

Effects of Inbreeding on Raven Matrices

Nirupama Agrawal,¹ S. N. Sinha,¹ and Arthur R. Jensen^{2,3}

Received 5 July 1984—Final 15 July 1984

Indian Muslim school boys, ages 13 to 15 years, whose parents are first cousins, were compared with classmates whose parents are genitically unrelated on the Raven Standard Progressive Matrices, a nonverbal test of intelligence. The inbred group (N = 86) scored significantly lower and had significantly greater variance than the noninbred group (N = 100), both on raw scores and on scores statistically adjusted to control for age and socioeconomic status. Genetic theory predicts both of these effects for a polygenic trait with positive directional dominance.

KEY WORDS: inbreeding depression; intelligence; Raven matrices; heritability; polygenic theory.

INTRODUCTION

The effect of inbreeding on the mean of a quantitative trait conditioned by polygenic factors is directly related to the amount of directional dominance deviation involved in the trait and to the coefficient of inbreeding. The coefficient of inbreeding, f , is the average probability over all gene loci that the same allele on both homologous chromosomes comes from the same ancestor (Crow and Kimura, 1970, pp. 64–65). If the alleles which enhance the phenotypic expression of the trait are dominant, the effect of inbreeding is to lower the mean of the trait in the inbred group relative to the mean of a noninbred but otherwise comparable population. This phenomenon is known as *inbreeding depression*. Also, because inbreeding brings out previously hidden recessive factors which contribute to the phenotypic variance, the variance of the trait is increased by in-

¹ Department of Psychology, University of Rajasthan, Jaipur, India.

² School of Education, University of California, Berkeley, California 94720.

³ To whom correspondence should be addressed.

breeding. The theory of the genetic mechanism responsible for these statistical effects of inbreeding on polygenic traits has been explicated elsewhere (Crow and Kimura, 1970; Jensen, 1978).

The effects of inbreeding in humans have been investigated by studies of the offsprings of incestuous matings ($f = \frac{1}{4}$), and of double first cousins ($f = \frac{1}{8}$), first cousins ($f = \frac{1}{16}$), first cousins once removed ($f = \frac{1}{32}$), and second cousins ($f = \frac{1}{64}$). Effects of inbreeding which are consistent with the theoretical genetic expectations have been reported in 11 studies (Adams and Neel, 1967; Bashi, 1977; Böök, 1957; Carter, 1967; Cohen *et al.*, 1963, Neel, 1970; Reed and Reed, 1965; Schull and Neel, 1965, 1972; Seemanova, 1971; Slatis and Hoene, 1961). These studies have been reviewed in an article by Jensen (1983), which also showed that variation in the degree of inbreeding depression found on the various subtests of the Wechsler Intelligence Scale for Children (WISC) is directly related to the subtests' loading on the general factor, g , which is common to all the subtests. Performance on tests with the largest and purest saturation of g is subject to the greatest degree of inbreeding depression. This finding is consistent with a polygenic theory of intelligence in which there is positive directional dominance; that is, dominant genes enhance phenotypic intelligence. The fact that inbreeding depresses intelligence is evidence for genetic dominance of intelligence-enhancing genes. The presence of directional dominance also suggests that intelligence is a fitness character which has been subjected to natural selection in the course of human evolution. It is of considerable interest that our present standard psychometric tests are capable of reflecting to some extent this biological aspect of human intelligence. This theory is spelled out in greater detail elsewhere (Jensen, 1983).

A problematic feature of a number of studies of inbreeding depression of psychometric intelligence arises from the fact that, in certain populations, inbreeding is negatively correlated with socioeconomic status (SES); that is, consanguineous matings occur more frequently among persons of lower SES than among persons of higher SES. Because SES is usually positively correlated with intelligence measurements, interpretation of the lower mean scores of inbred groups, as compared with noninbred groups, is rendered somewhat ambiguous. Although statistically controlling SES has had little effect on the magnitude of inbreeding depression of the IQ, it has been argued, however unconvincingly, that perhaps not all of the relevant SES factors have been fully taken account of (Kamin, 1980). A study of inbreeding in Israeli Arabs, however, found a significant degree of inbreeding depression of intelligence scores despite the fact that inbreeding was more prevalent in the upper socioeconomic classes than in the lower classes of Arab society (Bashi, 1977).