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Life history theory and race differences: An appreciation of Richard Lynn's contributions to science

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ABSTRACT

This essay describes six findings by Richard Lynn that substantially influenced my application of life history theory to human differences. Lynn was the first to observe that while sub-Saharan Africans averaged lower on IQ tests than Europeans, internationally, East Asians averaged *higher*. Further, he found reaction time measures of intelligence showed the same worldwide pattern. He also found the Black–White IQ differences in Africa are more pronounced on subtests having higher *g* loadings, just as in the US. He also found national IQ differences predictably aggregated into 10 population groups identified by Cavalli-Sforza, Menzoni, and Piazza (1994). Finally, Lynn proposed cold winters theory to parsimoniously explain why East Asians and Europeans evolved a larger brain and a higher IQ than more southerly populations.

1. Personal context

Although our research has been conducted independently of each other for three decades, Richard Lynn's and my research programs have come to similar conclusions about race and IQ. This essay will provide a perspective on how the programs interacted and thereby allow greater appreciation of Lynn's accomplishments.

I began to study race differences in January 1981 at the Institute of Human Development in the University of California, Berkeley while on leave from my home university. I had just completed a book, *Altruism, Socialization, and Society* (Rushton, 1980), which provided a social learning analysis of the family, the educational system, and the mass media. While writing the book, I'd read Wilson's (1975) *Sociobiology: The New Synthesis*, on the evolution of altruism in animals and decided to expand the social learning paradigm I had been working in since graduate school (1970–1973) to add individual differences, behavioral genetics, and evolutionary biology.

Many researchers at the Institute of Human Development had earned international reputations for documenting the early emergence of personality traits and their power to predict social adjustment; few, however, were interested in exploring their origins in behavioral genetics. The reason was not hard to find. At Berkeley, any discussion of behavioral genetics was but a nervous hop, skip, and a jump from Arthur Jensen's controversial findings on race differences. Since Jensen occupied an office in the School of Education, one floor up from my office in the Psychology Department, I decided to pay him a visit.

Jensen and I hit it off. I had been interested in his work on race and intelligence ever since graduate school although I had remained agnostic as to any genetic basis. Jensen was highly informative, sketching out his views and providing detailed answers to my questions along with copies of his reprints. However, the skepticism with which he held so many of his conclusions surprised me. While Jensen obviously agreed that twin and adoption studies showed intelligence was heritable *within* a race, and therefore likely to be heritable *between* races, he questioned whether a "real proof" of the genetic hypothesis was completely possible. Jensen's skepticism disquieted me. If such a scientifically important topic as IQ differences between the races could not be resolved, then what problem in psychology *could* be?

Jensen provided me with tremendous amounts of data and theory which greatly increased the plausibility of a gene-based evolutionary account. In both Jensen (1969, 1973) publications, he cited studies which documented that while Black babies are born an average of a week earlier than White babies, they are more mature as measured by amniotic fluid, bone development, muscular strength, and motor co-ordination. When two-week old African babies are placed in a sitting position, they can hold their heads up and backs straight while White babies often need 6–8 weeks. East Asian babies are even slower to mature.

Jensen also reported evidence of faster bone development in Black infants (established using X-rays), the earlier eruption of the permanent teeth (by an average of 1 year), and the greater maturity of brain wave patterns (measured using EEGs). Based on these converging lines of evidence he suggested that, "the three racial groups lie on a developmental continuum on which the Caucasian group is more or less intermediate." Jensen (1973) also

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pointed to race differences in production of two-egg twins, which is most common among African Americans and least common among East Asians, with Europeans again intermediate (16, 8, and 4 DZ twins per 1000 live births). This, he conjectured, "may be a reflection of evolutionary age."

Jensen's note struck a responsive chord for it reminded me of another cross-species progression that had caused me to think about race differences. In *Sociobiology*, Wilson (1975) described how the origins of altruism lay in parental care, which had increased in complexity over evolutionary time. Might the well-documented racial differences in family structure have such a gene-based evolutionary origin?

Wilson (1975) described two ends of a reproductive continuum. At one end, a "fast" life history (the *r*-strategy), eggs and sperm are produced and simply discharged into the water (for example, in frogs). At the opposite end, a "slow" life history (the *K*-strategy), an egg is not only laid in the ground but pollen and honey provided for future needs (as with wasps). Other steps in the *K* direction would include bringing food to the hatched larvae and ministering to the continuing needs of the offspring. In mammals, the physiological burden of gestation, the ordeal of delivery, the production of milk, and the activities of protecting and physically caring for the young are required. *K*-strategists also give their offspring a lot of care. They work together in getting food and shelter, help their kin, and have complex social systems. That is why *K*-strategists need more complex nervous systems and bigger brains but produce fewer eggs and sperm. The bigger an animal's brain, the longer it takes to reach sexual maturity and the fewer offspring it produces. Number of offspring, time between births, parental care, infant mortality, speed of maturity, life span, even social organization and altruism must all fit together like pieces of a puzzle.

I came to believe that the Darwinian revolution would only be completed by a full understanding of human origins and concomitant race differences. I began to review the international literature looking not only at IQ scores but at multifarious other traits. What I found is that, on average, for all the traits shown in Table 1, East Asians fell at one end of the spectrum, Africans at the other end, and Europeans in the middle, often closer to East Asians. I concluded that only a gene-based evolutionary theory could explain the totality of this pattern.

I felt confident I was on an important track when I had what almost seemed a revelation. I discovered that, after all, there was a correlation between IQ and brain size! And, the races differed substantially in average brain size in the same direction as they differed in IQ!! I found this especially illuminating because, like most researchers, I was under the (false) impression at that time that no relationship existed between brain size and intelligence, let alone that the races differed in brain size. Hadn't Gould (1981) "debunked" all those "19th century" studies? Yet, here I was reading good studies showing race differences in brain size existed – even before birth! Schultz (1923), for example, found that from the 9th week of intrauterine life, 165 Black fetuses averaged a smaller brain case (but larger face) than 455 White fetuses.

I also discovered something completely new and even more surprising since it hadn't been known before. East Asians averaged a larger cranial capacity than did Europeans (see Rushton & Ankney, 2009, for a full review of the race-IQ-brain size literature). From a theoretical perspective, it is crucial to note *the three-way inverse relationship* between brain size and two-egg twinning in Table 1. Population groups that average the largest brains average the lowest rates of two-egg twinning. There is no non-evolutionary theory to explain this trade-off.

Table 1
Average differences among East Asians, Europeans, and Africans.

	East Asians	Whites	Blacks
Brain size			
Mean across methods (cm^3)	1364	1347	1267
Autopsy data (cm^3 equivalents)	1351	1356	1223
Endocranial volume (cm^3)	1415	1362	1268
External head measures (cm^3)	1356	1329	1294
Cortical neurons (billions)	13,767	13,665	13,185
Intelligence			
IQ scores	105	100	70–85
Decision times	Faster	Intermediate	Slower
Cultural achievements	Higher	Higher	Lower
Maturation rate			
Gestation time	Longer	Longer	Shorter
Skeletal development	Later	Intermediate	Earlier
Motor development	Later	Intermediate	Earlier
Dental development	Later	Intermediate	Earlier
Age of first intercourse	Later	Intermediate	Earlier
Age of first pregnancy	Later	Intermediate	Earlier
Life-span	Longest	Intermediate	Shortest
Personality			
Activity level	Lower	Intermediate	Higher
Aggressiveness	Lower	Intermediate	Higher
Cautiousness	Higher	Intermediate	Lower
Dominance	Lower	Intermediate	Higher
Impulsivity	Lower	Intermediate	Higher
Self-esteem	Lower	Intermediate	Higher
Sociability	Lower	Intermediate	Higher
Social organization			
Marital stability	Higher	Intermediate	Lower
Law abidingness	Higher	Intermediate	Lower
Mental health	Higher	Intermediate	Lower
Administrative capacity	Higher	Higher	Lower
Reproductive effort			
Two-egg twinning (per 1000 births)	4	8	16
Hormone levels	Lower	Intermediate	Higher
Size of genitalia	Smaller	Intermediate	Larger
Secondary sex characteristics	Smaller	Intermediate	Larger
Intercourse frequencies	Lower	Intermediate	Higher
Permissive attitudes	Lower	Intermediate	Higher
Sexually transmitted diseases	Lower	Intermediate	Higher

2. The high IQ of East Asians

My interest in race differences really came alive when I re-read (in 1981) Lynn (1977) study which found that East Asians averaged a higher IQ than Whites. Lynn reported that when the Wechsler intelligence tests were standardized on 3352 Japanese adults and children, their mean IQ was 107, which at the time was the highest ever recorded for any nation. This result posed a problem for "culture-only" explanations of Black–White differences being due to "White racism," "culturally biased tests," or a disadvantaged upbringing. During the 1920s and 1930s, the childhood years of the oldest cohorts tested, Japan was well behind the US in per capita income and other social indicators. Yet this cohort too, had higher scores than White Americans.

Lynn (1978) followed up with studies reporting that the Chinese in Hong Kong and Taiwan also averaged higher IQs than Whites. Subsequently, Lynn (1982) demonstrated that the Japanese–American disparity in IQ had increased to 11 points based on the standardization of the Wechsler Intelligence Scale for Children (WISC-R) in Japan. Lynn's results were also confirmed by Vernon (1982) who recovered the school records for the children of the Chinese laborers who helped build the Canadian and US railways during the late 19th/early 20th centuries.

3. Sub-Saharan African IQ

Few of my academic colleagues took much notice of Lynn's discovery that the average IQ score for East Asians was higher than the one for Europeans. However, many greeted with outrage his

(1991a) statement that the mean IQ for sub-Saharan Africans was 70 (based on 11 studies from East, West, Central, and Southern Africa). To some, this simply proved that the entire concept of IQ was misleading since it would imply that by Western standards 50% of Black Africans were "mentally retarded." Lynn noted the difficulties of obtaining representative samples as well as accurate information on ages, both necessities for valid group comparisons. Despite the inadequacies in many samples, he found the results were consistent.

Given the heated controversy generated by these and subsequent results, it seemed important that I engage in some original research that might confirm or qualify Lynn's results. Even colleagues who agreed with my research were concerned about the quality of some of the data from Africa. So, in 1998, I flew to Johannesburg, South Africa, to begin a series of studies with Mervyn Skuy, Chair of the Division of Specialized Education at the University of the Witwatersrand, to collect new IQ data. We gave the students there the untimed Standard Progressive Matrices (SPM) under optimal testing conditions. The Raven's consists of 60 diagrammatic puzzles, each with a missing part that the test-taker attempts to identify from several options. It is acknowledged to be the best-known, most researched, and least culturally bound test of general mental ability.

Our first study was on 309 16- to 23-year-old psychology students at the University of the Witwatersrand. The 173 African students solved an average of 44 of the 60 problems, while the 136 White students solved 54, yielding mean IQ equivalents of 84 and 104, respectively (Rushton & Skuy, 2000). Subsequently we searched for African students with potentially much higher IQs, choosing those in the highly-select Faculty of Engineering. At the best American universities, engineering students score at the 98th percentile on tests such as the SAT and GRE. Psychology students, by comparison, typically average at the 84th percentile, which is still high given the overall average (by definition) of the 50th percentile.

In one study, we gave the SPM to 342 17- to 23-year-old engineering students (Rushton, Skuy, & Fridjohn, 2002). Out of 60 problems, Africans solved an average of 50; South Asians, 53; and Whites, 56, yielding IQ equivalents of 97, 102, and 110, respectively. Although the average IQ for African engineering students was higher than for psychology students (85), it still yielded an overall IQ of 70 for the general population if one makes the reasonable assumption that African engineering students are 2 SDs above the general average (as in the US).

Altogether, we published seven studies that yielded a median IQ of 84 for the African students (range 77–103). Assuming that they, like student groups around the world, are 1 standard deviation (15 IQ points) above the mean of their population, a median IQ of 84 is consistent with a general population mean of 70. The White university students averaged IQs of from 105 to 117; East Indian (South Asian) students were intermediate with average IQs of from 102 to 106.

4. Spearman's *g* and Jensen effects

In 1927, Spearman elaborated his 1904 term *g* to represent the general factor of intelligence, the underlying process common to all mental tests. He conjectured that Black–White differences would be "most marked in just those [tests] which are known to be saturated with *g*" (p. 379). Jensen (1998, p. 535) dubbed this "Spearman's hypothesis." They also became known as "Jensen Effects."

Jensen (1998) documented that *g* is the "active ingredient" in IQ scores, and embedded to a greater or lesser extent in every question on a test. He showed that a test's *g* loading is the best predictor, not just of that test's correlation with scholastic and workplace performance, but of *biological* measures such as heritability coefficients determined from twin studies, inbreeding depression scores calculated from children born in cousin marriages, brain evoked potentials, brain pH levels, brain glucose metabolism, as well as nerve conduction velocity and reaction time measures. These correlations argue strongly for the heritable and biological as opposed to the mere statistical reality of *g*.

Jensen (1998) developed the method of correlated vectors (MCV) to determine whether there is an association between a column of quantified elements (such as a test's *g* loading) and any parallel column of independently derived scores (such as the mean difference in pass rates between groups). Using that method, Jensen (1998, pp. 369–379) summarized 17 independent data sets of nearly 45,000 Blacks and 245,000 Whites derived from 149 psychometric tests and found the *g* loadings consistently predicted the magnitude of the mean Black–White differences ($r = .63$, $p < .001$). Most of these studies were carried out in the US and interpreted as support for a genetic component for the group differences on the grounds that *g* was highly heritable.

Lynn and Owen (1994) were the first to generalize these effects to sub-Saharan Africa. They administered the Junior Aptitude Test to thousands of White, Indian, and Black high-school students and found the (by now usual) 30 point IQ gap between Africans and Whites. They also found that the magnitude of the difference on each subtest correlated .62 ($p < .05$) with the *g* factor extracted from the African sample and .23 with it extracted from the White sample.

Subsequently, Rushton and Skuy (2000) confirmed and extended Lynn and Owen's (1994) finding on Spearman's hypothesis in Africa. Since the Raven's is a very good measure of *g*, it follows that the correlation between each item and its total score (the item-total correlation) provides a reasonable estimate of that item's *g* loading. We found, as predicted, that African-White differences were consistently more pronounced on the more *g* loaded items ($r = .34$–$.41$), and regardless of whether using the African or White item-total correlations.

In another study, of 306 17- to 23-year old engineering students, we carried out a multi-group confirmatory factor analysis (MGCFA) to corroborate that African-White differences are on *g* (Rushton, Skuy, & Bons, 2004). Thus, finding "Jensen Effects" is not restricted to using Jensen's method of correlated vectors. These results also refuted the related criticism that the Raven's tests have not been shown to have a high *g* loading among Africans.

Jensen's (1998) method of correlated vectors has also demonstrated a relation between the *heritability* of items and the pass rate differences between Blacks and Whites, a result even more directly implying the differences are genetic. Strong inference is possible: (1) genetic theory predicts a positive association between heritability and group differences; (2) culture theory predicts a positive association between environmentality and group differences; (3) nature + nurture models predict both genetic and environmental contributions to group differences; while (4) culture-only theories predict a zero relationship between heritability and group differences.

In several studies we found the African-White differences were more pronounced on the SPM items with the higher heritabilities. In one study we calculated heritabilities for each of 58 items using data from 152 pairs of twins in the Minnesota Study of Twins Reared Apart (Rushton, Bons, Vernon, & Cvorovic, 2007). Most of the twins from who we calculated heritabilities had been separated early in life, reared in adoptive families, and reunited only in adulthood. Yet, the heritabilities calculated from these twins correlated .40 ($p < .05$) with the pass rate differences between Blacks and Whites.

The item heritabilities were remarkably robust. They even generalized to predicting pass rate differences between groups as disparate as Europeans, South Asians, Coloreds, Africans, and Roma (Gypsies) from the US, South Africa, and Serbia. We also corroborated the results using alternative procedures. In one analysis we created six *parcels* of nine items that increased from low to high heritability. Parceling creates a more reliable composite than single items alone and so provides for a better hypothesis test. We found that as the heritability of the parcels increased, so did the magnitude of the pass rate differences (mean $r = .74$; $p < .01$). It is difficult to interpret these results as other than support for the genetic hypothesis.

5. Reaction time measures

Reaction time is one of the simplest culture-free cognitive measures. Many RT tasks are so easy that 9- to 12-year-old children can perform them in less than 1 s. Some of them require only that the respondent push a button as soon as they see a light appear. Yet even on these very simple tests, children with higher IQs perform faster than children with lower IQs, and in the US, East Asian 9- to 12-year-olds average faster RTs than Whites who average faster RTs than Blacks (Jensen, 1998). Moreover, in the US, the differences between Blacks, Whites, and East Asians in average RTs are largely on the *g* factor, with the correlations between *g* loadings and mean group differences ranging from .70 to .81. Lynn (1991a), Lynn & Vanhanen, 2002, , pp. 66–67 found the same pattern of IQ and RT scores internationally, with 1000 9-year-old East Asian children in Japan and Hong Kong, White children in Britain and Ireland, and Black children in South Africa.

6. National IQ scores

The landscape of the race-IQ debate shifted dramatically when Lynn's (1978, 1991a) review of the IQ literature morphed into a collation of over 620 studies from 129 countries (Lynn, 2006; Lynn & Vanhanen, 2002, 2006). One arresting fact that emerged is that the overall world IQ only averaged 90. Less than one in five countries has a mean IQ equal or near the British average of 100. Almost half have a mean national IQ of 90 or less. This poses a serious problem if Lynn's conclusion in *IQ and Global Inequality* is correct, that a mean IQ of 90 is the threshold for maintaining a technological economy. Lynn and Vanhanen (2006) also found the national IQs have predictive validity. Across 192 countries, national IQs correlated with national income (.68), adult literacy (.64), enrollment in higher education (.75), life expectancy (.77), level of democratization (.57), as well as several Quality of Life Indicators from the World Health Organization.

Most of Lynn and Vanhanen's (2006) results on national IQs have been corroborated. For example, Wicherts, Borsboom, and Dolan (2010) found that even after excluding low scoring countries in sub-Saharan Africa, 60 national IQs correlated with latitude (.50), fertility (.75), child mortality (.61), education (.60), calories per day (.44), and urbanization (.52). They also found that a dominant principal component explained 65% of the variance across 18 variables.

7. Cold winters theory

Lynn (2006) pushed well beyond the three-macro races that are typically studied. He devoted a chapter to each of the 10 "genetic clusters" or "population groups" identified by Luigi Cavalli-Sforza and colleagues in their 1994 tome, *The History and Geography of Human Genes*. Cavalli-Sforza et al. (1994) opted for the term "genetic cluster" over the older fashioned term "race" because (a) that described most accurately their data base, and (b) it suggested more flexible categories that could be separated and re-combined depending on new data being accumulated. Lynn (2006) opted to regard these genetic clusters as more or less the same as the traditional term "race" but added Cavalli-Sforza et al.'s new categories (e.g., splitting the term "Caucasoid" into "European" and "South Asian/North African," and differentiating between "East Asian" and "South East Asian").

Addressing the question of the cause of the national differences in IQ, Lynn and Vanhanen (2006) concluded that they reflect the racial composition of their respective populations. There was remarkable consistency in the mean IQs of countries when classified into racial clusters. Lynn found that the East Asians—Chinese, Japanese and Koreans—show the highest mean IQ at 105. Europeans follow with a mean IQ of 100. Next in order were the Inuit or Eskimos (IQ 91), South East Asians (87), Native American Indians (87), Pacific Islanders (85), and South Asians and North Africans (84). Lower means were found for sub-Saharan Africans (67), Australian Aborigines (62), with Kalahari Bushmen lower still.

To explain why East Asians achieve high IQs, Lynn (1991b, 2006) proposed cold winters theory. During the last ice age, from 28,000 to 12,000 years ago, higher intelligence resulted from natural selection for larger brained, higher IQ individuals better able to build shelters, store food, make clothes, and hunt large animals sufficiently well to keep their offspring alive during Siberian-level winters. Supporting Lynn's cold winters theory was a correlation of .62 between average cranial capacity and distance from the equator in 20,000 crania (Beals, Smith, & Dodd, 1984; see also Rushton & Ankney, 2009).

Lynn's (1991b) cold winters theory dovetailed nicely with the "Out-of-Africa" life history theory I had proposed to explain the traits in Table 1 (Rushton, 1995). The current consensus view of human origins posits that *Homo sapiens* arose in Africa about 150,000 years ago and expanded northward beyond Africa about 100,000 years ago, with a European–East Asian split about 41,000 years ago. Evolutionary selection pressures were different in the hot savanna, where Africans lived, than in the cold northern regions that Europeans experienced, or the even colder Arctic regions where East Asians evolved. As these populations evolved into present-day East Asians and Europeans, the ecological pressures selected for larger brains, slower rates of maturation, lower levels of sex hormone, and all the other life history characteristics in Table 1.

8. Evolutionary critique

Forceful critiques of Lynn's cold winters theory and my own life history theory of regional differences in IQ were made by Wicherts et al. (2010). They pointed to the many confounds among the measures and the poor quality of some of the data. They also argued that since any empirical test of events long past is virtually impossible, an evolutionary basis for national and regional IQs should only be inferred if "very strong prior knowledge of the processes that created the dependencies" existed, and such knowledge is "all but lacking" (p. 95). Wicherts et al. hypothesized, instead, that the co-variation among the variables was due to a country's "developmental status."

In response to the critique by Wicherts, Borsboom, and Dolan (2010), I suggested heritable "brain power," mediated by brain size, was the primary cause of the correlates of average national IQ (Rushton, 2010). Brain size provides an independent variable that breaks the chain of circular reasoning and allows testable predictions both within- and between-species (see Rushton & Ankney, 2009). For example, I cited a study showing that brain weight correlated across 234 mammalian (non-human) species with longevity ($r = .70$), gestation time (.72), birth weight (.44), litter size (.43), age at first mating (.63), duration of lactation (.62), body weight

(.44), and body length (.54). Even after controlling for body weight and body length, brain size predicted the other variables (.59). No cultural condition is producing these differences among animal species.

I (Rushton, 2010) also calculated a strong correlation between brain size and national IQ from the same data set by Lynn that Wicherts et al. (2010) claimed was flawed. For example, I found a .91 ($p < .01$) correlation between IQ scores for the ten major population groups provided by Lynn (2006) and the cranial capacities reported by Beals et al. (1984, p. 304, Figure 3). I calculated a further correlation of .83 between the average cranial capacity and the average IQ in another 10 data sets provided by Lynn (2006, p. 212, Table 16.2).

Brain size is central to the suite of life-history variables shown in Table 1. To reiterate, the co-variation of the traits in Table 1 arose through natural selection. Evolutionary pressures dictate that traits be harmonized rather than work independently or at odds with each other. Any theory, such as natural selection leading to larger brains, that explain differences across species as well as at the individual, national, and cross-national level among humans, deserves to be taken very seriously and researched further.

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