KING'S College LONDON

INSTITUTE OF PSYCHIATRY,
PSYCHOLOGY & NEUROSCIENCE

Module:
Biological foundations of mental health

Week 5:
Reward, emotion and action

Dr Frank Hirth

Topic 2
The structure and function of the Basal Ganglia

Part 4 of 5

Behavioural Abnormalities (1)

Basal ganglia dysfunction

Motor Abnormalities

Impaired Memory Formation

Attention Deficits

Affective Disorders

Sleep Disturbances

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Basal Ganglia-Related Disorders:

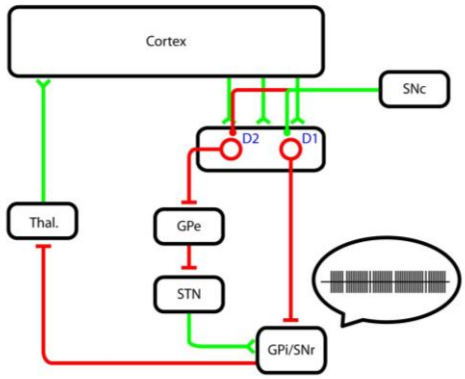
Parkinson's Disease, Huntington's Disease, Dystonia, Abulia, Dementia, Tourett's Syndrome,

Attention Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder,

Depression, Schizophrenia

Behavioural Abnormalities (2)

Parkinson's Disease: What happens when DA input is lost?



Behavioural Abnormalities (3)

Parkinson's Disease: What happens when DA input is lost?

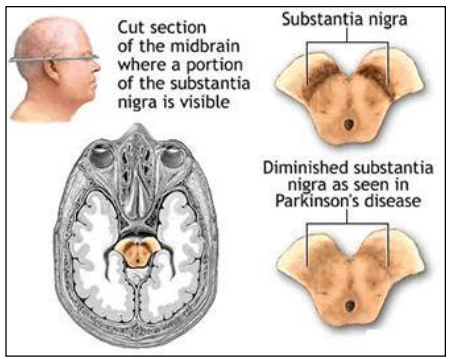


Figure 6: How Parkinson's Disease Affects the Brain

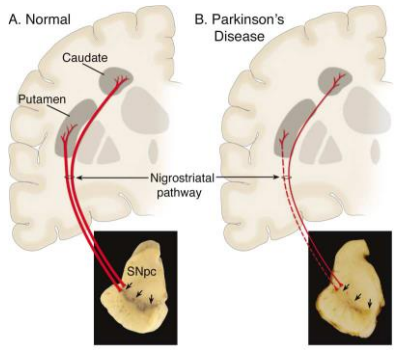
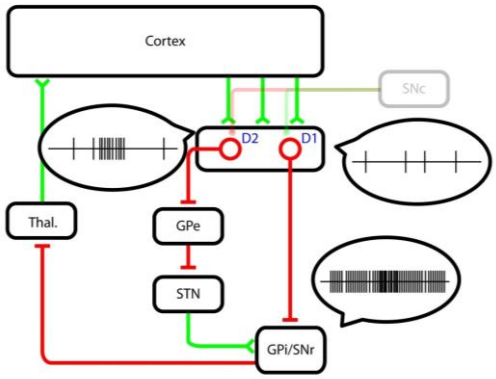


Figure 7: The nigrostriatal pathway in healthy individuals (A) and individuals with Parkinson's disease (B).

Specific Loss of DA neurons predominantly in the substantia nigra pars compacta

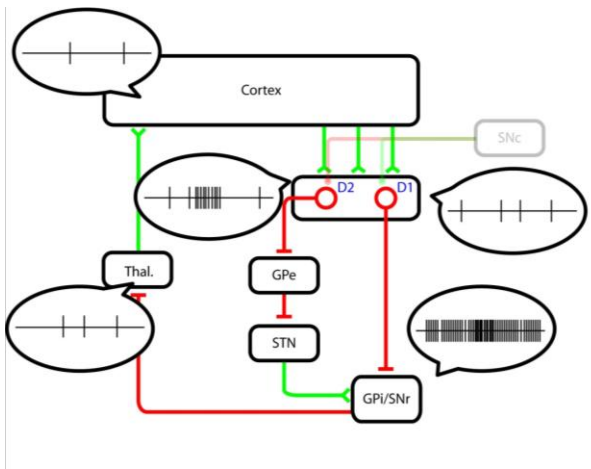
Behavioural Abnormalities (4)

Direct pathway become less active; indirect pathway becomes more active



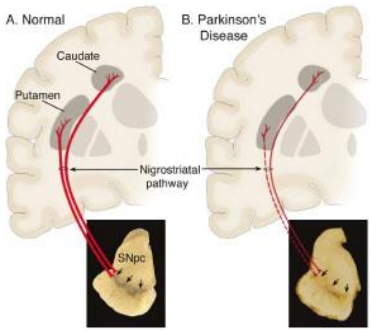
Behavioural Abnormalities (5)

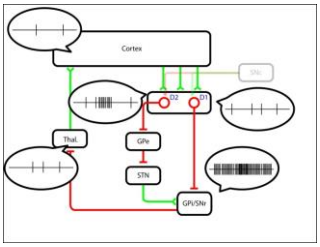
Action selection (direct pathway) is *suppressed*: action inhibition (indirect pathway) is *facilitated*



Behavioural Abnormalities (6)

Parkinson's Disease: Suppressed Action Selection and Facilitated Inhibition





Loss of SNc DA neurons leads to tremor, rigiditiy, bradikynesia
but also non-motor symptoms, e.g. sleep disturbances

Behavioural Abnormalities (7)

Basal ganglia dysfunction

Motor Abnormalities

Impaired Memory Formation

Attention Deficits

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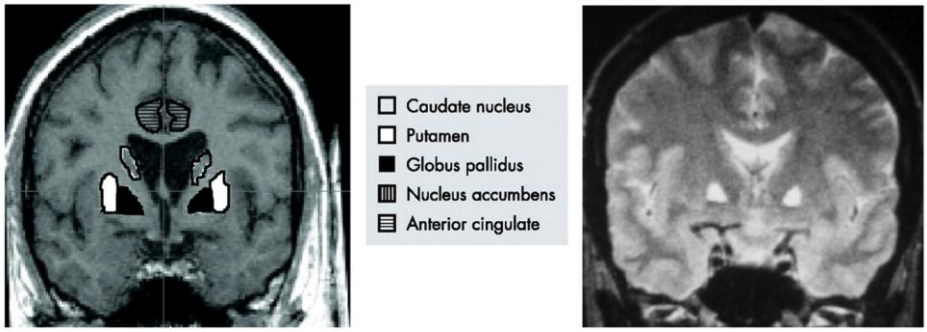
Attention Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder,

Depression, Schizophrenia...

Behavioural Abnormalities (8)

Other examples of basal ganglia dysfunction

Abulia/Athymhormia Caused by Lesions of the Globus Pallidus/Striatopallidal Pathway



"The essential semiological finding presented by these two patients consists in a profound inertia … [a]ction is impaired in its initiation and in maintenance as well … [a]ction is also impaired in its progress since it tends to stop unless kept up by external stimulation…"
Cited in Habib M (2004). 'Athymhormia and Disorders of Motivation in Basal Ganglia Disease', *J Neuropsychiatry Clin Neurosci* 16:509-524