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The Biology Behind the Benefits

By SHARON BEGLEY
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In recent studies, scientists are discovering the biological basis for the mental functions that stand up to aging. The research, which has compared people of different generations and tracked individuals over time, shows that "not all brain components age at the same rate," says Naftali Raz of the Institute of Gerontology at Wayne State University in Detroit.

First the bad news. The prefrontal cortex suffers, which causes the functions it controls -- complex "executive" tasks such as planning, organizing, multitasking, making sense of information from multiple senses and memories -- to deteriorate. Since the prefrontal cortex also controls "divided attention" -- the ability to switch between tasks, such as a steering wheel and a BlackBerry -- this ability usually goes south with age.

Age also brings deterioration to the hippocampus, the seahorse-shaped structure deep in the brain that takes thoughts and experiences and encodes them for long-term storage. As it becomes less efficient, so does your "declarative" memory -- where you saw someone, what someone told you and other facts in your life's narrative.

The good news is that other functions step in. So-called semantic memory, for facts and figures, relies less on the hippocampus and so "is relatively resistant to the effects of aging," says Arthur Kramer of the University of Illinois, Urbana-Champaign.

Selective attention, controlled by the age-resistant parietal cortex just past the crown of the head, also hangs tough. The brain's sensory areas hold up well, too, explaining why the elderly "don't lose their sense of touch or their ability to analyze the visual world," says John Morrison of New York's Mount Sinai School of Medicine. (Vision deteriorates because the eye, not the brain, does.)

In addition to discovering which brain structures and functions stand up to time, neuroscientists are finding a more dramatic age-related change that might explain how some mental

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abilities improve with time, like a good Cabernet. The brain is divided into two hemispheres, the right and the left. The right tends to handle novelty, says New York University's Elkhonon Goldberg; the left stores knowledge and cognitive templates.

As we encounter fewer truly novel things -- the "I've seen it all" feeling -- activity generally shifts from the right hemisphere to the left, according to several studies presented at a brain-imaging conference in 2003. The right-to-left shift means that negative emotions such as sadness, jealousy, discontent and hate diminish; they come from activation of the right brain. The dominant emotions become more positive; they are the domain of the left brain.

Other studies show that the amygdala, the seat of fear and anger, becomes less responsive to things that once triggered it, such as aggravation or threats. This fits with the cultural stereotype of being at peace with oneself and the world in old age.

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