

Airbrushing heritability

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Article:

Genetics and Human Behaviour: The Ethical Context by the Nuffield Council on Bioethics (2002) is the outcome of an extensive review of quantitative genetic studies conducted by a working party of 13 scholars in the United Kingdom that was based on their own reading of the scientific literature as well as interviews and consultations with 40 experts in behavior genetics and opinions submitted by 44 interested organizations and 64 individuals, mostly academics. After reviewing the history of behavior genetics and its relationship with eugenics, the document introduces the reader to the methods of heritability and linkage analysis, touches briefly on animal models and then presents a review focused on the quantitative genetics of intelligence, personality, antisocial behavior and sexual orientation. Much of the document appears to be a one-sided defense of heritability analysis, in which the many critics of that approach have no voice. The document states that: 'Estimates of heritability and other statistical techniques are useful in understanding the relative contribution of different types of influence.' (p. xxiii). Finally, there is a lengthy discussion of the practical policy implications of behavior genetic research.

The historical review of eugenics in relation to behavior genetics and heritability analysis does not fully confront past or present realities in our field. The Nuffield document acknowledges gross abuses of genetic theory in the 1920s and 1930s but denies that this sordid past means 'contemporary research on the genetics of behavior is in any sense eugenic or is driven by considerations that could be considered eugenic' (p. 22). While noting that there has been controversy in recent times concerning the heritability of intelligence in particular, it fails to make a clear connection between the concept of heritability and eugenical selective breeding. On the contrary, it suggests there is no connection in contemporary science.

The reader of the Nuffield report might be surprised to learn that the scientific concept of heritability as we know it today was formulated by Lush (1945) expressly for the purpose of selectively breeding farm animals. In a section entitled 'Practical Applications' (p. 97), he claimed that it is more efficient to improve the genotype of a breed than its environment, and he argued that the ratio of genetic variance to total phenotypic variance is predictive of the progress of artificial selection (p. 167). The theory of artificial selection was promulgated in the first undergraduate text in behavior genetics by McClearn & DeFries (1973), who asserted that the response to selective breeding R (the difference between offspring mean and mean of the unselected population) is equal to heritability h^2 (narrow sense) multiplied by the selection differential S (the difference between mean of the selected parents and the unselected population mean) or $R = h^2S$. This formula appeared prominently (p. 281) in the second edition of the text (Plomin *et al.* 1990), while the third edition (Plomin *et al.* 1997) moved the topic to the appendix, stating vaguely, without giving the formula, that 'narrow-sense heritability is particularly interesting in the context of selective breeding studies' (p. 300). To my knowledge, the $R = h^2S$ equation encapsulates the only practical claim of a heritability coefficient. If one intends to use heritability to anticipate the results of breeding for higher values of a phenotype, it makes a major difference whether heritability is judged to be 30, 40, 50 or 60%.

On the other hand, the value of so-called heritability in this broad range of possibilities has no valid implications for the educational or health policy of a nation (Wahlsten 1997a). In order to make valid use of genetic knowledge, we need to know the specific genes that are involved in phenotypic variation, but heritability provides no clue about the number or potencies of relevant loci. About all we can say with confidence is that, if the degree of phenotypic similarity of mono- zygotic (MZ) and dizygotic (DZ) twins is the same, implying zero heritability, then it is probably not worth doing a linkage study. As Plomin and McGuff in (2003) point out, a number of promising candidate genes pertinent to complex psychiatric disorders have not been confirmed in recent linkage studies and the search for these entities continues. Genes relevant to the normal range of human behavioral variation have been even more difficult to detect, and success is primarily evident for sensory functions (e.g., Kim *et al.* 2003).

The Nuffield report takes note of the arguments of Jensen (1969) and Herrnstein and Murray (1994) concerning the supposedly high heritability of intelligence but does not reveal the links those authors themselves make with contemporary eugenics. While Jensen (1969) argued, wrongly, that high heritability means environmental enrichment programs (e.g., Head Start in the U.S.A.) are doomed to failure, he also warned rhetorically: 'Is there a danger that current welfare policies, unaided by eugenic foresight, could lead to the genetic enslavement of a substantial segment of our population?' (p. 95), a segment he identified as 'Negro Americans'. In their widely read and cited book, *The Bell Curve*, Herrnstein and Murray (1994) called for an end to child support payments for unmarried, often poor and black, women, an end to 'the extensive network of cash and services for low-income women who have babies' (p. 548), and 'birth control mechanisms that are increasingly flexible, foolproof, inexpensive, and safe' (p. 549) to reduce births among low income women, measures they argued will improve the mean IQ of future Americans. Another prominent behavior geneticist, Raymond B. Cattell, who was honored with the Dobzhansky award for research by the Behavior Genetics Association, was an ardent advocate of large-scale eugenics throughout his career (Mehler 1997) and based much of his argument on the allegedly high heritability of desirable human traits. Cattell advocated the state control of reproduction of people 'with IQs in the 70–100 range' (cited in Mehler 1997; p. 155). He lamented that eugenics had been 'smeared in different ways in Germany and Russia, and (through the misunderstandings of a generation ago) in a few communities in America' (Cattell 1972; p. 347). His theory of Beyondism urges the extinction of several entire racial groups of humans as a means of achieving 'progress'. Thus, some leading figures in human behavior genetics do not simply deny the potency of environmental improvement but also support eugenical measures to prevent or discourage the reproduction of people with lower IQ scores. They base their ideas in part on the connection between heritability and response to selective breeding. Of course, many colleagues who cite heritability estimates do not advocate eugenical selective breeding on that basis. Nevertheless, it seems to me that the Nuffield document does the public a disservice by metaphorically airbrushing an ugly reality, suggesting there is a dispute about the magnitude of heritability but no serious advocacy of eugenics in our profession in recent times.

It is disconcerting to find the following conclusion in the Nuffield report: 'It is possible that contemporary understanding of the heritability of IQ and other behavioral characteristics, and increasing knowledge of the processes of inheritance of other traits, could provide a scientific foundation for a program of positive or negative eugenics, were there to be the political will or power to construct and implement such a policy' (p. 22). The unmistakable implication here is that heritability, if estimated properly, could provide a valid guide to social policy. The Nuffield report approves the methods of heritability analysis, calls for additional funding of this kind of research, and notes that this could be implemented in eugenic policies with scientific justification. All this is advocated in the name of ethics. While there are passages deep in the report that appear to limit this advocacy, as might be expected for anything written by a committee, I believe that the Nuffield Council on Bioethics should be held responsible for the major conclusions given prominence in its report.

It strikes me as unethical to propose the use of heritability estimates in a program of eugenical improvement of our species. There are abundant reasons to question the validity of methods used to estimate heritability in human populations (Devlin *et al.* 1997; Goldberger 1978; Gottlieb 1998; Guo 1999; Kempthorne 1978, 1990;

Wahlsten 1994, 1999, 2000, 2003), although one would never gain this impression from the unbalanced dissertation on quantitative genetics in the Nuffield document. The document makes vague mention of theories that do not use a 'conceptual dichotomy' between heredity and environment, but it dismisses this approach by asserting that 'no theory of development is generally accepted' (p. 22). This same standard is not applied to heritability analysis that most certainly is not generally accepted in the field of behavioral genetics.

Given that there is no scientifically valid way to determine from quantitative genetics whether any particular individual scores below the mean for mainly genetic or mainly environmental reasons, no valid policy implications about biological reproduction follow from low IQ test scores or school grades, at least not in a democratic society that recognizes individual rights. Admittedly, the conclusion could be different in a totalitarian regime that judges people on the basis of group membership.

Legitimate policy implications flow from scientifically verified and comprehensive understanding of single gene effects. In my opinion, an ethically based behavior genetics begins with the principle that all humans should enjoy equal rights and respect, and no person should be denied the benefits of citizenship because there happens to be a nucleotide base substitution in an exon of a gene somewhere on a chromosome that tends to impair development. The challenge to our profession is to discover the causes of poor development and find ways to overcome them. In individual cases where the cause includes a well documented genetic defect, this information may assist the individual or his or her guardian to make a decision about reproduction. Ethically, we should require that the information be full and accurate and that the decision be made voluntarily, taking account of the interests of the person afflicted with the disability.

An alternative view of rights was expressed by politicians in the province of Alberta in Canada where the Eugenics Board ordered 4725 children sterilized from 1929 to 1972 (Veit 1996; Wahlsten 1997b). This was the only jurisdiction in the British Empire that implemented compulsory sterilization. Although the Eugenics Board was undoubtedly inspired by bogus science espoused by the eugenics movement, its practice was not derived solely from behavior genetics. Instead, it was founded on the fundamental ethical principle of many leaders of 20th century eugenics; that humans with biological deficits are not fully human and the civil rights of 'defectives' should be curtailed in order to serve the interests of the taxpaying majority. It was from this perspective that the Alberta Eugenics Board ordered the castration of Down's syndrome boys, knowing full well they were already sterile, in order to obtain tissue samples for medical research (Veit 1996), and that the children in the Provincial Training School (PTS) were used as guinea pigs for experiments with powerful antipsychotic drugs such as trifluoperazine (Le Vann 1959), thioridazine (Le Vann 1961), trifluoperidol (Le Vann 1968) and haloperidol and chlorpromazine (Le Vann 1971) without obtaining consent from parents or guardians. The director of the PTS viewed normal children and some of his wards as almost a comparison of 'two separate species' where the children with lower IQ scores 'may, in fact, be a remote prototype of modern *homo sapiens*' (Le Vann 1950; p. 472). The utter lack of respect for the troubled children forcibly confined by the Province of Alberta went far beyond the abstract calculus of IQ heritability and selection differentials to a sweeping denial of their essential humanity.

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