Introduction to the Brain Imaging Research Center

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BIRC: Brain Imaging Research Center
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- Housed in the Philips Communication Building, Storrs campus
- Opened its door in 2015
- 3,200 square feet of renovated research space for cognitive neuroscience
- Provides a multidisciplinary hub for new research
- Offers clinical services in collaboration with UCHC Radiology since Fall, 2018
BIRC Vision

**FOSTER MULTIDISCIPLINARY COLLABORATION**

Clinical
UCHC
CogPsy
UConn Storrs
SLHS
BIRC
Kinesio
Com-unity
PNB
BME

**FACILITATE SCIENTIFIC DISCOVERY & ADVANCE THEORY**

Developmental
Biological Level
Cognitive Processes

**TIME SCALE**

**ENGAGE THE COMMUNITY**

Discovery
Out-reach
Impact

Others: Yale, CT St Comm-unity

UConn Region
What can brain imaging tell us?

- **Biomarkers.** Brain patterns can be used for early identification & to predict treatment response. E.g. Alzheimer’s Disease

- **Training Effect.** Brain pattern can track and change with treatment, instruction and training. E.g. exercise

- **Phenotypes.** Identification of unexplored subtypes. E.g. autism

- **Inform Practice.** R&D of practical tools such as an app

e.g. Biomarkers: Predicting outcome by MRI and behavior are not 2 sides of the same coin

Brain patterns using machine learning predicts outcome better than Bx alone (>90% vs. <60%).

Behavior (Bx) and Brain combo (81%) predicted academic outcome better than Bx (65%) or Brain (57%) alone (vs. 81%).

Hoeft ... Gabrieli. Beh neurosci 2007
Hoeft... Gabrieli. PNAS 2011
e.g. Intervention Effect: Different strategies: same pain reduction, different mechanism

Mindfulness meditation-based pain relief employs different neural mechanisms than placebo and sham mindfulness meditation-induced analgesia

Zeidan... Coghill. J Neurosci 2015
Reading intervention in dyslexia causes:

- **Rapid (~2.5wks) & specific reorganization** of white matter fibers.
- Reflects compensatory mechanism, **not normalization**.
- Relationship with behavior changes (so longitudinal research necessary, not snapshot)

Huber... Yeatman. Nat Comm 2018
Leverage multidisciplinary collaboration, technology, and insights from neuroscience for R&D of a school readiness & dyslexia-screener app

by F.Hoeft in collaboration with brainLENS, UCSF, Curious Learning, MIT, UConn
Techniques Available

- Complementary techniques available
- Multiple techniques probe brain function at different temporal and spatial scales
- Allows for a complete picture of macroscopic brain function

Shading indicates degree of invasiveness
Modified by R. Hancock from Kameyama et al. 2016
MRI: Magnetic Resonance Imaging

- Magnetic Resonance Imaging (MRI)
- Best commercially available high field MRI (Siemens 3T Prisma)
- MRI uses a powerful magnet to image the body (x600 strength of fridge!)
- Completely non invasive, no ionizing radiation exposure
- Measures anatomy and brain function
  
  functional MRI (fMRI), structural MRI, diffusion weighted imaging (DWI), magnetic resonance spectroscopy (MRS), etc…
Other Equipment

- High density electroencephalography (EEG)
  - 2x 256 channel systems
  - Records electrical activity in the brain
  - Systems for use in and out of the MRI

- Transcranial magnetic stimulation (TMS)
  - Modulates brain activity. Blocks & enhances.

- High density transcranial electrical stimulation (tES)

- Eye tracking
  - Records eye movement during behavior
  - Systems for use in and out of the MRI
Support for Participants: Mock MRI etc

- Mimics the feel and sound of an MRI
- Acclimates participants to the MRI
- Particularly helpful for children

- Staging of MRI & MRI prep video
Support for Users: Workspace and Data Analysis

- Shared space for data analysis
- Computing resources
- Access to high performance computing systems
Training: IBRAiN Fellowships

- IBACS-BIRC Research Assistantships in Neuroimaging
- Graduate training in neuroimaging
- 1-2 year 10hr/wk fellowships
- MRI scan time for fellows to develop their own projects
- Fellows support the community by consulting and mentoring faculty and students
- Your students can apply to become experts
- Your team can get support to jump start your project

Inaugural IBRAiN Cohort (2018)
Summary of BIRC

- BIRC provides a multidisciplinary hub for research in cognitive science and other fields
- Supports a wide range of basic and applied research
- Provides training opportunities and support to users
- And… MRI is one of the most expensive research tools that IDC applies (MRI: $500-1,000/sj, Bx: $0-10/sj) 😊

Visit birc.uconn.edu to learn more!
InCHIP offers a “one stop shop” for successful grant writing and to perform impactful health-related research.

Training, Mentoring, Researcher network, & Grant management

Visit [http://inchip.uconn.edu/](http://inchip.uconn.edu/)
The Institute for Collaboration on Health Intervention and Policy (InCHIP) and the Brain Imaging Research Center (BIRC) are offering a $30,000 seed grant for an innovative pilot project in health with a neuroimaging component.

- $15,000 exclusively for BIRC equipment usage.
- $15,000 for other research costs associated with the pilot project.

The funded pilot project must involve neuroimaging-related research that includes MRI, TMS, tDCS/tACS, and/or EEG usage at BIRC.

Click [here](#) for more information about this seed grant.

$30,000 seed grant opportunity!
LOI due 4/26