The Frontal Lobes as We Age

One theory of aging that focuses on loss of cognitive abilities suggests that the decline of the frontal lobes is the main culprit in age-related memory decline. This perspective is based on the recognition that some regions of the frontal lobes show greater age-related neural loss than the rest of the cerebral cortex and that the preservation of memory is correlated with the maintenance of frontal activation.

The prefrontal lobes can be divided into two general regions – those on the top and sides (dorsal and lateral), and those on the bottom and in the middle of the two sides (orbital and medial). For the sake of convenience, let's refer to these two areas as the DorsoLateral PreFrontal Cortex (DLPFC) and the OrbitoMedial PreFrontal Cortex (OMPFC). Both of these areas connect with other regions of the brain to perform a variety of tasks. The DLPFC lies at the apex of systems with the rest of the cortex and the hippocampus that combine attention, sensory information, memory and problem solving skills for the purpose of navigating our outer environments. The OMPFC is at the apex of networks that link subcortical regions and the amygdala to the body, organizing emotional processing, fear regulation and attachment in order to navigate our inner experience. The communication among the DLPFC and OMPFC allows us to integrate the experience of our inner and outer environments, and to combine emotion and cognition.

These two regions also have different developmental histories. The DLPFC develops gradually over the first two decades of life and begins to decline early in adulthood. This gradual rise and rapid decline of the DLPFC is in stark contrast to the OMPFC, which develops early in life and is well maintained into later adulthood. These different life histories are reflected in the changes in our ability to learn new information throughout adulthood as opposed to our sustained abilities to attach and our increasing abilities to regulate our emotions. While tasks involving working memory might suffer, those involved in emotional regulation and social processing are retained or even show improvement as we age.

With age, everyday problem-solving and verbal abilities seem to improve while performance on pencil-and-paper tests reliant on speed and new learning declines after middle age. We generally think of memory as a unitary function but, in fact, different forms of memory are processed within different neural networks. Two categories of memory are explicit and implicit. Explicit memory is best described as conscious semantic memory for names, places, and events. It is the loss of these forms of memory that are traditionally considered to be the

hallmark of aging. Implicit memories do not require conscious awareness or semantic labeling. Early attachment, fear conditioning, and other emotional memories fall into this category, as well as procedural memories such as riding a bicycle or playing a musical instrument. In contrast to the general loss of explicit memory, procedural and emotional memory are relatively unimpacted by aging.

Overall, as we age, there is a decrease in frontal lobe activation and an increase in the activation of other cortical regions, even when the quality of memory remains the same. It is believed that this shift reflects the fact that older adults are processing tasks across broader regions of the brain. The brain was designed to change, so the old adage, "use it or lose it" has a great deal of neural validity. The aging brain retains the capacity to birth new neurons and build new brain structures but, just as when we were children, it continues to grow in an experience-dependent manner and has to be stimulated by environmental, relational, and internal challenges. Being in a position where we have to solve problems tells our brain to stay alert, pay attention, learn, and grow.

Given the importance of continued bonding and attachment, one of the most important directions in which to orient our curiosity is toward those around us. What we have learned about neural plasticity tells us that the brain is primed to grow in states of safety, positive excitement, shared openness, and exploration. These states of mind create the flexibility that lets you adapt to your children and helps them discover their inner worlds. Attunement, secure attachment, curiosity, affect regulation, and brain plasticity go hand-in-hand.

In Buddhism, what is known as beginner's mind is a way to look at the world as if for the first time: with interest, enthusiasm, and engagement. This may be the optimal state of mind for a healthy brain. If you are seeking stimulation or balance for your brain, neurofeedback training is available, and you can visit our website: www.affectiveneurosciences.com to see how to improve many aspects of brain functioning, whether your brain is developing or maturing.