

# 3T MR Research Program

## Center for MR Research

TECH 2000 3T MRI RESEARCH FACILITY

WINTER 2016 ISSUE

## 3T Research News

By Mike Flannery

We would like to send a friendly reminder to everyone that the MRlx front projection system is showing its age and on occasion has problematic operation. Investigators may continue to use the front projection system as long as it is functioning; however, we cannot guarantee normal operation.

The 3T MR Research Program would like to inform everyone that we are in the process of acquiring the Human Connectome Project multiband (MB) fMRI and DWI MR pulse sequences on our GE 3T MR750 scanner. In addition to these cutting edge sequences, we will also have the capability to do robust analyses on the GE Advantage Workstation at the Harrison facility.

The HUMAN CONNECTOME PROJECT (HCP) is a comprehensive effort to map brain connectivity and its variability and producing a large amount of currently missing, but

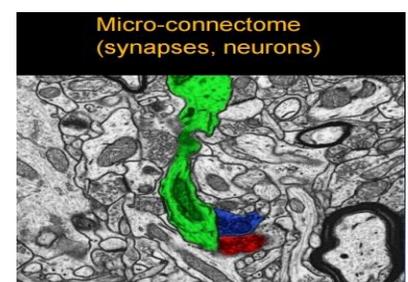
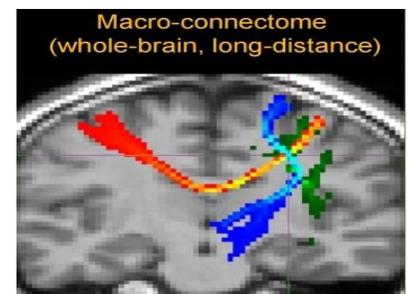
absolutely vital, data about the human brain. The 5 year project will yield fundamental information about how individual brain circuitry is related to behavior, environmental and genetic factors. This information will pave the way for future studies that reveal how brain circuitry changes during development and aging and how it differs in neurological and psychiatric disorders.

The HCP is pushing the limits of current state of the art in neuro-imaging to determine structural and functional whole brain connectivity.

The most significant pulse sequence development for the HCP was the implementation and optimization of slice-accelerated multiband (MB) acquisitions for fMRI and DWI. In general, multiband pulse sequences greatly increase the amount of data acquired per unit time, using a strategy of simultaneously exciting and acquiring multiple brain slices, which are then separated from one

another during image reconstruction, based on the spatial sensitivity profiles of the multiple receive coils (32 channel 3T head coil). This efficiency increase can lead to substantially improved functional SNR the ability to acquire more diffusion data points and/or increases in spatial resolution for fMRI or DWI.

More information about the HCP can be found at the following link:  
<http://www.humanconnectome.org>.



## Research spotlight

### Decoupling of the amygdala to other salience network regions in adolescent-onset recurrent major depressive disorder.

Dr. Rachel Jacobs, PhD

Dr. Jacobs is a Research Assistant Professor and Licensed Clinical Psychologist. Dr. Jacobs has a background in treatment outcomes for pediatric mood disorders and is interested in studying mechanisms of effective treatment. Recently, Dr. Jacobs has focused on the problem of relapse in adolescent depression and whether mindfulness may protect against the return of depressive symptoms.

The following abstract was presented to share with the research community. For further reading, please refer to the full article published in the January 2016 issue of Psychological Medicine. Imaging for this study was conducted at the 3T Center for MR Research Harrison Facility. All data were acquired utilizing the GE 3T Discovery MR750 scanner and the Invivo ESys and SensaVue presentation systems.

### Background

Recent meta-analyses of resting-state networks in major depressive disorder (MDD) implicate network disruptions underlying cognitive and affective features of illness. Heterogeneity of findings to date may stem from the relative lack of data parsing clinical features of MDD such as phase of illness and the burden of multiple episodes.

### Method

Resting-state functional magnetic resonance imaging data were

collected from 17 active MDD and 34 remitted MDD patients, and 26 healthy controls (HCs) across two sites. Participants were medication-free and further subdivided into those with single v. multiple episodes to examine disease burden. Seed-based connectivity using the posterior cingulate cortex (PCC) seed to probe the default mode network as well as the amygdala and subgenual anterior cingulate cortex (sgACC) seeds to probe the salience network (SN) were conducted.

### Results

Young adults with remitted MDD demonstrated hyperconnectivity of the left PCC to the left inferior frontal gyrus and of the left sgACC to the right ventromedial prefrontal cortex (PFC) and left hippocampus compared with HCs. Episode-independent effects were observed between the left PCC and the right dorsolateral PFC, as well as between the left amygdala and right insula and caudate, whereas the burden of multiple episodes was associated with hypoconnectivity of the left PCC to multiple cognitive control regions as well as hypoconnectivity of the amygdala to large portions of the SN.

### Conclusions

This is the first study of a homogeneous sample of unmedicated young adults with a history of adolescent onset MDD illustrating brain-based episodic features of illness.

