
Figures and figure supplements

Task-evoked metabolic demands of the posteromedial default mode network are shaped by dorsal attention and frontoparietal control networks

Godber M Godbersen *et al.*

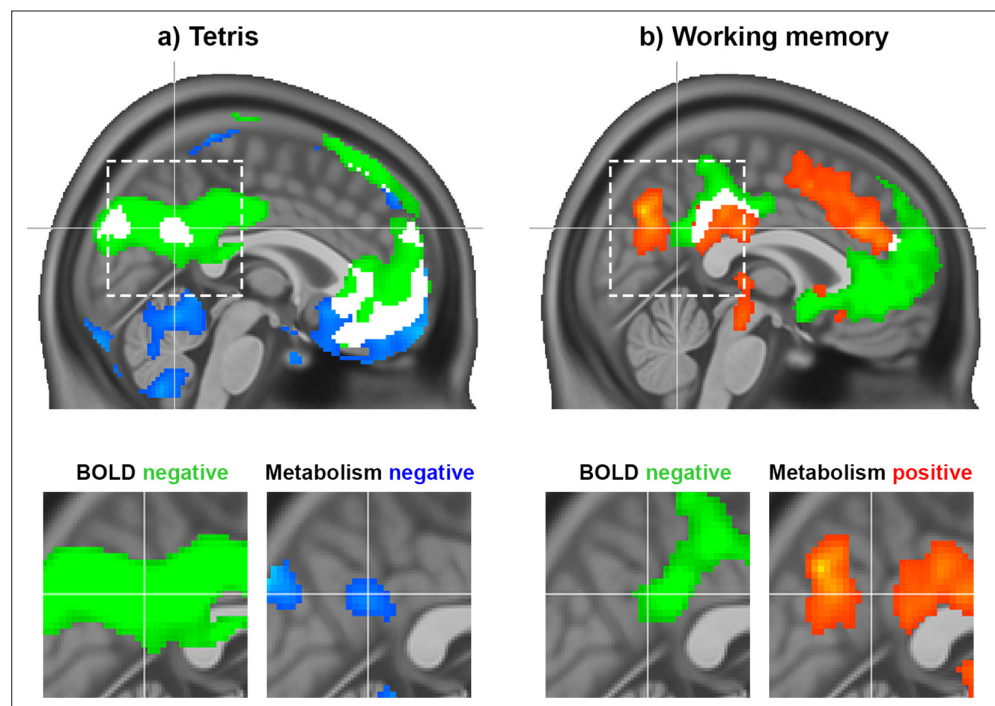


Figure 1. Task responses observed during the Tetris (DS1) and working memory tasks (DS2) (*Stiernman et al., 2021*). **(a)** The Tetris task employed in the current work elicited a negative response in the pmDMN for both the BOLD signal (green) and CMRGlu (blue). **(b)** For comparison, previously published results from a working memory manipulation task were also included, which showed a dissociation between BOLD and glucose metabolism in the PCC, that is, negative BOLD response (green) vs. increased metabolism (red). White clusters represent the intersection of significant CMRGlu and BOLD signal changes, irrespective of direction. Note, that also relevant differences between both imaging parameters can be observed, such as decreased CMRGlu in the cerebellum (in both datasets), without changes in the BOLD signal. The dashed rectangle indicates the zoomed section of the PCC. All modalities are corrected for multiple comparisons ($P < 0.05$). Crosshair is at $-1/-56/30$ mm MNI-space.

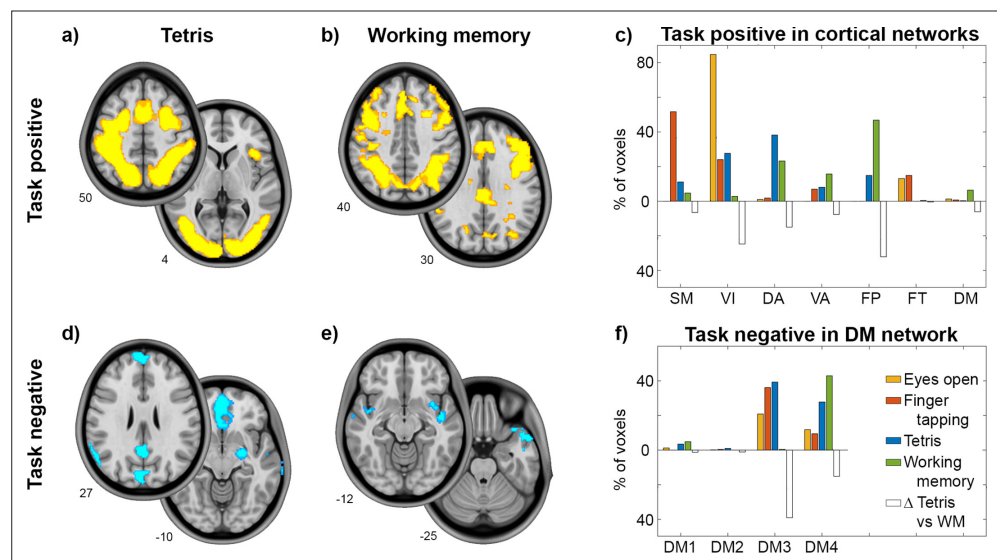


Figure 2. Detailed response for the cognitive tasks. Task effects represent the overlap computed as the intersection between BOLD signal changes and glucose metabolism (all $P < 0.05$ corrected). Slices show major clusters of positive and negative responses for the two tasks and numbers indicate the z-axis in mm MNI space. Bar graphs show the percentage of voxels with a positive task response for each of the 7 cortical networks (Yeo et al., 2011). (a–c) Differences in positive task responses between Tetriz (DS1) and working memory (DS2) (Stiernman et al., 2021) were most pronounced in visual, dorsal attention and fronto-parietal networks, as indicated by open bars (absolute difference between Tetriz and working memory). For completeness, previous CMRGlu data obtained while opening the eyes (orange) and right finger tapping (red) was also included (DS3) (Hahn et al., 2018). These elicited the main task-positive response in visual and somato-motor networks, respectively. (d–f) Negative task responses are shown for DMN subparts as given by the 17-network parcellation (Yeo et al., 2011), with DMN3 and DMN4 covering mostly core (PCC, mPFC, angular) and ventral areas (temporal, lateral OFC, superior frontal), respectively. The negative response was strongest in DMN3 for Tetriz, visual and motor tasks, but in DMN4 for the working memory task. The number of voxels per network was normalized by the total number of activated (c) or deactivated (f) voxels across both imaging modalities. Thus, each task sums up to 100% across all cortical networks.

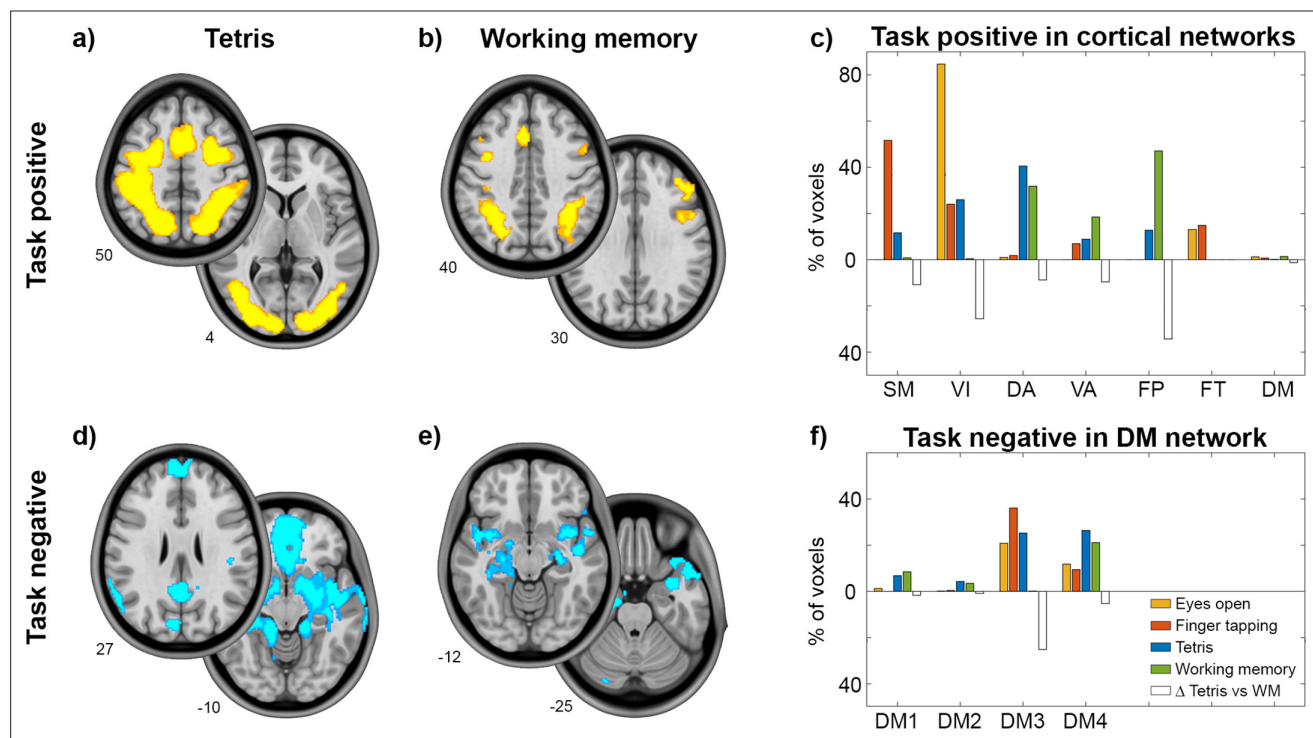


Figure 2—figure supplement 1. Task response computed by statistical conjunction analysis. For direct comparison with **Figure 2**, the overlap between CMRGlu and BOLD signal changes was computed by conjunction analysis in SPM12 (all $p < 0.05$ FWE corrected cluster-level after $p < 0.001$ uncorrected voxel level). Task-specific effects were similar to the intersection between imaging modalities: The Tetris paradigm showed increases in imaging parameters, mostly for VIN and DAN as well as decreases in DMN3 and DMN4. Working memory elicited the strongest positive effects in FPN and negative ones in DMN4. Changes in CMRGlu for eyes open and finger tapping paradigms are shown for comparison only as these are identical to **Figure 2** since only fPET data was available. For a detailed description see **Figure 2**.

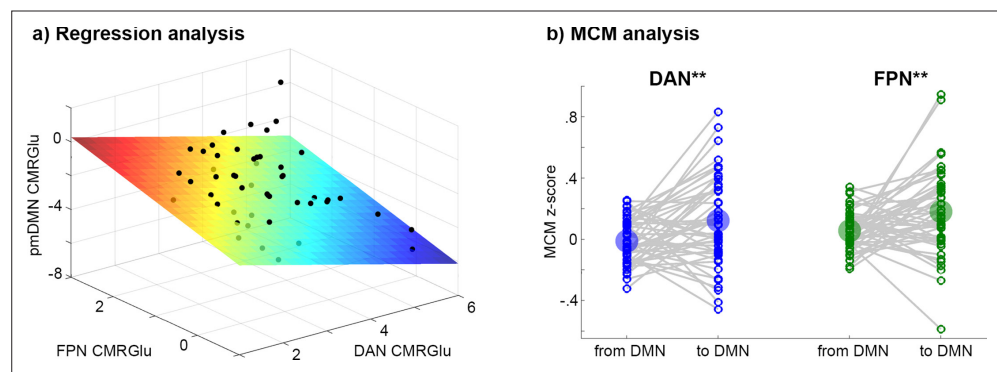


Figure 3. Relationship of CMRGlu response between networks. **(a)** Visualization of regression analysis results for the Tetris task (DS1, $F=4.84$, $p=0.005$). Positive CMRGlu task responses of the FPN ($p=0.006$) and the DAN ($p=0.010$) both explained the negative CMRGlu response in the pmDMN across subjects. Here, FPN and DAN exerted an inverse association with pmDMN, where low glucose metabolism in FPN and high metabolism in DAN yield a negative CMRGlu response in the pmDMN. Units on all axes are $\mu\text{mol}/100\text{ g}/\text{min}$. **(b)** MCM analysis for the Tetris task (DS1) combining the association of functional connectivity and CMRGlu for causal inference on directionality. The influence from DAN and FPN to DMN was significantly stronger than vice versa (both $**p<0.01$). The same regions were used for regression and MCM analyses: For FPN and DAN, CMRGlu was extracted from voxels showing a significant overlap of activations between imaging modalities but no overlap between Tetris and WM tasks.