tion of the ongoing attention-action plan. Supported by NINDS Grant NS21135

D34

ITEM AND CONTROL SIGNALS REVEALED BY FMRI DURING LEXICAL TASKS *Erica Palmer[1], Jill Lyon[1], Steven Petersen[1], David Donaldson[2]; [1]Washington University, St. Louis, [2]University of Stirling, Scotland* – Signals related to specific items and to task control processes are both likely to exist. An fMRI design combining elements of event-related and blocked paradigms can reveal both kinds of signals. In this study, sixteen subjects were scanned in two tasks: reading verb stems and generating past-tenses for them. Regular (walk-walked) and irregular (drink-drank) verbs were included. Across ten runs, subjects performed two blocks of a task, interspersed with fixation blocks. Timecourses for item-related and control signals were extracted using implementations of the general linear model. Brain regions had item timecourses that showed 1) greater activity during reading than past-tenses (e.g.,R.inferior frontal gyrus, R.parahippocampus), 2) greater activity during past-tenses than reading (e.g.,L.superior temporal gyrus, bilateral cuneus), and 3) greater activity for irregular past-tenses than regular past-tenses or reading (e.g.,L.inferior frontal gyrus). Residual timecourses extracted from each run revealed a number of regions in which past-tenses produced a sustained response during the task block (e.g.,bilateral lateral inferior frontal gyrus, frontal operculum). In these regions, the sustained response was much smaller for reading. Regions in bilateral insula and frontal operculum demonstrated transient responses coinciding with the onset of each task block; responses were comparable for both tasks. These results indicate that the following types of responses can be studied: (a) responses related to specific item types, (b) sustained control signals, in this case greater in the more demanding past-tense task than in reading, and (c) transient control signals possibly related to task instantiation. Supported by NS32979,NS41255, McDonnell Center of Higher Brain Function

D35

FEAR CONDITIONING IS INTERRUPTED BY CONCURRENTLY PERFORMING A WORKING MEMORY TASK *R. McKell Carter, Christof Koch; Caltech, Pasadena, CA* – Previous studies of human conditioning implicated awareness of CS/US relationship as a prerequisite for conditioning (described in Dawson et al., 1976). Clark and Squire (1998) showed that awareness of the CS/US relationship was necessary for eyeblink conditioning in a trace, but not a delay, paradigm. Using a differential fear conditioning protocol, with auditory CSs and a shock US, we evaluated subjects' abilities to be delay or trace conditioned while distracting them via a working memory task. CSs were 1s long, USs were 250ms, and the trace period was 3s. During attempted differential conditioning, some subjects were asked to perform a visually presented numeric1-back (current number matches previous) or 2-back task (current number matches the number before the previous one). Results indicate subjects can be conditioned using this protocol (trace and delay $p<0.01$, $n=6$). If subjects perform a '1-back' task during this procedure there is significant delay conditioning ($p<0.05$, $n=6$) but no significant trace conditioning ($n=6$). When conditioning was attempted using the same protocol while subjects performed a '2-back' task no significant conditioning was found using delay or trace paradigms ($n=6$). In addition, a post-experimental questionnaire showed that subjects who conditioned were more aware of the temporal relationships between stimuli than those who did not exhibit conditioning. These results indicate a working memory task can interfere with both delay and trace fear conditioning in humans. They also show that an increase in working memory load (an increase in remembered number stream length from 1 to 2) interferes with delay fear conditioning.

D36

DISSOCIATING RESPONSE SELECTION, RESPONSE COMPETITION, AND OTHER PROCESSES INVOLVED IN TASK SWITCHING *Eric H. Schumacher[1], Kimberly L. Brodsky[1], Puni A. Elston[1], Susan M. Landau[1], Richard Ivry[1], Mark D'Esposito[1], Eliot Hazeltine[2]; [1]University of California, Berkeley, [2]NASA, Moffett Field, CA* – We often have to quickly switch between important tasks. To be successful, this switching requires a complex set of mental processes. We must refocus our attention, update our goals, and select appropriate responses in the presence of competing ones. These processes are difficult to dissociate with behavioral measures like reaction time and error rate. Brain activation measures offer another (viz., spatial) dimension that may aid the dissociation of these processes. Our study attempts this dissociation by collecting brain activation data while manipulating experimental factors to differentially affect response selection and response competition difficulty within a task switching procedure. During functional MRI scans, participants quickly made manual button presses either to the color or the shape of a visually presented stimulus. They based their responses either on the same stimulus dimension as the previous trial or on the other one. We affected response selection difficulty by varying the set size of the colors and shapes presented. We affected response competition by varying the congruency between the appropriate response and the response associated with the irrelevant stimulus dimension. An analysis of the brain activation data show distinct patterns of activation related to response selection, response competition, and other task switching processes. Our data suggest that these processes are both functionally and neurally distinct.

D37

EFFECTS OF AGING ON TONIC & TRANSIENT PREFRONTAL ACTIVITY DURING STRATEGIC PROCESSING *Caroline Racine[1], Deanna Barch[1], Todd Braver[1], David Donaldson[2], David Noelle[3]; [1]Washington University, St. Louis, [2]Stirling University, U.K., [3]Vanderbilt University* – Within the cognitive neuroscience literature, evidence suggests that the prefrontal cortex (PFC) is crucial for the use of strategies during a range of cognitive tasks. Recent results from our laboratory using a mixed blocked-event related fMRI paradigm suggest that in younger adults, PFC regions are involved in the maintenance of strategic task-set (tonic) and in allocating strategic control per item (transient). Older adults have been found to demonstrate deficits in strategic processing, which is thought to correlate with deficits in frontal cortex function. The goal of this study was to use mixed blocked-event related fMRI with older adults to more closely examine the effects of aging on PFC activity associated with strategic processing. Do older adults show different tonic activity (i.e. maintenance of strategic "set"), alterations in transient activity (i.e. strategic control per item), or both? To examine these hypotheses, sixteen younger adults and sixteen older adults were scanned during a categorization task that required the application of an explicit verbal rule to abstract visual objects. BOLD signal was acquired using a 1.5T Siemens (TR=2.5, 158 frames, 5 BOLD runs). Each run was designed to allow for the extraction of both sustained (tonic) and event-related (transient) responses. Results suggest that older adults show a differential pattern of both tonic and transient activation associated with strategic processing when compared with younger adults. This is consistent with age differences observed in other neuroimaging studies, and supports the hypothesis that older adults have alterations in frontal lobe functions that support strategic processing.

D38

CONTROL IN THE STROOP TASK: ACCOUNTING FOR NEURIMAGING DATA WITH A NEURAL NETWORK MODEL *Seth Herd, Randall O'Reilly; University of Colorado, Boulder* – This work presents a new neural network model of attentional control within the Stroop task that accounts for recent neuroimaging and behavioral data. Banich and colleagues have found stronger functional magnetic reso-