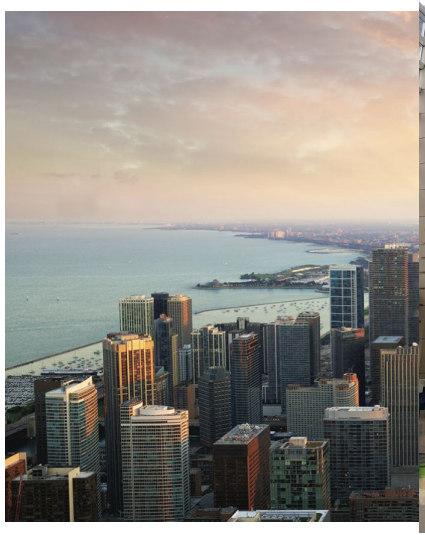
Society for Neuroscience 2019

Hyeonjin Kim, Soyeon Kim, Yoonseo Zoh
2019.10.29

The largest neuroscience society in the world

- The beginning
  - Washington DC, 1971
  - 1396 attendees
- SfN 2019 @ **Chicago**
  - aprx. 26,000 attendees
- Events everywhere
  - Special lecture
  - Symposium/ Nano-symposium
  - Workshop
  - graduate school affair
  - Socials



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  - Socials
- Posters
  - From neuron - animal - human

Society for Neuroscience

- Themes
  - Theme A: Development
  - Theme B: Neural Excitability, Synapses, and Glia
  - Theme C: Neurodegenerative Disorders and Injury
  - Theme D: Sensory Systems
  - Theme E: Motor Systems
  - Theme F: Integrative Physiology and Behavior
  - Theme G: Motivation and Emotion
  - Theme H: Cognition
  - Theme I: Techniques
  - Theme J: History, Education and Society

Talk #1. Let's work on theoretical neuroscience

THEME I: TECHNIQUES

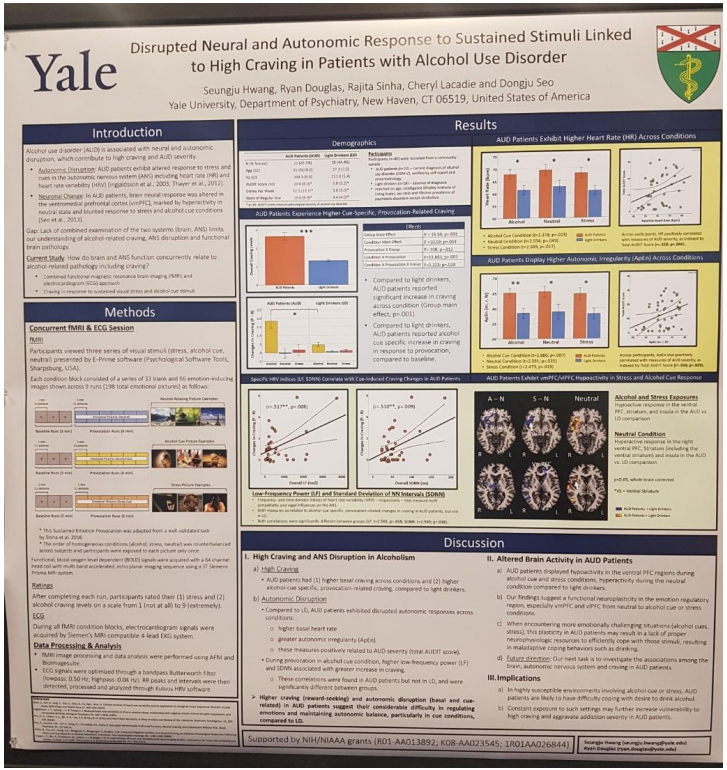
Theoretical Neuroscience: Decision Making and Its Discontents **CME**

Peter Dayan, PhD
Max Planck Institute for Biological Cybernetics
Sunday, Oct. 20, 9–10:10 a.m.

Theoretical neuroscience comes in three intertwined strands: data analysis, which is of ever greater importance in the present age of burgeoning big neural data; mathematical neuroscience, offering quantitative accounts spanning levels of description; and computational neuroscience, predicated on the fact that brains solve complex information processing problems. This lecture will review elements of each of these, focusing on the ever richer understanding of normal and dysfunctional affectively-charged decision-making.

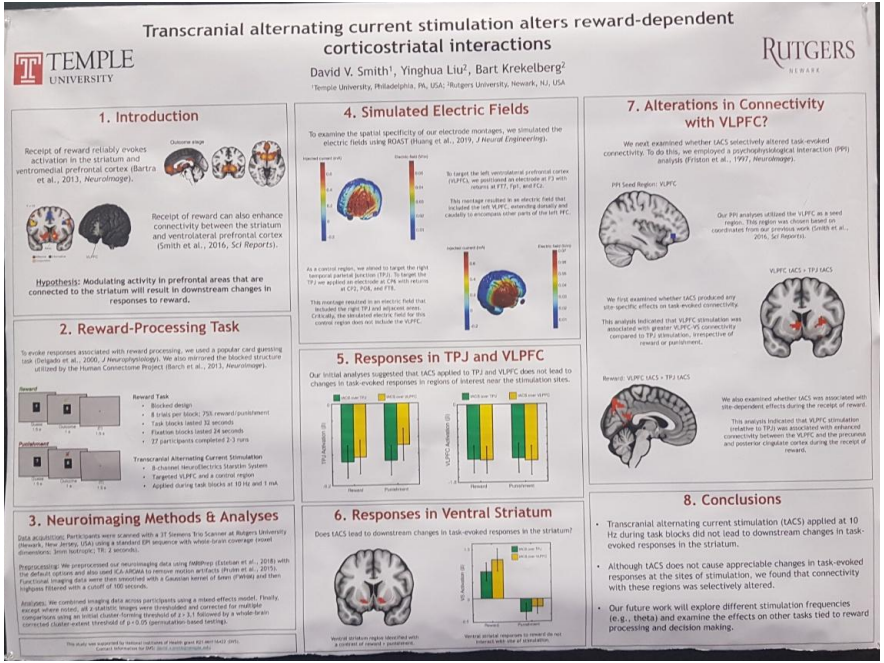
- Three parts
  - data analysis
  - mathematical modeling
  - computational theorizing
- Pavlovian mechanism
  - orthogonalized Go/ Nogo task

Poster #1. AUD shows disrupted neural and ‘autonomic’ response



- Neural and autonomic (heart rate) response to alcohol cue
- N = 50 (AUD 22, LD 28)
- What happens to AUD exposed to alcohol cue?
  - Higher craving level
  - Hypoactivation in emotion regulating area (vmPFC, vlPFC)
  - Disrupted heart rate variability

Poster #2. TACS on vlPFC alters connection to VS during reward receipt



Transcranial alternating current stimulation alters reward-dependent corticostriatal interactions

TEMPLE UNIVERSITY

RUTGERS NEWARK

David V. Smith[1], Yinghua Liu[2], Bart Krekelberg[2]

[1]Temple University, Philadelphia, PA, USA; [2]Rutgers University, Newark, NJ, USA

1. Introduction

Receipt of reward reliably evokes activation in the striatum and ventromedial prefrontal cortex (Bartra et al., 2013, *NeuroImage*).

Receipt of reward can also enhance connectivity between the striatum and ventrolateral prefrontal cortex (Smith et al., 2016, *Sci Reports*).

Hypothesis: Modulating activity in prefrontal areas that are connected to the striatum will result in downstream changes in responses to reward.

2. Reward-Processing Task

To evoke responses associated with reward processing, we used a popular card guessing task (Delgado et al., 2000, *J Neurophysiology*). We also mirrored the blocked structure utilized by the Human Connectome Project (Barch et al., 2013, *NeuroImage*).

Reward Task
- Blocked design
- 6 trials per block; 75% reward/punishment
- Task blocks lasted 32 seconds
- Fixation blocks lasted 24 seconds
- 37 participants completed 2-3 runs

Transcranial Alternating Current Stimulation
- 8-channel NeuroElectrics Starstim System
- Targeted VLPFC and a control region
- Applied during task blocks at 10 Hz and 1 mA

3. Neuroimaging Methods & Analyses

Data acquisition: Participants were scanned with a 3T Siemens Trio Scanner at Rutgers University (Newark, New Jersey, USA) using a standard EPI sequence with whole-brain coverage (voxel dimensions: 3mm isotropic; TR: 2 seconds).

Preprocessing: We preprocessed our neuroimaging data using fMRIPrep (Esteban et al., 2018) with the default options and also used ICA-AROMA to remove motion artifacts (Pruim et al., 2015). Functional imaging data were then smoothed with a Gaussian kernel of 6mm (FWHM) and then highpass filtered with a cutoff of 100 seconds.

Analyses: We combined imaging data across participants using a mixed-effects model. Finally, except where noted, all z-statistic images were thresholded and corrected for multiple comparisons using an initial cluster-forming threshold of $z > 3.1$ followed by a whole-brain corrected cluster-extent threshold of $p = 0.05$ (permutation-based testing).

This study was supported by National Institutes of Health grant R21 MH116422 (SVS).

4. Simulated Electric Fields

To examine the spatial specificity of our electrode montages, we simulated the electric fields using ROAST (Huang et al., 2019, *J Neural Engineering*).

To target the left ventrolateral prefrontal cortex (VLPFC), we positioned an electrode at F3 with returns at FT7, Fp1, and F7.

This montage resulted in an electric field that included the left VLPFC, extending dorsally and caudally to encompass other parts of the left PFC.

As a control region, we aimed to target the right temporal parietal junction (TPJ). To target the TPJ we applied an electrode at CP6 with returns at CP2, P08, and FT8.

This montage resulted in an electric field that included the right TPJ and adjacent areas. Critically, the simulated electric field for this control region does not include the VLPFC.

5. Responses in TPJ and VLPFC

Our initial analyses suggested that tACS applied to TPJ and VLPFC does not lead to changes in task-evoked responses in regions of interest near the stimulation sites.

6. Responses in Ventral Striatum

Does tACS lead to downstream changes in task-evoked responses in the striatum?

Ventral striatum region identified with a contrast of reward > punishment.

Ventral striatal responses to reward do not interact with site of stimulation.

7. Alterations in Connectivity with VLPFC?

We next examined whether tACS selectively altered task-evoked connectivity. To do this, we employed a psychophysiological interaction (PPI) analysis (Friston et al., 1997, *NeuroImage*).

PPI Seed Region: VLPFC

Our PPI analyses utilized the VLPFC as a seed region. This region was chosen based on coordinates from our previous work (Smith et al., 2016, *Sci Reports*).

VLPFC tACS > TPJ tACS

We first examined whether tACS produced any site-specific effects on task-evoked connectivity.

This analysis indicated that VLPFC stimulation was associated with greater VLPFC-VS connectivity compared to TPJ stimulation, irrespective of reward or punishment.

Reward: VLPFC tACS > TPJ tACS

We also examined whether tACS was associated with site-dependent effects during the receipt of reward.

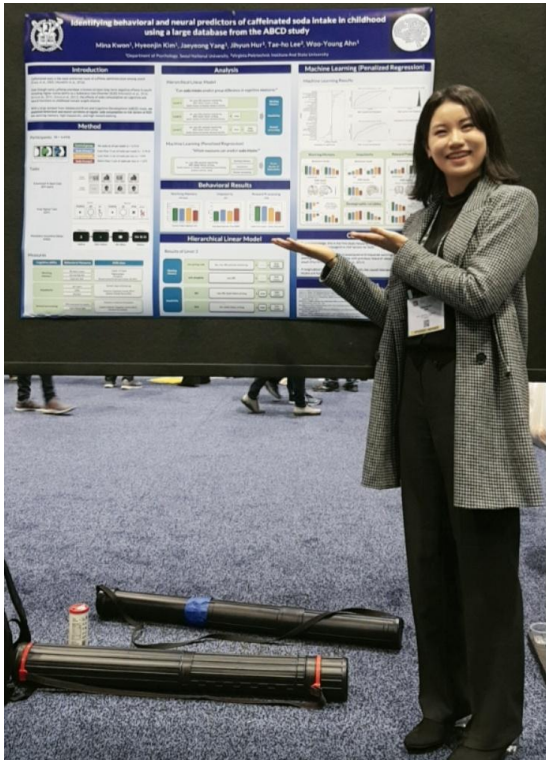
This analysis indicated that VLPFC stimulation (relative to TPJ) was associated with enhanced connectivity between the VLPFC and the precuneus and posterior cingulate cortex during the receipt of reward.

8. Conclusions

- Transcranial alternating current stimulation (tACS) applied at 10 Hz during task blocks did not lead to downstream changes in task-evoked responses in the striatum.
- Although tACS does not cause appreciable changes in task-evoked responses at the sites of stimulation, we found that connectivity with these regions was selectively altered.
- Our future work will explore different stimulation frequencies (e.g., theta) and examine the effects on other tasks tied to reward processing and decision making.

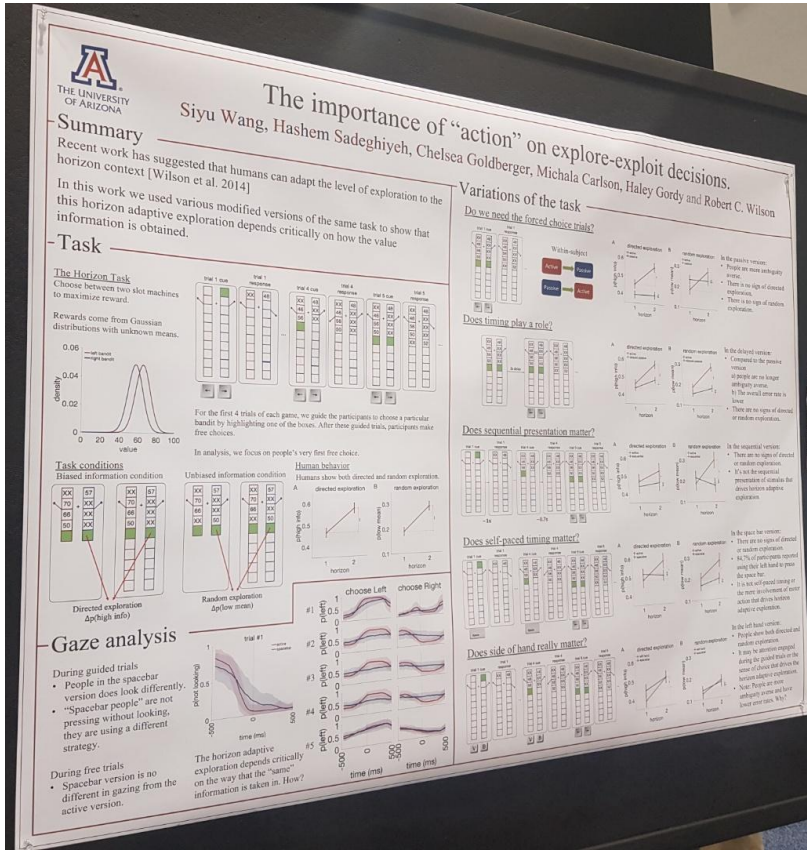
- Frontostriatal connection during reward processing
- Results
  - TACS on vlPFC did not change VS activation
  - TACS on vlPFC enhanced connection between vlPFC and VS during reward processing

Many useful comments - poster presentation @ Mina



- Interpretation of two analyses
  - Hierarichical regression
  - Machine learning
- Controlling for decaffeinated soda or other caffeinated drinks
- Clinical applications

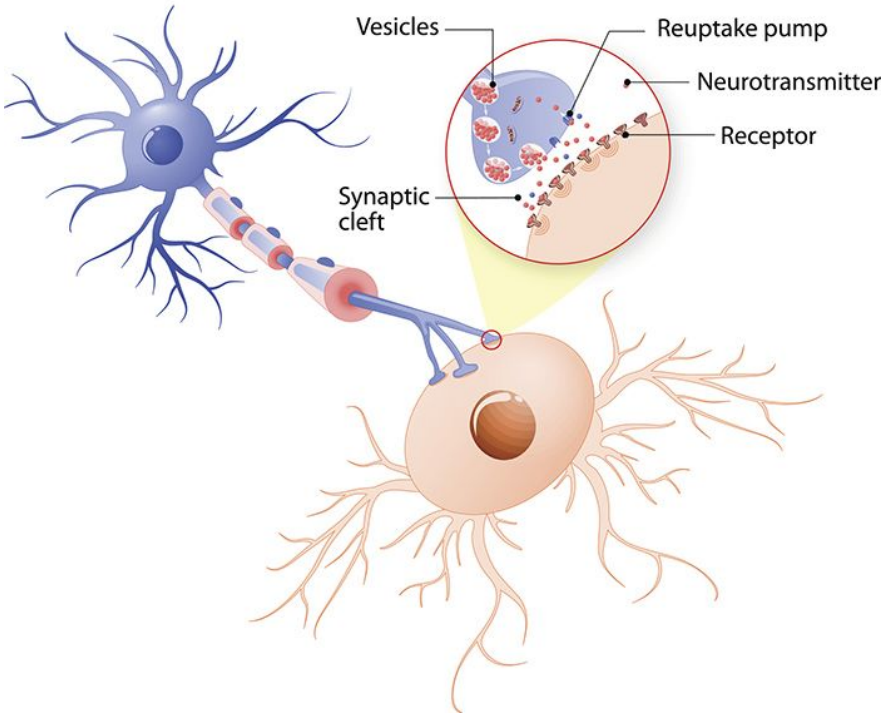
Poster #3. The importance of explore-exploit decisions



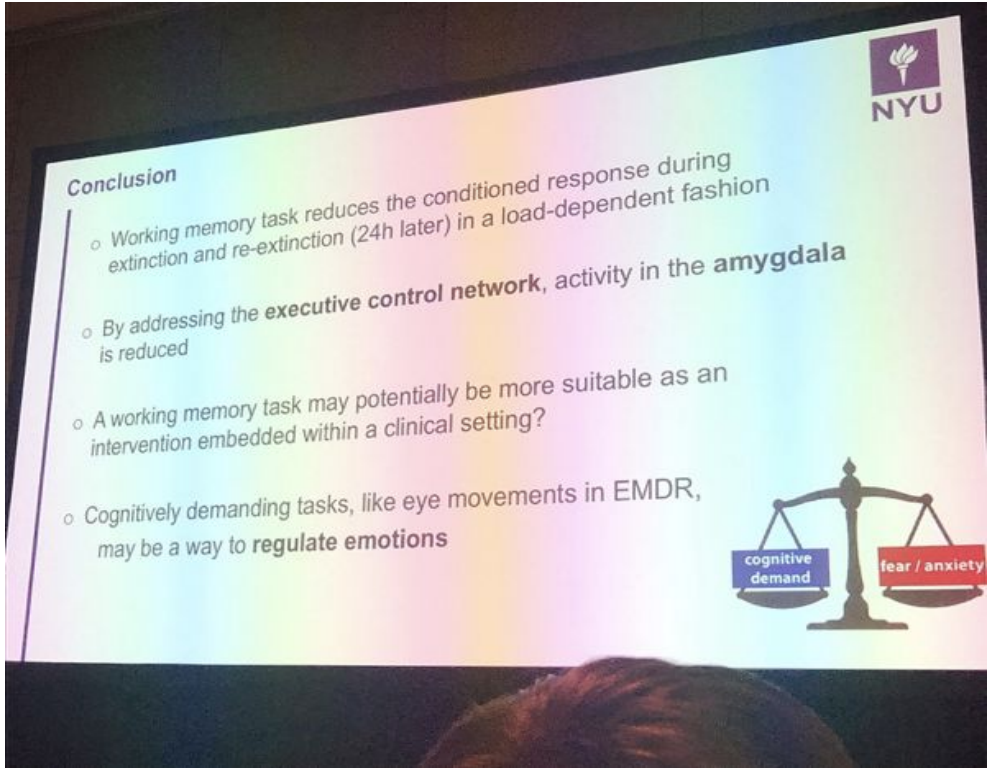

Home
My Schedule
수 16
목 17
금 18
토 19
일 20
월 21
화 22
AM
Professional Development Workshops - Reprod...
Room N228
10 AM
11 AM
Lecture - Dial...
12 PM
1 PM
15 Items Schedul...
Nanosymposium
7 Items Scheduled
Poster
2 PM
3 PM
4 PM
5 PM
Lecture - Presidential Special Lecture- From Base Pair...
6 PM
Satellite/Ancillary Events - Diving DEAP into Ado...
Hyatt McCormick - Regency Ballroom C
7
Home
Schedule
General Notes
Login Setting...
더 보기

Topic

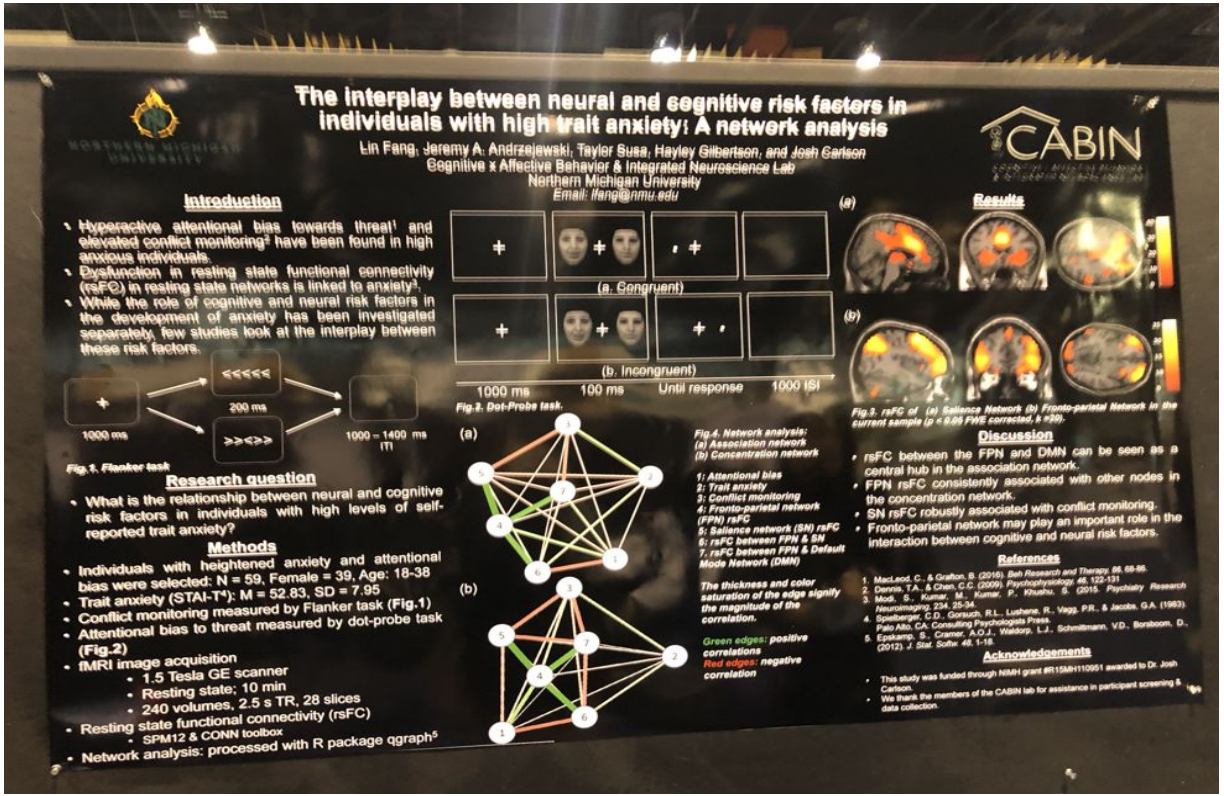
- Emotion
- Anxiety & Fear & Stress
- Eating Disorder
- Decision making
- Psychiatric Disorders...


Vesicles
Reuptake pump
Neurotransmitter
Receptor
Synaptic cleft

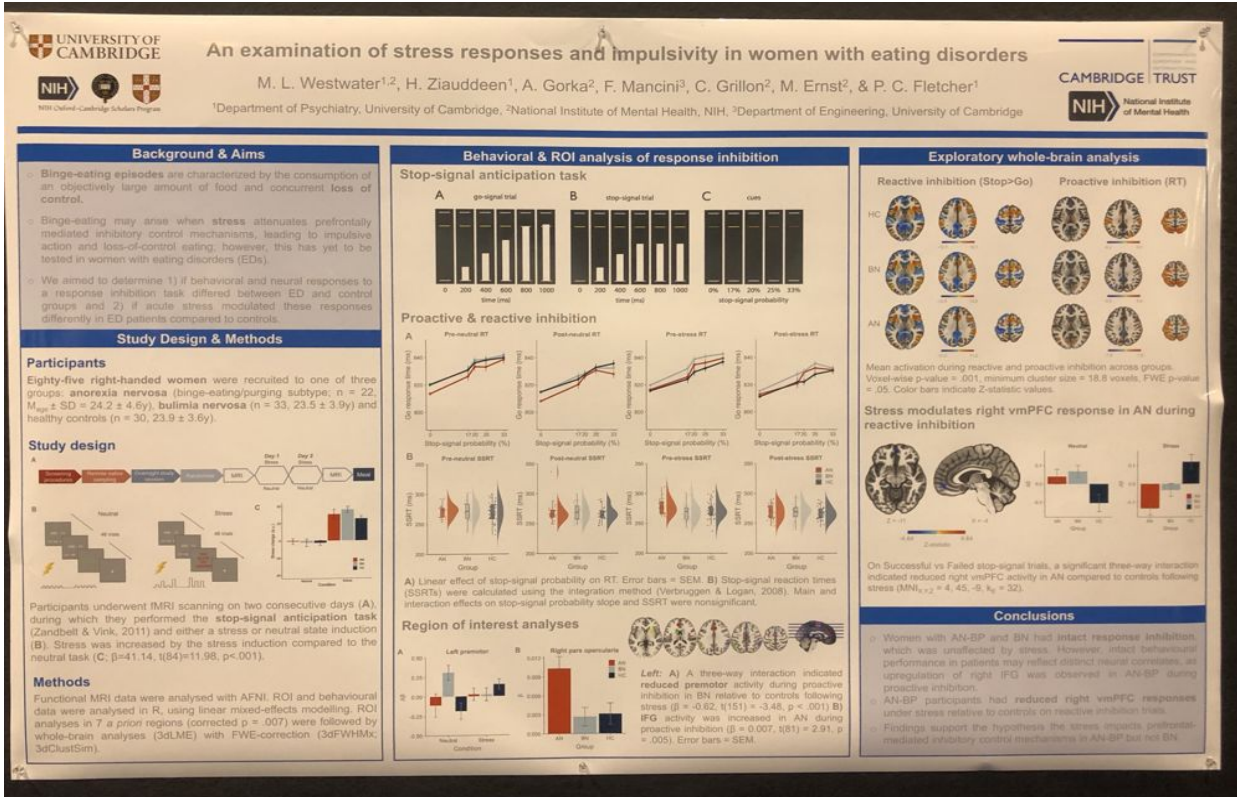
Talk #2. Enhancing extinction with a cognitive demanding task

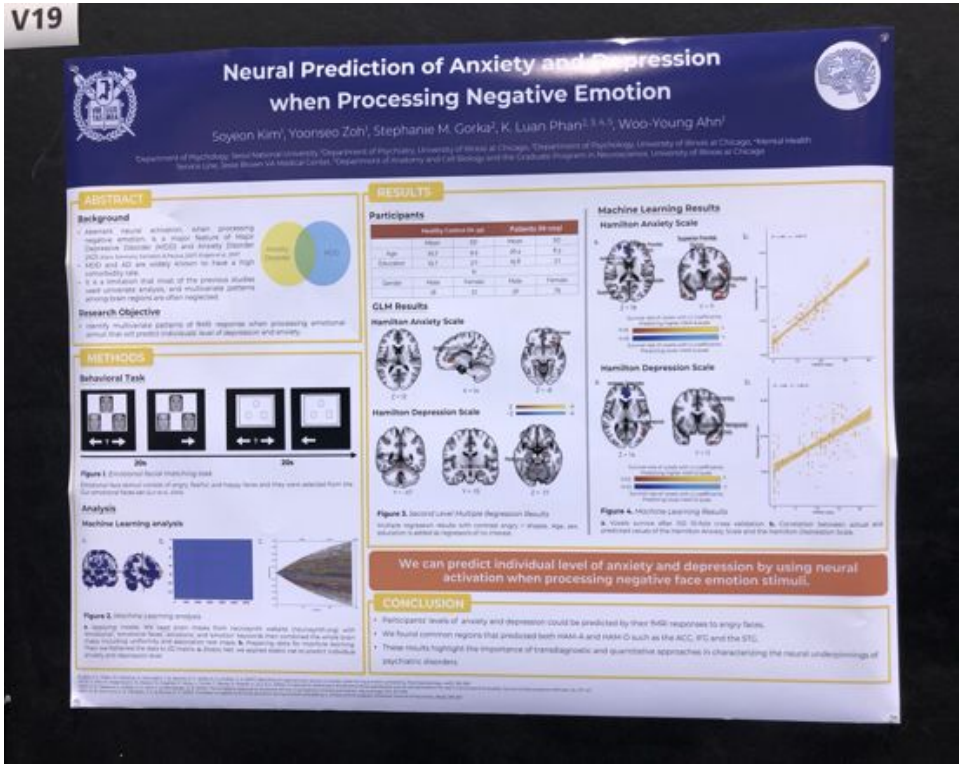


Poster #3. Network analysis



Poster #4. Eating Disorders





- Clinical implications
- Connectivity analysis
- rsfMRI
- Other brain mask/contrast