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New in Cerebrum: What Makes Me, Me?

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The question of how individual differences in behavior and personality develop—especially in terms of the interaction between genes and the environment—has proved to be a formidable challenge in neuroscience. In "One of a Kind: The Neurobiology of Individuality," the featured *Cerebrum* article for June, Richard J. Davidson, Ph.D., impressively summarizes mounting new imaging evidence that suggests brain circuits involved in our emotional responses are highly plastic and change with experience, affecting our disposition. He also points to new research that suggests that psychological interventions can further harness brain plasticity to promote positive behavioral changes—changes that increase resilience, well-being, and altruistic behavior.

"Individuality, particularly in the realm of emotion ding, provides color to our everyday life and infuses our interpersonal relation s Davidson. "The fact that the brain networks that underlie such individuality exhibi g, for we all recognize that early adversity can result in long-term deleterious eff the very plasticity that can cause pathology is also the source of potential positive ch otential of plasticity to shape the brain in more intentional ways to cultivate healt confer resilience."

Davidson has spent his career stu ndividuality. He is the William James and Vilas Research Professor of Psychology the Waisman Laboratory for Brain Imaging and Behavior, and founder of the Cent y Minds, Waisman Center, at the University of Wisconsin-Madison. Named one of the 100 most influential people in the world by *Time* magazine in 2006, Davidson is co-author (with Sharon Begley) of the *New York Times* Best Seller, *The Emotional Life of Your Brain* (Penguin, 2012) and founding co-editor of the new American Psychological Association journal *EMOTION*.

The studies Davidson references in his *Cerebrum* article are based on examining brain plasticity, or how the brain's structure and function change over time. Plasticity is hard to study, however, because it mostly takes place at the synaptic level. Studies have shown that activity—both physical and cognitive—increased adult neurogenesis of genetically identical mice. But the studies also demonstrated that there were differences between individuals in the amount of neuron growth.

Davidson believes that future research would benefit by examining experience-dependent amygdala plasticity in humans. His studies in nonhuman primates, he writes, suggest that individual differences in amygdala function and associated circuitry play a key role in determining individual differences in anxious temperament. The areas associated with amygdala function—the prefrontal cortex, the stria terminalis, the anterior hippocampus, and the periaqueductal gray—likely play an important role in governing individual differences in both reactivity to and recovery from negative events.

His lab recently published a study (using fMRI) that evaluated the impact of a short-term intervention designed to cultivate compassion and the associated positive emotions linked to compassion. At the conclusion of the interventions, both groups were administered an economic decision-making task to assess individual differences in altruistic behavior. They found that after two weeks of compassion training, those assigned to the compassion-training group showed significantly more altruistic behavior compared with the group assigned to the cognitive training. They also found systematic alterations in brain function that predicted the increase in altruistic behavior.

Writes Davidson: "The prospects of having this perspective be widely recognized and adopted is personally very significant to me, for I believe that if we all took more responsibility for our minds and brains in these ways by intentionally cultivating healthy habits of mind, we can exercise the brain in ways that are similar to exercising the body and potentially promote positive behavioral changes that might increase resilience and well-being in a large fraction of the population."

—Bill Glovin

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