Book Reviews

Accounting for Differences in Mean IQ

Educability and Group Differences. ARTHUR R. JENSEN. Harper and Row, New York, 1973. viii, 408 pp., illus. $10.

In summarizing this book Arthur Jensen writes as follows:

> In view of all the most relevant evidence which I have examined, the most tenable hypothesis, in my judgment, is that genetic, as well as environmental, differences are involved in the average disparity between American Negroes and whites in intelligence and educability, as here defined. All the major facts would seem to be comprehended quite well by the hypothesis that something between one-half and three-fourths of the average IQ difference between American Negroes and whites is attributable to genetic factors . . . [p. 363].

Since *Brown* vs. *Board of Education of Topeka* the black segment of American society has made considerable but insufficient progress toward social equality. Some will undoubtedly consider this latest book by Jensen another cruel blow to that progress; others may embrace it eagerly as a vindication of bigotry. How should the scientific community view it?

Figure 1 may help to clarify the central issue. Genotypic values (G) are plotted along the abscissa, environmental values (E) along the ordinate. All values are expressed as deviations from the general mean, m, of the composite (black + white) population. Assuming no $G \times E$ interaction, the phenotypic values (P) lie on a plane defined by the equation $P = m + G + E$ (the P axis is perpendicular to the G,E plane); lines of equal phenotype (IQ) are defined by the equation $G + E =$ constant (moderate $G \times E$ interaction would "curve" these IQ lines). The joint genotype-environment distribution of each of the two populations is represented by a contour ellipse. Population 1 (whites) has its mean on the IQ = 100 line; according to most available data, the mean of population 2 (blacks) must lie somewhere near the IQ = 85 line. In general, the phenotypic value of the jth individual from the ith population is

$$P_{ij} = m + G_i + E_i + g_{ij} + e_{ij} \quad (1)$$

where lower-case letters refer to within-population and upper-case letters to between-population deviations. The total phenotypic variance is then

$$\sigma_P^2 = \sigma_{B(\text{etween})}^2 + \sigma_{W(\text{ithin})}^2 = (\sigma_G^2 + \sigma_E^2 + 2\text{CV}_{GE}) + (\sigma_g^2 + \sigma_e^2 + 2\text{CV}_{ge}) \quad (2)$$

and the between and within-group heritabilities are $h_B^2 = \sigma_G^2/\sigma_B^2$ and $h_W^2 = \sigma_g^2/\sigma_W^2$, respectively.

The race-IQ controversy is, in part, over the question Around what point on the IQ = 85 line is the black population distributed? A strict hereditarian would center the black population at A ($\Delta E = 0$, $h_B^2 = 1$), a strict environmentalist at D ($\Delta G = 0$, $h_B^2 = 0$, dotted ellipse in Fig. 1). Jensen centers the black population in the interval $\Delta E < \Delta G < 3\Delta E$ (in Fig. 1 arbitrarily put at $\Delta G = 2\Delta E$, $h_B^2 = 4/9$, dashed ellipse).

This book, written primarily for "behavioral scientists and educational researchers," has five principal concerns: (i) explanation of relevant biometrical concepts; (ii) arguments for the hypothesis $h_B^2 > 0$; (iii) arguments against the hypothesis $h_B^2 = 0$; (iv) indictment of "environmentalism"; (v) the question Is the heritability of intelligence important to educators and society in general?

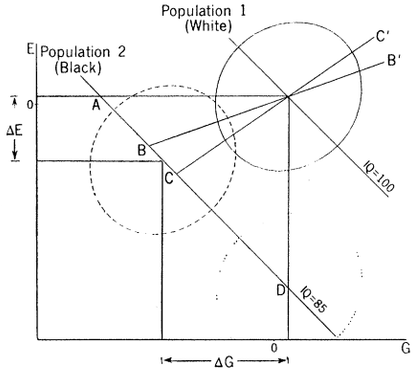

Fig. 1. The joint distribution of genotype and environment for two populations (black and white) with different phenotypic (IQ) means. Genotypic (G) and environmental (E) values are expressed as deviations from the general (black + white) population. The mean IQ of whites is 100, that of blacks is 85. The joint (G,E) distribution for whites is represented by the solid ellipse. The black (G,E) distribution must be centered somewhere on the IQ = 85 line. A strict hereditarian would center it at A. A strict environmentalist centers it at D. Jensen centers it in the interval $\Delta E < \Delta G < 3\Delta E$ (dashed ellipse). BB' is the regression of e on g in the white population; CC' has slope b_{eP}/b_{gP}, in whites.

Jensen's exposition of biometrical concepts sometimes falls short of his understanding. For example, his equation 2.2 ($P = G + E$), though one commonly used, is misleading. It makes no sense to partition a single value (in this case a mean) into genetic and environmental components; only differences (for example, between two individuals, between an individual and a mean, between two means) may be meaningfully partitioned. Jensen is careless with notation on p. 48 where he uses the symbols G_i and E_i each to mean two different things, and the "standard error of the genetic value" explained on p. 46 is small only because Jensen assumes h^2 is known without error. In addition, the statements that the regression of G on P is h (p. 47) and that it is equal to the regression of P on G (p. 319) are both slips of the pen, and equation A.3 needs a 2 before CovGE.

On the other hand, Jensen's discussion of $G \times E$ interaction and covariance is instructive and his description of the practical meaning of "environmentability" ($1 - h^2$) is worth quoting for its clarity and correctness:

> The proportion of variance indicated by $1 - h^2$, if small, does in fact mean that the sources of environmental variance are skimpy under the conditions that prevailed in the population in which h^2 was estimated. It means that the *already existing* variations in environmental (or instructional) conditions are not a potent source of phenotypic variance, so that making the best variations available to everyone will do little to reduce individual differences. This is not to say that as yet undiscovered (or possibly already discovered but as yet rarely used) environmental manipulations . . . cannot, in principle, markedly reduce individual differences in a trait which under ordinary conditions has very high heritability [p. 58].

A reader disinclined to accept the evidence for substantial within-group heritability should find the arguments of this book unconvincing. Indeed, the hypothesis that (for whites) $h_W^2 \simeq .8$, or at least that it is substantially greater than zero, is an explicit premise of each of the main arguments for a genetic

difference between groups. I believe the premise is a reasonable one. I will now sketch four of Jensen's more important lines of reasoning.

One argument is simply that a high within-group heritability adds plausibility to the contention that some of the difference between groups is genetic. Jensen acknowledges that large h^2_W does not *imply* large h^2_B.

A second argument concerns the phenomenon of regression toward the mean. Jensen observes, for example, that the IQ of sibs of black children and of white children matched for IQ regress to different means, and he states: "This very regular phenomenon seems difficult to reconcile with any strictly environmental theory of the causation of individual differences in IQ that has yet been proposed" (p. 118). Of course, an environmental model that invokes the idea that part of one's IQ is the result of parental influence and part the result of general milieu can be constructed to explain both the regressions and their difference; but it is fair to say that in this case, as in others, the environmental hypothesis is burdened by a bit of "ad hockishness" not suffered by the genetic model.

A third argument is roughly as follows: Since only about 20 percent of the total IQ variance in whites is environmental, the environmental standard deviation is about 5 IQ points and the black-white difference of 15 points is then 3 standard deviations on the environmental scale. But, says Jensen, ". . . no one has yet identified or measured any set of environmental conditions on which Negro and white populations differ, on the average, by even half as much as 3 sigmas" (pp. 166–167). There is the implicit assumption here that the transformation from measurable variables of the environment to environmental deviations (in the genetic model) is the same in the two groups.

The most novel argument appears on pp. 306–312. Jensen presents Raven (Raven's Progressive Matrices) and PPVT (Peabody Picture Vocabulary Test) test data on California white, black, and Mexican school children in the form of two regression analyses. For a given Raven score the PPVT scores are in the order white > black > Mexican as expected under a cultural-deprivation hypothesis. But for a given PPVT score the Raven order is Mexican > white > black. The black and white regression lines do not reverse order as expected. Jensen observes that this is what one should expect if there exists a substantial between-group genetic component. His reasoning is based on the assumption (supported to some extent by data) that the Raven test measures genotype and the PPVT measures (the same) genotype plus environment, and, of course, that $h^2_W > 0$ for whites. Jensen's argument is flawed by an algebraic error and he assumes no $G \times E$ covariance, but his qualitative conclusion appears to be correct. It can be shown that if the black population lies (in Fig. 1) between *B* and *C*, the data are predicted. On the other hand, Jensen's conclusion regarding the position of the Mexican children is not correct; the exact genotypic relation between the black and Mexican populations is indeterminate.

Jensen attacks the environmental hypothesis with, among others, two observations: (i) To the extent that genetic factors are operative, the environmental indices used by the environmentalist are correlated with genotype and, therefore, an "environmental" explanation of the IQ difference between blacks and whites has a hidden genetic component. (ii) "Despite this bias favoring an environmental hypothesis, no multiple correlations have yet been revealed which account for all of the between-groups variance" (p. 357). This latter point is elaborated in a series of chapters in which inequality of schooling, the Pygmalion effect, motivation, language deprivation, culture bias in intelligence tests, sensorimotor differences, and nutrition are all examined as possible explanations and found wanting.

Jensen also regards the "factor-X" hypothesis (that there exist environmental factors which contribute to the between-group variance but not to within-group variability) as untestable and therefore unscientific. I agree that it appears difficult to test such a claim, but nature is under no compulsion to avoid confounding in the arrangement of her variables. The factor-X hypothesis will certainly remain a haven for the dedicated environmentalist for some time.

Jensen distinguishes "environmentalism" from research on the environment: "Environmentalism is the scientifically anomalous attitude that ignores, shuns, or denigrates any hypothesis of genetic causation in specific classes of human individual or group differences" (p. 231). "This tendency results in the uncritical acceptance of almost any environmental factor that anyone suggests as an explanation . . ." (p. 232). What Jensen is describing is, of course, a matter of faith, not a scientific attitude. I agree with Jensen that "environmentalism" can contribute nothing of value toward answering the question at hand.

With respect to the social importance of the question, Jensen often appears at his weakest. Many of his statements are mere denials of opposing views rather than informative rebuttal. But the following is, I believe, indicative of his attitude:

> Differences in rates of mental development and in potential for various types of learning will not disappear by being ignored. It is up to biologists and psychologists to discover their causes, and it is up to educators to create a diversity of instructional arrangements best suited to the full range of educational differences that we find in our population. Many environmentally caused differences can be minimized or eliminated, given the resources and the will of society. The differences that remain are a challenge for public education. The challenge will be met by making available more ways and means for children to benefit from schooling. This, I am convinced, can come about only through a greater recognition and understanding of the nature of human differences [p. 365].

Some, in possession of Jensen's information and perhaps even sharing Jensen's conclusions, would not have written this book for social reasons. So be it. The book is written and it will be read, with and without understanding. It will be quoted, accurately and inaccurately. It will lead to conclusions, valid and invalid. Therefore, Jensen has forced upon us both a scientific challenge and a social obligation to clarify, to test, and, if possible, to resolve the issues raised.

In sum, the case erected by Jensen for the proposition that a substantial genetic component exists in the IQ difference between the black and the white populations is neither frivolous nor compelling. The opposing view, that no such genetic component exists, has long been popular among social scientists and educators. But popularity is not corroboration. Jensen has demonstrated that the genetic hypothesis is a viable one and that it must be considered seriously.

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