Saccade Analysis

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Saccades

- Saccades--rapid movements of the eye that change point of fixation
 - Can be involuntary or voluntary (you can choose where to look), but reflexive (you don't consciously control the kinematics)
- Controlled by brain:
  - Frontal lobe, substantia nigra
  - Brainstem burst neurons (pulse)
  - Activation of extraocular muscles
  - Pulse height ~ peak velocity of saccades and density of action potential during saccade generation
 - Pulse amplitude ~ amplitude of saccade
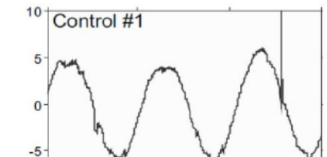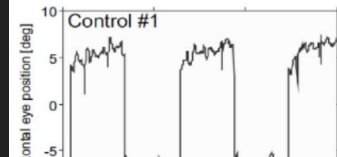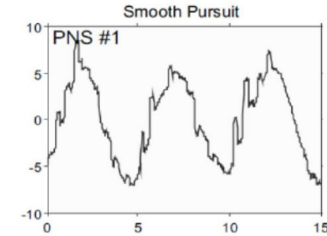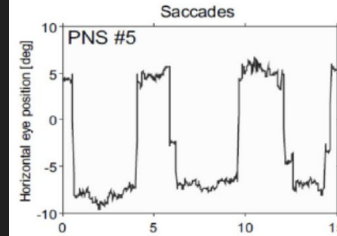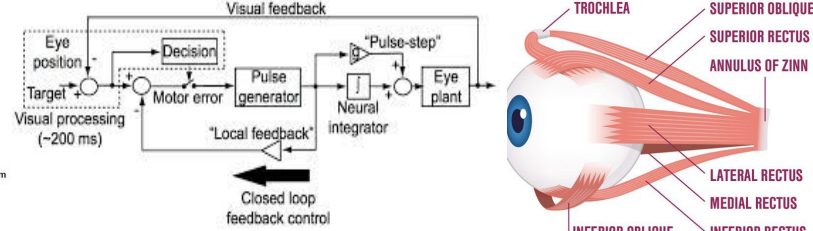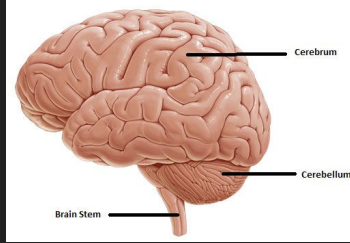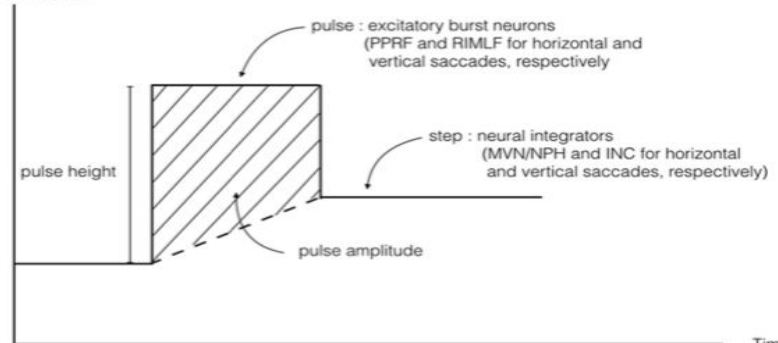
Decision Making, Motor Control, and Parkinson's Disease

- Parkinson's disease--caused by lack of dopamine
- Rate of misdiagnosis:
  - 20% of patients with Parkinson's disease who have come to medical attention have not been diagnosed with Parkinson's [2]
- Need: Make evaluations more objective (quantitative) and accessible
  - Saccade vigor-amplitude relationship: notable change in profile with surgical treatments for Parkinson's [1]
  - PD patients are slower (lower velocity)
 - Impairment in voluntary saccadic eye movements
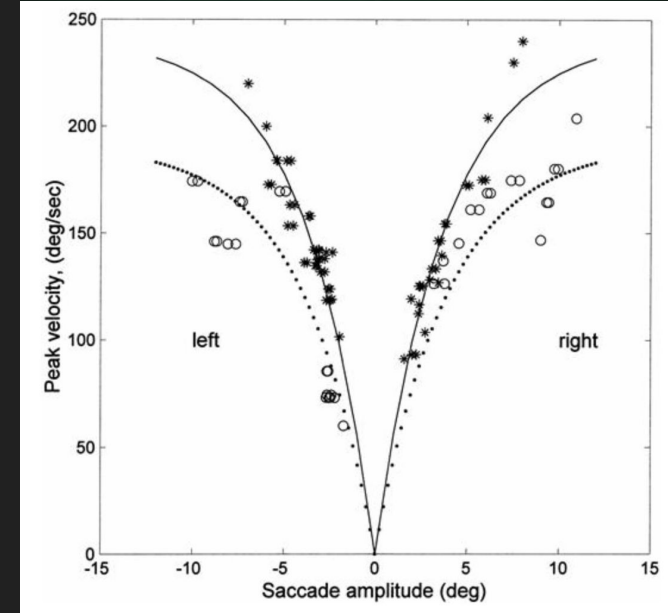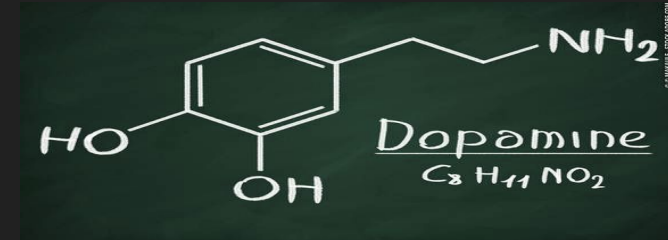
Pre and Post Surgical Peak Velocity vs. Amplitude for Anti-Saccades in Parkinson's
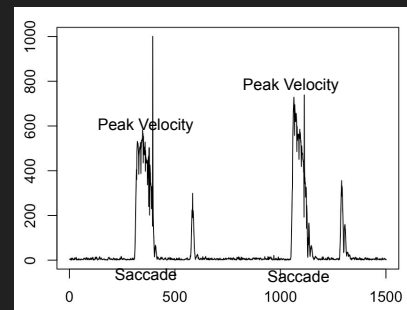
Saccade Analysis

- Input raw eye tracker data (MAT file)
- Filters position data using Savitzky-Golay filter
- Extracts maximum saccade velocity (vigor) for each saccade
- Provides comparison of movement vigor with amplitude of saccade
- Fits data using least squares method of curve fitting to the model equation, to find best parameters for hyperbolic model of saccade amplitude-vigor profile
- Comparison of model parameters between subjects, populations, pre- or post-treatment/surgery
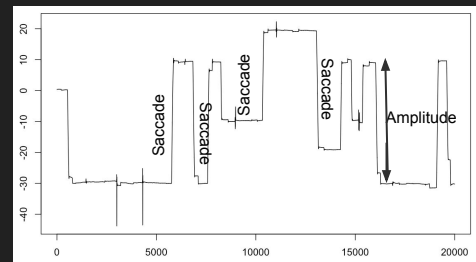
Velocity Data

Peak Velocity-Amplitude Profile

$$V = \alpha \left(1 - \frac{1}{1 + \beta x} \right)$$
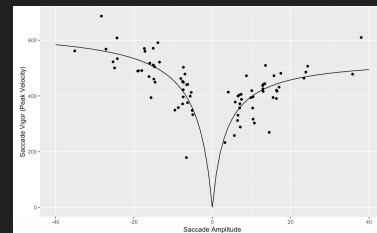
Saccade Data Analysis

Choose MAT File

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| Upload complete |

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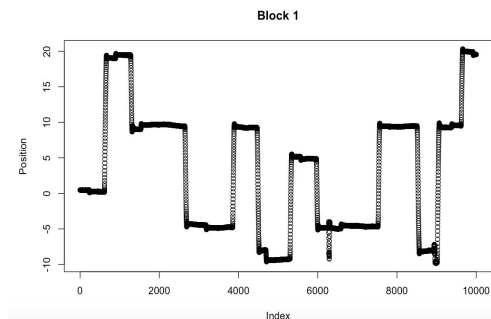| Browse... | DATA_ALL20.mat |
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1

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Comparison of Saccade Vigor-Amplitude Profiles

type
— Data Set 1
— Data Set 2

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References

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