
Myths, Countermyths, and Truths About Intelligence

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Ten myths and countermyths about intelligence are considered, as well as what is currently our best account of the truth. We need to be circumspect in our claims for tests of intelligence and for what intelligence can tell us about people in general.

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Is intelligence one thing or many? Is it modifiable or not? Is it inherited or is it environmental? Are there differences between racial and ethnic groups or aren't there? Educators, laypersons, and even psychologists are confused about these issues as never before, in part because of the conflicting claims that have arisen out of *The Bell Curve* (Herrnstein & Murray, 1994) and various responses to it (e.g., Fraser, 1995; Jacoby & Glauber, 1995), and in part because many of these issues have never been satisfactorily resolved, regardless of what has been written in the most recent in a long series of skirmishes between believers in alternative views about intelligence.

A major thesis of this article is that in the desire for simplicity and, perhaps, for the greater publicity that accompanies extreme rather than moderate statements, psychologists and others writing about intelligence have sometimes taken strong positions that are not justified by either the current state of theory or recent data. Reporters from the various media are often more interested in controversy than in scientific truth, because it is controversy that sells newspapers, magazines, or whatever. Moreover, the lay public often wants simplicity, not qualifications like "the answer depends on a number of factors, including how you define the construct." But what sells magazines or books is often not what best reflects the state of our scientific knowledge. Pendulum shifts from one extreme to another may appeal to the public, but may retard the progress of both science and education, as we find that the extremes that may capture people's fancies do not work in practice.

The goal of this article is to raise some of the main questions that are being asked about intelligence and to indicate our current state of knowledge about their answers. The structure of the article is shown in Table 1, which lists a series of myths, countermyths, and, I believe, truths about human intelligence.

1. **Is intelligence one thing or many?** On no question about intelligence has there been greater disagreement among psychologists than on the question of its structure (see Sternberg, 1990, for a discussion of many alternative views). At one extreme, theorists from Spearman (1904) to Herrnstein and Murray (1994) have argued for the primacy of a general factor of intelligence; at the other extreme, theorists such as Guilford (1982) have argued for as many as 150 factors of intelligence. At the same time, we have theo-

rists such as Gardner (1983) who argue that intelligence is not one thing but many, theorists such as Perkins (1995) who argue that intelligence is not only multiple but includes aspects of values and personality as well as cognitive skills, and theorists such as Neisser (1979) who argue that intelligence is merely a cultural invention having no existence outside our invention of it as a prototype of what we value as a culture.

The most widely accepted view at the current time is probably a hierarchical one, such as that of Carroll (1993), according to which abilities can be laid out in a hierarchy, with general ability at the top and successively more specific abilities at successively lower levels of the hierarchy. But the consensus is by no means unanimous, and in any case, scientific truth is not decided by plurality (or even majority) vote (see Sternberg & Lubart, 1995). The weight of the evidence at the present time is that intelligence is multidimensional, and that the full range of these dimensions is not completely captured by any single general ability (Sternberg, 1994). For example, practical aspects of abilities seem to be theoretically and empirically rather distinct from more academic ones (Sternberg, 1985; Sternberg, Wagner, Williams, & Horvath, 1995).

We need to be much more cautious than we have been in trumpeting as truths our views on the nature of intelligence. In this respect, psychologists have been less than circumspect. Almost all psychologists agree, at the level of definition, that intelligence involves adaptation to the environment (see "Intelligence and Its Measurement," 1921; Sternberg & Detterman, 1986). What is left unclear is just what environment is being talked about.

If we are talking about cultural environment, it is quite clear that the overwhelming majority of theories and tests have been tailored to Western environments and might not apply as well in nonwestern ones (see Cole, 1990; Laboratory of Comparative Human Cognition, 1982). Indeed, non-Western tests might look quite different from Western ones and might create a rank-ordering different from the one we are comfortable creating.

If we are talking about biological adaptation, species other than the human one might get the last laugh. Although humans are quick to put themselves at the top of the evolutionary scale in intelligence, even evaluating dogs and other species in terms of the kinds of skills that we, as humans, value (Coren, 1994), our view may be rather species-specific. For example, if the devastation wrought

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Table 1
Myths, Mythical Countermyths, and Truths About Intelligence

Myth	Mythical Countermyth	Truth
1. Intelligence is one thing, <i>g</i> (or IQ)	Intelligence is so many things you can hardly count them.	Intelligence is multidimensional but scientifically tractable.
2. The social order is a natural outcome of the IQ pecking order.	Tests wholly create a social order.	The social order is partially but not exclusively created by tests.
3. Intelligence cannot be taught to any meaningful degree.	We can perform incredible feats in teaching individuals to be more intelligent.	We can teach intelligence in at least some degree, but cannot effect radical changes at this point.
4. IQ tests measure virtually all that's important for school and job success.	IQ tests measure virtually nothing that's important for school and job success.	IQ tests measure skills that are of moderate importance in school success and of modest importance in job success.
5. We are using tests too little, losing valuable information.	We're overusing tests and should abolish them.	Tests, when properly interpreted, can serve a useful but limited function, but often they are not properly interpreted.
6. We as a society are getting stupider because of the dysgenic effects of stupid superbreeders.	We have no reason at all to fear any decline in intellectual abilities among successive generations.	We have some reason to fear loss of intellectual abilities in future generations, but the problem is not stupid superbreeders.
7. Intelligence is essentially all inherited except for trivial and unexplainable variance.	Intelligence is essentially all environmental except for trivial and unexplainable variance.	Intelligence involves substantial heritable and environmental components in interaction.
8. Racial differences in IQ clearly lead to differential outcomes.	Racial differences in IQ have nothing to do with differential environmental outcomes.	We don't really understand the relationships among race, IQ, and environmental outcomes.
9. We should write off stupid people.	There's no such thing as a stupid person. Everyone is smart.	We need to rethink what we mean by "stupid" and "smart."

by the HIV virus were attributed to extraterrestrial aliens who attacked Earth and devised weapons and counter-weapons that so far always outwitted our own, we might view the aliens as smarter than we are. And if we read of some other species that was unique in the history of all species in devising the weapons of its own mass destruction, we might not necessarily conclude that this species was the most intelligent of all. The question of what is intelligent in a long-term evolutionary perspective, therefore, is wide open.

2. Is the social order a natural result of people's differing levels of intelligence? A central and particularly controversial claim of Herrnstein and Murray's (1994) is that differences in intelligence across people have resulted in the formation of a "cognitive elite." According to these authors, "no one decreed that occupations should sort us out by our cognitive abilities, and no one enforces the process. It goes on beneath the surface, guided by its own invisible hand" (p. 52).

This somewhat glib and modernized version of social Darwinism is belied by the fact, recognized by Herrnstein and Murray, that at different points in the history of civilization, different factors have sorted people into different social classes. During the Middle Ages, one's social status was completely determined by one's parentage. If you were born a noble, a noble you remained. If you were born a serf, so you remained.

Even as late as the 1950s in the United States, scores on standardized tests of cognitive abilities counted for far less in society than they do now. As Herrnstein and Murray point out, in 1950, only 55% of high school graduates in the top IQ quartile went directly to college (compared with 80% in 1980), and the mean SAT-verbal score at Harvard was a mere 583 (on the older SAT scale), compared with 678 in 1960.

The point is that societies choose their bases for sorting, and abilities measured by current cognitive tests are simply one of many bases for sorting. The abilities for which societies sort change: They have changed in the United States over the past several decades, and they have changed in Russia over just the past several years, causing social upheaval.

We should not overestimate the importance of the fact, pointed out by Herrnstein and Murray (1994), that people in higher prestige occupations in the United States have higher IQs. Of course they do: Their passage through the gates that enable them to enter these occupations generally requires that they take cognitive tests—the SAT or ACT for college, the GRE for graduate school, the LSAT for law school, the GMAT for business school, the MCAT for medical school, and so on. If you do not score well on these tests, your ability to pass through the gates for entry into the more prestigious occupations is severely curtailed. If you do not test reasonably well, you are likely to find that

you can't even get the training, much less the high-prestige job, that you well might want.

We might have chosen to focus on other attributes. For example, one could argue that creativity—which is not measured by any of the widely used cognitive tests, is at least as important for job success as are the kinds of memory and analytical abilities measured by the conventional tests (see Sternberg, 1988; Sternberg & Lubart, 1995). As a different kind of example, if we decided only to admit tall people to selective colleges, and very tall ones to graduate, law, business, and medical schools, we would notice some years after our decision that people in high-prestige occupations tend to be tall. Lest this sorting procedure sound silly, we should keep in mind that there is, in fact, a correlation between height and various kinds of success (CEOs, for example, tend to be well above average in height).

At the same time, it would be foolish to dismiss altogether the role of psychometrically measured intelligence in societal success. For better or worse, we have created a society in which such intelligence does matter, a fact amply documented by Hunter and Schmidt (Hunter & Hunter, 1984; Schmidt & Hunter, 1981, 1993). And the same skills may well matter in greater or lesser degree in other societies. Our own social order, then, is partially a function of the kinds of cognitive abilities measured by psychometric tests, but the proportions of variation accounted for in job placement, usually in the order of .1 to .3, are far from a complete explanation of what leads some people to high-prestige and others to low-prestige jobs.

3. Can intelligence be taught to any meaningful degree? Herrnstein and Murray (1994), like Jensen (1969) before them, have argued that intelligence cannot be modified to any meaningful degree. This claim is a bit strange in view of the results of one highly successful program directed by Herrnstein himself (Herrnstein, Nickerson, De Sanchez, & Swets, 1986) and of the documented success (in refereed journals) of other programs as well (e.g., Ramey, 1994). A comprehensive review of programs for teaching cognitive skills (Nickerson, Perkins, & Smith, 1985) shows that intellectual skills can be taught to at least some of the people, some of the time. Our own research is consistent with these results (Davidson & Sternberg, 1984; Gardner, Krechevsky, Sternberg, & Okagaki, 1994; Sternberg, Okagaki, & Jackson, 1990).

Whether one views the history of attempts to teach children to think and learn better as successful or not depends in part on what one's expectations are. Certainly, we have not been able to achieve dramatic gains consistently, and overblown claims have soured some by raising their expectations beyond what we can achieve. But to say that "taken together, the story of attempts to raise intelligence is one of high hopes, flamboyant claims, and disappointing results" (Herrnstein & Murray, 1994, p. 389) is an exaggeration. Disappointment is in the mind of the beholder, and in fact, many people working in the field have been cautious rather than flamboyant in their claims.

We need to keep in mind that contemporary attempts to raise intellectual abilities really date back only to the 1960s—to the Head Start program. We can scarcely expect programs in their first 10, 20, or even 30 years to have the kind of stunning success that some might have hoped for. Imagine if we judged medicine by the accomplishments of its first years in ancient Greece, or anywhere else. More-

over, our understanding of cognitive abilities has increased greatly since the 1960s, although of course there is still much to be learned. Certainly it is too early to come to the conclusion that attempts to raise intelligence have been, and will continue in the near term to be, unsuccessful. At the same time, we are in no position to claim that dramatic successes can be achieved on a regular basis.

4. Do intelligence tests measure pretty much all it takes for success in school and on the job? We discussed above the role of psychometrically measured intelligence in sorting people into various educational and job streams. How well do such tests account for success, once people are in those streams?

Again, the work of Hunter and Schmidt, cited above, as well as the work of many others, shows correlations between scores on psychometric tests of intelligence and both school and job performance (see, e.g., Hunt, 1995; Jensen, 1980; Ree & Earles, 1993). The cause of these correlations is unclear: Amount of schooling, for example, may affect IQ at least as much as IQ affects amount of schooling (see Ceci, 1990).

During recent years, it has also become amply clear that there is more to the cognitive abilities required for various kinds of school and job success than is measured by IQ and related constructs (such as scores on SATs and ACTs). For example, Ceci and Liker (1986) have shown that men who are successful in making bets at the race track and who use highly complex mental algorithms for predicting winners may have only average IQs. Nunes and her colleagues (Nunes, Schliemann, & Carraher, 1993) have shown that Brazilian street children who can successfully do the math to run a school business may be failing math. And Lave, Murtaugh, and de la Roche (1984) have shown that housewives who can choose better buys by computing unit prices in a supermarket cannot do comparable mathematical operations in a paper-and-pencil arithmetic-operations test.

In our own work, we have shown that measures of practical intelligence that predict success in school as well as measures of practical intelligence that predict performance on the job do not correlate meaningfully with psychometrically measured intelligence (Sternberg & Wagner, 1993; Sternberg, Wagner, & Okagaki, 1993; Sternberg et al., 1995). We have also found, however, that psychometrically measured intelligence predicts these kinds of performances independently of our own tests. In other words, psychometrically measured intelligence is a reasonable predictor of various kinds of success; it is, however, far from being the only one. Thus, it is not true that tests of constructs other than psychometric intelligence "that predict well do so largely because they happen themselves to be correlated with tests of general ability" (Herrnstein & Murray, 1994, p. 70).

5. Are we underusing, or overusing, intelligence tests? Herrnstein and Murray (1994) are not alone in their view that we are losing valuable information by not paying sufficient attention to the results of psychometric tests. Indeed, Herrnstein and Murray make these claims largely on the basis of the Hunter-Schmidt work cited above.

From the standpoint of the organization, there may indeed be economic or other gains to be had by paying more attention to scores on tests. We need to ensure that these gains are there to be had, though. For example, we found

that for 10 years' worth of matriculants into our psychology graduate program at Yale, scores on the GRE, although predictive of 1st-year grades in the graduate program, were not predictive of professors' ratings of students' analytical, creative, practical, research, or teaching abilities, or of dissertation ratings. When the middle 50% or even 80% of the distribution was eliminated in order greatly to increase the standard deviation of the distribution, prediction of grades shot up, but prediction of the more meaningful kinds of graduate performance did not (Sternberg & Williams, 1994).

If we are going to increase our use of tests, however, we might well wish to consider whether we should broaden the sphere of abilities tested, for example, to include important creative and practical as well as analytical abilities of the kinds measured by conventional tests (Sternberg, 1985). Moreover, we need to remember that what works well, on average, may be disastrous for certain individuals. Those who do not test well may be consistently disadvantaged by heavy reliance on tests, as may be those who are tested under inappropriate circumstances. For example, my own son was moved from the top reading group in one school to the bottom reading group in another, comparable school solely on the basis of a reading-test score obtained in his 1st day in the new school. And some gifted programs still classify children as gifted solely on the basis of a single score on a psychometric test of intelligence or related constructs.

Ultimately, the problem is not with tests, *per se*, but with how we use them. Tests were originally intended to level the playing field—to increase fairness by reducing the subjectivity of judgments about children. Tests can still serve this purpose, when they are used in conjunction with other predictors and when they measure diverse abilities rather than only unitary aspects of abilities.

6. Are we becoming stupider as a society as a result of the dysgenic effects of higher rates of reproduction among those with lower psychometric intelligence? Herrnstein and Murray (1994) argue that the national level of intelligence in the United States, not to mention other countries, is imperiled by the higher reproduction rates of less intelligent as compared with more intelligent individuals. A fact that they never quite successfully deal with is the so-called "Flynn effect" (Flynn, 1984, 1987)—the fact that intelligence as measured by conventional tests has been rising over a period of a number of years (at least since the 1930s), not only in the United States but in other nations as well.

Of course, it is possible and indeed likely that some influences lead to increases and others to decreases in psychometrically measured intelligence and that the forces leading to increase have been winning out to date, but may not continue to do so. Certainly, higher levels of education would be one of the forces leading to increases (Ceci, 1990).

It is not clear what effect differential rates of reproduction are having on national IQs, nor is it clear what we would do if it did indeed turn out that such differential rates of reproduction were lowering IQs. For one thing, they might be lowering IQs at the same time that they raised levels of other attributes that are important for adaptation. For another thing, it is not clear that IQ should serve as the basis, or even an important basis, for the valuing of a person. And perhaps most importantly, it is not clear that if our goal is to improve societal productivity and

well-being in general, reproduction rates are where we should be turning our attention.

In my own view, there is a far greater source of alarm, and a far more manageable one, than differential reproduction rates. It is the dumbing down of textbooks in the United States, which has been amply demonstrated by Reis and Renzulli (1992). The same phenomenon may be occurring elsewhere as well. One has only to compare current texts at a given grade level with the texts of 10, 20, or 30 years ago to see a progressive deterioration in our standards for what constitutes an acceptable level of reading difficulty for students of a given grade level. If one looks back at the old McGuffey Readers, one may become thoroughly depressed, so much higher were the expectations early in U.S. history than they are at present. And anyone who has written a college text, as I have, knows that the same issues that apply at the elementary and secondary levels apply at the college level as well: The pressure is to keep reading level low, not high.

Some would like to blame the publishers, but really, we have only ourselves to blame, because publishers merely produce what they find will sell. And what they have discovered is that people talk about high standards, but then buy books that meet only low ones. As it is said, educators talk out of both sides of their mouths. If we really want to help our children, we have not only to talk about high standards, but to enforce them, and a good place to start would be in our choice of texts.

7. Is intelligence essentially inherited or essentially environmental? Probably no one today would claim that individual differences in intelligence are due wholly to heredity, nor are many psychologists familiar with the data available in 1995 likely to echo the claims of Kamin (1974) that there is no credible evidence for any hereditary effects at all. The heritability of intelligence will depend, of course, on how intelligence is defined (and thus what is inherited) as well as the population about which we are talking. Available data, for example, suggest that heritability in the United States is higher for Whites than for Blacks (Scarr, *in press*), and that heritability increases with age (Plomin, *in press*).

To my knowledge, every investigator who actually studies the behavior genetics of human intelligence believes that there is some role both for heredity and for environment in intelligence (see essays in Sternberg & Grigorenko, *in press*). I personally am not enthusiastic about attempts to assign percentages to heredity and environment because what percentages are assigned depend on so many factors, including geographic, temporal, and other factors. Perhaps more important from an educational point of view is to realize that the heritability of intelligence is a question entirely distinct from that of the modifiability of intelligence. Intelligence could be partially or even highly heritable and, at the same time, partially or highly modifiable. The two issues are simply distinct, as shown, for example, by the fact that certain highly heritable traits are also highly modifiable. For example, height has a heritability coefficient in excess of .9, but heights have gone up in recent generations both in the United States and elsewhere. Phenylketonuria has a heritability of 1 (i.e., it is completely heritable), but its symptoms (such as mental retardation) can be alleviated by a wholly environmental intervention (withholding of phenylalanine from the diet from the time of birth). Our

ability to modify intelligence, therefore, is not determined in the least by the heritability of intelligence.

8. Are there racial and ethnic group differences in intelligence, and if so, what causes them and what are their implications for societal outcomes? The difference of about 1 standard deviation between Blacks and Whites in the United States on psychometric tests of intelligence has been documented many times (Jensen, 1980), although there is also quite credible evidence that the difference has been shrinking (Nisbett, 1995), and the difference may well continue to shrink. Contrary to the claims of Herrnstein and Murray, the preponderance of evidence, reviewed by Nisbett (1995), is that the difference is environmental rather than genetic in origin. But given the probable environmental origins of the difference, we really have very little idea of what the factors are that lead to the difference. We also need to remember that the difference is on tests that many scholars believe measure only certain aspects of intelligence, but by no means the whole thing.

Whatever the origins of the current difference between Blacks and Whites on psychometric tests, it is clear that much more is going on in terms of differences in societal outcomes than is caused by IQ differences. Herrnstein and Murray (1994) themselves point out that of Blacks and Whites with the same average IQ, Blacks are twice as likely as Whites to be in poverty (p. 326), five times more likely to be born out of wedlock (p. 331), three times more likely to be on welfare (p. 332), more than twice as likely to have lived in poverty during the first 3 years of their life (p. 335), and twice as likely to have had low birth weight (p. 334). Given that IQ was equated for Blacks and Whites, it is clear that much more is contributing to differences in societal outcomes than just IQ.

One of the greatest temptations we face, whether in education or otherwise, is that of falling victim to confirmation bias. We have a bias, whatever it may be, and then seek out or interpret evidence to support that bias. Such bias is particularly dangerous when it comes to differences between groups in levels of intelligence. One of the easiest ways to fall victim to this bias is to interpret correlational differences as causal in a direction that is consistent with one's prior expectations. Thus, suppose there are differences between groups, on average, in IQ, and also differences, on average, in societal outcomes, and suppose one believes, deep down, that the IQ differences between the groups cause the differences in outcomes. It is easy to fall into the trap of interpreting the correlational data as supporting one's causal hypothesis, when in fact one knows that correlations do not permit causal inference. IQ differences between groups may lead to differences in societal outcomes; differences in societal outcomes may lead to IQ differences; both may be dependent on some third factor. Or any combination of these three mechanisms may be at work. Moreover, we need to remember that we cannot draw conclusions about individuals from data that apply only to groups.

9. Should we write off stupid people as not having much hope of contributing much of value to society? Perhaps the most pernicious conclusions that come out of the Herrnstein-Murray book are those of the last chapters, which basically argue that we should not expect much from people with low IQs and should treat them accord-

ingly, forming a "custodial state" that will take care of the "underclass" (Herrnstein and Murray's terms).

An alternative perspective would be that we need to rethink what we mean by intelligence, recognizing that there is more to intelligence than IQ and, more importantly, that we need not get caught in the ancient human trap of conflating some attribute of humans that we may happen to value with human worth. Somewhere, some time, it may have been noble birth; at another time or place, sheer wealth; at yet another time or place, hunting or gathering skills, physical prowess, physical attractiveness, or whatever. At any given time, we probably consider a combination of these and other attributes in assessing people. But none of these attributes is tantamount to human worth—to our values as human beings. Nor is the economic value of a person's labor, whether predicted from IQ or from something else.

It is always tempting to value most what we ourselves possess—and, in the process, to scapegoat other groups. It is happening in ethnic wars around the world. And one might argue it happens when Herrnstein and Murray (1994) cheerfully note that most readers of their book are members of the cognitive elite (p. 47) and other elite groups. We need to remember that over time and space, those at the higher rather than the lower end of the various intellectual spectra have been those most likely to be persecuted or scapegoated. However it is defined, intelligence is only one attribute of human beings and one attribute leading to certain kinds of success, but tests of intelligence can at best provide measures of certain cognitive skills (Keating, 1984); they are not measures of human worth.

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