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fied value are ignored. The number of accepted trials is accumulated separately for each channel. We investigated the utility of this program in a large dataset (10 blocks of 4 minutes with 1024 channels, in 48 subjects). We compared main effects in the NIRS data across subsamples of "clean" subjects and "noisy" subjects before and after cleaning and found cleaning to improve the consistency of results between the "clean" and "noisy" groups, without introducing noticeable spurious effects.

B100

ANATOMICAL AND FUNCTIONAL SEGMENTATION OF THE COGNITIVE CONTROL NETWORK *Sudhir Pathak[1,2], Bruna Martins[2], Michael W. Cole[1,3,2], Walter Schneider[1,2,3]; [1]Center for Neuroscience, University of Pittsburgh, [2]University of Pittsburgh, [3]Center for the Neural Basis of Cognition, University of Pittsburgh* – Diffusion tensor imaging (DTI) was used to segment functional regions (using probabilistic tractography) based on anatomical connectivity within the cognitive control network, identifying subregions with specialized connectivity. Previous work has shown that this set of regions is active across a wide variety of task demands and forms a highly integrated functional network (Cole & Schneider, 2007). Here we anatomically segmented the network's (functionally defined) regions, which include dorsolateral prefrontal cortex (DLPFC), posterior medial frontal cortex (PMFC), inferior frontal junction (IFJ), dorsal pre-motor cortex (DPMC), anterior insula cortex (AIC), and posterior parietal cortex (PPC). We found that all these regions are segmented based on their differing anatomical connections within the network. For instance, functionally defined PMFC is segmented into three sub-regions based on its anatomical connectivity with DLPFC, AIC, and PPC. We hypothesize that anatomically coupled areas will exhibit higher functional connectivity with their respective sub-regions than with functionally-defined regions (based on resting state correlations between fMRI signals). These findings would support our prediction that functional regions can be segmented into functional sub-regions, showing tight coupling of functions within the cognitive control network.

B101

TO DO THE RIGHT THING: TEMPORAL DIFFERENCE LEARNING AS TOOL TO DISSECT THE ROLE OF FEEDBACK IN THE STRIATUM. *Erik Peterson[1], Carol Seger[1]; [1]Colorado State University, Fort Collins, CO* – Always do the right thing! That's the ideal policy; however, determining what action is optimal in a given situation is difficult. The basal ganglia are thought to be crucial in forming associations between stimuli and actions. Studies of Parkinson's Disease and other basal ganglia disorders suggest that dopaminergic activity is crucial for feedback mediated learning in the basal ganglia. Multiple lines of evidence also suggest that one of dopamine's roles is as an error signal, representing the difference between expectation and result. One theoretical framework for understanding this signal is temporal difference (TD) learning, which utilizes a similar error signal. We are using the TDf ramework and event-related fMRI to identify the particular learning functions subserved by different corticostriatal loops. As a first step we used a classification of arbitrary visual stimuli task, with simple (but probablistic) feedback: "correct" or "incorrect". Previous work indicated that TD regression predicts BOLD responses in, among others, the ventral striatum, and the dopaminergic substantia nigra (SNc). Our preliminary results are consistent with these findings. However the paradigms used to test the TD framework may be biased in favor of TD-consistent results. We plan to test the TD framework under more challenging conditions.

B102

FEATURE-DRIVEN DECOMPOSITION OF MEG SIGNALS TO CLARIFY VISUAL INFORMATION PROCESSING IN THE BRAIN *Marie Smith[1,2], Philippe Schyns[1,2]; [1]University of Glasgow, [2]Centre for Cognitive NeuroImaging, University of Glasgow* – In this study, we present an analysis methodology that merges our Bubbles techniques of assigning specific information processing content to brain signals with spatially and temporally resolved MEG signals to clarify the dynamics of visual information processing in the brain. We illustrate this by applying it to the analysis of two biologically relevant face categorization tasks: judgments of facial gender and expressiveness in four observers. On the sensor level, we initially observe MEG sensitivity to contra-lateral eye information bi-laterally over occipito-temporal regions irrespective of task, which then extends to ipsi-lateral regions in the gender task and diminishes to be replaced by sensitivity to the mouth in the expressiveness task. Selecting three key sensors, we map out with a 1ms temporal resolution the visual information underlying the M170 and P300 brain responses, and observe complementary information processing from the horizontal and vertical orientation recordings. In the source space, (5000 voxels, 1cm resolution), we track the processing of three key visual features, (left eye, right eye and mouth), as it flows within the cortex from initial task independent sensitivity in lateral occipito-temporal regions to medial parietal sensitivity to task specific information. Crucially, while standard approaches may find activity in a particular brain region during one task vs' another (or baseline), our approach establishes which information in the visual stimulus the brain signal is responding to and how this response varies with time, cortical location and task demands to establish a more precise tracking of information processing mechanisms.

B103

IDENTIFICATION OF LANGUAGE AREAS FROM EVENT-RELATED FMRI PARADIGMS USING DATA-DRIVEN METHOD *Yanmei Tie[1], Ralph Suarez[1], Stephen Whalen[1], Alexandra Golby[1]; [1]Brigham and Women's Hospital, Harvard Medical School, Boston, MA* – Vocalized event-related language fMRI paradigms for studying language function offer an advantage of more closely simulating natural language performance. However, the motion artifact resulting from verbalizing the responses and co-activations in the sensory-motor areas may lead to contamination in the statistical maps generated using a conventional general linear model (GLM) method. To address this problem, we investigated the capability of a data-driven method, probabilistic ICA (PICA), in separating the language area activations from such complex language paradigms. We analyzed event-related fMRI data from 13 normal healthy controls performing two language tasks (antonym generation, and noun categorization) with two different stimulus modes (visual and auditory presentations). The PICA results consistently revealed two functional networks for each subject's data, one in the putative language areas and the ipsilateral pre-motor area (PMA), the other in the motor and/or sensory (visual or auditory) areas. The time course of the language-related components showed relatively poor correlation ($r = 0.34 \pm 0.19$) with the reference hemodynamic response (HR) function based on the design matrix, indicating deviation from the HR model used in the GLM method. Combining the results for the same language task across different stimulus modes revealed the essential language areas. In conclusion, this type of data-driven method maybe more appropriate for analyzing language fMRI data with complex paradigms, so as to capture the language-related neural activity that deviates from the putative time course. This may be particularly helpful for patient studies for pre-operative language mapping.

B104

VARIATIONS AMONG MEDITATIVE AND CONCENTRATIVE STATES: A CASE STUDY *Emanuela Tura[1], Jessica Turner[2], Matthew Turner[2], Tugan Muftuler[2]; [1]University of Victoria, [2]University of California, Irvine* – Meditation is a state of consciousness that varies according to technique, person, and session, as well as state achieved. The complexity of the meditation task may imply the use of different brain circuitries and partially explains the different results of past neuroimaging studies. Variability in the results may also be due to the limited number of neuroimaging studies conducted on meditation. The purpose of our study was to assess the level of variability within different sessions of the same individual and to characterize the circuitry of different levels of meditative absorption. We selected an advanced meditator from the Maya school in Rome. He underwent five functional Magnetic Resonance Imaging (fMRI) sessions. Each session was characterized by three conditions: concentration on the breath, meditation on a verse displayed on a screen, and meditation on a verse played by audio and spoken by his teacher. The sequence of the conditions reflected the deepening of the absorption level (as understood by the Maya school). We used Partial Least Squares, a data-driven multivariate approach, to determine the primary covariance patterns generated by the comparison of the three conditions. We found that brain patterns were the same across each session. Primary patterns differentiated the two types of meditations while patterns related to concentration did not covary with the meditation patterns at all. It appeared that neural structures used for concentration and meditation were different, and that the deeper stages of meditation were characterized by the use of different prefrontal and temporal areas.

B105

PROBING INTRINSIC CONNECTIVITY NETWORKS WITH TASK-FREE FMRI: EYES OPEN, OR CLOSED? *Weiming Zeng[1,2], Daniel Simmonds[2], Stewart Mostofsky[1,2], James Pekar[1,2]; [1]Johns Hopkins University, Baltimore MD, [2]Kennedy Krieger Institute, Baltimore MD* – The distributed modular organization of brain function appears to be maintained absent external stimuli or directed behavior, as "intrinsic connectivity networks" (ICNs) [Seeley et al., J. Neurosci. 27:2349, 2007] are revealed by exploratory analyses of fMRI data acquired during "rest." While task-free acquisitions reduce demands on participant compliance, vs. typical neuroimaging paradigms, simply maintaining visual fixation or eye closure can be a challenge for children and some clinically diagnosed populations. Hence, we assessed ICNs using data from alternating four-minute scans of two "task-free" conditions: eyes-open rest and eyes-closed rest. Data were acquired at 3.0 Tesla, and analyzed using Independent Component Analysis (ICA). ICA of individual scans, group ICA of all eyes-open data, and group ICA of all eyes-closed data, all yielded very similar ICNs. Overall, results were similar to the findings of De Luca et al. [NeuroImage 29:1359, 2006] for eyes-closed rest. Group ICA of all scans from all participants yielded ICNs for which loading factors for eyes open and eyes closed can be compared. Median component loading factors across the two conditions were similar, although larger inter-scan variance – dominated by inter-individual variance – was noted in occipital ("visual") ICNs in the eyes closed condition. Further study of differences in inter-individual variance is called for, as different degrees of inter-individual variance are favorable in different contexts: less variance within a population may lead to more robust between-group comparisons, whereas more variance may be advantageous when the goal is to exploit inter-individual differences for examining brain-behavior correlations.

Methodological Issues: Other

B106

SUCCESSFUL TMS DISRUPTION OF LEFT POSTERIOR FUSIFORM DURING READING *Keith J Duncan[1,2], Philip Kelly[1,2], Joseph T Devlin[1,2]; [1]University College London, UK, [2]Institute of Cognitive Neuroscience, University College London, UK* – There is considerable debate regarding the role of the left posterior fusiform gyrus in skilled reading that is based primarily on functional neuroimaging data. If it were possible to selectively perturb neural activity in this region using transcranial magnetic stimulation (TMS), this would offer a powerful complementary tool for investigating the nature of neural information processing in the region. It is commonly assumed, however, that its position on the ventral surface of the brain makes it inaccessible to TMS. We tested this assumption in a set of 10 healthy, native English speakers performing a visual lexical decision task. Using a frameless stereotaxy system, we targeted the lateral posterior fusiform gyrus and/or posterior occipito-temporal sulcus using a trajectory immediately superior to the cerebellum and inferior to the inferior temporal gyrus. In 50% of the trials, repetitive TMS (10Hz for 500msec at 120% active motor threshold) was delivered during the presentation of a letter string, resulting in a significant increase in reaction times for TMS versus non-TMS trials. In contrast, when TMS was delivered to a control site it had no significant effect on RTs. These findings demonstrate the feasibility of using TMS to temporarily disrupt processing in the posterior fusiform region and offers the potential to investigate the question of reading-specific representations in a novel fashion.

Motor control

B107

BEHAVIOURAL CONSEQUENCES OF PREFERRED DIRECTION CODING IN HUMAN MOTOR CORTEX *Christopher Cowper-Smith[1], David Westwood[2]; [1]Dalhousie University, Life Sciences Centre, Halifax, Nova Scotia, Canada, [2]School of Health and Human Performance, Dalhousie University, Halifax, Nova Scotia, Canada* – Here we examine the behavioural consequences of Georgopoulos' (1986) model of movement direction coding in human primary motor cortex (M1). Based on evidence that motor neurons in M1 exhibit preferred direction tuning curves where neural activity is strongest in the preferred direction and weakest at a 180 degree offset, we analyzed reaction times of consecutive, endogenously cued arm and eye movements in separate experiments. Each trial consisted of a prime and probe movement made in rapid succession. Participants sat at a computer workstation and fixated a central target that was surrounded by 8 equidistant peripheral targets. When the 'prime' cue was displayed (a centrally presented arrow pointing to one of the peripheral targets), participants responded as quickly as possible with a corresponding reaching or eye movement. The probe movement was cued by a second arrow 1.5 seconds after prime onset and required a movement response that was offset from the prime movement by 0, ±45, ±90, or 180 degrees. Successive trials were separated by a 4 second delay. Based on the hypothetical tuning curves for neurons in M1, we predicted a sinusoidal relationship between the reaction time for the probe movement and its directional offset from the prime movement. Our results suggest that reaching and eye movements are modulated differently by the degree of offset between prime and probe movements, indicating that directional tuning curves for arm and eye movements may have distinct shapes that can be defined by different functions.

B108

PREPARATION OF FAMILIAR AND UNFAMILIAR MOVEMENT SEQUENCES REFLECTED IN EEG. *Elian de Kleine[1], Rob H.J. van der Lubbe[1]; [1]University of Twente, The Netherlands* – Learning movement sequences, like playing the piano, develops through various phases, from an initial attentive to a more automatic phase. With practice execution of familiar motor sequences becomes faster, which is suggested to occur at an abstract rather than a peripheral processing level. We examined whether these effects were already present during the preparation of familiar sequences by focusing on several measures derived from the electroencephalogram. The contingent negative variation (CNV) was used as a general index of motor preparation, whereas the lateralized readiness potential (LRP) was employed to index effector-specific motor preparation. Furthermore, the posterior contralateral negativity (PCN) was used to index differences in spatial attention. Fixed series of eight keypresses, which were familiar or unfamiliar, had to be prepared, and executed in case of a go-signal. Familiar sequences were executed faster and more accurately than unfamiliar sequences. During the 200 ms before the go-nogo signal the central CNV was enlarged for unfamiliar sequences and the PCN was enlarged for familiar sequences. No differences were found on the LRP. These findings confirm that preparation of familiar sequences requires less attention and involves an abstract rather than a peripheral motor level.