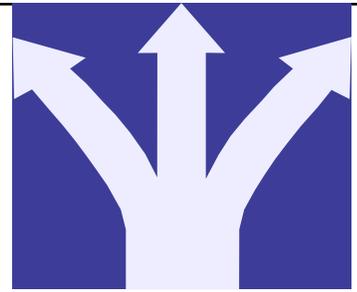


# OUTLOOK ASSOCIATES of New England

637 Massachusetts Avenue, Arlington, MA 02476  
781-643-5251  
www.outlookassociates.com



Volume 12, Number 1

May/June 2012

## The Brain and Anger

Studies of anger and the brain are complex. Patterns of aggressive behavior match specific neural pathways. Research is beginning to explain individual reactions to anger and why these occur. Brain anatomy and neurotransmitters are two factors that interact to create and control angry feelings and thoughts. Research results will guide better treatment using targeted psychopharmacology and anger management interventions.

### Brain Functions

Each area of the brain has a function. The anterior cingulate cortex (ACC) and prefrontal cortex (PFC) influence emotion processing, social behavior and decision making. Both provide executive function: understand consequences of actions, control impulses and define goals. The PFC also controls personality. The orbitofrontal cortex (OFC) is linked to emotional regulation. The ACC, the amygdala and the hippocampus involve memory. The amygdala also responds to threats. Dysfunction of areas of the PFC, amygdala and ACC increase the risk for violent and aggressive behavior.

Functional Magnetic Resonance Imaging (fMRI) is a measure of neural response. A classic anger research method is to measure subjects' reactions to facial emotions and social behavior. Contrary social responses to facial images (toward angry face and away from happy one) were longer and showed more OFC activity than the socially acceptable response (approach happy, avoid angry). The OFC works to consciously control reactions to social stimuli. The authors conclude that the choice of social emotional response is based on social norms, not on automatic reactions. Future research will help to better understand what occurs in the brain of people who appear to be unable to control hostile responses (e.g., borderline personality disorder and intermittent explosive disorder). (Roelofs, et. al. 2008).

### Rumination

Denson et al. (2009) replicated the experience of being insulted to study angry rumination and aggressive personalities. Two types of rumination correspond to two distinct areas of the brain. General aggression, where people "fly off the handle", affects the anterior cingulate cortex (ACC) which modulates level of anger and control of conflict. ACC activity was positively related to self-reported feelings of anger and individual differences in general aggression. Displaced aggression, where people "take it out" on others later, affects the prefrontal cortex (PFC) of emotion regulation and social cognition. Increased activity in the PFC was related to self-reported rumination and individual differences in displaced aggression. The hippocampus and ACC encode memory of the insults resulting in rumination, as the experience of anger is remembered over and over.

### Serotonin

What is the role of the neurotransmitter serotonin in the expression of angry behavior? Lower serotonin levels throughout the brain (particularly in the PFC) increase risk of aggressive and/or impulsive reactions. However, serotonin levels alone may not lead to increased violence, but may be mediated by other factors such as aging neuron cells. In violent adults, lower serotonin levels occur at a young age when violence is more frequent, but levels increase more than in healthy adult levels after age 40. (Meyer, et al. 2008).

Passamonti, et al. (2012) manipulated serotonin levels through dietary intake by decreasing tryptophan, a chemical precursor to serotonin. The PFC uses serotonin to decrease intensity of angry emotions received from the amygdala. Changes in serotonin levels affect emotion expression and decision-making. Presently, the selective serotonin uptake inhibitor (SSRI) medications are recommended despite lack of decisive evidence. Psychopharmacology and dietary changes to increase serotonin levels are recommended treatments as well.

(Continued)

Conclusions:

- Neuroscience research is evolving and will become the foundation of evidence-based anger management interventions.
- Brain research identifies specific areas and chemicals of the brain to target for effective treatment.
- Current research calls attention to the interplay between the brain and psychosocial factors.
- That interplay needs to be considered as part of a comprehensive anger management assessment and treatment plan.
- Specialized psychopharmacology will be developed with future research.
- Dietary changes to increase serotonin levels may be an adjunct therapy.

Meyer, J.H., Wilson, A.A., Rusjan, P., Clark, M., Houle, Woodside, S., Arrowood, J., Martin, K., Colleton, M. "Serotonin2A receptor binding potential in people with aggressive and violent behaviour." *Journal of Psychiatry Neuroscience*. (2008) 33(6): 499-508.

Passamonti, L., Crockett, M.J., Apergis-Schoute, A.M., Clark, L., Rowe, J.B., Calder, A.J., Robbins, T.W. Effects of Acute Tryptophan Depletion on Prefrontal-Amygdala Connectivity While Viewing Facial Signals of Aggression. *Biological Psychiatry*. (2012) 71(1):36-43.

Roelofs, K., Minelli, A., Mars, R.B., van Peer, J., Toni, I. On the neural control of social emotional behavior. *Social Cognitive and Affective Neuroscience*. (2009) 4 (1):50-58.

Denson, T.F., Pederson, W.C., Ronquillo, J., Nandy, A.S. The Angry Brain: Neural Correlates of Anger, Angry Rumination, and Aggressive Personality. *Journal of Cognitive Neuroscience*. (2009) 21(4):4734-744.

Stanton, S.J., Wirth M.M., Waugh C.E., Schultheiss, O.C. Endogenous testosterone levels are associated with amygdala and ventromedial prefrontal cortex responses to anger faces in men but not women. *Biological Psychology*. (2009) 81(2):118-122.

(The article was done with the research/writing assistance of Alice Miele, LICSW)

## FROM THE FILES:

### Spanking Linked to Lower IQ in Children

Research suggests children who are spanked have lower IQs than those who are not, and that the difference is large enough to lower national IQ scores in countries where corporal punishment of children is used.

Murray Straus, PhD, head of the Family Research Laboratory at the University of New Hampshire in Durham presented his results at the 14th International Conference on Violence, Abuse and Trauma in San Diego, CA.

"The longitudinal part of our study showed that children who were spanked the most fell behind the average IQ development curve, and those who were never spanked advanced ahead of the average," Dr. Straus said.

In the United States, Dr. Straus and colleague Mallie Paschall, PhD studied nationally representative US samples of 806 children aged 2 to 4 years and 704 children from aged 5-9 years. Both groups were retested 4 years later. The IQs of children aged 2-4 years who were not spanked were 5 points higher 4 years later than the IQs of those who were spanked. The IQs of children aged 5-9 years who were not spanked were 2.8 points higher 4 years later than the IQs of children the same age who were spanked.

*Medscape Medical News, October 2009*

### Childhood Physical Abuse Linked to Later Migraines

Adults and children who suffered physical abuse as children may have a heightened risk of migraines two studies have suggested.

In one study, Canadian researchers found that migraines were twice as common among adults with a history of childhood physical abuse compared to those who reported no such abuse.

The second study, in nearly 4,000 Taiwanese teenagers found a higher prevalence of migraine among those who said they had ever been beaten by a family member. And the more frequent the abuse, the greater the chances of migraines.

Both studies, which appeared online March 2010 in *Headache* pointed to an association between childhood physical abuse and migraine although the exact reasons for the connection were unclear.

*Reuters Health Information, April 2010*