phase (old) and traits that were not presented (new).
Results: Our behavioral findings showed the highest memory accuracy on the recognition test for traits that were associated with the "self" condition, which is consistent with previous studies on SRE. Additionally, we found that traits associated with the "friend" category were more accurately recognized than those associated with a celebrity, indicating that personally familiar information—even if not self-related—improves memory recognition. Through single-unit analyses from target brain regions, including the medial temporal lobe (MTL) and medial prefrontal cortex (mPFC), we identified unique patterns of neural activity during the memory encoding phase, specifically increased responses during self-referential encoding in a subset of the neuronal population.
Conclusions: Future analyses will explore the relationship between increased MTL activity during self-referential encoding and improved memory recognition of traits rated in relation to the self, and network interactions between MTL and mPFC in self-oriented memory processes.

Categories: Neurophysiology/EEG/ERP/fMRI
Keyword 1: memory: normal
Keyword 2: temporal lobes
Keyword 3: neurophysiology
Correspondence: Andreina Hampton, Department of Neurosurgery, University of California, Los Angeles, Los Angeles, CA, USA; amhampton@mednet.ucla.edu

61 Robustness of Attention Networks Across Multiple Sessions: Behavioral and ERP Findings

Catherine Tocci[1], Elena Polejaeva[2], Andreas Keil[1], Sarah Long[1], Jennifer Ly[1], Alexia Brown[1], Christopher N Sozda[3], William M Perlstein[1]
[1]University of Florida, Gainesville, Florida, USA. [2]Veterans Administration San Diego Healthcare System, San Diego, California, USA. [3]Malcolm Randall Veterans Administration Medical Center, Gainesville, Florida, USA

Objective: Attention is the backbone of cognitive systems and is requisite for many cognitive processes vital to everyday functioning, including memory, problem solving, and the cognitive control of behavior. Attention is commonly impaired following traumatic brain injury and is a critical focus of rehabilitation efforts. The development of reliable methods to assess rehabilitation-related changes are paramount. The Attention Network Test (ANT) has been used previously to identify 3 independent, yet interactive attention networks—alerting, orienting, and executive control (EC). We examined the behavioral and neurophysiological robustness and temporal stability of these networks across multiple sessions to assess the ANT's potential utility as an effective measure of change during attention rehabilitative interventions.
Participants and Methods: 15 healthy young adults completed 4 sessions of the ANT (1 session/7-day period). ANT networks were assessed within the task by contrasting opposing stimulus conditions: cued vs. non-cued trials probed alerting, valid vs. invalid spatial cues probed orienting, and congruent vs. incongruent targets probed EC. Differences in median correct-trial reaction times (RTs) and error rates (ERs) between the condition pairs were assessed to determine attention network scores; robustness of networks effects, as determined by one-sample t-tests at each session, against a mean of 0, determining the presence of significant network effects at each session. Sixty-four-channel electroencephalography (EEG) data were acquired concurrently and processed using Matlab to create condition-related event-related potentials (ERPs)—particularly the cue- and probe-related P1, N1, and P3 deflection amplitudes, measured by using signed-area calculation in regions of interest (ROIs) determined by observation of spherical-spline voltages. This enabled us to examine the robustness of cue- and probe-attention-network ERPs.
Results: All three attention networks showed robust effects. However, only the EC RT and ER network scores remained significantly robust [$t(14)s>13.9, ps<.001$] across all sessions, indicating that EC is robust in the face of repeated exposure. Session 1 showed the greatest EC-RT robustness effect which became smaller during the subsequent sessions per ANOVAs on Session x Congruency [$F(3,42)=10.21, p<.0001$], reflecting persistence despite practice effects. RT robustness of the other networks varied across sessions. Alerting and EC ERs were similarly robust across all 4 sessions, but were more variable for the

orienting network. ERP results: The cue-locked P1-orienting (valid vs. invalid) was generally larger to valid- than invalid-cues, but the robustness across sessions was variable (significant in only sessions 1 and 4 [t(14)s>2.13,ps<.04], as reflected in a significant main effect of session [p=.0042]. Next, target-locked EC P3s were generally smaller to congruent than incongruent targets [F(1,14)=9.40,p=.0084] , showing robust effects only in sessions 3 and 4 [ps<.005].
Conclusions: The EC network RT and ER scores were consistently robust across all sessions, suggesting that this network may be less vulnerable to practice effects across session than the other networks and may be the most reliable probe of attentional rehabilitation. ERP measures were more variable across attention networks with respect to robustness. Behavioral measures of EC-network may be most reliable for assessing progress related to attentional-rehabilitation efforts.

Categories: Neurophysiology/EEG/ERP/fMRI
Keyword 1: brain plasticity
Keyword 2: attention
Keyword 3: traumatic brain injury
Correspondence: Catherine Tocci, University of Florida, Ctocci1@ufl.edu

62 Neural Correlates of Cognitive Function in the Basal Ganglia

Chris M Hunter, Vaibhav Khandelwal, Nandakumar Narayanan
University of Iowa, Iowa City, Iowa, USA

Objective: Timing, or the decision of when to act, is essential to mammalian behaviors from escaping predators to driving a car. It requires cognitive functions such as working memory for time-based rules and attention to the passing of time. Thus, it can be used as a proxy for higher order executive functions that are difficult to measure but are impaired in many neurological disorders. Therefore, insights from studies of interval timing, tasks which require estimating time intervals of several seconds, have great value for our understanding of human disease. Crucial to timing is the basal ganglia, which integrates cortical activity with midbrain dopamine signals and sends out signals to the spinal cord that regulate movement, motivation, and other behaviors. We have previously found that within the basal ganglia, medium spiny neurons of the striatum exhibit ramping activity in time-related tasks. In other words, they gradually increase or decrease firing frequency across a timed interval, and this is thought to encode time. Yet it is still unknown how the encoding of time is translated into time-based motor responses. To answer this question, we turned to the external globus pallidus (GPe) because it is a regulatory hub within the basal ganglia and is thus well positioned to regulate timing behavior. We sought to examine how the GPe functions in response to time-based demands.
Participants and Methods: We recorded from neuronal ensembles using 16 channel electrode arrays implanted in the GPe of five mice while they performed an interval timing task called the switch interval timing task. Spike sorting was then used to identify signal from individual neurons.
Results: Data were compiled from 43 neurons over several trials. Principal component analysis of neural firing activity was then conducted and revealed a downward ramping pattern in GPe neurons during interval timing trials. Data were then separated based on trials in which mice made correct decisions and those in which mice made a mistake. We found that when mice make correct timing decisions, there is downward ramping activity in the GPe, yet when mice make timing mistakes, this ramping pattern is lost.
Conclusions: Our findings suggest that the GPe processes timing signals through ramping activity, before projecting to the output nuclei of the basal ganglia. This is a novel finding and contributes to a growing understanding of the temporal code of the basal ganglia. The full extent of this code is still unknown, but this insight contributes to a better understanding of how the globus pallidus represents cognition. If we can better explain the neural correlates of timing, we can use this knowledge to inform therapeutic interventions for basal ganglia dysfunction, which could have profound implications for diseases like Parkinson’s disease, which affects millions around the world.

Categories: Neurophysiology/EEG/ERP/fMRI
Keyword 1: basal ganglia
Keyword 2: movement disorders
Keyword 3: movement