Subdivisions of the Subthalamic Nucleus

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Research question and background
Current academic consensus holds that the subthalamic nucleus (STN) located at the lateral border of the hypothalamus consists of three parts, each anatomically distinct and selectively associated with cognitive, emotional, or motor functioning. However, in a recent review evaluating cytoarchitectonic and lesion studies in non-human primates and humans ranging from 1925 to 2010 we conclude that the number of subdivisions in the STN remains uncertain, and that academic consensus in support of a tripartite STN is presently unwarranted (Keuken, Uylings, Geyer, Schaefer, Turner, & Forstmann, 2012).

Methods and tissues used
Formalin fixed tissue will be scanned using ultra-high resolution 7T MRI using the protocol reported in Weiss et al., (2011). After scanning tissues will be paraffin embedded and we will investigate the existence of STN subdivisions using quantitative analysis over the entire rostro-caudal axis of the STN in consecutive serial coronal sections. Subdivisions will be defined using the following markers: a) Iron: ferritin & transferrin & ion beam analytical methods LIPSION; b) Neurotransmitter: GABA and glutamate; c) Cells: Gallyas & Nissl; d) Immunohistochemistry and/or *in situ hybridization*: Parvalbumin, Calretinin, Calbindin, MBP, CRTL-1, SMI-311, GAD. The use of these staining protocols will allow us to extrapolate the data to the obtained MRI scans and using a probability map to images obtained in MNI standard space. In addition, it will allow us to further dissect the cytoarchitecture of the STN to study the functional neuroanatomy in more detail. For this study we aim to investigate the STN of 10 subjects without clinical signs of neuropsychiatric of neurodegenerative disease.

Results and conclusion
Based on our literature review, we expect to find several subdivisions of the STN. Most importantly, the results will be essential for understanding the functional anatomy of the human STN, and to translate these data to findings form *in vivo* imaging techniques, such as MRI.