DOWNLOAD PDF VENTROLATERAL PREFRONTAL CORTEX AND CONTROLLING MEMORY TO INFORM ACTION DAVID BADRE

Chapter 1 : Neuroscience of Rule-Guided Behavior - Oxford Scholarship

16 Ventrolateral Prefrontal Cortex and Controlling Memory to Inform Action 17 Exploring the Roles of the Frontal, Temporal, and Parietal Lobes in Visual Categorization 18 Rules through Recursion: How Interactions between the Frontal Cortex and Basal Ganglia May Build Abstract, Complex Rules from Concrete, Simple Ones.

However, the hypothesized spontaneous recovery i. In order to resolve these open questions, we employed a machine-learning algorithm to identify distributed patterns of brain activity associated with retrieval of interfering information that engenders PI and causes forgetting. Participants were scanned using functional magnetic resonance imaging during an item recognition task. We induced PI by constructing sets of three consecutive study lists from the same semantic category. The classifier quantified the magnitude of category-related activity at encoding and retrieval. Category-specific activity during retrieval increased across lists, consistent with the category information becoming increasingly available and producing interference. Critically, this increase was correlated with individual differences in forgetting and the deployment of frontal lobe mechanisms that resolve interference. Collectively, these findings suggest that distributed patterns of brain activity pertaining to the interfering information during retrieval contribute to forgetting. The prefrontal cortex mediates the relationship between the spontaneous recovery of interfering information at retrieval and individual differences in memory performance. Introduction Why do we forget? Human memory is a remarkably powerful and efficient system for storing and retrieving information. But, we are, perhaps, most aware of our memory when it fails, and we find ourselves unable to remember a particular name, event, or fact. The reasons for such forgetting have long been a source of debate. One major hypothesized cause of forgetting is proactive interference PI. In general, interference refers to conditions in which the information one wants to retrieve is blocked, suppressed, or otherwise suffers from competition with other information also active in memory Crowder, ; Anderson and Neely, Though viewed as a major source of forgetting, the nature of PI and the neural mechanisms by which it is resolved remain controversial. In particular, PI may diminish the quality of memory formation i. Whether PI is assumed to be a learning phenomenon, a retrieval phenomenon, or both affects theorizing about its mechanisms of action and resolution. Consequently, resolving this controversy is fundamental to our basic understanding of PI-induced forgetting. Importantly, to date, the presence of interference and its effect on memory performance has been inferred from behavior e. This is because the hypothesized latent states that are the source of interference have not been accessible to measurement. Consequently, it has been difficult to directly demonstrate the presence of interference, its dynamics, at which stage of processing it is elicited, and how it is modulated by cognitive and neural mechanisms that help resolve its negative impact on memory performance. Recently, Kuhl et al. Following a similar logic, we sought to elicit forgetting due to PI during fMRI scanning, and then index the degree to which interfering information is activated in the brain during encoding and retrieval using MVPA. During fMRI scanning, participants were shown lists of words, presented one at a time. They then repeated the process again, receiving a new list of words followed by a delay and probe word. In particular, consecutive list-delay-probe cycles were grouped into sets of three across which all words came from the same semantic category e. When items from the same category are studied for several consecutive lists, PI gradually builds up and leads to a decline in memory performance at the probe across the lists. Importantly, both the encoding and retrieval accounts of PI can offer an explanation for forgetting in this task. At retrieval, PI might reduce the discriminability of items Crowder, The common semantic category is increasingly evoked and available in memory because of its repetition over lists. It follows that changing the category results in more efficient retrieval, as the target memory now has unique features that it does not share with other recent memories. An alternative account is that PI affects the quality of encoding Wickens, ; Watkins and Watkins, From this perspective, the repetition of the same semantic category results in the emphasis on the salient, but non-diagnostic feature i. Alternatively, an encoding account could also pose that the repetition of the semantic category might spontaneously elicit recovery of related items and thus render pattern separation more difficult due to the high degree of overlap in the context. While there has been some indirect behavioral evidence supporting the contention that PI primarily affects retrieval Gardiner et al. To date, a direct demonstration of how PI builds up and leads to forgetting has not been provided. Accordingly, we sought to use MVPA to index the degree to which the interfering information that causes PI is represented in the distributed activity in the brain during encoding and retrieval stages. A neural net classifier was trained to distinguish the 10 semantic categories employed in the experiment based on neural activation in the lateral temporal cortex LTC. LTC has been previously implicated in storage and retrieval of semantic information Damasio, ; Badre and Wagner, ; Thompson-Schill, ; Badre et al. Following previous research, the classifier was trained during encoding and was tested at retrieval. Importantly, the encoding and retrieval phases were separated by a s distractor period, allowing us to independently estimate each phase. This served to test the amount of category-specific activity at retrieval, and track changes in the amount of category-related activity across levels of PI. On another iteration, the classifier was trained during the retrieval phase and tested at encoding. Materials and Methods Participants Twenty-two right-handed adults 16 female, ages 18 to 29 participated in the experiment. Participants had normal or corrected-to-normal vision and were native speakers of English. All participants were screened for use of CNS affecting drugs, for psychiatric or neurological conditions, and for contraindications for MRI. Informed consent was obtained in accordance with the Research Protections Office at Brown University. Participants were compensated for their participation. Design and Stimuli Stimuli consisted of 21 instances of 10 semantic categories from the category norms of Van Overschelde et al. The experiment consisted of eight min runs. Each run contained 30 experimental trials, in which participants studied a five-item list, solved four math problems, and made a recognition judgment to a test word. PI was manipulated by employing a release from PI paradigm: Semantic categories were pseudo-randomly selected from the 10 categories, with the constraint that no category was repeated within a run. Participants were tested with positive and negative probes equally often. Positive test probes were randomly chosen from the five members of the study list. Negative probes consisted of lures that were drawn from members of the same semantic category of the studied items, but had not been presented within the current run. That is, the negative probes used in the first run were novel, and in the following runs, a negative probe could be a word presented in the previous runs. Importantly, however, the likelihood of repetition of a word from a prior run was equal across the three repetitions of the same category within a run. This design structure illustrated in Figure 1 A yielded 80 experimental trials for each of the three lists with 40 positive and 40 negative test trials in each list upon completion of the experiment. Illustration of the proactive interference PI manipulation A and an example trial sequence B. Each trial proceeded with the presentation of a 5-word study list sequentially for ms each. Following the fifth word, participants solved four math problems ms each consisting of addition or subtraction of two randomly selected two-digit numbers. Participants indicated whether the solution presented next to the math problem was accurate by pressing either the middle or index finger on the button box. Following the fourth math problem, participants were presented with a test word and indicated whether the word was a member of the current study list. Participants had ms to respond to the test probe. Proactive interference was manipulated by employing a release from PI paradigm: The category was switched on the upcoming trial, where performance is expected to return to its original level i. Procedure Figure 1 B presents sequence of events within a single experimental trial. Following the fifth word, participants solved four math problems consisting of addition or subtraction of two randomly selected two-digit numbers. Participants had ms to respond to each math problem. The inter-trial interval consisted of presentation of a fixation cross on the center of the screen for variable duration ranging from 0 to ms. Head motion was restricted using firm padding that surrounded the head. Visual stimuli were projected onto a screen, and viewed through a mirror attached to a standard head coil. Following quality assurance procedures to assess outliers or artifacts in volume and slice-to-slice variance in the global signal, functional images were corrected for differences in slice acquisition timing by resampling all slices in time to match the first slice, followed by motion correction across all runs using sinc interpolation. Functional data were then normalized based on MNI stereotaxic space using a parameter affine transformation along with a non-linear transformation using cosine basis functions. Images were resampled into 2-mm cubic voxels and then spatially smoothed with an 8-mm FWHM isotropic Gaussian kernel. Data for MVPA analyses underwent all of these preprocessing steps in addition to detrending to account for baseline shifts across runs, and for scanner drift across the entire session. Separate regressors were generated for each condition [encoding for each of the three lists, distractor period collapsed across lists , recognition probes for each of the three lists] and were modeled using a canonical hemodynamic response function and its temporal derivative. Data across runs were concatenated and modeled as one session with mean signal and scanner drift entered as covariates. For each participant, statistical effects were estimated using a subject-specific fixed-effects model. Specifically, the anterior VLPFC ROI was restricted to the pars orbitalis portion of the left inferior frontal gyrus, located ventrally to the horizontal Sylvian ramus, and the midVLPFC ROI was restricted to the pars triangularis portion, located between the inferior frontal sulcus, the horizontal ramus of the Sylvius, and the ascending ramus of Sylvius. The hippocampus region contained the dendate gyrus, the uncus, and the hippocampus proper. It was limited caudally by the parahippocampal ramus of the collateral fissure. The parahippocampal region contained the parahippocampal gyrus and parahippocampal uncus including both the entorhinal and the perirhinal cortices , and was limited caudally by the parieto-occipital sulcus, and ventrally by the collateral sulcus Tzourio-Mazoyer et al. Active voxels within these predefined anatomical boundaries from a contrast that assessed retrieval-based activation i. This approach provided unbiased estimates of fMRI signal change in these a priori hypothesized regions. These effects were followed by additional comparisons to reveal the statistical pattern across conditions. Multi-Voxel Pattern Classifier Analysis Multi-voxel pattern classifier analysis were carried out using a two-layer neural net classifier 3 see Norman et al. A classifier was trained to distinguish the 10 semantic categories used in the experiment based on the distributed activation in LTC. The time courses from these voxels were normalized across runs to z scores. As feature selection step, voxels were further constrained by employing a one-way ANOVA that determined the voxels that exhibited an omnibus reliability across the 10 classification conditions e. Then, a set of regressors that assigned each functional scan to a particular classification condition i. Consistent with previous research Polyn et al. The classifier was trained on the preprocessed imaging data. In one iteration, the classifier was trained from scans during the encoding phase i. On a second iteration, the classifier was trained during retrieval and tested at encoding. Training was achieved using a two-layer neural network consisting of k input units and m output units, where k equals the number of selected voxels within the temporal cortex ROI and m equals the number of conditions to be classified i. Each input unit was connected to each of the 10 output units through a weighted feed-forward connection, thereby relating distributed activation across voxels to each semantic category.

Chapter 2 : - NLM Catalog Result

Comprehending the world based on memory and stored knowledge often precedes goaldirected, context-appropriate action. Cognitive control processes permit memory to be accessed strategically and can.

Nearest Nobel PubMed Report error 62 high-probability publications. We are testing a new system for linking publications to authors. If you notice any innacuracies, please sign in and mark papers as correct or incorrect matches. If you identify any major omissions or other inaccuracies in the publication list, please let us know. Journal of Cognitive Neuroscience. Evidence for a Functional Hierarchy of Association Networks. Learning and transfer of working memory gating policies. Frontal Cortex and the Hierarchical Control of Behavior. Trends in Cognitive Sciences. Striatal prediction errors support dynamic control of declarative memory decisions. A Nimble Working Memory. Working memory gating mechanisms explain developmental change in rule-guided behavior. Frontiers in Systems Neuroscience. Multiple gates on working memory. Current Opinion in Behavioral Sciences. A statistical approach harnessing the analytical potential of the local connectome. Oscillatory dynamics coordinating human frontal networks in support of goal maintenance. Parallel temporal dynamics in hierarchical cognitive control. The Journal of Neuroscience: How cognitive theory guides neuroscience. Ventral fronto-temporal pathway supporting cognitive control of episodic memory retrieval. Cerebral Cortex New York, N. Simultaneous control of error rates in fMRI data analysis Neuroimage. Multiple gates on working memory Current Opinion in Behavioral Sciences. Hierarchical Reinforcement Learning Brain Mapping: Working memory updating and the development of rule-guided behavior. Ventral striatum and the evaluation of memory retrieval strategies. Corticostriatal output gating during selection from working memory. Distinct regions of prefrontal cortex are associated with the controlled retrieval and selection of social information. Working memory management and predicted utility. Frontiers in Behavioral Neuroscience. Ventral striatal activity correlates with memory confidence for old- and new-responses in a difficult recognition test. Journal of the American Statistical Association. Opening the gate to working memory. Impact of aging on the dynamics of memory retrieval: Journal of Memory and Language. Striatal contributions to declarative memory retrieval. Finding parallels in fronto-striatal organization. Microstructural organizational patterns in the human corticostriatal system. Rostrolateral prefrontal cortex and individual differences in uncertainty-driven exploration. Mechanisms of hierarchical reinforcement learning in cortico-striatal circuits 2: Mechanisms of hierarchical reinforcement learning in corticostriatal circuits 1: The neuroscience of goal-directed behavior Goal-Directed Behavior. Cognition, Behavior, and Brain Imaging. Frontiers in Human Neuroscience. Defining an ontology of cognitive control requires attention to component interactions. Topics in Cognitive Science. Is prefrontal cortex necessary for the storage and acquisition of relational concepts? Separable prefrontal cortex contributions to free recall. Frontal cortex and the discovery of abstract action rules. Multiple forms of learning yield temporally distinct electrophysiological repetition effects. Optimizing design efficiency of free recall events for FMRI. Is the rostro-caudal axis of the frontal lobe hierarchical? Hierarchical cognitive control deficits following damage to the human frontal lobe. Cognitive control, hierarchy, and the rostro-caudal organization of the frontal lobes. Functional magnetic resonance imaging evidence for a hierarchical organization of the prefrontal cortex. Left ventrolateral prefrontal cortex and the cognitive control of memory. Computational and neurobiological mechanisms underlying cognitive flexibility. Dissociable controlled retrieval and generalized selection mechanisms in ventrolateral prefrontal cortex. Frontal lobe mechanisms that resolve proactive interference. Analogical reasoning and prefrontal cortex: Selection, integration, and conflict monitoring; assessing the nature and generality of prefrontal cognitive control mechanisms. In search of executive control in internal attention shifting. Semantic retrieval, mnemonic control, and prefrontal cortex. Behavioral and Cognitive Neuroscience Reviews. Temporal sensitivity of event-related fMRI. Want to start a new tree?

Chapter 3 : Prefrontal cortex - Wikipedia

Cognitive control mechanisms, supported by the prefrontal cortex (PFC), allow us to be strategic in making memory subject to our intents and needs. Hence, the cognitive control of memory is fundamental to flexible, goal-directed behavior.

Interconnections[edit] The prefrontal cortex is highly interconnected with much of the brain, including extensive connections with other cortical, subcortical and brain stem sites. The medial prefrontal cortex has been implicated in the generation of slow-wave sleep SWS , and prefrontal atrophy has been linked to decreases in SWS. Goldman-Rakic spoke of how this representational knowledge was used to intelligently guide thought, action, and emotion, including the inhibition of inappropriate thoughts, distractions, actions, and feelings. Fuster speaks of how this prefrontal ability allows the wedding of past to future, allowing both cross-temporal and cross-modal associations in the creation of goal-directed, perception-action cycles. Shimamura proposed Dynamic Filtering Theory to describe the role of the prefrontal cortex in executive functions. The prefrontal cortex is presumed to act as a high-level gating or filtering mechanism that enhances goal-directed activations and inhibits irrelevant activations. This filtering mechanism enables executive control at various levels of processing, including selecting, maintaining, updating, and rerouting activations. It has also been used to explain emotional regulation. The prefrontal cortex is of significant importance when top-down processing is needed. Top-down processing by definition is when behavior is guided by internal states or intentions. Subjects engaging in this task are instructed to sort cards according to the shape, color, or number of symbols appearing on them. The thought is that any given card can be associated with a number of actions and no single stimulus-response mapping will work. Human subjects with PFC damage are able to sort the card in the initial simple tasks, but unable to do so as the rules of classification change. Miller and Cohen conclude that the implications of their theory can explain how much of a role the PFC has in guiding control of cognitive actions. Neuroscientists are suggesting that social priming influences activity and processing in the amPFC, and that this area of the prefrontal cortex modulates mimicry responses and behavior. The exemplar theory states that we categorize judgements by comparing it to a similar past experience within our stored memories. Yuan from the University of Arizona found that larger prefrontal cortex volume and greater PFC cortical thickness were associated with better executive performance. This idea was first formulated by Jacobsen, who reported in that damage to the primate prefrontal cortex caused short-term memory deficits. The concept of working memory used by proponents of this theory focused mostly on the short-term maintenance of information, and rather less on the manipulation or monitoring of such information or on the use of that information for decisions. Consistent with the idea that the prefrontal cortex functions predominantly in maintenance memory, delay-period activity in the PF has often been interpreted as a memory trace. The phrase "delay-period activity" applies to neuronal activity that follows the transient presentation of an instruction cue and persists until a subsequent "go" or "trigger" signal. To explore alternative interpretations of delay-period activity in the prefrontal cortex, Lebedev et al. Although the task made intensive demands on short-term memory, the largest proportion of prefrontal neurons represented attended locations, not remembered ones. These findings showed that short-term memory functions cannot account for all, or even most, delay-period activity in the part of the prefrontal cortex explored. The authors suggested that prefrontal activity during the delay-period contributes more to the process of attentional selection and selective attention than to memory storage. Several studies have indicated that reduced volume and interconnections of the frontal lobes with other brain regions is observed in patients diagnosed with mental disorders and prescribed potent antipsychotics ; those subjected to repeated stressors ; [35] those who excessively consume sexually explicit materials; [36] suicides ; [37] those incarcerated; criminals ; sociopaths ; those affected by lead poisoning; [38] and daily male cannabis users only 13 people were tested. And it is theorized that, as the brain has tripled in size over five million years of human evolution, [41] the prefrontal cortex has increased in size sixfold. The standard presentation e. He became irritable, quick-tempered, and impatientâ€”characteristics he did not previously display â€” so that friends described him as "no longer Gage"; and, whereas he had previously been a capable and efficient worker, afterward he was unable to complete tasks. Yet, when actually performing, they instead pursued behavior aimed at immediate gratification, despite knowing the longer-term results would be self-defeating. The interpretation of this data indicates that not only are skills of comparison and understanding of eventual outcomes harbored in the prefrontal cortex but the prefrontal cortex when functioning correctly controls the mental option to delay immediate gratification for a better or more rewarding longer-term gratification result. This ability to wait for a reward is one of the key pieces that define optimal executive function of the human brain. There is much current research devoted to understanding the role of the prefrontal cortex in neurological disorders. Many disorders, such as schizophrenia , bipolar disorder , and ADHD , have been related to dysfunction of the prefrontal cortex, and thus this area of the brain offers the potential for new treatments of these conditions. A downstream target of this drug, the HCN channel , is one of the most recent areas of exploration in prefrontal cortex pharmacology. It has been hypothesized that his choice of the term was based on the prefrontal bone present in most amphibians and reptiles.

Chapter 4 : Concordia Journal | Fall by Concordia Seminary - Issuu

Left ventrolateral prefrontal cortex and the cognitive control of memory David Badre a, âˆ—, Anthony D. Wagner b a Helen Wills Neuroscience Institute, Barker Hall, MC, UC Berkeley, CA , United States.

Chapter 5 : Publications Authored by David Badre | PubFacts

David Badre Page 1 3/16/10 Ventrolateral prefrontal cortex and controlling memory to inform action. In (S. the left ventrolateral prefrontal cortex to memory.

Chapter 6 : Your IP has been blocked

Barredo, Jennifer, Verstynen, Timothy D., Badre, David Organization of cortico-cortical pathways supporting memory retrieval across subregions of the left ventrolateral prefrontal cortex. Journal of Neurophysiology/Journal of Neurophysiology. ; (3):

Chapter 7 : Ventrolateral Prefrontal Cortex and Controlling Memory to Inform Action - Oxford Scholarship

Badre, D. (). Is prefrontal cortex necessary for the storage and acquisition of Ventrolateral prefrontal cortex and controlling memory to inform action.

Chapter 8 : Neuroscience of rule-guided behavior | Search Results | IUCAT

How does ventrolateral prefrontal cortex (VLPFC) control mnemonic processing? Alternative models propose that VLPFC guides top-down (controlled) retrieval of knowledge from long-term stores or selects goal-relevant products of retrieval from among competitors.

Chapter 9 : David Badre - Publications

Results from functional magnetic resonance imaging (fMRI) have strongly supported the idea that the ventrolateral prefrontal cortex (VLPFC) contributes to successful memory formation, but the role the dorsolateral prefrontal cortex (DLPFC) in memory encoding is more controversial.