ARTICLES

DIFFERENTIAL K THEORY AND RACIAL HIERARCHIES

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ABSTRACT

Rushton's Differential K theory, derived from the r/K model of evolutionary selection, purportedly explains racial differences in sexual practices and anatomy, fertility, IQ, and criminality. These differences supposedly define an evolutionary ladder on which Mongoloids > Caucasoids > Negroids. We point out that the r/K model is frequently misinterpreted and overgeneralized, that the predictions that Rushton derives from the r/K model are arbitrary, and that these predictions are supported by the selective citation and misrepresentation of the research literature and by the use of unreliable sources. Changes in human life-history traits are so rapid that there is no need to posit genetic selection to explain intergroup variation.

Many critics have charged that human sociobiology embodies a form of biological determinism which serves to justify existing social inequalities on the grounds that they reflect underlying biological differences. Sociobiologists themselves, however, have tended to focus largely on those features of human individual and social existence which are universal (with the major exception of gender). Indeed, several eminent sociobiologists (Barash, 1979; Trivers, 1981) have defended the discipline from charges of racism or conservative political bias precisely on the grounds that sociobiology has not concerned itself with group differences.

Rushton's Differential K theory (e.g., Ellis, 1987; Rushton, 1985, 1988a, 1988b, 1989a; Rushton & Bogaert, 1987, 1988) represents a significant departure from this precedent. This theory is based on the assumption that racial and social class differences are deeply rooted in evolutionary history. It borrows its specific evolutionary ideas from life-history theory, that area of evolutionary ecology concerned with the evolution of major individual characteristics across the life span (e.g., fecundity, developmental rate, age at sexual maturity, longevity, and mode of parental investment).

Specifically, Rushton (1985) has proposed that blacks invest more heavily in traits and activities directly relevant to sex and reproduction than do whites, who in turn invest more than Orientals. According to Rushton, however, this leaves blacks with far fewer resources available for non-procreative purposes than the other two racial groups. These differences in the allocation of resources leads to differences in a number of other traits, psychological, social, and physical. Thus Rushton argues that blacks are the least intelligent, least sexually restrained, most criminal, and least altruistic of the races. Orientals are on the opposite extreme for all these traits, and whites fall in the middle. A similar ordering exists for social class; lower social class individuals resemble blacks behaviourally, and "upper income" [sic] individuals resemble whites and Orientals.

Rushton's Differential K theory incorporates a number of familiar vulgar stereotypes, integrated by the hypothesis that these differences define a hierarchy of evolutionary progress (Rushton, 1989a), in which Orientals are the most advanced, blacks the most primitive, and whites intermediate between the two. Although Rushton and Bogaert (1988) claim that the differences between racial groups in sexual behaviour are stronger than the

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differences between social classes, they propose that social class differences also reflect evolutionary differences. While the idea of such an evolutionary hierarchy among human races (e.g., Haller, 1965) is not new, Rushton's placing of Orientals rather than whites at the top of the hierarchy is, perhaps, something of an innovation; the genetic ordering of social classes, however, is entirely consistent with older eugenic traditions (Cravens, 1978).

Rushton uses the very existence of racial and social differences as evidence for the applicability of this evolutionary model, and the model, in turn, is then used to explain these same differences. Thus only the scientific soundness and relevance of the underlying biological evolutionary model can save Differential K theory from circularity. The claims for Differential K theory are hardly modest: Rushton (1985) has suggested that the K-dimension may underlie "much of the field of personality" (p. 445). The extravagance of its claims and the attention it has received justify a careful examination of Differential K theory, especially since it does exactly what critics of human sociobiology have charged; namely, it provides a biological rationale for existing patterns of social inequality.

r- and K-Selection

As an evolutionary scheme, Differential K theory represents an extension of the concepts of r- and K-selection to humans. Although building on earlier research and theory, these terms were first introduced by MacArthur and Wilson (1967) in their influential work on island ecology. In this work, they examined the nature and consequences of selection pressures on organisms colonizing uncrowded islands and compared them with the pressures that obtain as the habitat becomes more crowded and population densities increase.

In the first instance, they theorized that selection would favour traits supporting rapid and prolific population growth. In the second, selection would favour traits supporting the efficient exploitation of environmental resources, rather than sheer prolificacy. These ideas quickly became generalized beyond island settings; *r-selection* was hypothesized to operate in any unstable, fluctuating, or ephemeral habitat, and *K-selection* was hypothesized to typify the selection pressures operating in more stable and persisting environments, such as the tropics (Murray, 1979). (Readers should note that this implies that human populations who have persisted longest in the tropical ancestral habitat, i.e. blacks, should be more K-selected than other human groups.) Species began to be described as being r-strategists or K-strategists. Each of these evolutionary strategies came to be strongly identified with a particular complex of specific life-history traits, as articulated by Pianka in an influential article in 1970 (Boyce, 1984; Stearns, 1977).

Population regulation for r-selected species was assumed to be independent of population density, and such species were characterized as discovering new or empty habitats, reproducing rapidly and prolifically, and using up resources before competitors appeared or before the habitat itself disappeared (Murray, 1979). In order to maximize reproduction, parents would invest as little as possible in individual offspring. Achieving maximal reproduction also meant that traits leading to increased reproduction would be selected even at the cost of traits supporting individual maintenance and survival (e.g., Pianka, 1970; Stearns, 1976, 1977). K-selected species were presumed to evolve under conditions where population density would regulate population growth. Under these conditions there would be greater competition for scarce resources, and so selection would favour the production of fewer offspring who were better equipped to meet the challenges of intraspecific competition (e.g., Pianka, 1970; Stearns, 1976, 1977).

In the late 1970s, criticisms of the r/K model, especially in the more generalized form popularized by Pianka (1970) and others, began to appear. In one influential critique, Stearns (1977) pointed out that life-history theorists tended to ignore the importance of developmental plasticity and the role of developmental influences in shaping the phenotype (Schlichting, 1986; Stearns, 1977). However, there is often considerable plasticity in those life-history characteristics frequently assumed to be the consequences of r- or K-selection. Marmosets, for example, are small colonizing primates who can produce two sets of twins a year when food is plentiful (Hrdy, 1981, p. 40). When food is scarce, however, the spacing between births is increased, as is the likelihood that one member of the twin pair may die. Hrdy has written that "...marmosets, like many small animals, must be ecological double agents, shuttling back and forth along a continuum ranging from r- to K-selected strategies

— from reliance on proliferation to reliance on competition'' (p. 41).

Plasticity may be especially adaptive when environmental conditions are changing rapidly and unpredictably (Roughgarten, 1979), precisely the conditions under which r-selection may be most evident. Insofar as plasticity itself is an adaptive response to evolutionary selection, however, it undercuts the idea that there is a general relationship between selection and any specific set of traits. On the contrary, plasticity in r/K behaviour, conjoined with the many examples of organisms that possess both r-selected and K-selected traits (marine turtles, for example, both lay numerous eggs and have long life spans), suggest that there is little evidence for the existence of complexes of r or K traits at the level of the genes.

Stearns also criticized the empirical robustness of the r/K model in his 1977 review. He noted that only 18 of the 35 studies reviewed provided positive evidence for the model, and most of these had significant methodological limitations. As Begon and Mortimer (1981) have noted, it has been the better designed studies that have failed to support the r/K model.

In fairness, it should be pointed out that these negative empirical findings, as well as the general criticisms noted above, apply more to the ambitious claims of the extended versions of the model than they do to the more modest idea of r/K selection itself (Boyce, 1984). The original model of r/K selection did not imply that r- or K-selection was to be identified with a specified group of life-history traits (Boyce, 1984). However, it is precisely this extended and oversimplified version of the r/K model, with its rigid specification of traits, that has been embodied in Differential K theory.

Differential K Theory

Based on his analysis of the r/K literature, Rushton (1985) concludes that there is an evolutionary trend towards K within the mammalian order. Not only are primates highly K-selected, but humans are the most K-selected of the primates. Rushton (1985; Rushton & Bogaert, 1987, 1988) and his associates (Ellis, 1987) argue that while humans as a species are K-selected, there are nonetheless relative differences among groups in this regard. That is, they assume that if r/K selection can account for evolutionary differences between species, then differences in evolutionary reproductive strategies may also account for a number of differences among human groups. Translating our earlier description of Rushton's hypotheses into r/K terminology, Rushton (1985) has hypothesized that because of imputed differences in evolutionary history, Negroes (blacks) are less K-selected than Caucasians (whites), who in turn are less K-selected than Orientals.

One major problem with Differential K theory is that neither the biological theory nor the data on which it rests provide a solid foundation for its extension to humans. While there is no a priori reason why r/K selection cannot operate within species, Rushton provides no evidence regarding those environmental factors which might have differentially selected for r- or K-traits among human groups. In fact, Stearns (1983) found little evidence that life-history selection occurs at the level of either the subspecies (i.e., varieties or races) or the species. He reported that the selection of life-history traits which form the basic ground-plan of the organism are more evident at biological levels more inclusive (e.g., class, family, and order) and evolutionarily older than the species level.

Rushton has argued that there are biological differences among the races, so that less strongly K-selected (i.e., more r-selected) groups are hypothesized to have larger genitalia, lower age at menarche, higher levels of multiple births, and a higher rate of infant mortality, all of which can be interpreted fairly directly as manifestations of a more r-like, less K-like strategy. He and his colleagues have also argued, however, that evolutionary r/K differences would also lead to differences in a variety of traits whose relationship to r/K selection is neither immediately obvious nor compelling to us. These include differences in measured intelligence, altruism (undefined), attitudes toward the environment, degree of social organization, extraversion and introversion (Rushton, 1985; Rushton & Bogaert, 1987, 1988), law-abidingness, and economic behaviour and business practices (Ellis, 1987).

In his earlier writings Rushton (1985) did not offer any theoretical rationale for including such traits as altruism (undefined), degree of social organization, and abstract intelligence in his list of r/K selected traits. The way the list is presented makes it appear that these traits are simply taken from Pianka's (1970) list of traits, on which Rushton's is based. In fact these traits do not occur in Pianka. More recently, Rushton (Rushton & Bogaert, 1988) has attempted to justify their inclusion by suggesting that these traits are K-selected because they contribute to social organization, which helps insure the viability of offspring.

The ascription of r- or K-selected status to these traits seems arbitrary, however. For example, there is no reason to assume that K-selection, which involves interindividual competition, will lead to the evolution of altruism, however defined. In the absence of any knowledge about the environmental context in which selection took place, one could as easily (and more directly) argue that K-selection would place a premium on selfishness. To take another example, Rushton and his colleagues (Ellis, 1987) have suggested that the higher crime rate found among American blacks indicates that they are less K-selected and more r-selected. As is well known among criminologists, however, black crime is largely directed at black victims (Bureau of the Census, 1988); hence, it could be argued easily that such behaviour is more strongly K- than r-selected (i.e., that it represents competition for limited resources).

In the end, then, there is neither any justification from the biological literature nor any strong theoretical justification for Rushton's ascription of r-selected or K-selected status to traits like altruism, criminality, etc. What Rushton has done is to employ the terminology of r/K theory to justify a number of stereotypic beliefs, all the while ignoring not only the limitations of the r/K model, but frequently the very model itself.

Heritability

Rushton (1985) has claimed that traits and the group differences among them are largely heritable and that such heritability provides a basis for arguing that group differences represent the outcome of different evolutionary strategies. Leaving aside the problems of inferring conclusions about genetic variability from correlations reflecting phenotypic familial resemblance, problems which have been discussed at length in the literature (e.g., Hirsch, 1970; Roughgarten, 1979; Wachs, 1983; Wahlsten, 1979), there are some serious limitations of the concept of heritability itself which Rushton has ignored. (For additional discussions of heritability, see Angoff, 1988; Feldman & Lewontin, 1975; McGuire & Hirsch, 1977; Plomin, 1983; Scarr, 1981a, 1981b).

A *heritability coefficient* is simply a numerical estimate of the amount of additive genetic variation underlying the phenotypic variation in a given trait for a particular population. Since heritability only involves variation within a population, it says nothing about the operation of genes within individuals; thus, heritability cannot be identified with heredity, a confusion which is quite common, even among geneticists (Paul, 1985). Changes in either genotypes or environments can lead to different heritability estimates (Falconer, 1960, p. 166). In fact, Angoff (1988) has recently suggested that obtaining a reliable heritability estimate for intelligence may be impossible, since estimates of the heritability of intelligence vary so widely. Given the difficulty of ascertaining the heritability of human traits, such a conclusion is not surprising.

The descriptive nature of heritability also means that one cannot generalize heritabilities from one population to another. For example, all of the variation in a genetically homogeneous population is necessarily environmental, which results in a heritability estimate of .00; however, one cannot generalize this figure to more genetically heterogeneous populations.

Similarly, it is important to emphasize that within-group heritability scores, whether high or low, are absolutely silent regarding the cause of between-group differences. Heritability is a descriptive measure which cannot be generalized beyond the range of genotypes or environments on which the estimates were originally made, a point disputed to our knowledge only by Rushton (1989b). Since groups may differ genetically and/or environmentally, average differences can be caused by either and/or both factors, and they cannot be disentangled without employing a highly specialized and demanding methodology (Zuckerman & Brody, 1988). Zuckerman and Brody point out that Rushton never uses or cites studies that employ methods which can separate genetic and environmental factors as causes of group differences. Of the several such studies Zuckerman and Brody found in the area of intellectual differences, none report any evidence that group differences in intelligence are genetic.

Even differences between groups which are totally due to genetic influences may not generalize to other environments. Changing the environment of rearing may change the magnitude or even the direction of group differences. Whether group differences are genetic has only to do with the causes of variation between groups within a given environment and does not necessarily predict what the pattern of group differences will be in other environments. For this reason, evolutionary hypotheses about the development of population traits need to be tested in the environments in which they were presumed to have evolved, a condition which most data on racial differences do not meet.

The usefulness of heritability measures is that they provide an index of the amount of genetic variation available for selection. Without such variation, selection has no raw material on which to work. While heritability is necessary for selection to occur, however, the very process of selecting for a trait, if successful, reduces genetic variation and thus works towards lowering heritability, at least within the range of environments within which the selective pressures operate.

For that reason, traits on which selection may be presumed to have operated quite strongly often tend to have relatively low heritabilities (e.g., Falconer, 1960; Mousseau & Roff, 1987). More generally, any traits which are universal have low heritabilities, since the requisite genes for producing the traits are also universal. While such traits may help exemplify the effects of natural selection, however, they hold little promise for those seeking to find an evolutionary sanction to rationalize beliefs about racial inequality. Hence Rushton's (1984; Rushton, Fulker, Neale, Nias, & Eysenck, 1986) assumption that data indicating that high heritability constitutes evidence that a trait has been the subject of selective pressures is simply wrong.

Rushton (1985) further compounds this misunderstanding of the relationship between heritability and natural selection by misconstruing the relationship between heritability and plasticity. Thus, in accord with recent versions of sociobiological theory (Lumsden & Wilson, 1981) which provide an explicit, if highly limited, role for learning and cultural influences, Rushton acknowledges (Rushton & Bogaert, 1987) that there is some room for individual change in r/K selected traits. However, Rushton explains this plasticity on the grounds that the correlations indicating heritability are of only moderate size (Rushton & Bogaert, 1987), implying that heritability limits plasticity.

High heritability, however, does not limit changeability or imply lack of educability, nor does low heritability necessarily imply plasticity (e.g., Angoff, 1988; Hirsch, 1970; Hunt, 1961; Oyama, 1985; Scarr-Salapatek, 1971; Weizmann, 1971). The fact that heritabilities for various traits can change during development indicates that heritability estimates respond to change, they do not constrain it. As research dating back to T.H. Morgan (Morgan, Sturtevant, Muller, & Bridges, 1915) indicates, however, even minor environmental variations can produce markedly different phenotypes.

Race

Rushton nowhere discusses the basis for his racial classification beyond stating that his three major racial categories follow "common usage" (Rushton, 1988a, p. 1009). Given the weight that Rushton places on racial classification, however, his response is unacceptable. Common usage is not a justification for a scientific category. The tripartite racial classification of common usage has been widely discredited as a biological concept (Molnar, 1975, p. 97), even if it has not disappeared as an explanatory variable in some circles. In particular, the biological concept of race has been found wanting on a number of grounds. There is no evidence supporting a typological conception of race, that is, the view that there is a prototypical individual who is representative of a race (Benton & Harwood, 1975; Molnar, 1975; Williams, 1973). The population variance among population groups inhabiting particular regions contradicts any concept of racial homogeneity (King, 1981; Molnar, 1975; Stringer & Andrews, 1988). In fact, no morphological characteristic or combination of characteristics (such as skin colour, skull shape, or stature) reliably defines a subgroup of Homo Sapiens (Molnar, 1975; Williams, 1973). Clines, which are geographical gradients of gene frequencies between distant populations, indicate that group characteristics vary continuously, and there are no clear-cut divisions between groups (Benton & Harwood, 1975; King, 1981; Molnar, 1975).

Plasticity, Change, and Group Differences

Change presents particular difficulties for sociobiological genetic explanations because the rapidity and the extent of many population changes cannot be accounted for by any known model of genetic change. If substantial changes within a population are due to environmental changes, then similar explanations may also apply to differences between groups. Many of the traits and behaviours that Rushton and his colleagues describe have undergone rapid and substantial change. For example, not only have IQ gains (Angoff, 1988; Flynn, 1987) been reported for many groups and nationalities that rival or exceed the average 15-point black-white difference that Rushton (1988a) reports, but the gap between whites and blacks on standardized tests of intellectual achievement lessened considerably in the 1960s and '70s (see Angoff, 1988).

Human Fertility

It is worth examining some aspects of human fertility and population growth, since they are central to Differential K theory. Recent research on the sensitivity of human fertility to changing environmental and social conditions (Coale & Watkins, 1986) has led researchers to conclude that the declining birthrate in Europe over the last century constituted a "social revolution" (Watkins, 1986, p. 420). The speed with which the initiation of family limitation spread throughout the provinces of Europe (Coale & Watkins, 1986) was most dramatic. National fertility levels (i.e., birth rates) declined from 90% to 60% of their previous levels in only 18–30 years (Coale & Watkins, 1986). Similar trends occurred in North America. During the sixteenth century, Quebec had one of the highest birth rates in the world. Since the Great Depression of the 1930s, however, the birth rate has fallen from a total fertility rate of 4.3 in 1926, just prior to the Depression, to the current rate of 1.4 (Lachapelle, 1988), a figure much below the replacement rate. Similarly, while the birth rate in the United States is now comparable to the low rates found in other industrialized countries, in colonial days women had, on average, eight children (Kiser, Grabill, & Campbell, 1968).

Past research tended to ignore the effects of age, SES-related factors, or rural/urban residence patterns on ethnic and racial differences in fertility. In more recent research in which these factors have been better controlled, many previously observed racial and ethnic differences weakened or disappeared (Bean & Swicegood, 1985). This change in emphasis has been particulary apparent in studies of black fertility. Bean and Swicegood, citing the work of Lee and Lee, indicate that the only case in which American nonwhite fertility exceeded that of whites was among less educated farm residents, while fertility among more highly educated blacks was actually lower than that found among similarly educated whites (1985, p. 10).

Bean and Swicegood (1985) conclude that one can predict the birth rates of female minority group members from the educational attainments of their respective mothers (p. 21). Among women with 8 or fewer years of education, black fertility exceeds that of whites by 1.42 children. For women with 4 or more years of university, blacks averaged only 0.08 more children than whites (Johnson, 1979, cited by Bean & Swicegood). Similarly, Kiser et al. (1968) reported that, for the period 1950–1960, the fertility rates of nonwhite American women reporting 1 or more years of college tended to be lower than those of white women. At other educational levels, the extent to which the fertility of nonwhite women exceeded that of white women tended to be inversely related to educational level. Among wives of professional men, the average number of children was frequently lower for nonwhite than for white women (p. 291).

The high degree of plasticity evident from the human fertility data certainly seems to indicate that humans can change fertility rates quite drastically in response to environmental change. The data regarding the relationship of environmental factors to lowered fertility rates in black and Hispanic populations are particularly apposite in view of Rushton's (1989a) recently expressed fears that when selection pressures are relaxed, natural selection will favour "r-genotypes" [sic] because of their more rapid rate of reproduction.

Perhaps the most dramatic illustration of the absurdity of Rushton's linking of race or population differences in fertility with what he assumes are gene-based differences in r- or K-selected traits is the fact that one of the highest fertility rates found anywhere in the world is that of the Hutterites of the Western United States and Canada (Potts & Selman, 1979). The fertility rate of this group of Swiss-German descent is so high that demographers consider it to be close to the theoretical possible maximum and employ it as the standard against which other groups are compared (Potts & Selman, 1979). This high fertility rate, however, has not evidently diminished the parental investment of the Hutterites in their young. Observers report that all members of the Hutterite community express concern for all of the children in the colony (Hostetler &

Huntington, 1967). It should be noted that the Hutterite's "racial" compatriots in Switzerland and Germany presently have very low birthrates.

Twinning

A second important area for testing Differential K theory, is group differences in the rate of dizygotic (DZ) twinning. DZ twinning rate is considered to be an indicator of the tendency to have multiple births ("litter size" in Rushton's phrase). "Racial differences in r/K sexual strategies were predicted because human populations are known to differ in egg production: namely, lower socioeconomic > higher socioeconomic, and Negroid > Caucausoids > Mongoloids." (Rushton & Bogaert, 1988, p. 261).

Rushton's emphasis on genetic explanations for such group differences, however, ignores more obvious and plausible explanations that are clearly specifiable and testable; that is, that DZ twinning results from dietary or other environmental factors which increase follicle stimulating hormone or follicle stimulating releasing hormone (FSH or FSRH). Nylander (1981) suggests that the high rate of DZ twinning in Western Nigeria occurs because "some environmental factor (e.g., a substance in the diet) may be acting like a fertility pill. . . causing high serum FSH and increased tendency to multiple births." (p. 201). James (1985) suggests that specific dietary substances such as milk products may be one such factor, since the consumption of milk products correlates 0.78 with DZ twinning rates in Europe.

James (1985) has recently reported that geographic latitude correlates substantially with DZ twinning rates in both Europe and America. It is interesting to note that given Rushton's assumptions about the meaning of twinning, this finding would lead to the conclusion that the higher twinning rates which characterize Northern Europe and America indicate that the inhabitants of those regions employ a more r-selected reproductive strategy. This would also suggest that whites and Orientals are more r-selected (or less K-selected) than blacks.

In addition to ignoring environmental factors in twinning, Rushton also ignores the remarkable shifts in DZ twinning rates that have occurred in a large number of geographical regions in very short periods of time (James, 1986): such rates declined in all European countries for which data is available during the 1960s, and most continued to decline through the 1970s. The DZ twinning rate in England, Wales, Finland, Eire, Holland, Greece, and Spain declined nearly 40% during this time (James, 1986). New Zealand's DZ twinning rate declined more than 40% from the late 1950s to 1973 (James, 1982). Similarly, Trinidad and Tobago's rate declined 40% during the period 1961–1975 (James, 1982). These widespread and substantial changes are based on reliable data and are independent of maternal age.

The largest change in DZ twinning rate has occurred, however, in Western Nigeria, a region known to have one of the highest rates of twinning in the world. While Nylander (1969) reported a twinning rate of 45–53 per 1,000 births for the mainly Yoruba area of Western Nigeria in 1969, more recent investigators (Marinho, Ilesanmi, Ladele, Asuni, Omigbodun, & Oyejide, 1986) found that the rate had declined to 23.8 per 1,000 for the same area by 1982–83. That is, the DZ twinning rate had declined 50% in just 14 years. Not only is the rapidity of such a large change quite remarkable, but it acquires additional significance from the fact that it is the high DZ twinning rates in Nigeria which have constituted one of the important bases for the generalization that blacks have a higher twinning rate than whites and Orientals.

As in the case of the changes in human fertility, it seems overwhelmingly clear that something other than genetic shifts are affecting DZ twinning rates. Thus the evidence provides no support for Rushton's views regarding the genetic basis of racial differences in this area.

Rushton's parallel claim (Rushton & Bogaert, 1987) that there is a genetic basis for socioeconomic differences in DZ twinning rates is even weaker because, contrary to Rushton's assertion, the evidence that there are any consistent class related differences in DZ twinning rates is itself highly questionable. Rushton and Bogaert (1987) make it appear that Nylander's data support the claim of class differences in twinning rates in both Europe and Nigeria. Nylander (1979, 1981) however, reports no evidence for class differences in European twinning rates, although he does report such differences in Nigeria. Because there is no familial tendency towards twinning in Nigeria, however, this suggests that these class differences are not genetically based.

Genital Size

In accord with their formulation that blacks are more r-selected than whites or Orientals, Rushton and Bogaert (1987) assert that blacks have larger genitalia than whites who, in turn, have larger genitalia than Orientals. One of the major sources for their conclusions is an alleged report of an anonymous French Army surgeon (1896), a curious source for reliable data. While Rushton and Bogaert (1987; Rushton, 1988a) describe the work as an example of the "ethnographic record," it might more accurately be described as an example of nineteenth century "anthroporn." The anonymous author regales the reader with descriptions of sexual perversions of all sorts, as well as pseudoscientific descriptions of human physical traits, including genitalia of varying size, shape, texture, and colour, and the strange sexual customs of a large number of "semi-civilized" peoples. It even contains a recipe for do-it-yourself penis enlargement employing an eggplant and hot peppers!

This work is filled with internal contradictions. For example, an average African Negro penis is said to be 7 3/4 to 8 inches long on p. 56, while on p. 242 it is stated that it "generally exceeds" 9 inches. Similarly, while the French Army surgeon announces on p. 56 that he once discovered a 12-inch penis, an organ of that size becomes "far from rare" on p. 243. As one might presume from such a work, there is no indication of the statistical procedures used to compute averages, what terms such as "often" mean, how subjects were selected, how measurements were made, what the sample sizes were, etc.

Of course a 100-year-old volume of tall tales about the semi-civilized peoples should not be criticized for methodological flaws and internal inconsistencies. The use of such material in a scholarly article raises questions, however, regarding the methodological standards of those who mine such a source for evidence of biologically based race differences. It should be noted that the French Army surgeon (1896) is not an unimportant source. It is Rushton's (Rushton, 1988a; Rushton & Bogaert, 1987) only source for the "data" on racial differences in clitoral size and on the placement of female genitalia. It is also the only source which contains comparative "data" on male genitalia from all three racial groups, and the only source (e.g., Rushton, 1988a) at all for data on erectile "angle and texture" ("Orientals parallel to body and stiff, blacks at right angles and flexible." p. 1015).

Much of Rushton's other data (Rushton, 1988a; Rushton & Bogaert, 1987) on penis size relies heavily on studies based on Kinsey's data, which, as Zuckerman and Brody (1988) point out, can hardly be considered representative. Two more recent publications, however, allow some comparisons to be made between white (Czech) and black (Nigerian) flaccid penises. Farkas (1971) found the average penis length of 177 Czech Army recruits to be 72.18 mm with a circumference of 95.65 mm. Using the same methods of measurement, Ajami, Jain, and Saxena (1985) found the average penis length of Nigerian medical students to be 81.6 mm with a circumference of 88.3 mm.

These sources provided enough numerical detail to test the significance of the size differences. When these tests were carried out, black penises were indeed found to be significantly longer than white, $t = 7.98, p < .001$, but white penises had significantly larger circumferences than black, $t = 8.96, p < .001$. Thus while the length of the penis, which perhaps receives more attention because of its visual salience, "favoured" blacks in this comparison, circumference did not. Farkas (1971) measured and reported differences in penis size between Bulgarian and Czech males and concluded that penis size differences were attributable to "ethnic, social, alimentary, geographical and other factors" (p. 328). Clearly then, one cannot simply generalize findings obtained from one white (or black) group to whites (or blacks) in general, let alone use them as bases for general black/white comparisons.

However, whether or not there are some average racial differences in genital size does not seem important, and, like Zuckerman and Brody (1988), we do not find the topic terribly relevant. As Zuckerman and Brody note, Rushton manifests a "strange naivete" in his attitude toward sex. He ignores the fact that humans dissociate sex and procreation in ways influenced by religion and socio-cultural factors (Zuckerman & Brody, 1988).

Rushton's understanding of human sexuality seems to pre-date that of Masters and Johnson (1966) and other modern sexologists. Indeed, following Weinrich (1977), Rushton (1985) assumes that larger genitalia indicates more frequent copulation, while oral-genital contact indicates less. While he assumes that copulation is always aimed at procreation, birth control notwithstanding, oral-genital sex and noncoital sexuality are not taken as indicative of a lack of sexual restraint, as one might think, but as instances of less reproductively-oriented (i.e., more K-selected) behaviour (Rushton, 1985). Perhaps Rushton and Weinrich make such an interpretation simply because the Kinsey data indicate that blacks indulge in less oral-genital and noncoital sex than do whites.

While the Kinsey data on sexual behaviour are outdated and based on nonrepresentative, nonrandom samples, Rushton and Bogaert (1987, 1988) make a number of racial comparisons relevant to Differential K theory using these data, as presented and described in Gebhard and Johnson (1979). Based on these comparisons, Rushton and Bogaert (1987) conclude that blacks are more precocious and less sexually restrained than whites. The authors seem to have omitted a number of comparisons which run counter to their conclusions, however. For example, although Rushton and Bogaert are quite emphatic about the sexual nature ("...mock copulation" p. 546) of African dance, they do not cite Kinsey's data indicating that blacks in his sample dance less than white college students. Rushton and Bogaert also do not mention that the Kinsey survey revealed that blacks are more prudish regarding nudity, are less likely to have a prostitute as their first coital partner, and are less eager, relative to whites, to have large families. (These data are contained in Gebhard & Johnson, 1979, Tables 42, 220, 258, 259, 299, 302, & 303.) All of these comparisons appear relevant to Differential K theory, but all of them contradict its predictions. In addition, by carefully selecting the comparisons from the vast number that could be made, Rushton and Bogaert render the reported levels of statistical significance moot.

Brain Size and Intelligence

Rushton (e.g., Rushton, 1988a) has argued that human races differ in average cranial capacity as well as in brain weight and that there is a correlation between brain size and intelligence. Craniometry, of course, has been long discredited for reasons clearly articulated in Gould's (1981) excellent historical review of the topic. As a scientific tool, craniometry has shown itself to be not merely useless, but positively harmful.

In a review of the topic, Tobias (1970) listed a number of the difficulties involved in measuring and making meaningful comparisons of brain weight. These include equating subjects on age, sex, body size, cause of death, time since death, method of preservation, temperature, and the methods employed in removing and preparing the brain. In addition, brain development is plastic, and brain size may be affected by early environmental factors. Because of all these difficulties, Tobias (1970) concluded that no adequate racial comparative studies had actually been conducted.

Nonetheless, Rushton (1988a) presents comparative cranial data from several sources indicating the expected order of cranial capacity, that is, Orientals > whites > blacks. Although he cites Tobias's (1970) paper, Rushton does not discuss the comparability of the samples nor any of the methodological problems raised by Tobias.

In response to Rushton's (1988a) claims, Zuckerman and Brody (1988) cited a well-known study by Herskovits (1930) which reported only a negligible difference in brain size between American blacks and British university students. In a rejoinder, Rushton (1988b) cited some additional data provided by Tobias (1970, p.9), in which Tobias had reported brian sizes for eight different racial subgroups and nationalities corrected for brain/body ratios. For illustrative purposes, Tobias used a formula which translated brain weight into an estimate of the number of neurons available for general adaptive purposes over and above that necessary for maintaining bodily functioning. In his article, Tobias also pointed out that, because there are other cells in the brain besides neurons and because the density and complexity of neurons varies from one part of the brain to another, one had to make a number of implausible assumptions in applying the formula (see Tobias, 1970).

Ignoring Tobias's (1970) cautions as well as his conclusions that the racial differences he reports are negligible, Rushton (1988b) used Tobias's illustrative data to compute average racial differences in neuronal number. Rushton (1989a) then reported that Orientals averaged 250 million more neurons than whites who, in turn, averaged 100 million more neurons than blacks and concluded that these differences were "sufficient to underlie the cultural differences observed" (p. 1036).

Actually, a most impressive characteristic of Tobias's (1970) data was the variability of the subgroups making up each interracial sample. Zuckerman and Brody (1988) were also impressed by the variability in the craniometric data they examined. In fact, while the Swedish brains were the largest ones among all the racial and ethnic groups described in Tobias's report, they were the smallest ones obtained from any of the Caucasian groups in the Herskovits (1930) study. Interestingly enough, the brain sizes of American blacks reported in Tobias's summary were larger than any of the white groups, (which included American, French, and English whites) except those from the Swedish subsample, and were estimated to contain some 200 million more neurons than American whites.

Rushton ignores the intraracial variability in cranial size, as well as in other traits, on the grounds that by aggregating scores across each race, unique or idiosyncratic variance (i.e., error) will average out (Rushton & Bogaert, 1987). This applies only to random error, however; constant or systematic error cumulates (Gulliksen, 1950). As Molnar (1975) has pointed out, ignoring variability that occurs within broad racial groups obscures important differences (p. 97). While the existence of racial differences would not necessarily imply genetic causation in any case, even aggregating data on cranial size across races does not support the idea that there are such differences. Vanderwolf (1989) recently reviewed the literature on racial differences in brain size in the light of Rushton's claims and concluded that Rushton's own survey of the literature was "less than careful" and that, in fact, there was no good evidence supporting these claims.

Rushton also cites several studies to support his hypothesis of a positive relationship between brain size and intelligence. Although Rushton (1988a) correctly reports that Van Valen (1974), the author of one well-known study in the area, computed a correlation coefficient of .30 between brain size and intelligence, that statement by itself is misleading. The average correlation of the studies reported by Van Valen is actually about .10, little different from chance. In order to obtain the .30 correlation, Van Valen argued that the low correlation was actually due to the poor measures of intelligence employed. He then applied a statistical correction to the original correlation based on his "guess" about the amount of information lost due to poor measures, thus obtaining the final "correlation" of .30. This seems to be a somewhat dubious procedure, and Van Valen admitted that his study does not prove that a relationship between brain size and intelligence exists. Indeed, he stated that he knows of no study which directly correlates brain size (or cranial capacity) and intelligence.

Rushton (1989a) also cites several studies by Passingham (1982) in support of his hypothesis. As Rushton himself notes, however, although Passingham concurred with Van Valen's (1974) estimates of a .30 correlation between brain size and intelligence, when Passingham controlled for stature, the correlation vanished. Rushton also cites the results of a second study by Passingham (1982) in which a positive relationship between cranial size and intelligence was reported. As Passingham admits, however, the study was methodologically flawed (IQ was not actually measured, but was estimated from occupational status), and the effect was so small and the groups overlapped to such an extent that Passingham was reluctant to draw any positive conclusions from his findings. In short, there is no reliable evidence indicating that brain size is correlated with intelligence.

Conclusions and Discussion

We have demonstrated that Rushton's Differential K theory has no foundation whatsoever in evolutionary biology; rather, the theory reflects a number of basic misunderstandings about the nature of evolution and genetics. We have also demonstrated that many of Rushton's claims about racial and group differences, including some which are central to his theorizing, are either false, highly overstated, or are much more likely to reflect social and environmental causes than genetic ones.

At a more general level, Rushton's work represents the juxtaposition of two ideas, the first, a belief in an evolutionary hierarchy, a scala naturae, an idea which in its preevolutionary form can be traced to the Greeks. It constitutes, as the historian Arthur Lovejoy (1936) wrote, one of the five or six most basic themes in Western thought.

The idea of the scala naturae quickly became integrated into evolutionary theory and, as Hodos and Campbell (1969) note, the phylogenetic tree, a genealogy, quickly became transformed into a ladder of evolutionary progress with humans at the apex. While the idea that the human races are hierarchically ordered also antedated evolutionary theory, it quickly took its place within the new evolutionary version of the ladder of progress: It was not simply humans who represented the surge of evolutionary progress but, more specifically, white Northern European males.

Blacks, whites, and Orientals were regarded by some as having evolved separately. Coon (1962), for example, hypothesized that the various races evolved independently from different Homo erectus ancestors. More commonly, various races were regarded as representing different stages of human evolution (Haller, 1965). Blacks were hypothesized to represent a later, somewhat degenerate stage, or (as in Rushton) an earlier less advanced one. Thinkers like Herbert Spencer and Lewis Henry Morgan also posited stages of cultural evolution paralleling the putative physical evolution of the groups (Haller, 1965).

Hodos and Campbell (1969) point out that while the idea of a scala naturae is scientifically unjustified, it nonetheless continues to exercise a great deal of influence on scientific thought. Certainly those who, like Rushton, argue for the fundamental reality and importance of racial differences often seem to assume that there is such a ladder of evolutionary progress (e.g., Jensen, 1980, p. 176).

Rushton's second guiding idea is that there is an inverse relationship between the deployment of energy for sex and reproductive purposes on the one hand, and "higher" moral and intellectual purposes on the other. The idea that the poor, and later the feeble-minded, the racially, ethnically, and socially undesirable, were promiscuous and would outbreed the more desirable or advanced segments of the population is an old and powerful one which has often been "biologized" and merged with the belief in a racial evolutionary hierarchy. In this form, these ideas helped fuel the eugenics movements in both Europe and North America (e.g., Kevles, 1985; Weizmann, 1988) and constituted a major influence on the formulation of Nazi racial doctrine as well (e.g., Chase, 1977; Mosse, 1978; Muller-Hill, 1988).

It is, of course, logically impossible to prove that there are no fundamental genetically based differences in behaviour among human groups and races; that would amount to proving the null hypothesis. Propositions of human equality, therefore, always remain fragile and vulnerable to any who care to challenge them. At the same time, however, there are so many enormous methodological, ethical, and practical difficulties involved in establishing important gene or evolutionary-based race and group differences in behaviour, that one can question whether the study of such differences should command any of our limited scientific resources.

Leaving aside the thorny issue of defining race, in order to establish that race differences in behaviour have genetic bases, one would have to systematically compare the same race in different environments, different races in the same environment, and hybrids in all environments. Ideally, one should also be able to employ the experimental techniques that behaviour geneticists use to study the interaction of genes and environments in animals, techniques such as cross-fostering and interuterine transplantation. Obviously, such a programme would be neither feasible nor desirable. In its absence, however, the collecting and cataloguing of ad hoc racial differences in behaviour says nothing about the evolutionary, genetic, or environmental origins and causes of such differences. It also betrays a rather naive and outdated inductivist view of science.

RÉSUMÉ

La Théorie différentielle K de Rushton dérivée du modèle r/K de la sélection évolutionnaire prétend expliquer les différences raciales dans le domaine des pratiques sexuelles, l'anatomie, la fertilité, le quotient intellectuel, et la criminalité. Ces différences sont sensées définir une échelle évolutionnaire sur laquelle on retrouve les Mongoliens, les Causasiens, et les Negroïdes. L'article fait remarquer que le modèle r/K est fréquemment mal interprété et trop généralisé, que les prédictions que Rushton en retire sont arbitraires et qu'elles sont appuyées par une citation sélective, une mauvaise représentation de la littérature de la recherche et par l'utilisation de sources sur lesquelles on ne peut pas compter. Les changements dans les caractéristiques de l'histoire de la vie humaine sont tellement rapides que le besoin de faire appel à la sélection génétique pour expliquer la variation entre les groupes n'existe pas.

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