
The Answer Depends On the Question: A Reply To Eric Jensen



Mr. Sternberg does not doubt that brain science has implications for education. The problem, he shows, is that brain research has yielded too many contradictory findings for educators to know with certainty which policies and practices to adopt.

BY ROBERT J. STERNBERG

THE QUESTION that Eric Jensen addresses in his article is whether brain research can provide a basis for educational practice. He debates John Bruer, president of the James S. McDonnell Foundation, and argues that brain research can, in fact, provide a basis for what educators do. Most of Jensen's article is devoted to showing ways in which brain research can provide a basis for educational interventions.

Wrong question. The question is not whether educators can take brain-based or other biological research and derive educational implications from it. The right question is whether they can take such research and derive *unequivocal* educational implications. If not, then we have metaphor, but we do not really have science — or at least, not the kind of science that prescriptively is going to help us design educational interventions.

Consider an important example. Is there a general

ability that dominates over all others,¹ or are there multiple intelligences, each relatively independent of the others, that work in tandem with one another, but that are coequal in importance? Howard Gardner has presented an impressive array of neuropsychological evidence in favor of multiple intelligences.² This work is cited and discussed in the Jensen article. At the same time, John Duncan has supplied targeted evidence in support of a general factor and has even identified in the brain the alleged loci in the lateral frontal cortex.³ Duncan's initial article was published in *Science*, one of the most prestigious journals in all of the sciences. A second article was published in another highly prestigious journal, *Cortex*. There is actually a much more extensive literature claiming that general intelligence can be localized in one part or another of the frontal cortex.

So what can we conclude from brain research? We can conclude either that children can be ordered on a unidimensional scale that pretty much captures their different abilities to succeed in school, or we can conclude the opposite. Thus brain research does indeed have implications for education. What they are, however, de-

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pends in large part upon one's preferred ideology.

Okay, maybe I picked a loser example. So let's try another question. Is intelligence correlated with brain size? Stephen Jay Gould ridiculed this notion and claimed that the evidence for it was absurd.⁴ Yet there is evidence that suggests that there is a relationship. The idea that the size of the brain may relate to intelligence was proposed by Paul Broca nearly a century and a half ago and was reintroduced by Francis Galton a generation later.⁵ Brain size is a rough proxy for processing capacity, but a proxy for brain size is head size. The correlation between head size and brain size in adults has been estimated variously, with .60 a typical estimate.⁶ In infants and young children, the correlation is higher.⁷

Generally positive correlations have been found between various measures of head size and I.Q. A meta-analysis of 35 studies with 54 independent samples and 56,793 participants revealed correlations ranging from .02 to .54, with a mean of .19.⁸ Thirty-six of the 54 correlations were statistically significant. Of course, a more accurate estimate of the relationship of brain size to I.Q. can be obtained by using brain-imaging techniques that directly study the size of the brain. A meta-analysis of 15 samples with a total N of 657 revealed an unweighted mean correlation of .40. These data suggest, again, that there is some correlation.

Where do these results leave us? Well, it appears that either there is or there is not a relationship between brain size and intelligence. Let's say, for the sake of argument, there is. What is the cause? Perhaps that is the more important question. Why do people have different head or brain sizes? Experience plays some role. Work by William Greenough and by Marian Diamond shows that experience can alter the structure and therefore the function of the brain.⁹ In particular, these investigators have shown that experience can result in increases in brain weight, cortical thickness, and number of synapses. But genetics no doubt plays a role in brain size, as well. Indeed, there is evidence of genetic determinants of brain size.¹⁰ Moreover, Geoffrey Miller and Lars Penke have also argued for genetic relations between brain size and intelligence: smarter people have bigger brains. They have also claimed that evolutionary theory and evidence support this point of view.¹¹

So if there is a relationship between brain size and intelligence — something not yet universally agreed upon — it is either genetic, or environmental, or both. We can thus conclude that brain size is related or unrelated to intelligence because of genetics, environment, or both. This wealth of incompatible conclusions does not get us far.

We can take as a third example a more controver-

sial issue. What is the relationship between race and intelligence? If you believe Philippe Rushton, then the answer is clear. There are differences in intelligence between different racial groups, and they are genetic. Indeed, Rushton and Arthur Jensen claimed to cite multiple sources of data showing this conclusion to be essentially irrefutable.¹² Linda Gottfredson, long a proponent of general intelligence and its biological bases, agrees.¹³ But then, Richard Nisbett claims that their claim is a crock, and I have argued that it is unlikely to be true, but that, even if it were, there would be no public-policy implications.¹⁴ So either race differences in measured intelligence are biological or not, and if they are, either that is educationally significant or it isn't.

Someday, brain science may give us conclusions that clearly point in one direction or another. We are not there yet. For the most part, the brain metaphor is comforting and may even be useful. But it does not provide us with unequivocal conclusions that lead to one educational practice versus another.

There is a good reason, I believe, why John Bruer emphasized caution in the use of brain science as a basis for educational interventions. For much of the 20th century, what passed as brain science was rather spotty. For example, programs were devised to reach the "right half" of the brain, based on the erroneous notion that the left and right hemispheres work in completely different ways and that what is preventing us from using our brains to best advantage is the dominance of left-brained thinking. I agree with Jensen that brain research has implications for education. The problem, at this point, is that it does not have *unequivocal* implications. Scholars can and do argue for exactly opposing conclusions, often on the basis of the same data.

There are issues in education that need serious attention — more so, I would argue, than whether brain science can serve as a basis for education. Personally, I would be happy to say sure, or of course not, if either response allowed us to move on to more pressing issues, such as whether more and more tests of less and less important knowledge and skills represent a good direction for education.

One issue is whether the No Child Left Behind Act is causing more harm than good or whether there is a model for such a law that can have good impacts without the attendant bad impacts, such as one Jensen mentions, the reduction or elimination of physical education. Can a society that is becoming increasingly obese and that is risking the health and well-being of its children afford to reduce or eliminate physical education to improve test scores? And how about music and art? Can we afford to eliminate those? Can we afford to

eliminate gifted programs because gifted children are not those who are likely to be left behind? Should we forget about fostering creativity and wisdom in our schools because the tests don't measure those either? Do we actually have much of what traditionally has been referred to as "education" left? Or has education become, in large part, test preparation?

A second issue is what to do about the achievement gap between children of different ethnicities. This is an extremely difficult and vexing question, one to which many scholars have given a great deal of attention.¹⁵ Our society desperately needs to close this gap. I am skeptical that arguments about the brain will, in the short run at least, help us close the gap. More likely, the arguments will pursue the red herring of whether such differences are biological. That question is a red herring because answering it will not help bring us any closer to closing the gap.

In the end, the brain undoubtedly has implications for education. But, at present, it is unclear that there are any *unequivocal* implications. Perhaps we would do better, at least now, to focus the lion's share of our attention on the many pressing issues that demand immediate solutions. We may then choose to leave the brain issue as one to be dealt with later, in the longer term.

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