

**Supplementary material***Cognitive tests*

Premorbid IQ was measured using the National Adult Reading Test, and current IQ was estimated using five subtests from the Wechsler Adult Intelligence Scale – III (similarities, digit-span, arithmetic, picture completion and matrix reasoning). Executive function was measured using the Hayling sentence completion test (Burgess and Shallice, 1996) and the Stroop colour-word interference test (Trener et al., 1989). An executive function z-score was produced by averaging z-scores on the Hayling and Stroop tests (in each case based on the number of standard deviations from the mean of controls). Processing speed was measured using the symbol-digit modalities test (SDMT; Smith, 1991), for which z-scores were obtained with reference to published norms (Lezak et al., 2004). Immediate and delayed memory was assessed using the story recall (verbal memory) and figure recall (visual memory) from the adult memory and information processing battery (Coughlan and Hollows, 1985). A memory function z-score was produced by averaging z-scores on the immediate and delayed visual and verbal memory tests (based on the number of standard deviations from the mean of the controls). Anxiety and depression were measured using the hospital anxiety and depression scale (HADS; Zigmond and Snaith, 1983).

*Cambridge Gambling Task*

Responses were registered by a touch sensitive screen, with the subjects using their dominant hand. Participants were presented with an array of ten blue and red boxes and were told that a token was hidden beneath one of the boxes. They were given a bank of points to bet with. Participants were asked to guess if the token was hidden under a red or a blue box, and to wager a proportion of their points on that decision. The wagers were offered in an ascending and descending sequence. This allows differentiation of impulsive responses from genuine risk preference, as participants must wait to make large bets in the ascending condition, or to make small bets in the descending condition;

the difference in the amounts bet between the two conditions would be larger if the subject is more impulsive. The ratio of red to blue boxes gives explicit outcome probabilities of winning and losing.

### *Diffusion MRI analysis*

#### *Group differences in FA and MD*

Patients had significantly lower FA than controls in the hippocampus ( $p < 0.001$ ) and the occipital pole ( $p < 0.01$ ) but no significant differences in any of the other parcellations. Patients also showed significantly higher MD than controls in the medial prefrontal ( $p = 0.001$ ), middle frontal gyrus ( $p < 0.01$ ), anterior cingulate ( $p < 0.001$ ), hippocampus ( $p < 0.001$ ), caudate ( $p < 0.001$ ) and occipital pole parcellations ( $p < 0.001$ ).

#### *Associations between FA and MD and decision-making components in patients*

Regression analyses were used to assess whether decision-making was better predicted by DOC or by the diffusion tensor metrics (FA and MD). Rational choice scores were significantly related to DOC in the anterior cingulate parcellation (Exp (beta): 0.1, 95% Confidence Interval [CI]: 0.01, 1.35,  $p < 0.05$ ) but not to FA or MD. Deliberation time was related to DOC in the medial prefrontal cortex parcellation (Exp (beta): -3032.3, 95% CI: -4808.0, -1256.6;  $p < 0.001$ ) but not to FA or MD, while in the hippocampus deliberation time correlated with FA (Exp (beta): -40096.3, 95% CI: -65018.5, -15174.0;  $p < 0.01$ ) but not with DOC or MD.

**References**

- BURGESS, P. W. & SHALLICE, T. 1996. Response suppression, initiation and strategy use following frontal lobe lesions. *Neuropsychologia*, 34, 263-272 doi: 10.1016/0028-3932(95)00104-2.
- COUGHLAN, A. K. & HOLLOWES, S. E. 1985. *The Adult Memory and Information Processing Battery (AMIPB): Test manual*, AK Coughlin, Psychology Department, St James' Hospital.
- LEZAK, M. D., HOWIESON, D. B., LORING, D. W., HANNAY, J. H. & FISCHER, J. S. 2004. *Neuropsychological assessment 4 Ed*, Oxford university press.
- SMITH, A. 1991. *Symbol-digit modalities test: manual*. , Los Angeles, CA., Western Psychological Services.
- TRENERRY, M. R., CROSSON, B., DEBOE, J. & LEBER, W. 1989. *Stroop neuropsychological screening test manual*, Psychological Assessment Resources Odessa, FL.
- ZIGMOND, A. S. & SNAITH, R. P. 1983. The hospital anxiety and depression scale. *Acta psychiatrica scandinavica*, 67, 361-370 doi: 10.1111/j.1600-0447.1983.tb09716.x.

Supplemental Table 1. Group mean (standard deviation) scores for FA and MD.

	<b>Controls</b>	<b>Patients</b>	RR	SP	PP
<b>FA</b>					
MFG	<b>0.139 (0.013)</b>	<b>0.142 (0.017)</b>	0.142 (0.017)	0.142 (0.020)	0.141 (0.012)
Medial prefrontal	<b>0.105 (0.012)</b>	<b>0.101 (0.012)</b>	0.102 (0.011)	0.100 (0.012)	0.100 (0.012)
Hippocampi	<b>0.147 (0.011)</b>	<b>0.127 (0.015)</b>	0.130 (0.016)	0.121 (0.013)	0.129 (0.013)
Anterior Cingulate	<b>0.136 (0.011)</b>	<b>0.137 (0.022)</b>	0.131 (0.018)	0.147 (0.024)	0.143 (0.024)
Caudate	<b>0.146 (0.016)</b>	<b>0.148 (0.019)</b>	0.145 (0.019)	0.150 (0.018)	0.143 (0.024)
Occipital Pole	<b>0.123 (0.014)</b>	<b>0.115 (0.014)</b>	0.115 (0.012)	0.117 (0.018)	0.112 (0.011)
<b>MD</b>					
MFG	<b>0.85 (0.05)</b>	<b>0.90 (0.11)</b>	0.90 (0.13)	0.91 (0.07)	0.90 (0.07)
Medial prefrontal	<b>0.93 (0.06)</b>	<b>1.00 (0.12)</b>	0.98 (0.14)	1.03 (0.07)	1.02 (0.06)
Hippocampi	<b>1.00 (0.07)</b>	<b>1.14 (0.18)</b>	1.10 (0.20)	1.21 (0.14)	1.15 (0.10)
Anterior	<b>0.89 (0.06)</b>	<b>0.97 (0.13)</b>	0.95 (0.15)	1.00 (0.08)	0.98 (0.10)

Cingulate					
Caudate	<b>0.92 (0.10)</b>	<b>0.92 (0.10)</b>	0.95 (0.13)	1.12 (0.19)	0.98 (0.10)
Occipital Pole	<b>0.91 (0.05)</b>	<b>1.00 (0.13)</b>	0.98 (0.15)	1.02 (0.12)	1.02 (0.08)