The aim of the current study was to identify sources that contribute to the Cm-cluster pre-response activation on correctly-performed trials in adolescents with high ADHD symptoms.

**Results & Discussion**

- **Background**: Superior medial frontal (e.g., pre-supplementary motor area or pre-SMA) neural response (rather than after) on a given trial has been posited as a mechanism for components analysis can aid in identifying the time-courses and spatial locations of circuitry is activated in both response-selection and response-inhibition tasks and is thought to guide the appropriateness of one's behavior (Mostofsky & Simmonds, 2008).

- **Method**: Sample: adolescent monozygotic twins (N = 46 pairs, age range 14 - 16) drawn from the Ad lib study at the Minnesota Center for Twin and Family Research.

- **EEG task/data**: Sixty-one scalp electrodes positioned at standard 10/20 locations recorded EEG continuously throughout completion of an odd-ball task. On each trial, subjects view a five-letter array (e.g., SSSSS, HHHHH, SSHSS, HHSSH, HHHHH) and are instructed to respond with either a left or right button-push to indicate the target (center) stimulus (see Figure 1).

- **EEG processing**: EEGs were decomposed into independent components (ICs) using an adaptive mixture algorithm (Delorme & Makeig, 2004) to recover putative source generators.

- **Equivalent current dipoles**: Fit to realistic boundary element (BEM) head models derived from anatomical MRIs. At the time of dipole-fitting, subject-specific forward BEM models for 23% of the current sample had already been computed using a recently-developed MATLAB software (see Figure 2).

- **Dipole locations**: Different dipoles were fit using the standard head model from the Montreal Neurological Institute.

- **Prediction models**: Only ICs that had less than 15% residual variance between dipole projection and IC scalp topography were considered for the current study. Located dipoles were input to a k-means clustering algorithm to identify ICs across the entire sample that may have been generated in comparable regions of cortex. A prominent central-midline cluster (out of several others, hereafter referred to as “Cm”) was the focus of the present study. Dipoles as part of the Cm cluster were plotted in Figure 3A and the cluster centroid in 3B.

- **Trials**: Trial-level IC-activations were extracted to 2 to 4 seconds relative to the onset of the button-press. For the sake of computational efficiency, only trials containing an erroneous button-press (N) were included for analysis. The remaining correct trials (Ne) formed the control group.

- **Modeling**: The amplitude on all three of the Cm measures (PNe, Ne, and Pe) was predictive of trial-level accuracy on the flanker task (Table 1). Specifically, enhancement of the response-preceding PNe was associated with about 10% increase in the odds of appropriate responding for a given trial. Additionally, enhancements of the response-preceding Ne and Pe were indicative of decremented correct response performance. This tendency for incorrectly-performed motor responses to occur before the peak Cm amplitude and correctly-performed motor responses to occur before peak Cm amplitude is bolstered in Figure 4.

- **Inattention**: When entered into regression as predictors of ADHD symptoms, only the response-preceding PNe activation from the Cm cluster was associated with high ADHD for both hyperactive and inattentive symptom types, decreased PNe was indicative of more symptoms. This finding is illustrated in Figure 5.