Abstract

Objective
Both Tourette's Disorder (TD) and Attention-Deficit/Hyperactivity Disorder (ADHD) have been related to abnormalities in glutamatergic neurochemistry in the fronto-striatal circuitry. TD and ADHD often co-occur and the neural underpinnings of this co-occurrence have been insufficiently investigated in prior studies.

Method
We used proton magnetic resonance spectroscopy (1H–MRS) in children between 8 and 12 years of age (TD n = 15, ADHD n = 39, TD + ADHD n = 29, and healthy controls n = 53) as an in vivo method of evaluating glutamate concentrations in the fronto-striatal circuit. Spectra were collected on a 3 Tesla Siemens scanner from two voxels in each participant: the anterior cingulate cortex (ACC) and the left dorsal striatum. LC-model was used to process spectra and generate glutamate concentrations in institutional units. A one-way analysis of variance was performed to determine significant effects of diagnostic group on glutamate concentrations.

Results
We did not find any group differences in glutamate concentrations in either the ACC (F(3132) = 0.97, p = 0.41) or striatum (F(3121) = 0.59, p = 0.62). Furthermore, variation in glutamate concentration in these regions was unrelated to age, sex, medication use, IQ, tic, or ADHD severity. Obsessive-compulsive (OC) symptoms were positively correlated with ACC glutamate concentration within the participants with TD (rho = 0.35, p uncorrected = 0.02).

Conclusion
We found no evidence for glutamatergic neuropathology in TD or ADHD within the fronto-striatal circuits. However, the correlation of OC-symptoms with ACC glutamate concentrations suggests that altered glutamatergic transmission is involved in OC-symptoms within TD, but this needs further investigation.