Resting-state functional connectivity – control analyses

First, we tested whether our results were specific to the partial signal regression approach we applied. We repeated the hierarchical cluster analysis and subsequent regression analysis after applying global signal regression instead of partial signal regression. Hierarchical cluster analysis on the average connectivity profile partitioned the 22 ROIs, as after partial signal regression, into four clusters (threshold of 70% of the maximum linkage). Similar to the main analysis described in the main text, the two clusters of the DMN consisted of 1) the main-DMN, that included the ventral, anterior and dorsal medial prefrontal cortex, posterior cingulate cortex, left posterior inferior parietal lobule, bilateral temporoparietal junction and the bilateral lateral temporal cortex, and the 2) MTL_RSC-DMN comprising the bilateral MTL and retrosplenial cortices. The FPN consisted of the dorsal anterior cingulate cortex, bilateral lateral prefrontal cortex, inferior temporal cortex and the anterior inferior parietal lobule, and the precuneus and right posterior inferior parietal lobule again formed a fourth cluster. The individual connectivity scores between and within the MTL_RSC-DMN, main-DMN and FPN were again submitted into a stepwise multiple regression with successful memory performance as dependent variable. Confirming the results reported in the main text of the manuscript, lower connectivity within the MTL-DMN in combination with stronger connectivity between the main-DMN and the FPN predicted successful memory performance. None of the other within- and between-network interactions explained memory performance. The resulting best-fitted model explained 53.7% of the variance ($R^2$) and the resulting equation was: Predicted memory performance= 65.86 - (61.27 x MTL_RSC-DMN) + (115.88 x main-DMN × FPN).

Second, we verified the stability of the resulting subnetworks of the DMN and the FPN by repeating the cluster analysis with an independent sample of 25 healthy male participants (see Supplemental_Materials_and_Methods.pdf). This analysis revealed again the same four clusters; the MTL_RSC-DMN cluster, the main-DMN cluster, one cluster forming the FPN, and a cluster comprising the precuneus and right posterior inferior parietal lobule. These four subnetworks were identical to the clusters reported in our main results (Resting-state functional connectivity, ROI-to-ROI
connectivity and identification of the networks). When probing the clustering of the DMN and FPN further, the left and right inferior temporal cortices formed a separate cluster, but no additional clusters emerged from the DMN.

Third, to verify whether successful memory performance was specifically predicted by network interactions within the MTL_RSC-DMN and between the main-DMN, we repeated the functional connectivity analyses using the visual and auditory network which are not expected to explain individual differences in memory performance (see Supplemental_Materials_and_Methods.pdf and see Supplemental_Table_S1.pdf). Cluster analysis identified two networks, a visual network comprising the bilateral fusiform gyri, lingual gyrus, cuneus and bilateral temporo-occipital gyri, and an auditory network, consisting of the bilateral postcentral gyri and superior temporal gyri. Connectivity within these two networks was significantly above zero (visual: mean Fz = 0.51, t(23) = 21.59, p < .0005; auditory: mean Fz = 0.74, t(23) = 25.84, p < .0005). To test whether interactions within or between these two networks predicted memory performance, the individual average connectivity scores were submitted to a stepwise multiple regression analysis with successful memory performance as dependent variable. None of the interactions significantly predicted memory performance. Also, there were no significant correlations between any of the network interactions and memory performance (p > .05).

Fourth, to test the stability of our model predicting successful memory performance, we repeated the regression analyses using a Lasso approach with connectivity within and between the DMN and FPN subnetworks as predicting variables. Results confirmed the stepwise regression analysis and showed that lower connectivity within the MTL_RSC-DMN in combination with stronger connectivity between the main-DMN and the FPN predicted successful memory performance (lambda= 2.19). None of the other within- and between-network interactions explained memory performance. The resulting best-fitted model explained 47.8% of the variance (R²) and the resulting equation was: Predicted memory performance= 43.14 - (34.82 X_MTL_RSC-DMN) + (55.50 X_main-DMN × FPN).
When repeating the regression analysis using Lasso with within- and between-network connectivity of the auditory and visual control networks as predicting variables, none of the within- and between-network interactions could predict successful memory performance, again confirming the stepwise regression approach.