

## FMRI INVESTIGATION OF THE CROSSED RESPONSE INHIBITION TASK IN THE ELDERLY AND PARKINSON'S DISEASE

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### Introduction

All MRI's were carried out on a Siemens Allegra 3T head scanner at the University of Florida McKnight's Brain Institute. While this study is still in the process of analysis, preliminary analysis has generated two abstracts which have been submitted to this years Cognitive Neuroscience Meeting. They are:

#### 1) Negative Bold across Age Groups

**Objectives:** This event-related fMRI investigation was concerned with age-related differences in levels of negative BOLD during a tactile-cued, simple motor response task.

**Methods:** Eighteen (9 older; 9 younger) right-handed individuals performed a simple unimanual hand raise in two response conditions (Uncrossed; Crossed). During Uncrossed trials, subjects were to move the hand receiving tactile stimulation (computer-controlled air puff). In Crossed trials, subjects were asked to move the hand opposite of tactile stimulation. Subjects performed a total of 200 counterbalanced response executions (50 per hand per condition). A three-factor analysis of variance (ANOVA: Age x Response Condition x Handedness) for the whole brain was completed using area under the curve of the estimated hemodynamic response functions obtained from a deconvolution procedure. A region of interest (ROI) analysis was also performed for primary motor cortices (Left & Right M1). Hemodynamic response function estimates for maximally active voxels in selected ROI for each subject and response condition were subsequently compared using repeated measures ANOVA.

**Results:** Relative to the movement laterality and regardless of response condition, both age groups displayed negative BOLD in ipsilateral M1 and positive BOLD in contralateral M1. ANOVA analysis indicated younger adults displayed greater response amplitude in both positive and negative BOLD as compared to older adults regardless of movement laterality.

**Conclusions:** These preliminary results indicate age-related differences in response patterns during the tested movements. Results are compared with a previous investigation using a learned, complex response sequence comparing negative BOLD across age groups.

#### 2) An fMRI Study of the Crossed Response Inhibition Task in Parkinson's Disease

**Background:** The crossed response inhibition (CRI) task has been shown to be impaired in many non-demented patients with Parkinson's Disease (PD). Previous studies of this task suggest a critical role for the supplementary motor area (SMA). While pathological studies show specific cell loss in the SMA of PD patients, functional imaging studies have shown mixed results using other paradigms, including both increased and decreased activation.

**Objective:** To determine the activity of medial motor systems in PD utilizing the CRI task.

**Methods:** Five non-demented patients with PD and 9 healthy right-handed age-matched controls performed a simple unimanual hand raise in two response conditions. During Uncrossed trials, subjects were to move the hand ipsilateral to a tactile stimulation (computer-controlled air puff) given to the hand. In Crossed trials, subjects were asked to move the hand contralateral to the tactile stimulation. Subjects performed a total of 200 counterbalanced response executions (50 per hand per condition). A group analysis of the healthy controls was performed using a three-factor ANOVA (Age x Response Condition x Handedness) for the whole brain using area under the curve of the estimated hemodynamic response functions obtained from a deconvolution procedure. Individual analyses were done for the PD patients due to an expected increase in response and signal variability in this group.

**Results:** Our preliminary analyses indicate that patients with PD demonstrate less activity than controls in medial motor areas during crossed response trials.

**Conclusions:** fMRI and the CRI task may be useful in documenting medial frontal pathology in PD.

### Conclusions

Preliminary analysis of our data suggests interesting patterns of difference in the neurophysiology of the Crossed Response Task between both young and old subjects and between patient's with Parkinson's Disease and age matched controls. Further analysis of our data is needed to better specify these effects.