Background: Neurobiological models of obsessive-compulsive disorder (OCD) emphasize disturbances in the function and connectivity of brain cortico-striatal networks or ‘loops’. Although neuroimaging studies of patients support this network model of OCD, very few have applied measurements that are sensitive to brain connectivity features.

Aim: Using resting-state functional magnetic resonance imaging (fMRI), we tested the hypothesis that OCD is associated with disturbances in the functional connectivity of primarily ventral cortico-striatal regions, measured from coherent spontaneous fluctuations of the blood oxygen level-dependent (BOLD) signal.

Design & Setting: Case-control cross-sectional design. Hospital referral OCD unit and MRI facility.

Participants: Twenty-one OCD patients (10 males and 11 females) and twenty-one healthy control subjects matched for age, gender and estimated intelligence.

Main Outcome Measure(s): Voxel-wise statistical parametric maps testing the strength of functional connectivity of four striatal ‘seed’ regions of interest with remaining brain areas. Seed placements were (A) dorsal caudate \([x(\pm)=13, y=15, z=9]\); (B) ventral caudate (inferior), corresponding to the nucleus accumbens \([x(\pm)=9, y=9, z=-8]\); (C) dorsal caudal putamen \([x(\pm)=28, y=1, z=3]\); and (iv) ventral rostral putamen \([x(\pm)=20, y=12, z=-3]\).

Results: For both groups, there was a clear distinction in the pattern of cortical connectivity of dorsal and ventral striatal regions, in keeping with the notion of segregated motor, associative and limbic cortico-striatal networks. Depicted right: Significant within-group cortico-striatal functional connectivity maps \((P_{FDR} < 0.05)\) for (A)=dorsal caudate; (B)=ventral caudate/accumbens; (C)=dorsal putamen; (D)=ventral putamen. Green overlay=controls; red=OCD patients; yellow=spatial overlap of connectivity maps between the groups.

Between groups, OCD patients had significantly increased functional connectivity along a ventral cortico-striatal axis, implicating the orbitofrontal cortex and surrounding areas. The specific strength of connectivity between the ventral caudate/nucleus accumbens and the anterior orbitofrontal cortex predicted patients’ overall symptom severity \((r^2 = .57, P < .001)\). Additionally, OCD patients showed evidence for reduced functional connectivity of the dorsal striatum and lateral prefrontal cortex, as well as ventral striatum with the region of the midbrain ventral tegmental area.

Conclusions. This study provides direct support for the hypothesis that OCD is associated with functional alterations of brain cortico-striatal networks. In particular, our findings suggest abnormal and heightened functional connectivity of ventrolimbic cortico-striatal regions in OCD patients.