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The fancier the cortex, the smarter the brain?

July 17 2009

Why are some people smarter than others? In a new article in *Current Directions in Psychological Science*, a journal of the Association for Psychological Science, Eduardo Mercado III from the University at Buffalo, The State University of New York, describes how certain aspects of brain structure and function help determine how easily we learn new things, and how learning capacity contributes to individual differences in intelligence.

Cognitive plasticity is the capacity to learn and improve cognitive skills such as solving problems and remembering events. Mercado argues that the structural basis of cognitive plasticity is the cortical module. Cortical modules are vertical columns of interconnected neuronal cells. Across different areas of the cerebral cortex, these columns vary in the number and diversity of neurons they contain. Identifying how cortical modules help us learn cognitive skills may help explain why variations in this capacity occur — that is, why people learn skills at different rates and why our ability to learn new skills changes as we age.

Studies examining a number of different species have shown that, on average, a larger cortex predicts greater intellectual capacity. The source of this correlation is unclear, but Mercado believes that a "more expansive cortex provides more space within which a larger quantity and greater diversity of cortical modules can be distributed." In other words, Mercado notes that when it comes to intellectual potential, it is not the absolute or even relative size that is important, but how many cortical modules (with various types of neurons) are available. These features of cortical organization and function determine how effectively our brain

distinguishes events. This ability to differentiate events may be what enables us to learn cognitive skills.

One implication of this proposal is that experience can be as important as genetics in determining intellectual capacity. Specifically, structural changes of cortical modules generated by development and learning experiences may also contribute to individual differences in intelligence. As these networks of neurons develop over time, their diversity increases, leading to further increases in cognitive plasticity.

This research has important implications for improving educational techniques and can potentially lead to new methods for rehabilitating patients suffering from brain damage. In addition, understanding how cortical modules function may lead to new ways of increasing intelligence. However, Mercado cautions that "new technologies for increasing cognitive plasticity have ethical implications far beyond those raised by doping in sports." He concludes, "The phrase 'changing your mind' may soon take on a whole new meaning."

Source: Association for Psychological Science (news : web)