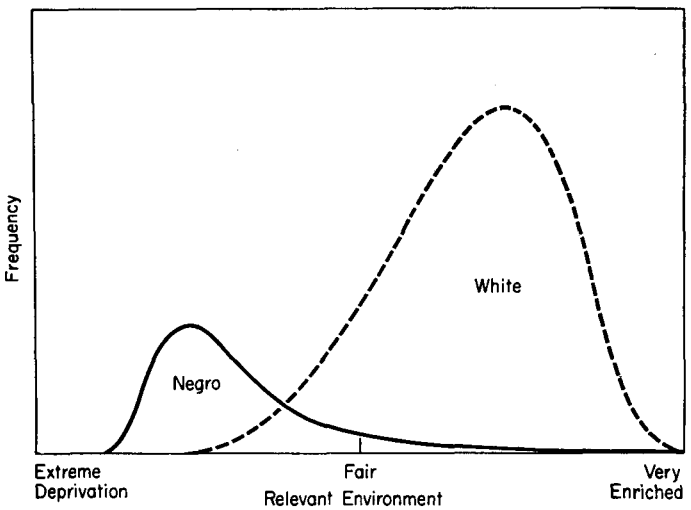

Fig. 4. Hypothetical distribution of numbers of Negro and White students raised under extreme deprivation to very enriched environmental conditions.

F ratios and their significance, calculated separately for Negro and White twin pairs, are shown in Tab. I.

It is clear from this tabulation that there is good evidence for the thesis that the ratio between hereditary potential and realized ability was generally lower for Negroes than Whites, although it should be kept in mind that the F ratio for Negroes frequently did not reach significance because of the small number of DZ pairs.

It should finally be stressed that comparisons were made, not of the original scores, but of the statistical significance of the hereditary contribution to the variance.

Tab. I

***a*) F ratios between DZ and MZ within-pair variances for Negro and White students**

Test	Factor	F ratio	
		Negro	White
Spelling Test	Verbal	1.58	2.94 (P <0.001)
Wide Range Vocabulary	Verbal	1.30	1.55 (P <0.05)
Heim AH4 Vocabulary	Verbal	1.97 (P <0.10)	2.75 (P <0.001)
Inference Test	Reasoning	1.14	1.29
Logical Reasoning	Reasoning	2.45 (P <0.02)	0.85
Whiteman Social Understanding	Verbal reasoning	2.53 (P <0.02)	1.30 (P <0.10)
Ship Destination Test	Numerical reasoning	1.01	2.31 (P <0.001)
Arithmetic Test	Numerical	2.10 (P <0.05)	2.69 (P <0.001)
Cube Comparisons	Spatial	0.58	1.61 (P <0.01)
Surface Development	Spatial	1.83 (P <0.10)	2.29 (P <0.001)
Formboard	Spatial	0.18	1.21
Paper Folding	Spatial	1.03	1.22
Object Aperture	Spatial	1.04	1.11
Card Rotation	Spatial	0.66	1.85 (P <0.001)
Newcastle Spatial Test	Spatial	0.52	2.20 (P <0.001)
Calendar Test	Perceptual speed	0.46	1.20
Mazes	Perceptual speed	1.45	1.37 (P <0.10)
Identical Pictures	Perceptual speed	2.63 (P <0.02)	1.52 (P <0.05)
Bourdon Cancellation	Perceptual speed	1.00	1.69 (P <0.005)
Mooney Faces	Closure	1.06	0.75

***b*) Number of variables for the different levels of significance**

	F <1.00	F >1.00							Total significant
		n. s.	P <0.10	P <0.05	P <0.02	P <0.01	P <0.005	P <0.001	
Negro	5	9	2	1	3	0	0	0	6
White	2	5	2	2	0	1	1	7	13

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