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ABSTRACT

This paper repudiates Jensen's hypothesis that differences in IQ scores and scholastic achievement in Negro and white children are genetically based. Specifically, Jensen's identification of IQ scores as a measure of abstract reasoning and problem solving and of levels of ability, and his evaluation of the magnitude of the genetic component in IQ scores, are stated to have raised serious questions. The alternative hypothesis presented is that the distribution of the genetic component in the white and Negro populations both, which Jensen postulated was a reflection of the observed differences in IQ scores, is considered the same in both groups. Using the model from quantitative genetics, it is assumed that the IQ score (the phenotype) can be represented as the sum of two components: (1) that resulting from the genetic structure of the individual (the genotype), and (2) the sum total of all the non-genetic influences (the "environment"). Detailed but simplified mathematical analysis is used to demonstrate that Jensen has omitted consideration of the effects of environmental influence. The need for research on the evaluation of environmental effects involving a wealth of hitherto ignored cultural and psychological factors is emphasized. [Not available in hard copy due to marginal legibility of original document.] (RJ)

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Comments on the "Jensen Report"

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In his paper on IQ and scholastic achievement in the Harvard Educational Review [1], Professor Jensen has suggested, among other things, that there appears to be a wide diversity of mental abilities in human beings, and, consequently, a need to develop diversified educational programs. Few educators would quarrel with this statement, but many of his other statements and conclusions have raised serious questions. These include his identification of IQ scores as measures of abstract reasoning and problem solving, his definition of Level I and Level II abilities, and his evaluation of the magnitude of the genetic component in IQ scores. In particular, the suggested hypothesis that observed Negro-white differences in IQ scores are largely genetic in origin is extremely controversial.

The comments here are concerned primarily with the probability model Professor Jensen is examining, and the implications that can be drawn from it. An example is given of an alternative hypothesis in which racial differences are ascribed only to environmental differences. This hypothesis leads to results which are well supported by the data that Professor Jensen cites.

The alternative hypothesis is described as follows. For clarity of presentation a number of simplifying assumptions are made. For example, we assume that we are dealing with "true" scores, ignoring measurement error. However, a more complex formulation which would lead to similar results could easily be devised. Following the model from quantitative genetics, we assume that the IQ score, i.e., the phenotype, can be represented

as the sum of two components. One, the genotype, is the result of the genetic structure of the individual. For our purposes, we will not decompose it further. The other component is the result of all non-genetic circumstances that affect the individual, and is generally subsumed under the term "environment." We use the term here to include both the main effect of the individual's environment and the interaction effect of genetic structure and environment. Following Falconer [2], the basic equation can be written as

$$P = G + E , \tag{1}$$

where

P = phenotypic value, the IQ score ,

G = genetic component in the score ,

E = the totality of environmental effects .

The equation given in (1) represents the structure of the IQ score for any individual, be he black, white, or green. The actual values of the components depend not only upon the individual, but also on the manner in which the test scores have been scaled. Further, the mean values, variances, and covariances in a particular population depend upon the joint probability distribution of G and E in that population. While Professor Jensen has clearly stated this fact in general, he seems to ignore it in a number of specific instances.

Suppose we consider first the characteristics of the groups of individuals used in norming IQ tests. These groups have been almost altogether white, with a "normal" range of environmental effects. The scores for a given test are scaled so that the mean for the norming group is 100, and the variance of the scores ignoring measurement error is approximately 200.

The average of the environmental effects for the group is taken as zero. If we assign the index 1 to the norming population, we can represent the relation between the mean values of the phenotype and genotype by the equation

$$\bar{P}_1 = \bar{G}_1 = 100 . \tag{2}$$

If we ignore the covariance of the genetic and environmental components, the variance of the IQ scores in a given population is the sum of the variances of the two components. For the norming population, this relation can be represented by the equation

$$V_{P_1} = V_{G_1} + V_{E_1} = 200 . \tag{3}$$

The heritability index for this population H_1 is defined by

$$H_1 = V_{G_1} / V_{P_1} . \tag{4}$$

Professor Jensen believes that the best estimate of H_1, derived from available data on correlations between IQ scores of individuals with varying degrees of family relationships, including monozygotic twins reared apart, is about .80. However, as he points out, this is a sample value, based on calculations made from relatively small samples, in which the sampled environments may not be represented in the same proportions as in the norming population, so that the true value of H_1 is still in doubt. For example, in the Burt study [3] of 53 identical twins reared apart, 29 of the natural parents and 32 of the foster parents were in semi-skilled or unskilled occupations, so that the occupational distributions of the parents are skewed, and concentrated at one end of the occupational scale.

Suppose, however, for the time being, that we accept the value of .80

as the value of H_1 . In such a case, some simple calculations give us

$$\bar{G}_1 = 100 , \qquad V_{G_1} = .80 \cdot (200) = 160 ,$$

$$\bar{E}_1 = 0 , \qquad V_{E_1} = .20 \cdot (200) = 40 ,$$

for the norming population, that is, a white population with a "normal" distribution of environments. The corresponding standard deviations are

$$S.D._{G_1} = 12.6 ,$$

$$S.D._{E_1} = 6.3 .$$

Now let us consider a second population, namely, a Southern Negro population. A number of studies have shown (e.g., see [4], [5]) that for this group the mean IQ score is about 85, while the standard deviation of the scores is about 12.6 . That is, we have

$$(5) \qquad \bar{P}_2 = \bar{G}_2 + \bar{E}_2 = 85 ,$$

and

$$(6) \qquad V_{P_2} = V_{G_2} + V_{E_2} = 160 .$$

The values of the component means and variances depend upon the joint probability distribution of G and E in the Negro population.

The hypothesis proposed for study by Professor Jensen states that the observed differences in the means and variances of the IQ scores reflect differences in the distribution of the genetic component in the two groups. The alternative hypothesis proposed here considers that this distribution is the same in both the white and Negro populations with the result that

$$\bar{G}_1 = \bar{G}_2 = 100 ,$$

and

$$V_{G_1} = V_{G_2} = 160 .$$

Now, if assume that for Negroes in the South, the totality of the environmental effects, represented by the component E, is to depress each IQ score by a fixed amount, and we assume that this amount is 15 points, we have

$$\bar{E}_2 = -15 , \qquad V_{E_2} = 0 ,$$

so that

$$\bar{P}_2 = \bar{G}_2 + \bar{E}_2 = 100 - 15 = 85$$

and

$$V_{P_2} = V_{G_2} + V_{E_2} = 160 + 0 = 160 .$$

Thus, we obtain from the model exactly the values that have been observed.

The fact that we can formulate a model which reproduces an observed set of data does not necessarily validate the model. For the simplified model given above, a number of questions can be raised, including the effect of ignoring measurement error in the Negro scores. By appropriate modifications, however, it seems possible to formulate a more realistic model, which is intuitively plausible, and which would yield equally good agreement with the data. The real point of the simplified model is to illustrate the fact that a number of alternative models exist which yield results in accordance with the data, and to emphasize the need, particularly in our present social situation, for the concentration of research efforts on the evaluation of environmental effects.

In this connection, it seems worth mentioning that the kinds of

socio-economic measures that have been used so far in attempting to control on environmental effects appear to omit a wealth of cultural and psychological factors which may be much more important than father's occupation, or parents' education, in determining children's responses to IQ tests. The problems of measurement involved in evaluating such factors are massive, but they cannot be ignored.

References

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