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Temperature and evolutionary novelty as forces behind the evolution of general intelligence ☆

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Abstract

How did human intelligence evolve to be so high? Lynn [Lynn, R. (1991). The evolution of race differences in intelligence. Mankind Quarterly, 32, 99–173] and Rushton [Rushton, J.P. (1995). Race, evolution, and behavior: A life history perspective. New Brunswick: Transaction] suggest that the main forces behind the evolution of human intelligence were the cold climate and harsh winters, which selected out individuals of lower intelligence. In contrast, Kanazawa [Kanazawa, S. (2004). General intelligence as a domain-specific adaptation. Psychological Review, 111, 512–523] contends that it is the evolutionary novelty of the environment which increased general intelligence. Multiple regression analyses support both theories. Annual mean temperature and evolutionary novelty (measured by latitude, longitude, and distance from the ancestral environment) simultaneously have independent effects on average intelligence of populations. Temperature and evolutionary novelty together explain half to two-thirds of variance in national IQ.

Keywords: Evolutionary psychology; Population differences in general intelligence; *IQ and the Wealth of Nations*; *IQ and Global Inequality*

1. Introduction

How did human intelligence evolve? Why did humans attain such high levels of general intelligence?

Two leading intelligence researchers (Lynn, 1991; Rushton, 1995) both point to the importance of climate and temperature in the evolution of general intelligence. Life in temperate and cold climate in Asia and Europe is harder to survive than that in tropical and subtropical climate in Africa, where humans lived most of their evolutionary history. Food is scarcer, and shelter and clothing more difficult to construct properly, in colder than in warmer climate. Cognitive demands placed by the need to survive harsh winters in cold climate select for higher intelligence, and thus general intelligence is expected to evolve and become higher in colder climates. In this view, the colder the climate, the higher general intelligence evolves.

Kanazawa (2004) offers a slightly different explanation for the evolution of general intelligence. He argues that what we now call general intelligence originally evolved as a domain-specific adaptation to solve evolutionarily novel problems. Since, by definition, there were very few evolutionarily novel problems for our ancestors to solve during most of human evolutionary history, general intelligence was never that important in the ancestral environment. It has become universally important now in the modern world because our environment, and the problems it presents us, are almost entirely

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evolutionarily novel. In this view, the more evolutionarily novel the environment, the higher general intelligence evolves. Cold climate is part of evolutionary novelty, so Kanazawa's (2004) *evolutionary novelty theory* in a sense subsumes Lynn's (1991) and Rushton's (1995) *temperature theory*, but there are other aspects of evolutionary novelty besides cold temperature, such as new species of fauna and flora, geography, topography, and altitude.

Given that cold temperature emphasized in Lynn and Rushton's theory is part of evolutionary novelty underscored in Kanazawa's theory, it would be difficult to adjudicate between them. Templer and Arikawa's (2006) recent study provides empirical support for Lynn and Rushton's view. Their analysis shows that, across 129 nations, winter temperature is negatively correlated with average intelligence ($r=-.76$, $p<.01$, with winter high temperature, and $r=-.66$, $p<.01$, with winter low temperature). The negative correlations hold for both within ($r=-.32$, $p<.05$, with winter high temperature, and $r=-.37$, $p<.05$, with winter low temperature) and outside ($r=-.56$, $p<.01$, with winter high temperature, and $r=-.47$, $p<.01$, with winter low temperature) sub-Saharan Africa. However, Templer and Arikawa do not include measures of evolutionary novelty in their analysis.

In this paper I empirically test Lynn (1991) and Rushton's (1995) temperature theory and Kanazawa's (2004) evolutionary novelty theory of the evolution of general intelligence in a cross-sectional analysis similar to Templer and Arikawa's (2006) study. If Lynn and Rushton's theory is correct, then geographical distribution of general intelligence will be negatively correlated with the annual mean temperature. If Kanazawa's theory is correct, then it will be correlated with the degree of evolutionary novelty.

I measure evolutionary novelty of an environment by its latitude, longitude, and distance from three arbitrarily chosen locations for the ancestral environment (the intersection of the prime meridian and the equator, South Africa, and Ethiopia). Given that mean temperature is negatively correlated with latitude but positively correlated with longitude, Lynn and Rushton's theory would predict opposite effects of latitude and longitude on the evolution of general intelligence. In contrast, Kanazawa's theory would predict that both latitude and longitude (as well as distance) have positive effects.

2. Data

2.1. Dependent variable

I use data on national IQ (the mean IQ of a national population) from Lynn and Vanhanen (2006), which is an updated and expanded edition of Lynn and Vanhanen (2002). Lynn and Vanhanen (2006) compile a comprehensive list of national IQs of 192 nations in the world (all the nations with a population of at least 40,000), either by calculating the mean scores from primary data or carefully estimating them from available sources.

In the 2006 edition, Lynn and Vanhanen increase the number of nations with measured (as opposed to estimated) national IQ from 81 to 113, and the total number of nations in their data from 185 to 192. They also address the criticisms leveled against their national IQ data presented in their 2002 book. First, they demonstrate the validity of the national IQ estimation procedure (as do Kanazawa, 2006; Templer and Arikawa, 2006), by showing that the correlation between the estimated national IQs of 26 nations in the 2002 book and their subsequently measured national IQ in the 2006 book is .9230 (Lynn & Vanhanen, 2006, pp. 53–55).[1]

Second, Lynn and Vanhanen establish the reliability of the construct of national IQ by showing that the correlation between two extreme scores (the highest and the lowest) across 71 nations for which two or more IQ scores are available is .92. The correlation between the second highest and the second lowest scores across 15 nations for which five or more scores are available is .95 (Lynn & Vanhanen, 2006, pp. 61–62).

Third, they underscore the validity of the construct of national IQ by showing that the correlation between national IQ and national scores on tests of mathematics and science range from .79 to .89 ($ps<.01$). Correction for measurement errors, by assuming the reliability of .95 for national IQ and of .83 for test scores produces a corrected correlation of 1.0 between national IQ and educational achievement (Lynn & Vanhanen, 2006, pp. 62–66).

2.2. Independent variable: temperature

I use data on annual mean temperature from Lynn and Vanhanen (2006, pp.327–333, Appendix 3). Unlike Templer and Arikawa's (2006) measures for seasonal highs and lows, Lynn and Vanhanen's is an annual (January–December) mean temperature (in degrees Celsius) over the entire 20th century (1901–2000).

[1] Lynn and Vanhanen (2006, p. 55) report a correlation of −.913 across 25 nations. However, their Table 4.2. (p. 54) inadvertently omits Cameroon. If one includes Cameroon in the calculation, the correlation increases slightly to −.923.