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African cognitive ability: Research, results, divergences and recommendations

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ABSTRACT

In the past different researchers have come to diverging cognitive ability estimates for people in Africa and of African descent. The paper tries to check the validity of past results by comparing them with outcomes of two new psychometric test studies from East and South Africa; with results from student assessment studies; with predictions based on those variables which, outside Africa, correlate most strongly with intelligence; and by comparing them with further indicators of cognitive ability (descriptions of everyday life and human accomplishment). Integrating these cognitive ability measures with the application of several corrections (due to the higher age of students in Africa, lower African school enrollment, selectivity of samples and higher African secular IQ rise), the best guess for an African average is IQ 75. Finally, possible environmental and genetic (evolutionary, therefore past environmental) causes are discussed and suggestions are given how to enhance cognitive development in African countries.

1. Cognitive ability research in Africa

Cognitive abilities and differences between groups have been a hotly debated subject in research, with the differences between "Whites" (people of European descent) and "Blacks" (people of sub-Saharan African descent), in particular, causing scientific and non-scientific conflicts (e.g. Segerstråle, 2000). Within the US and other Western countries the mean cognitive ability difference in various tests (from psychometric IQ to student competence tests as SAT or TIMSS) averages around one standard deviation (Gonzales, 2000, p. 59, 61; Hunt, 2011, p. 411f.). The ability levels for Africans in Africa are the subject of strong disagreement. Rushton studied positively selected samples (South African university engineering students; Rushton, Skuy, & Fridjhon, 2003), but the mean differences between Africans and Europeans (14 IQ points) were similar to the ones found in Western countries. Lynn and Vanhanen (2006) estimated that sub-Saharan African countries had a mean IQ of 70. Wicherts, Dolan, and Maas (2010) using a different selection procedure came to a mean IQ of 82.

This paper will present data from two independently conducted psychometric intelligence studies, reanalyze student achievement data, use predictive variables, which have been validated in the rest of the world, to estimate mean African ability, and give a short overview on everyday life indicators of cognitive abilities.

2. Cognitive ability

Cognitive ability (equivalent to cognitive competence) comprises the ability to think (intelligence), knowledge (true and relevant knowledge) and the intelligent use of this knowledge. A broad concept of "intelligence" also includes knowledge aspects ("crystallized intelligence"). Cognitive ability enhances the individual's understanding of concepts and causal relationships, it increases insight, foresight, and rationality. It leads to proximal consequences, such as higher quality of work and more reasonable decisions in everyday life. Higher cognitive ability also improves individuals' access to better environments and enables individuals, institutions, societies, and cultures to improve the quality of the available environment. Cognitive ability also brings about distal consequences, such as greater wealth and health; a more democratic society; political and economic liberty; a more complex culture; and longitudinally, by backward effects of these environmental factors, again enhanced cognitive ability (e.g. Rindermann, 2012; Rindermann & Meisenberg, 2009; Rindermann & Thompson, 2011).

3. Preliminary remarks on research

Science sometimes creates tensions between research findings and society. Epistemic-scientific principles can be at conflict with legitimate economic, cultural or ideological interests, usually represented by the political class, media, church, intellectuals or the public. However, also in hotly debated areas of research, fundamental principles of scientific thinking should be applied. Science is seen as a process based on epistemic rationality guided by logicality,

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empiricity and argumentativity. Scientists write for an abstract, rational reader who can be convinced (an ability and a willingness) through argumentation using logic, empirical facts and systematic reasoning. Freedom of research and respect for others in their scientific endeavor will help the entire scientific community to progress (Ceci & Williams, 2009; Flynn, 2007).

Other, in their fields legitimate orientations are empirically relevant, but not for science as endeavor to pursue truth. In science, from an epistemic-scientific view, only the truth or falseness of statements matter and an angel's truth is as true as a devil's truth. It is irrelevant, if a statement is blue or red, progressive or conservative, up or down, welcomed by the *x* or *y*, right or left, pc or non-pc, published here or there, welcomed and repeated by the right or wrong people. Of importance is, if it is correctly describing the world and explaining it, and secondly, if it is new and develops stimulating theoretical approaches.

Not all those arguing about intelligence have observed such rules, and participants of past conflicts have suffered from offensive treatment including violent attacks (Gottfredson, 2010; Nyborg, 2003). But intellectual conflicts are not new in the history of thought, as the fate of scholars like Thomas Aquinas, Galilei, Spinoza, and Darwin show. From today's perspective many past disputes sound quite ridiculous and their formerly not questionable "arguments" are today scientifically and ethically disapproved. But the conflicts have been important in developing in the long run a climate of argumentation and thinking. The frequently difficult process of Enlightenment will not be strengthened if people shy away from such conflicts.

4. Cognitive ability measures and samples – method

A detailed data and method description can be found in the Supplementary data file ("Method and further results"). Briefly:

(1) Data from $N = 174$ students in grades 8 and 9 were collected in *Tanzania* in 1999 and 2000 by the use of three culture-reduced intelligence tests (APM, MRT, LPS). For interpretation, "FLynn" corrections of German norms, Greenwich IQ correction, school enrollment correction and the larger FLynn effect in Africa were considered (we assume for the last two decades in Africa a stronger secular rise of intelligence than in western countries; Daley, Whaley, Sigman, Espinosa, & Neumann, 2003).

(2) The cognitive ability of blind, visually handicapped and non-blind students in the age of 10 to 16 years in *South Africa* ($N = 153$, African ancestry 41%, Mixed/"Coloured" 34%, European 25%) and *Austria* ($N = 63$) were compared by the use of WISC-IV working memory and verbal comprehension scales. The results from 2008 were corrected for selection bias in South Africa, composition of the South African population, lower school enrollment in older ages and the FLynn effect. In this study the visual handicap itself is not important, but the difference between people of different descent and the possible furtherance effect by a visual handicap on working memory.

(3) Results from student assessment studies (1964–2009, in Africa mainly TIMSS, PIRLS and SACMEQ; $N_c = 14$ countries) collected by four different research groups were combined, corrected (for school enrollment, age and grades) and restandardized to international Greenwich norm (UK set at IQ 100).

(4) Finally, in a regression analysis the two variables most highly predictive of cognitive ability (in the rest of the world outside sub-Saharan Africa), but theoretically distinct, were selected to predict cognitive ability levels in countries populated by a majority of people with African ancestry ($N_c = 52$ sub-Saharan-African and Caribbean countries). To have a predictive value a causal theory is not necessary. The predictors stem from the two competing paradigms, nurture vs. nature: The first is the *Human Development Index* (HDI; with IQ $r = .75$ in $N_c = 107$ non-African countries), the second is *skin brightness* (or skin reflectance with IQ; $r = .75$, $N_c = 82$; correlating which each other: $r = .70$, $N_c = 78$). Their results (SD corrected) were averaged. HDI correlates more strongly with cognitive ability than education or wealth ($r = .67$, .53/.60, last logged wealth). Skin brightness cannot have a direct causal effect on cognitive ability. This variable and its relation to evolutionary development may be distressing normatively. It is also related to history, slavery, apartheid and other physical and psychological maltreatment of African people. The same ambiguity is true for HDI: Although it is a clear environmental indicator, it depends on cognitive ability and differences can depend on yet unknown genetic factors.

As a reference point Greenwich-IQ was used. Results were compared with psychometric IQ measures from Lynn and Vanhanen (2006, updated), psychometric IQ measures from Wicherts et al. (2010), and a cognitive ability measure consisting of student assessment and psychometric IQ test results. Finally a difference was calculated between the here new predicted and formerly published ability levels.

5. Results

The mean of the two newer unpublished psychometric studies ($N_c = 2$ countries, Table 1, column 1, S1–2; see online Supplement "Table 1") in 2010 norms is IQ 79. The mean result in student assessment studies ($N_c = 14$ countries, Table 1, column 2, SAS-k) in international norms (majority of studies 1995–2007) is IQ 71. Lynn's 1979 norm data have a mean of IQ 70 ($N_c = 52$), or of IQ 76 (in 2010) after FLynn correction (larger than in UK since 1979). Wicherts' collection ($N_c = 17$) results in IQ 77. Rindermann's collection results in IQ 68 ($N_c = 52$), or IQ 73 after FLynn correction. HDI predicts a mean IQ of 70 ($N_c = 48$), skin brightness IQ 68 ($N_c = 42$), both together IQ 70 ($N_c = 50$). FLynn-corrected for 2010, the predicted IQ's are around IQ 75. The total mean range of all studies and different values discussed by the authors is between 68 and 82. If one considers only 2010 estimates and excludes outliers the range is between 71 and 78. Student assessment studies with their larger school-related test content and therefore larger dependence on educational quality seem to boost the difference to more developed countries.

HDI based IQ-predictions are higher than measured IQ's for countries in the Caribbean and in South-Africa, and they are higher for countries with formerly only by neighboring countries' test results estimated data. In the Caribbean and in South-Africa the general living conditions are better than expected by cognitive ability. The near Western world may positively affect the living conditions, and the additional effects of minorities and of enduring institutions of past mother countries (UK, Netherlands) could influence the fate of nations even today (Harrison, 2006). Past estimations (especially with downward corrections) seem to underrate IQs. Other countries such as Zimbabwe and Mozambique are less developed than expected by their measured cognitive ability level, perhaps because of past civil war or bad government.

"Skin brightness", compared to "HDI", is the better predictor (less deviation of the predicted from measured and estimated values: mean squared difference for the HDI-predictions is $D^2 = 76.14$, for the skin brightness-predictions $D^2 = 31.09$). In the same sample of $N_c = 17$ countries the Lynn-data correlate more highly with the