

Center for Cognitive and Social Neuroscience: Member Profile

Emil Coccaro

Members of the CCSN conduct research related to cognitive and social neuroscience in their field of expertise and with their unique scholarly perspectives. Emil F. Coccaro, M.D., Chairman of the Department of Psychiatry and Director of Clinical Neuroscience and Psychopharmacology Research Unit (CNPRU), and the Ellen C. Manning Professor of Psychiatry at the University of Chicago, was interviewed about his work with impulsive aggression and its clinical form: Intermittent Explosive Disorder (IED).

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hat is IED, and how did you come to study this disorder?

I began my career studying mood and anxiety, specifically investigating the biology of depression. Work on the relationship between endocrine function and neurotransmitters led to research looking at the connection between serotonin and aggression. This work showed a consistent inverse relationship between brain serotonin and aggression. Given that agents that increase brain serotonin can be used to treat depression and other psychiatric symptoms, I designed a clinical trial to determine if the serotonin selective reuptake inhibitor (SSRI) fluoxetine can reduce aggressive behavior. We found that taking fluoxetine did reduce aggressive behavior in most study participants. At this time, the early 1990s, there was no clear diagnosis for people with ongoing problems with aggression. The DSM (Diagnostic and Statistical Manual of Mental Disorders) had criteria under the diagnosis Intermittent Explosive Disorder, but the criteria required modification to better reflect the findings of

EVERYONE GETS UPSET... BUT IF YOU ARE EMOTIONALLY INTELLIGENT, YOU CAN THINK ABOUT YOUR EMOTIONS, UNDERSTAND THEM, AND REPAIR THEM.

EMIL F. COCCARO

biological and treatment studies. Likewise, the term aggression needed to be expanded beyond simply causing physical harm to include behaviors like violent outbursts, verbal threats, and other forms of aggressive reactivity. Today, IED is defined as a behavioral disorder of impulse control, characterized by clinically significant expressions of reactive, impulsive aggression disproportionate to the situation or provocation. Recent research on IED employs family studies and epidemiology to better understand the disorder.

What research is currently underway in your lab?

Much of our work looks at IED subjects as a group, and compares them to a control group. Some of this work employs fMRI (functional magnetic resonance imaging) and DTI (diffusion tensor imaging) techniques. In 2007, we published a paper looking at the amygdala response to angry faces, and found that for people diagnosed as having IED, the amygdala response to anger faces is elevated, when compared to that of the control group. In a recent study with John Csernansky and Lei Wang at Northwestern University, we measured the shape of the amygdala and hippocampus of individuals in these two groups and discovered there are differences in the shape of these two important limbic brain structures. With K. Luan Phan, a former University of Chicago colleague, now at the University of Michigan, we conducted a voxel-based morphometry (VBM) study looking at grey matter differences in IED patients versus controls. The results tell us that there is a reduction in grey matter in the orbitofrontal cortex of those with IED. This part of the brain is critical in inhibiting the amygdala. This means that those with IED may have fewer brain cells to inhibit the amygdala when provoked. This brain region is also heavily populated with serotonin neurons, the neurons that appear to function less well in people with problems with aggression.

Does IED relate to other psychological constructs?

One psychological construct critical to this line of inquiry is social and emotional information processing (SEIP). With regard to aggression, social information processing is important because people with IED have a hostile attribution bias, and they assume hostile intent on the part of others. Since this perception is highly correlated with anger, it is easy to see how people with IED are vulnerable to aggressive outbursts in the social contexts where there really is little threat. In assessing hostile attribution bias, a researcher presents a participant with a simple vignette where one character does another harm, and asks if the harm was intentional (hostile attribution), or accidental (benign), or instrumental (the harm done was to achieve some other end). Child and adolescent psychologists have found that hostile attribution bias was more common in patients who had suffered traumatic childhood abuse. Likewise, these children have difficulties with aggression and impulsivity as they get older. It turns out that the relationship between early childhood abuse, which also correlates with aggression, is mediated by deficits in social information processing and in emotional intelligence.

For our current research, we developed these vignettes into videos in order to look at brain activation. For example, in one ten-second vignette, a participant watches two people in a karate class sparring in an exhibition. In the 'hostile' experimental condition, one of the people in the match gets hit by the other, falls to the ground, and cries out in pain. After the participant has watched this vignette in the fMRI scanner, we ask them, "Did the character who hit the other do it intentionally, to hurt their sparring partner, or to make them look bad?" Their response helps us understand how they perceive potentially hostile situations.

We are just beginning to look at the data to determine which brain regions may be activated in this hostile condition, compared to



ABOVE: Emil F. Coccaro, Ellen C. Manning Professor of Psychiatry at the University of Chicago

more neutral conditions, and we see activation in the orbitofrontal region of the brain. We are looking to see what other areas may be activated, such as the dorsolateral prefrontal cortex, an area related to working memory, or the amygdala, but we are just at the beginning of this research.

Why is this research important?

Everyone gets upset about things from time to time, but if you are emotionally intelligent, you can think about your emotions, understand them, and repair them. Paying attention to emotions is important, and understanding how to repair your own hurt feelings is important, but these are both moderated by clearly understanding what you are feeling and why. If you are driving your car, and the engine light goes on, you can look at your engine light all you want, and you can worry about your engine all you want, but if you do not open the hood and see what is wrong with the engine, you cannot fix it. I look forward to better understanding how all of these different models and concepts fit together-- behavior, emotional intelligence, social information processing, and the neural and biological substrates of healthy people and of people with IED. ■

UPCOMING EVENTS

Research in Progress Seminars

The Center faculty also participate in workshops, brown bags, and research in progress seminars. To be added to the email list for announcements of talks and events, email Anna Gomberg, agomberg@uchicago.edu.

Support the CCSN

To make a donation to the Center for Cognitive and Social Neuroscience, please contact ccsn@uchicago.edu.

CCSN Workshops

The Center for Cognitive and Social Neuroscience offers workshops, lectures and other special events. Upcoming learning opportunities include:

7 October 2011
Beecher Hall, Room 102
3:00 pm

John-Stockton Irick, Engineer
Physiological Data Collection

This workshop will discuss the procedures associated with collecting EMG (electromyography), EDA (electrodermal activity), EEG (electroencephalography), ECG (electrocardiography), and eye-tracking data.

14 October 2011
Beecher Hall, Room 102
3:00 pm

John-Stockton Irick, Engineer
Stimuli Presentation

This workshop will discuss how stimuli are presented in the experimental chambers of the CCSN, available audio-visual options, different input methods, and correct timing practices.

Society for Social Neuroscience 2011 Annual Meeting

10-11 November 2011
Washington, D.C.

The second annual meeting of the Society for Social Neuroscience is approaching. To register for the meeting or to learn more about the Society, please visit www.s4sn.org.