Executive dysfunction in early stages of Huntington's disease is associated with striatal and insular atrophy: a neuropsychological and voxel-based morphometric study.

BACKGROUND: Huntington's disease (HD) is characterized by a progressive multisystem neuronal atrophy in the brain. Apart from motor signs, cognitive symptoms, particularly executive dysfunctions, are proposed to be recognizable in early stages of disease. The aim of the present study was to clarify if cognitive dysfunction in early stages of HD is correlated with loco-regional structural changes in 3D-MRI.

METHODS: Twenty-five patients with genetically confirmed HD in early clinical stages were included in the study and underwent neuropsychological testing, i.e., the executive tasks Tower of Hanoi (ToH), Stroop Colour Word Interference Test (STROOP), and modified Wisconsin Card Sorting Test (mWCST). High-resolution volume-rendering MRI scans (MP-RAGE) were acquired on a 1.5 T scanner in all patients and were analyzed by statistical parametric mapping and voxel-based morphometry (VBM) in comparison to an age-matched control group.

RESULTS: Group analysis of HD patients demonstrated robust regional decreases of gray matter volumes (p<0.05, corrected for multiple comparisons) in the caudate and the putamen bilaterally with a global maximum at Talairach coordinates 11/4/11 (Z-score=7.06). Executive dysfunction was significantly correlated with the areas of highest significant differences out of VBM results which were located bilaterally...
in the caudate (ToH: \( r=0.647, p<0.001 \); STROOP: \( r=0.503, p<0.01 \); mWCST: \( r=0.452, p<0.05 \)). Moreover, subgroup analyses revealed marked insular atrophy (Talairach coordinates 43/-3/1; Z-score=5.64) in HD patients who performed worse in the single executive tasks. CONCLUSION: Two aspects were most remarkable in this correlational study: (i) striatal atrophy in HD patients in early stages plays an important role not only in impaired motor control but also in executive dysfunction, and (ii) extrastriatal cortical areas, i.e., the insular lobe, seem to be involved in executive dysfunction as assessed by neuropsychological tests requiring for planning and problem solving, stimulus response selectivity and concept formation.