



Editorial

James Watson tells the inconvenient truth: Faces the consequences ☆

Summary Recent comments by the eminent biologist James Watson concerning intelligence test data from sub-Saharan Africa resulted in professional sanctions as well as numerous public condemnations from the media and the scientific community. They justified these sanctions to the public through an abuse of trust, by suggesting that intelligence testing is a meaningless and discredited science, that there is no data to support Dr. Watson's comments, that genetic causes of group differences in intelligence are falsified logically and empirically, and that such differences are already accounted for by known environment factors. None of these arguments are correct, much less beyond legitimate scientific debate. Dr. Watson was correct on all accounts: (1) Intelligence tests *do* reveal large differences between European and sub-Saharan African nations, (2) the evidence *does* link these differences to universally valued outcomes, both within and between nations, and (3) there *is* data to suggest these differences are influenced by genetic factors. The media and the larger scientific community punished Dr. Watson for violating a *social* and *political* taboo, but fashioned their case to the public in terms of scientific ethics. This necessitated lying to the public about numerous scientific issues to make Watson appear negligent in his statements; a gross abuse of valuable and fragile public trust in scientific authority. Lies and a threatening, coercive atmosphere to free inquiry and exchange are damaging to science as an institution and to scientists as individuals, while voicing unfashionable hypotheses is not damaging to science. The ability to openly voice and argue ideas in good faith that are strange and frightening to some is, in fact, integral to science. Those that have participated in undermining this openness and fairness have therefore damaged science, even while claiming to protect it with the same behavior.

© 2008 Elsevier Ltd. All rights reserved.

It's difficult to name many more important living figures in 20th century biology than James Watson. He ushered in the current age of molecular biology with his achievements in 1953, he built up one of the world's greatest biological research facilities and led it for nearly 40 years, and he is a former head of the Human Genome Project.

But given only the media's response to his recent comments on race, one might believe that this eminent geneticist was somehow unqualified to speak on such a topic at all.

In his October of 2007 interview with the *Times*, we learned that Watson:

"... is 'inherently gloomy about the prospect of Africa' because 'all our social policies are based on the fact that their intelligence is the same as ours – whereas all the testing says not really,' and [he knows] that this 'hot potato' is going to be difficult to address [1]".

These thoughts were a continuation of the concluding paragraphs from his new book *Avoid Boring People*:

"A priori, there is no firm reason to anticipate that the intellectual capacities of peoples geographically separated in their evolution should

☆ A slightly different and expanded version of this editorial first appeared at: http://www.gnnp.com/blog/2007/10/james-watson-tells-inconvenient-truth_296.php.

prove to have evolved identically. Our wanting to reserve equal powers of reason as some universal heritage of humanity will not be enough to make it so [2, p. 326]”.

The Independent provoked an instant media stir by calling attention to both quotes with a front-page headline: “Africans are less intelligent than Westerners says DNA pioneer” [3].

Watson was in England at the time, and over the next week several of Watson’s sold-out speaking engagements were cancelled, many critical articles appeared in the British press trailed by the American press a few days later, a number of associations issued statements condemning his words, and soon he was suspended from his chancellorship at Cold Spring Harbor. Watson cancelled his already ruined book tour and flew home to tend to the destruction. It was too late; the distinguished biologist retired in disgrace on October 26th.

Unsupported by science?

The “scientific community” is a broad and inappropriately encompassing term, but to the extent such a thing exists as a social or public entity (apart from the research literature), it is fair to say it pronounced Watson’s claims not only false, but also outside the bounds of appropriate scientific discourse. For instance, the Science Museum in London responded by canceling Watson’s speaking engagement, saying:

“We know that eminent scientists can sometimes say things that cause controversy and the Science Museum does not shy away from debating controversial topics... However, the Science Museum feels that Nobel Prize winner James Watson’s recent comments *have gone beyond the point of acceptable debate* and we are as a result cancelling his talk at the museum” [4, my emphasis].

Watson’s claim was that intelligence testing shows lower intelligence scores in Africa than Europe. Francis Collins, Watson’s successor over the Human Genome Project, released a statement asserting the claim is *not* true:

“I am deeply saddened by the events of the last week, and understand and agree with Dr. Watson’s undoubtedly painful decision to retire in the aftermath of a racist statement he made that was both profoundly offensive and *utterly unsupported by scientific evidence*” [5, my emphasis].

University of Chicago geneticist, Rick Kittles, told the media that “*Watson’s remarks aren’t backed by science*” [6, my emphasis].

Robert Sternberg, a psychometrician at Tufts University, told the media that Watson knows nothing about intelligence research, that his claims were false, “racist and most regrettable,” and an expression of his “*own ideology rather than scientific findings*” [6, my emphasis].

Steven Rose, a professor of biology and neurobiology in London similarly told the media that “... *If [Watson] knew the literature in the subject he would know he was out of his depth scientifically, quite apart from socially and politically*” [3, my emphasis].

The Federation of American Scientists issued a statement condemning Watson, claiming that there is no scientific literature supporting his claims:

“The Federation of American Scientists condemns the comments of Dr. James Watson that appeared in the Sunday Times Magazine on October 14th... The scientific enterprise is based on the promotion and proof of new ideas through evidence, however controversial, but Dr. Watson chose to use his unique stature to promote personal prejudices that are racist, vicious and *unsupported by science*” [7, my emphasis].

But one thing was conspicuously missing from these numerous *scientifically* framed condemnations: any semblance of factual refutation. There is good reason for this: everything Watson got in trouble for saying was entirely correct!

The suggestion in *Avoid Boring People* that basic evolutionary logic predicts physical *as well as* mental differences between genetically divergent human populations is, if anything, an uncomplicated truth. The claim central to the Watson controversy, that intelligence testing shows lower scores in Africa than Europe, is likewise, entirely supported by the scientific literature. As is Dr. Watson’s statement in the same interview that there are many talented people of African descent, which clarifies the obvious fact he was speaking of different *average* scores, not that said populations are homogenous for any trait.

Table 1 lists 48 selected intelligence test reports from sub-Saharan Africa: 12 citations for each region of Western, Central, Southern, and Eastern Africa. There is currently data for 26 out of 42 mainland sub-Saharan African countries (62% or >83% of the people by national population numbers). The average IQ score from the 48 studies is 72, and the scores do not vary greatly by region (66 in Western Africa, 71 in Central, 77 in Southern, and 74 in Eastern). The studies vary in quality, sam-

Table 1 Intelligence test results from sub-Saharan Africa

Nation	Age	N	Test	X	%	FC	IQ	Admin
Gambia	17	579	CPM	9.0	<0	−4	50	2001 [8]
Ghana	11–20	1736	CPM	18.7	<0	−2	62	1988 [9]
	16	5100	TMSS	266	—	—	65	2003 [10]
Guinea	Adult	1159	SPM	25.9	1	+4	69	1959 [11]
Mali	Adult	1806	SPM	25.1	1	+3	68	1963 [12]
	8–85	413	CPM	12.8	<0	−2	56	1987 [13]
Nigeria	6–13	375	CPM	11.7	1	+1	66	1974 [14]
	10–15	402	SPM	20.9	3	−6	66	2006 [15]
	16	1465	SIMS	34	—	—	69	1988 [16]
Senegal	7–14	1040	DAM	—	—	−6	69	1959 [17]
	Adult	416	SPM	23.1	1	+4	69	1959 [11]
Sierra Leone	Adult	119	CPM	13.3	<0	+2	58	1965 [18]
Western Africa							66	
Botswana	15	5150	TMSS	366	—	—	78	2003 [10]
	15	4768	IEAR	330	—	—	75	1991 [19]
Mozambique	16–30	149	CPM	15.2	<0	+2	60	1968 [20]
	Adult	506	YERKES	—	—	—	58	1948 [21]
Namibia	7–12	116	CPM	15.8	7	−5	73	2004 [22]
South Africa	15	1093	SPM	27.7	4	−2	72	1992 [23]
	16	8146	TMSS	259	—	—	64	1999 [24]
	15	8592	TMSS	254	—	—	63	2003 [10]
Swaziland	15	904	SIMS	34	—	—	68	1988 [16]
Zimbabwe	12	1143	CBS	6.1	—	−3	77	1993 [25]
	16	2749	IEAR	372	—	—	79	1991 [19]
	14	1842	SPM	27.8	2	+4	73	1962 [26]
Southern Africa							73	
Cameroon	Adult	3005	SPM	29.4	2	+4	73	1959 [11]
Cen Afr Rep	Adult	1144	SPM	19.8	<0	+5	69	1953 [27]
Dem Rep Congo	6–13	130	KABC	—	—	−3	63	1995 [28]
	10–17	1704	SPM	27.0	4	+4	78	1955 [29]
	5–12	194	KABC	—	—	−3	65	1994 [30]
	7–9	185	CPM	15.0	10	−5	76	2003 [31]
Rep Congo	Adult	2176	SPM	23.7	1	+4	69	1953 [27]
	17–29	320	SPM	26.3	1	+4	69	1952 [27]
	13	88	SPM	28.5	5	−3	72	1993 [32]
Rwand-Burundi	13–20	127	TNG	—	—	—	62	1954 [33]
Zambia	Adult	1163	SPM	32.3	4	+3	77	1964 [34]
	Adult	1937	SPM	30.0	2	+3	72	1963 [35]
Central Africa							71	
Eritrea	11	152	SPM	20.7	2	−3	66	1996 [36]
Ethiopia	5–14	162	CPM	12.2	<0	−2	62	1990 [37]
	7–18	326	CPM	15.9	<0	−4	60	1994 [38]
Kenya	6–14	903	CPM	19.5	11	−6	76	2006 [39]
	Adult	205	CPM	27.3	4	—	74	1980 [40]
	6–10	1222	CPM	15.9	13	−4	79	2000 [41]
Sudan	7–16	291	Misc	—	—	—	75	1964 [42]
	8–12	146	SPM	18.5	7	−4	74	1989 [43]
Tanzania	13–21	2959	SPM	34.2	5	+2	77	1966 [44]
	Adult	179	CPM	26.4	2	—	69	1980 [40]
	11–13	458	WCST	18.5	5	−3	70	2001 [45]
Uganda	11	2019	SPM	21.4	4	+2	76	1972 [46]
Eastern Africa							74	

Note: 'X' = Raw score; '%' = Percentile; 'FC' = Flynn correction; 'Admin' = Year of administration. All raw scores from studies using Raven's Progressive Matrices have been converted into IQ using Lynn & Vanhanen's [47, App 1] 'Greenwich IQ', the 1979 British Standardization [48]. For more on the inclusion and conversion of international student assessment tests see [49].

ple size, age, and representativeness, but broadly agree in their findings. Representative studies of the school age population with large sample sizes do not exhibit higher scores than smaller studies, much less scores that approach anything like European norms. Intelligence test scores are significantly lower in sub-Saharan Africa than in any other world region [47]. Scores from this region are 2 to 3 standard deviations lower than those found in developed regions of Europe and Asia, and 1 to 2 standard deviations lower than what is even typically found in other *developing* world regions.

Our problems are not relevant to them?

In 1988 Stanley Rothman and Mark Snyderman published *The IQ Controversy, the Media and Public Policy* [50]. Using data from their survey of over 1000 scholars in fields familiar with IQ testing, such as psychology, sociology, and behavioral genetics [51], Rothman and Snyderman took a quantitative look at media coverage of IQ and demonstrated how this media coverage habitually diverged with mainstream scholarly opinion.

And, indeed, media reports and editorials were quick to attack Watson on the premise that any statement about intelligence measures is scientifically indefensible, because science cannot study something so immeasurable and indefinable as intelligence. Cornelia Dean condemned Watson's science in her report for the *New York Times*:

"[T]here is wide disagreement about what intelligence consists of and how — or even if — it can be measured in the abstract.

For example, in "The Mismeasure of Man," Stephen Jay Gould, the evolutionary biologist, dismissed "the I.Q. industry" as little more than an effort by men of European descent to maintain their prominence in the world" [52].

Laura Blue in *Time Magazine* asserted:

"... science has no agreed-upon definition of "intelligence" either — let alone an agreed-upon method to test it. All kinds of cultural biases have been identified in IQ tests, for example. If there is something fundamental in our brains that regulates our capacity to learn, we have yet to separate its effects from the effects of everything that we experience after we're born" [53].

Similarly, Steven Rose in the *New Statesmen*:

"... the question of what constitutes "intelligence" is itself problematic — the word has

much broader and diverse meanings than what can be encompassed in IQ tests" [54].

Robert Sternberg in the *Chicago Tribune*:

"Sternberg, a critic of traditional intelligence testing, believes intelligence can mean something different for different cultures. In parts of Africa, a good gauge of intelligence might be how well someone avoids infection with malaria — a test of cleverness that most Americans likely would flunk.

In the same way, for many Africans who take Western IQ tests, "our problems aren't relevant to them", Sternberg said [6].

First, the popular assertion of widespread chaos within science over intelligence measurement is false. This has been demonstrated, apart from the evidence of the literature itself, by a survey of scientists showing broad scholarly consensus [50,51], by a jury of scholars organized by the American Psychological Association to summarize basic agreements in the field [55], and by a consensus statement drafted and signed by concerned scholars [56]. The statement that there are a number of theoretical differences about the concept of intelligence is only trivially true. In the practical context of research, provisional understanding, and "normal science" this is rhetorically equivalent to underlining evolution as "only a theory" in media reports. Intelligence research is broadly consistent in theory, methods, premises, and data. The century-old psychometric approach is quite clearly the dominant framework scientists have used to study human intelligence in clinical, practical, and research settings [55]. In the same manner as Dr. Watson's comments, the research literature most commonly uses the measurements from this paradigm as its working definition of "intelligence".

Second, an intelligence test by itself cannot and is not designed to tell you the reasons people score differently on it. So the fact that a test score without context has nothing to say about genetics is not a failure of the test. And it certainly is not indicative of test "bias".

In fact, "test bias" has a very specific and practical meaning within psychology. An 11 member "taskforce" assembled by the American Psychological Association in 1996 for a consensus statement on intelligence research reported:

"... the relevant question is whether the tests have a "predictive bias" against Blacks, Such a bias would exist if African-American performance on the criterion variables (school achievement, college GPA, etc.) were systemat-

ically higher than the same subjects' test scores would predict. This is not the case... *Considered as predictors of future performance, the tests do not seem to be biased against African Americans*" [55, my emphasis].

Likewise, there is no "predictive bias" in the tests against Africans. The relationship between intelligence measures and academic/job performance in Africa is strong and virtually identical to findings from developed nations. In their literature review, Kendall et al. [57] found that correlations between employee performance and educational outcomes and cognitive ability did not differ for blacks and whites in Southern Africa (.20–.50). More recently, IQ was equally predictive of exam scores, achievement test scores, university grades, and high school grades for samples of white and black students in South Africa [58,59]. Table 2 lists some examples of the relationship between intelligence and academic achievement from various regions of sub-Saharan Africa since 1970. The correlations (.30–.70) are identical to Mackintosh's [60, p. 44] summary of Western studies (.40–.70).

Ignoring this, Robert Sternberg (an author on the APA statement quoted above, no less) implies the tests are biased against Africans because they allegedly don't measure the sorts of abilities that are necessary for Africans to succeed in their unique environmental niche. This statement is not only a patronizing and idyllic caricature of African needs, it is also empirically false.

Economists Hanushek and Wößmann [65] report that the association between economic outcomes and cognitive skills appears to be even *higher* within mostly African developing countries than within Western countries. Both Glewwe [66] in Ghana

and Boissiere et al. [40] in Kenya and Tanzania found a significant relationship between Intelligence test scores and adult earnings. Both researchers found that intelligence affects earnings mainly by enabling people to learn demanding, but occupationally useful, academic skills. Taking this pathway into account, a half standard deviation difference in intelligence leads to a 5%, a 5%, and an 8% change in personal income in Ghana, Tanzania, and Kenya respectively [67]. By some estimates this is the same as the relationship in the US [68,69]. Moll [70] finds an even larger influence of academic skills on income in South Africa, where intelligence is just as highly associated with academic success [57–59,64].

Similarly, at the national level, psychologists Hunt and Wittmann [71] found that the relationship between GDP and national average IQ was *stronger* for the mostly African developing countries than it was among the developed industrial countries (.70 vs. .58). National average IQ scores are one of the best known predictors of national wealth and economic growth [47,72–74]. Regression models [74] and longitudinal analysis [75,76] provide evidence that IQ is a significant cause, and not just a passive correlate, of economic development and prosperity.

Cross-national differences in intelligence are associated with virtually every measure of well-being: Life expectancy: .82 [77], maternal mortality: –.73 [47], infant mortality: –.77 [47], homicide rates: –.86 [78], corruption: –.68 [79], democracy: .56 [80], rule of law: .64 [80], and HIV infection: –.48 [81].

So "our problems" certainly are relevant to Africans, and certainly are "their" problems; unless issues such as health, social order, political stability, material comfort, and global influence are somehow not relevant to Africans.

Table 2 IQ and academic success in sub-Saharan Africa

Nation	Group	Achievement	Correlation	Admin
Kenya/Tanzania	Labor force	Literacy and numeracy	.43	1980 [40]
Kenya	Primary school	School grades	.40	2000 [61]
South Africa	University students	Grades and tests	.28	2002 [58]
Namibia	Primary school	Reading	.41	2004 [22]
Nigeria	Primary school	Math	.76	1976 [109]
Ghana	Labor force	Math/reading	.62/.58	2000 [108]
Kenya	Primary school	Exam scores	.56	1984 [62]
Kenya	Rural children	Arithmetic/behavior	.71/.39	2003 [63]
South Africa	University students	Final exams	.34	2001 [59]
South Africa	Primary School	Math and reading	.54	1994 [64]
Ethiopia	Primary school	School grades	.36	1990 [37]
Uganda	Primary school	Math/reading	.71/.46	1972 [46]

One obvious reason Sternberg played such a prominent role in publicly condemning Watson was Watson's reliance on orthodox IQ measurement instead of Sternberg's own minor (and flawed) alternative theory of intelligence [82], which Sternberg suggests has measured intelligence more appropriately in Africa. Sternberg alludes to his own work in Kenya [61], where he found that a test of knowledge of local folk medicines was *inversely* related to measures of psychometric intelligence and school achievement, which were, in turn, significantly correlated with each other (Table 2). Sternberg has argued that it is irrelevant whether this folk knowledge is related to positive health outcomes – or even if it causes harm – as long as the children “believe that the medicines work,” they have demonstrated abundant ‘practical’ intelligence [83, p. 11]. But if all beliefs are evidence of ‘practical intelligence’, then no beliefs are evidence of ‘practical intelligence’. So, conveniently and tellingly, this is not his position in the media statement against Watson, where he implies his “practical intelligence” is associated with successful avoidance of malaria infection in Africa, while so-called “Western IQ tests” are not; an untested position that is in high probability false given that wealth and education, which are strongly influenced by intelligence in Kenya, really *are* significantly related to successful malaria avoidance behaviors in that country [84], and across Africa, in general [85].

The bottom line is that Dr. Watson's stated concerns over the consequences of low intelligence test scores in Africa were completely valid, both in theory and given the available evidence, and he was perfectly justified in bringing these important matters to public attention. Intelligence tests are no more or no less a method for ranking people or nations on a scale from human “inferiority” to “superiority” than measures of wealth or health, which are also used by scientists to compare people and nations in order to investigate and improve the human condition. Referring to low intelligence in Africa is, logically, no more an expression of contempt for Africans than speaking of high poverty in Africa or any other disparity of sociological interest. Inequalities in intelligence will continue to remain important, if nothing, for their relationship to the agreed-upon concern of inequalities in wealth. When the tests stop revealing useful information about shared concerns between populations, we can more reasonably entertain the Gouldian supposition that their “purpose” is establishing a meta-physical hierarchy of human worth.

Media red herrings about the supposed ineffability of intelligence or lies about the scientific worth-

lessness of intelligence testing are designed to moot honesty and openness on this issue, and simply side step the uncomfortable facts. But avoiding facts does not change reality or help shape it to our liking. Intelligence measures predict the kind of social and personal outcomes that people the world over agree are important and desirable. For this reason we need to start engaging this data instead of shooting the messengers. Especially when the messengers we are so casually discarding are important figures like James Watson.

Race has nothing to do with it?

James Watson implied a belief that the uniquely low intelligence of both continental Africans and African-Americans are probably related to familiar genetic causes. This belief is deemed unacceptable to express in public, even in most academic contexts, or hold in private. This is despite the fact that the research evidence in support of this position is stronger than the research evidence that contradicts it. Thus even top scientists like Watson are punished by their peers for holding beliefs that are more scientific and logical, while scientists that hold to less scientific beliefs and illogical arguments are rewarded. This is an embarrassment to science.

Many statements in the press asserted or implied that various environmental theories account for intelligence differences between ethnic groups. These statements do not, in fact, agree with the evidence.

The Chicago Tribune asserted:

“The study of racial differences in IQ is among the most deeply contentious fields in all of science. Most researchers agree that tests have revealed some differences among racial groups – but even larger differences between people of different income levels” [6].

Steven Rose asserted:

“Even where there are such average differences in IQ score, as for instance between Black and White populations in the US, there are no scientifically valid methods to enable one to untangle the many interacting factors of the validity of IQ tests themselves, as measures of anything other than school performance, educational and social deprivation, the history of slave-owners versus slaves and continuing racism, which may account for them” [54].

The Associated Press reported:

“Jan Schnupp, a lecturer in neurophysiology at Oxford University, said Watson's remarks “make

it very clear that he is an expert on genetics, not on intelligence.” Schnupp said undernourished and undereducated people often perform worse on intelligence tests than the well off. “Race has nothing to do with it, and there is no fundamental obstacle to black people becoming exceptionally bright,” Schnupp said” [86].

Contrary to the above claims, differences in intelligence between income groups are *not* larger than intelligence differences between racial groups in the US, nor do differences in income or wealth account for the racial differences [87]. Whites from households in the lowest income bracket have higher average IQ scores than blacks from households in the highest income bracket [88, p. 358; 89, pp. 404–405]. One of the largest modern sociology studies of American students found that ethnicity was the single most important demographic predictor of academic achievement [90].

Contra Rose, a number of experiments are able to test all of these environmental theories. For one, transracial adoption experiments control for all the *shared* aspects of the environment that differ between whites and blacks (parenting, income, nutrition, neighborhood). Meanwhile, structural equation models test for possible *nonshared* factors between whites and blacks that could be acting on IQ (which would include influences like racism) [91,92]. These experiments do not lend support to any existing or plausible environmental theories for the remaining lower intelligence scores of people of African descent in America.

Table 3 shows results from the Minnesota Transracial Adoption Study. By adulthood, the difference in IQ scores between adopted black and adopted white children raised side by side in the same high income households in mostly homogeneous Northern US upper class neighborhoods was 18 points. This is the size of the IQ gap between black and white adults in the general American population [94, p. 123].

We also see large differences depending on the race of both biological parents. Table 3 shows that the difference in IQ scores between the adoptees with 1 black biological parent and the adoptees with 2 black biological parents is nearly 10 points despite the fact that both share the exact same social identity. This is about the same as the difference between the white adoptees and the adoptees with 1 black parent, even though American social categorization is based on hypodescent.

Likewise, a dozen mixed race children that were raised under some mistaken information that they had two black biological parents nevertheless developed IQ scores like the other mixed race children [95].

There are no simple or plausible environmental theories to explain these kinds of findings. Studies do not support a large role for peer effects on developed intelligence [96], and this is not a credible explanation for the racial gap among the adoptees or in the general population. A recent meta-analysis of 62 adoption studies found that neither age at adoption or even coming from an abusive or neglectful environment had an effect on the developed IQ scores of adopted children [97]. This makes it unlikely that confounding differences in preadoption experiences can explain the outcomes of this study, as argued originally by the study authors [60, p. 155; 93, p. 186; 88, p. 477].

An additional popular argument is that the Flynn Effect, the observed rise in IQ scores over time, is powerful evidence that African-Americans and African countries will eventually reach parity with typical white norms. This is a flawed argument for two reasons. First of all it is premised on the widely believed fallacy, already mentioned, that IQ scores are, without context, supposed to be reflections of genetic intelligence. Journalist Malcolm Gladwell, writing for the *New Yorker*, suggested that James Watson’s genetic claim for Africans was not convincing because:

“If whatever the thing is that I.Q. tests measure can jump so much in a generation, it can’t be all that immutable and it doesn’t look all that innate” [98].

This is a confused argument. Whether the Flynn Effect is genetic or environmental, and whether the difference between Europeans and Africans is genetic or environmental are two entirely different, and unrelated questions. One can be influenced, to whatever degree, by genetics, both can, or neither; the score by itself tells us nothing. Only the investigation of the scores can unravel their nature. Which leads to the second flaw: the Flynn Effect is not a gain in real *g* factor intelligence [99,100], while the difference between black and white Americans is a difference in *g* factor intelligence [89,101].

The Flynn Effect does not represent an enhancement of the latent traits the tests are supposed to measure. Another example of this is practice gains on IQ tests. Repeated exposure to an IQ test can raise scores on that test up to one standard deviation (in a manner much like the Flynn Effect), but this doesn’t mean the test taker has enhanced their general ability to solve novel problems outside of the test, it means they’ve learned how to solve specific items on the test more effectively. In other words, practice gains do not show improvements of the latent *g* factor general problem-solving trait

[102]. The inflated scores represent measurement bias.

James Flynn, namesake of the secular increase, finally agrees that these IQ gains are not *g* factor gains [103], but believes that they still represent economically relevant skill gains. This is doubtful for two reasons: first, because measures of academic ability over time do not reveal any concomitant Flynn-like gains [104, p. 8; 105]. Second, because we know from large-scale military research that almost all the predictive power of IQ tests in training contexts comes through *g* alone [106, p. 129].

The *g* factor represents the ability to learn, and there is no evidence that this ability to learn has increased over time.

This also has implications for scores found in sub-Saharan Africa. The Flynn Effect reveals that IQ scores in the developed world were some 1.5–2 standard deviations lower in the beginning of the 20th century [104, pp. 6–8]. These scores are similar to what is found in modern Africa. Some studies also reveal even faster Flynn gains in developing countries than what we observe in developed countries [107], and some argue these countries are simply experiencing, in slight delay, what happened in developed countries during the 20th century. But this interpretation is not tenable if there were no actual gains in *g* factor intelligence in developed countries. It is incorrect that developed countries had lower *g* intelligence in the first half of the 20th century corresponding to IQs of 70. Meanwhile, it appears that extremely low IQ scores in modern Africa, unlike scores in developed countries prior to the mid-20th century, correspond to genuine deficits in general intelligence. Academic achievement differences are negligible between generations, but large between nations, and correspond to large *g* factor differences [23, 49, 58, 110; but see 111 for one failure of replication].

With improvements in nutrition, it is likely that scores in Africa will rise over time [67, 39]. These increases will probably be genuine and of a different nature than the gains we observed in developed countries over the 20th century. Given the available evidence, it is unlikely that average IQ scores

in sub-Saharan Africa will rise above the current average for African-Americans, unless the economic, political, and social environment in Africa first exceeds what is typical for suburban Minnesota.

In closing: who damaged science?

According to the media and members of the scientific community, James Watson hurt science itself.

An editorial in the top science journal *Nature* asserted:

“Crass comments by Nobel laureates undermine our very ability to debate such issues, and thus damage science itself” [112].

Similarly the Chicago Tribune featured this:

“The damage to Watson’s legacy from his statements may be difficult to mend,” said Jerry Coyne, a professor of evolutionary genetics at the University of Chicago.

“He’s done tremendous damage to science, to himself and to social equality,” Coyne said. “It makes us all look bad” [6].

James Watson is one of the most distinguished living figures in American science, and yet even he was not immune to immediate expulsion from the very lab he created and built up over 40 years of his life, and excommunication from the scientific establishment that celebrated him. All this for one crime: voicing scientific facts and hypotheses that made this community uncomfortable. The same personal and professional fate befell former Harvard president Larry Summers in 2005 for a *purely academic* discussion of females in science during an economics conference intended for discussing this very subject!

What effect will this continuing intellectual mob violence have on future and current scientists and researchers who want to freely study human genetics, cross-cultural psychology, sociology, or any discipline that may reveal similar facts that have the potential to cause their professional or personal destruction by an intellectual community that resembles the medieval church?

Those who punish, those who lie, those who silence, those who condemn, those who intimidate... *they* have corrupted science.

They have injured the intellectual openness, freedom, and fairness of our society and our institutions, with untold costs to our collective human well-being.

Not James D. Watson.

Table 3 The Minnesota Transracial Adoption Study

Race of biological parents	<i>N</i>	IQ age 7	IQ age 17
Black–Black	21	91.4	83.7
Black–White	55	105.4	93.2
White–White	16	111.5	101.5

Note: Adapted from [93, p. 185].

References

- [1] Hunt-Grubbe C. The elementary DNA of Dr Watson. *The Sunday Times*; October 14, 2007.
- [2] Watson JD. *Avoid boring people: lessons from a life in science*. New York: Knopf; 2007.
- [3] Milmo C. Fury at DNA pioneer's theory: Africans are less intelligent than Westerners. *The Independent*; October 17, 2007.
- [4] Milmo C. Science Museum cancels talk by Watson after 'racist' comments. *The Independent*; October 18, 2007.
- [5] Collins F. Statement by Francis S. Collins, M.D., Ph.D. on the retirement of James D. Watson. NHGRI news release; October 25, 2007.
- [6] Manier J. Peers horrified by famed scientist's race remarks. *The Chicago Tribune*; October 19, 2007.
- [7] Federation of American Scientists, FAS condemns Watson's comments unsupported by scientific evidence that dishonor entire science community. FAS news release; October 18, 2007.
- [8] Jukes MCH, Pinder M, Grigorenko EL, Smith HB, Walraven G, Bariau EM, et al. Long-term impact of Malaria Chemoprophylaxis on cognitive abilities and educational attainment: follow-up of a controlled trial. *PLoS Clin Trials* 2006;1:e19.
- [9] Glewwe P, Jacoby H. Estimating the determinants of cognitive achievement in low-income countries. Washington, DC: World Bank; 1992.
- [10] Martin MO, Mullis IVS, Chrostowski SJ (Eds.). TIMSS 2003 technical report, TIMSS and PIRLS International Study Center, Boston College, Chestnut Hill, MA; 2004.
- [11] Morgaut ME. Note sommaire sur quelques comparaisons psychologiques entre des populations Africaines, Malagaches et Européennes. *Rev Psychol Appl* 1959;9: 23–34.
- [12] Fontaine C. Notes sur une expérience d'application de tests au Mali. *Rev Psychol Appl* 1963;13:235–46.
- [13] Bellis G, Chaventre A, Roux F, Bisset JP, et al. Measurement of endemic cretinism in the Bwa region (Mali). *Coll Anthropol* 1988;12:237–45.
- [14] Fahrmeier ED. The effect of school attendance on intellectual development in northern Nigeria. *Child Dev* 1975;46:281–5.
- [15] Ijarotimi OS, Ijadunola KT. Nutritional status and intelligence quotient of primary schoolchildren in Akure community of Ondo State, Nigeria. *Tanzan Health Res Bull* 2007;9:69–76.
- [16] Travers J, Westbury I. *The IEA study of mathematics, I: international analysis of mathematics curricula*. Oxford: Pergamon Press; 1989.
- [17] Bardet C, Moreigne F, Senecal J. Application du test de Goodenough à de écoliers africains de 7 à 14 ans. *Enfance* 1960;14:198–208.
- [18] Berry JW. Temne and Eskimo perceptual skills. *Int J Psychol* 1966;1:207–29.
- [19] Elley WB. *How in the world do students read?* The Hague: IEA; 1992.
- [20] Kendall IM. The predictive validity of a possible alternative to the classification test battery. *Psychol Afr* 1976;16:131–46.
- [21] Augusto A. *Estudos psicotécnicos; nível intelectual de algumas tribos de Moçambique*. Lisbonne. Ministère des Colonies; 1949.
- [22] Veii K, Everatt J. Predictors of reading among Herero–English bilingual Namibian school children. *Biling-Lang Cogn* 2005;8:239–54.
- [23] Owen K. The suitability of Raven's Standard Progressive Matrices for various groups in South Africa. *Pers Indiv Differ* 1992;13:149–59.
- [24] Martin MO, Gregory KD, Stemler SE (Eds.). *TIMSS technical report: IEA's third international mathematics and science study at the eighth grade*, Intrenational Study Center, Boston College, Boston; 2000.
- [25] Wilson D, Mundy-Castle A, Panditji L. Birth Order and Intellectual Development among Zimbabwean Children. *J Soc Psychol* 1990;130:409–11.
- [26] Irvine SH. Selection for secondary education in Southern Rhodesia, Faculty of Education Occasional Paper No. 4. Salisbury: University College of Rhodesia and Nyasaland; 1965.
- [27] Faverge JM, Falmagne JC. On the interpretation of data in intercultural psychology. *Psychol Afr* 1962;9:22–36.
- [28] Giordani B, Boivin MJ, Opel B, Nseyila DN, Lauer RE. Use of the K-ABC with children in Zaire. *Int J Disabil Dev Educ* 1996;43:5–24.
- [29] Laroche JL. L'analyse des erreurs sur le Matrix 38. *Bull CERP* 1956;6:161–72.
- [30] Boivin MJ, Giordani B, Bornfeld B. Use of the tactual performance test for cognitive ability testing with African children. *Neuropsychology* 1995;9:409–17.
- [31] Kashala E, Elgen I, Sommerfelt K, Tylleskär T, Lundervold A. Cognition in African children with attention-deficit hyperactivity disorder. *Pediatr Neurol* 2005;33: 357–64.
- [32] Nkaya HN, Huteau M, Bonnet JP. Retest effect on cognitive performance on the Raven Matrices in France and in the Congo. *Percept Mot Skills* 1994;78:503–10.
- [33] Maistraux R. La sous-évolution des Noirs d'Afrique. Sa nature, ses causes, ses remèdes. *Rev Psychol Peupl* 1955;10:167–89.
- [34] Crawford-Nutt DH. Are black scores on Raven's Standard Progressive Matrices an artefact of method of test presentation? *Psychol Afr* 1976;16:201–6.
- [35] MacArthur RS, Irvine SH, Brimble AR. *The Northern Rhodesia mental ability survey*. Lusaka: Rhodes Livingstone Institute; 1964.
- [36] Wolff PH, Fesseha G. The orphans of Eritrea: a five-year follow-up study. *J Child Psychol Psyc* 1999;40:1231–7.
- [37] Aboud F, Samuel M, Hadera A, Addus A. Intellectual, social and nutritional status of children in an Ethiopian orphanage. *Soc Sci Med* 1991;33:1275–80.
- [38] Ayalew T. Parental Preference, Heterogeneity, and Human Capital Inequality. *Econ Dev Cult Change* 2005;53:381–407.
- [39] Neumann CG, Murphy SP, Gewa C, Grillenberger M, Bwibo NO. Meat Supplementation Improves Growth, Cognitive, and Behavioral Outcomes in Kenyan Children. *J Nutr* 2007;137:1119–23.
- [40] Boissiere M, Knight JB, Sabot RH. Earnings, schooling, ability, and cognitive skills. *Am Econ Rev* 1985;75:1016–30.
- [41] Costenbader V, Ngari SM. A Kenya standardisation of the Coloured Progressive Matrices. *Sch Psychol Int* 2001;22:258–68.
- [42] Fahmy M. Initial exploring of the intelligence of Shilluk children. *Vita Hum* 1964;7:164–77.
- [43] Ahmed RA. The development of number, space, quantity, and reasoning concepts in Sudanese schoolchildren. In: Adler LL, editor. *Cross cultural research in human development*. Westport, Conn.: Praeger; 1989.
- [44] Klingelhofer EL. Performance of Tanzanian secondary school pupils on the Raven Standard Progressive Matrices test. *J Soc Psychol* 1967;72:205–15.

- [45] Sternberg RJ, Grigorenko EL, Ngorosho D, Tantufuye E, et al. Assessing intellectual potential in rural Tanzanian school children. *Intelligence* 2002;30:141–62.
- [46] Heyneman SP, Jamison DT. Student learning in Uganda. *Comp Educ Rev* 1980;24:207–20.
- [47] Lynn R, Vanhanen T. IQ and global inequality. Augusta, GA: Washington Summit Publisher; 2006.
- [48] Raven J. Manual for Raven's Progressive Matrices and Mill Hill Vocabulary Scales, Research Suppl. No. 1. London: H.K. Lewis; 1981.
- [49] Rindermann H. The g-factor of international cognitive ability comparisons: the homogeneity of results in PISA, TIMSS, PIRLS and IQ-tests across nations. *Eur J Pers* 2007;21:667–706.
- [50] Snyderman M, Rothman S. The IQ controversy, the media, and public policy. New Brunswick, NJ: Transaction Books; 1988.
- [51] Snyderman M, Rothman S. Survey of expert opinion on intelligence and aptitude testing. *Am Psychol* 1987;42:137–44.
- [52] Dean C. Nobel winner issues apology for comments about blacks. *The New York Times*; October 19, 2007.
- [53] Blue L. The mortification of James Watson. *Time Magazine*; October 19, 2007.
- [54] Rose S. Race and intelligence. *New Statesman*; October 19, 2007.
- [55] Neisser U, Boodoo G, Bouchard Jr TJ, Boykin AW, Brody N, Ceci SJ, et al. Intelligence: knowns and unknowns. *Am Psychol* 1996;51:77–101.
- [56] Gottfredson LS. Mainstream science on intelligence: an editorial with 52 signatories, history and bibliography. *Intelligence* 1997;24:13–23.
- [57] Kendall IM, Verster MA, von Mollendorf JW. Test performance of Blacks in Southern Africa. In: Irvine SH, Berry JW, editors. *Human abilities in cultural context*. Cambridge, England: Cambridge University Press; 1988. p. 299–339.
- [58] Rushton JP, Skuy M, Bons TA. Construct validity of Raven's advanced progressive matrices for African and non-African engineering students in South Africa. *Int J Sel Assess* 2004;12:220–9.
- [59] Rushton JP, Skuy M, Fridjhon P. Performance on Raven's advanced progressive matrices by African, East Indian, and White engineering students in South Africa. *Intelligence* 2003;31:123–37.
- [60] Mackintosh NJ. IQ and human intelligence. Oxford, UK: Oxford University Press; 1998.
- [61] Sternberg RJ, Nokes C, Geissler PW, Prince R, Okatcha F, Bundy DA, et al. The relationship between academic and practical intelligence: a case study in Kenya. *Intelligence* 2001;29:401–18.
- [62] Sigman M, Neumann C, Jansen AA, Bwibo N. Cognitive abilities of Kenyan children in relation to nutrition, family characteristics, and education. *Child Dev* 1989;60:1463–74.
- [63] Holding PA, Taylor HG, Kazungu SD, Mkala T. Assessing cognitive outcomes in a rural African population: development of a neuropsychological battery in Kilifi district. *J Int Neuropsychol Soc* 2004;10:246–60.
- [64] Liddell C, Rae G. Predicting early grade retention: a longitudinal investigation of primary school progress in a sample of rural South African children. *Br J Educ Psychol* 2001;71:413–28.
- [65] Hanushek E, Wößmann L. The role of education quality for economic growth. World bank policy research working paper No. 4122; 2007.
- [66] Glewwe P. Schools and skills in developing countries: education policies and socioeconomic outcomes. *J Econ Lit* 2002;40:436–82.
- [67] Behrman J, Alderman H, Hoddinott J. Hunger and malnutrition. In: Lomborg B, editor. *Global crisis, global solutions*. Cambridge, England: Cambridge University Press; 2004. p. 363–420.
- [68] Zax JS, Rees DI. IQ, academic performance, environment, and earnings. *Rev Econ Stat* 2002;84:600–16.
- [69] Bowles S, Gintis H, Osborne M. The determinants of earnings: skills, preferences, and schooling. *J Econ Lit* 2001;39:1137–76.
- [70] Moll P. Primary schooling, cognitive skills and wages in South Africa. *Economica* 1998;65:263–84.
- [71] Hunt E, Wittmann W. National intelligence and national prosperity. *Intelligence* 2008;36:1–9.
- [72] Lynn R, Vanhanen T. IQ and the wealth of nations. Westport, CT: Praeger; 2002.
- [73] Weede E, Kämpf S. The impact of intelligence and institutional improvements on economic growth. *Kyklos* 2002;55:361–80.
- [74] Jones G, Schneider WJ. Intelligence, human capital, and economic growth: A Bayesian Averaging of Classical Estimates (BACE) approach. *J Econ Growth* 2006;11:71–93.
- [75] Rindermann H. Relevance of education and intelligence at the national level for the economic welfare of people. *Intelligence* 2008;36:127–42.
- [76] Jones G, Schneider WJ. IQ in the production function: evidence from immigrant earnings. Working paper; 2006.
- [77] Kanazawa S. Mind the gap ... in intelligence: re-examining the relationship between inequality and health. *Br J Health Psychol* 2006;11:623–42.
- [78] Templer DI, Connelly HJ, Lester D, Arikawa H, Mancuso L. Relationship of IQ to suicide and homicide rate: an international perspective. *Psychol Rep* 2007;00:108–12.
- [79] Meisenberg G. Talent, character, and the dimensions of national culture. *Mankind Q* 2004;45:123–68.
- [80] Rindermann H. Relevance of education and intelligence for the political development of nations: Democracy, rule of law and political liberty. *Intelligence* 2008; in press. doi:10.1016/j.intell.2007.09.003.
- [81] Rindermann H, Meisenberg G. Relevance of education and intelligence at the national level for non-economic welfare: HIV and AIDS. Working paper; 2008.
- [82] Gottfredson LS. Dissecting practical intelligence theory: its claims and evidence. *Intelligence* 2003;31:343–97.
- [83] Sternberg RJ, Grigorenko EL. Dynamic testing. New York: Cambridge University Press; 2002.
- [84] Macintyre K, Keating J, Sosler S, et al. Examining the determinants of mosquito-avoidance practices in two Kenyan cities. *Malar J* 2002;1:14.
- [85] Worrall E, Basu S, Hanson K. Is malaria a disease of poverty? A review of the literature. *Trop Med Int Health* 2005;10:1047–59.
- [86] DNA pioneer James Watson says he is 'mortified' by race comments. *Associated Press*; October 18, 2007.
- [87] Jencks C, Phillips M, editors. *The Black–White test score gap*. Washington, DC: Brookings Institution Press; 1998.
- [88] Jensen AR. *The g factor: the science of mental ability*. New York: Praeger; 1998.
- [89] Thernstrom S, Thernstrom A. *America in Black and White: one nation, indivisible*. New York: Simon and Schuster; 1997.
- [90] Steinberg L. *Beyond the classroom: why school reform has failed and what parents need to do*. New York: Simon & Schuster; 1996.

- [91] Rowe DC, Vazsonyi AT, Flannery DJ. No more than skin deep: ethnic and racial similarity in developmental process. *Psychol Rev* 1994;101:396–413.
- [92] Rowe DC, Cleveland HH. Academic achievement in Blacks and Whites: are the developmental processes similar? *Intelligence* 1996;23:205–28.
- [93] Loehlin JC. Group differences in intelligence. In: Sternberg RJ, editor. *Handbook of intelligence*. Cambridge, England: Cambridge University Press; 2000. p. 176–93.
- [94] Flynn JR. What is intelligence? Beyond the Flynn effect. - New York: Cambridge University Press; 2007.
- [95] Scarr S, Weinberg RA. IQ test performance of Black children adopted by White families. *Am Psychol* 1976;31: 726–39.
- [96] Gilson MS, Hunt CB, Rowe DC. The friends of siblings: a test of social homogamy vs. peer selection and influence. *Marriage Fam Rev* 2001;33:205–24.
- [97] van Ijzendoorn MH, Juffer F, Poelhuis CW. Adoption and cognitive development: a meta-analytic comparison of adopted and nonadopted children's IQ and school performance. *Psychol Bull* 2005;131:301–16.
- [98] Gladwell M. None of the above. *The New Yorker*; December 17, 2007.
- [99] Wicherts JM, Dolan CV, Hessen DJ, Oosterveld PG, van Baal GCM, Boomsma DI, et al. Are intelligence test measurements invariant over time? Investigating the nature of the Flynn effect. *Intelligence* 2004;32: 509–37.
- [100] Beaujean AA, Osterlind SJ. Using item response theory to assess the Flynn effect in the national longitudinal study of youth 79 children and young adults data. *Intelligence* 2008; in press. doi:10.1016/j.intell.2007.10.004.
- [101] Dolan CV, Hamaker EL. Investigating Black–White differences in psychometric IQ: multi-group confirmatory factor analyses of WISC-R and K-ABC and a critique of the method of correlated vectors. In: Columbus F, editor. *Advances in psychology research*, Vol. 6. Huntington, NY: Nova Science; 2001. p. 30–59.
- [102] te Nijenhuis J, van Vianen AEM, van der Flier H. Score gains on g-loaded tests: no g. *Intelligence* 2007;35:283–300.
- [103] Flynn JR. Efeito Flynn: Repensando a inteligência e seus efeitos [The Flynn Effect: Rethinking intelligence and what affects it]. In: Flores-Mendoza C, Colom R, editors. *Introdução à Psicologia das Diferenças Individuais*. Porto Alegre: Artmed; 2006:387–411.
- [104] Flynn JR. Searching for justice: the discovery of IQ gains over time. *Am Psychol* 1999;54:5–20.
- [105] Flynn JR, Weiss LG. American IQ Gains From 1932 to 2002: The WISC Subtests and Educational Progress. *Int J Test* 2007;7:209–24.
- [106] Ree MJ, Earles JA. The ubiquitous productiveness of g. In: Rumsey MG, Walker CB, Harris JH, editors. *Personnel selection and classification*. Hillsdale, NJ: Lawrence Erlbaum; 1994. p. 127–36.
- [107] Daley TC, Whaley SE, Sigman MD, Espinosa MP, Neumann C. IQ on the rise: the Flynn effect in rural Kenyan children. *Psychol Sci* 2003;14:215–9.
- [108] Serneels P. Human capital revisited: The role of experience and education when controlling for performance and cognitive skills. *Labour Economics* 2008; in press. doi:10.1016/j.labeco.2007.10.003.
- [109] Adejumo D. The Reliability and Validity of Modified Hall's Matrices (MHM) for Predicting Mathematics Achievement Among Nigerian Children. *Educ Psychol Meas* 1977;37:501–3.
- [110] Rushton JP, Jensen AR. African–White IQ differences from Zimbabwe on the Wechsler Intelligence Scale for Children–Revised are mainly on the g factor. *Pers Indiv Differ* 2003;34:177–83.
- [111] Dolan CV, Roorda W, Wicherts JM. Two failures of Spearman's hypothesis: The GATB in Holland and the JAT in South Africa. *Intelligence* 2004;32:231–45.
- [112] Editorial. Watson's folly. *Nature* 2007;449:948.

Jason Malloy

E-mail address: jmalloy@nyc.com

Available online at www.sciencedirect.com



ScienceDirect