Introduction
Past research has shown that attentional lapses are related, at least in part, to the functional connectivity between different brain regions (Weissman et al., 2006; Kelly et al., 2008). We have developed a technique for studying the temporal evolution of functional connectivity with functional magnetic resonance imaging (Thompson et al., 2013). Thompson and colleagues showed that differences in functional connectivity between the task positive and default mode networks can predict fast vs. slow performance on a sustained attention task. We hypothesized that the temporal dynamics of functional connectivity between the before mentioned networks should predict reaction times in two tasks that require subjects to overcome a habitual response via selective attention. In order to gain a better picture of the temporal dynamics images were acquired with a multi-band sequence with a repetition time of 700ms.

Methods
Stimulus 1,500ms
Flanker Task: 9 blocks, 17 trials per block
Mean ITI 18,200ms
ITI: 16,800ms 18,200ms 19,600ms
Each trial type was preceded equally often by every trial type in the task.
Global Local Task: 10 blocks, 17 trials per block
Stimulus 200ms
Mean ITI 18,200ms
ITI: 16,800ms 17,500ms 18,200ms 18,900ms 19,600ms
Each trial type was preceded equally often by every trial type in the task.

- 9 blocks, 17 trials per block
- ITI: 16,800ms 18,200ms 19,600ms
- Each trial type was preceded equally often by every trial type in the task.

Dynamic Connectivity Analysis
Seed Based Networks
- Default Mode Network (DMN): Top 10% of gray matter voxels most correlated with the left precuneus (AAL)
- Task Positive Network (TPN): Top 10% of gray matter voxels most anti-correlated with the seed
- Sliding Window Correlation: Correlation between the mean signals of the two networks was calculated for a series of sliding time windows each with a length of 11.9 seconds (17 TRs)
- Trials were split by median reaction time separately for congruent and incongruent trials.

Behavioral Results
Three sessions were removed from the analysis. For RT a within subjects ANOVA (Task X Congruency) revealed a significant interaction of task and congruency F(1,8)=63.115, p < .001 driven by a weaker congruency effect for the global local sessions relative to the flanker sessions.
P values
* p < .05
** p < .001

Connectivity Results
Figure 1: Example of Stationary Correlation Map
No significant difference, but predicted prestimulus connectivity gap present in the flanker task and to a lesser extent in the global-local task.

K-Means Brain States
- Regions of interest are spheres (12mm diameter) with coordinates taken from Dosenbach et al., 2007 converted into MN space.
- K means clustering was used to classify the TRs of the task scans. Two through ten clusters were extracted and for each k value 25 replications were carried out. For each k value the replicate with the lowest sum of point to centroid distances was chosen for inspection.
- The second derivative of the summed distances, for each cluster extraction number, as a percentage of the total sum of squared differences was plotted. A protrusion in the plot determined that a k of seven was the best option.

References

Acknowledgements
This research was conducted with the assistance of Seul Gi Moon, Julia Ting, Yenny Laksana, Yu Hao, Manali Desai, Angela Wang, and Nicole Martin.