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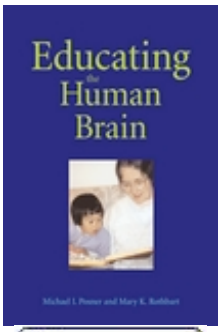
Are We Ready for a Neuropedagogy?

A review of



Educating the Human Brain
by Michael I. Posner and Mary K. Rothbart

Washington, DC: American Psychological Association, 2007. 263 pp. ISBN 978-1-59147-381-7. $79.95

Reviewed by
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In *Educating the Human Brain*, Michael I. Posner and Mary K. Rothbart—a team well suited to take on this issue—argue that pedagogy, the art and science of teaching, would benefit from a deeper understanding of how the brain of a child learns. They state that prior attempts to use "connections between psychological ideas about the basis of learning and the educational process" have had some long-lasting success, but these ideas have not generally been grounded in neuroscience. They argue that we are now in a position to build real connections between neuroscience and the process of education. They are right.

There are plenty of reasons to recommend this book to students in education, psychology, and cognitive neuroscience. Posner and Rothbart present a fine primer on developmental cognitive neuroscience and cognitive psychology, including the emerging role of functional and structural neuroimaging and the import of genetic analysis as tools for studying typical and atypical cognitive development. The organization of the book lends itself to use as a foundation for a graduate-level seminar on developmental cognitive neuroscience and psychology. The emphasis on the developmental issues of emotion and temperament, and how these factors interact with development of executive control, sets this book apart from others in its genre. The authors are at their best when synthesizing the extant literature on development of attention, reading, numeracy, temperament, and expertise. The sections on the history of attempts to link psychological constructs with pedagogy are also very interesting.

Now let's pose a question that is seldom asked of teachers by parents: "Has your proposed curriculum been directly compared to an alternative plan in a randomized trial?" Here is another question: "What are the long-term risks and benefits of your proposed curriculum?" As a pediatric neurologist, I get the medical parallels of these questions daily. Parents, appropriately, want to know the evidence basis for the recommendations I make. The application of evidence basis has become a central tenet of medicine. Although it is not always possible to make evidence-based medical recommendations or decisions, not doing so when evidence does exist typically constitutes a failure to meet professional standards. By contrast, evidence-based approaches to education have yet to capture the mainstream of the discipline.

Although I agree that we are now in a position to build connections between neuroscience and education, I think it is quite unlikely that the benefit of these connections would come about because "parental knowledge of what is happening in the brains of their children can serve as the basis for enlisting a new level of involvement, at least from those parents most likely to be concerned with school achievement." More likely, the benefit would come as a consequence of rational, testable approaches to education that engender evidence basis for particular strategies and promote the construction of well-justified individualized curricula.

Knowing that a particular set of brain regions supports reading acquisition, or changes functional activity as a consequence of a reading intervention, is undoubtedly important. But that knowledge does not (or should not) translate directly into an educational strategy at school or at home. Rather (and the lesson from clinical medicine is clear here), insights into the basic mechanisms for a particular process are not sufficient to impute the best pathway for treatment. It is necessary to perform the well-designed clinical trial with appropriate outcome measures, hypothesis testing, and subject randomization.

The repeated message in *Educating the Human Brain* is that if parents and educators knew more about how brain networks acquire skill in development (and in adults), this knowledge would facilitate good decisions on the part of the parent and teacher. By not addressing the need for well-designed "clinical" trials with appropriate outcome measures, the authors miss an excellent opportunity to promulgate the importance of generating evidence for educational decision making. For example, the chapter on literacy mentions the controversial Fast ForWord Language Programs, but there is no mention of the controversy. This commercially available intervention for reading disability, motivated by the hypothesis that dyslexia is a consequence of deficient phonological

awareness, has been reported to improve phonemic processing. But there is, at present, no consensus that Fast ForWord improves reading skill. Indeed, some relatively large randomized controlled trials have demonstrated no effect on reading skill. Yet in this book there is only a single citation about Fast ForWord—a relatively small intervention study that uses functional magnetic resonance imaging to measure brain changes. Unfortunately, there is no discussion of concerns with this study, especially the issue of incomplete control populations. Readers of the cited primary article know that its authors provide a cogent self-criticism regarding deficient controls. Targeted discussion of the pitfalls of insufficient controls in an intervention study would have been a welcome addition to this volume.

Regarding the brain development sections, one might quibble with some details. For example, the authors offer that "At birth, the upper layers of the cortex are only sparsely settled by cells, and during the 1st year, cells migrate into these upper layers, allowing increased performance." Let us look more closely at this claim. First, in humans, cortical neurons do not continue to migrate into the superficial cortical layers through the first year of life. Cortical neurons populate the cortical plate well before birth (i.e., by the 24th week of gestation). Second, what evidence supports the contention that cells migrating into the superficial layers permit an increase in performance? It is not even clear what such a statement would mean.

Admittedly, this factual error about cortical neurogenesis, made twice in the volume, has little if any consequence on the overarching objectives of *Educating the Human Brain*. But two aspects of this particular error are troubling. First, if the argument is that neuroscientific details matter for motivating educational interventions, then the neuroscientific details must be correct. Second, care must be taken before leaping from an event in the sequence of brain development (migration of neurons into the superficial cortical layers) to suggesting that such an event specifically links to a behavioral manifestation, such as improved performance. Indeed, this strong cautionary note is reminiscent of John Bruer's *Myth of the First Three Years* (Bruer, 1999), a critique of the misappropriation of brain science to build the foundations for early intervention.

Teachers and parents can parlay information about brain development and function into a better education for their children. But the best bet is to combine this knowledge with an understanding of the importance of rational, well-designed educational trials and then demand a culture that values evidence-based approaches to education. Although developmental cognitive neuroscience is well positioned to inform potential testable interventions, specific curricular decisions ought to be motivated, not just by brain science but by the results of trials specifically designed to test their

efficacy.

Reference

Bruer, J. (1999). *The myth of the first three years: A new understanding of early brain development and lifelong learning.* New York: Free Press.

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