

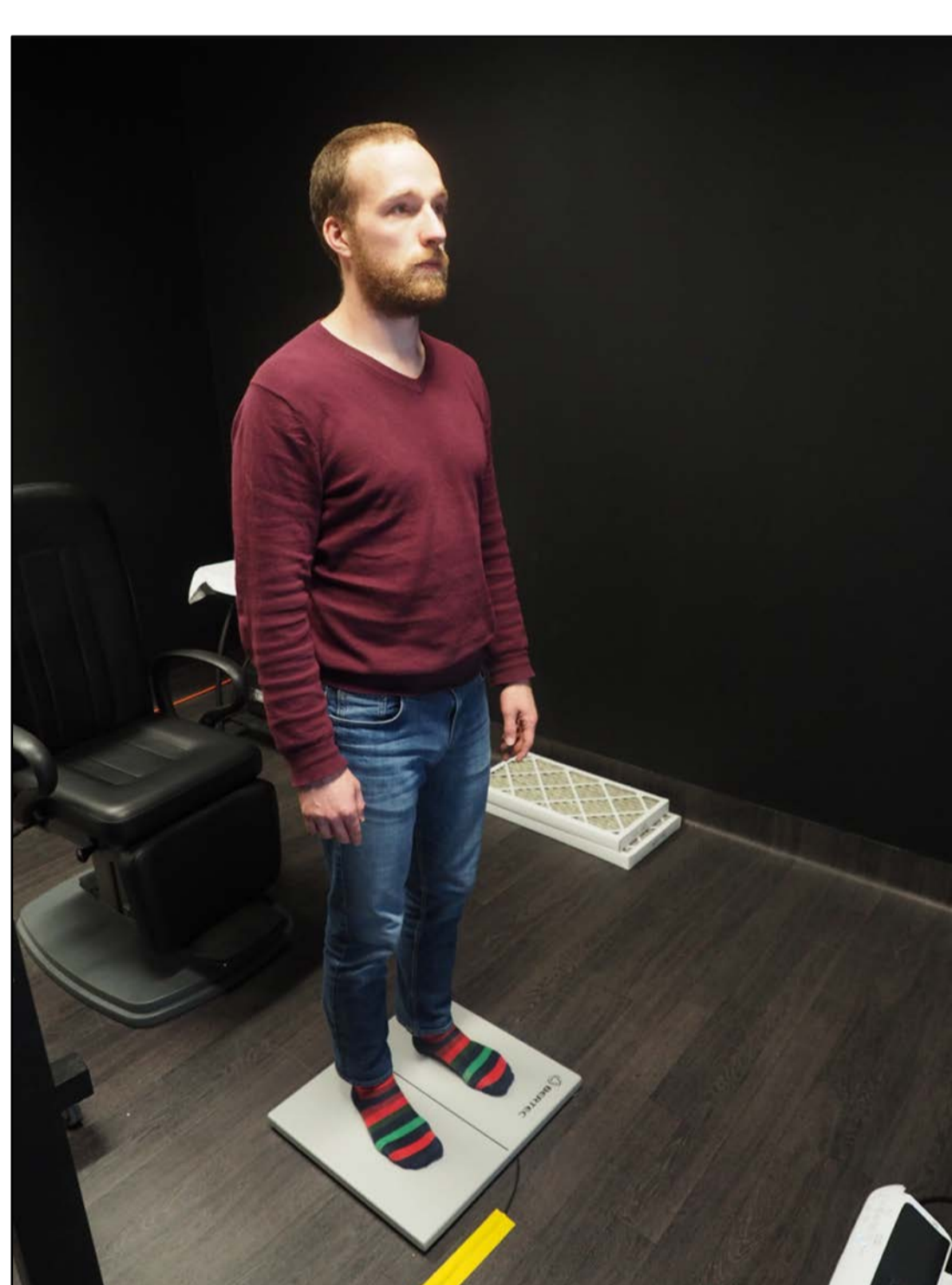


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# 'Postural sway and the contingent negative variation as objective measures of disease status in Parkinson's disease'

As presented at the ACT Multiple Sclerosis Symposium 2020

To identify objective measures of disease status, people with Parkinson's disease (PD) and controls performed postural sway (PS) and event-related potential (ERP) experiments, and underwent tests of cognition and quality of life. Motor and non-motor symptoms of PD were associated, and PS showed potential as a measure of disease status in PD. The combination of ERPs and machine learning showed promise as a diagnostic tool, as our algorithm reliably classified patients and controls.



## Postural sway and cognition

### Sway Measurement

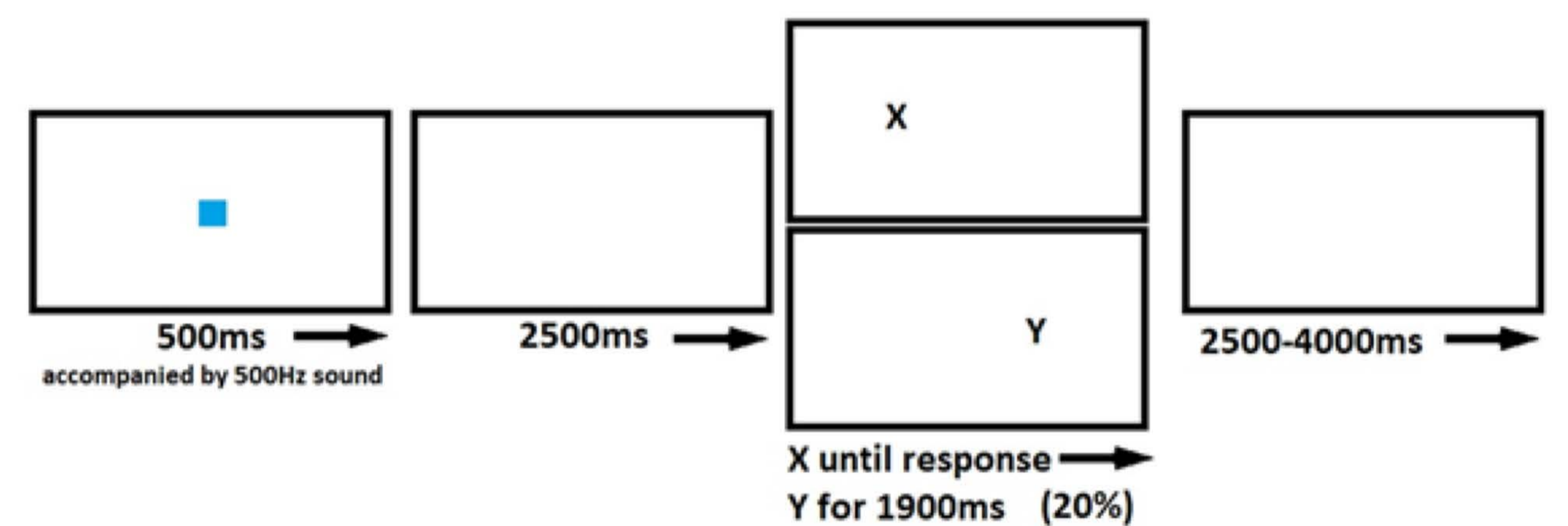
- BERTEC force plate
- Measured sway during quiet standing with eyes open and eyes closed

### Sway calculations

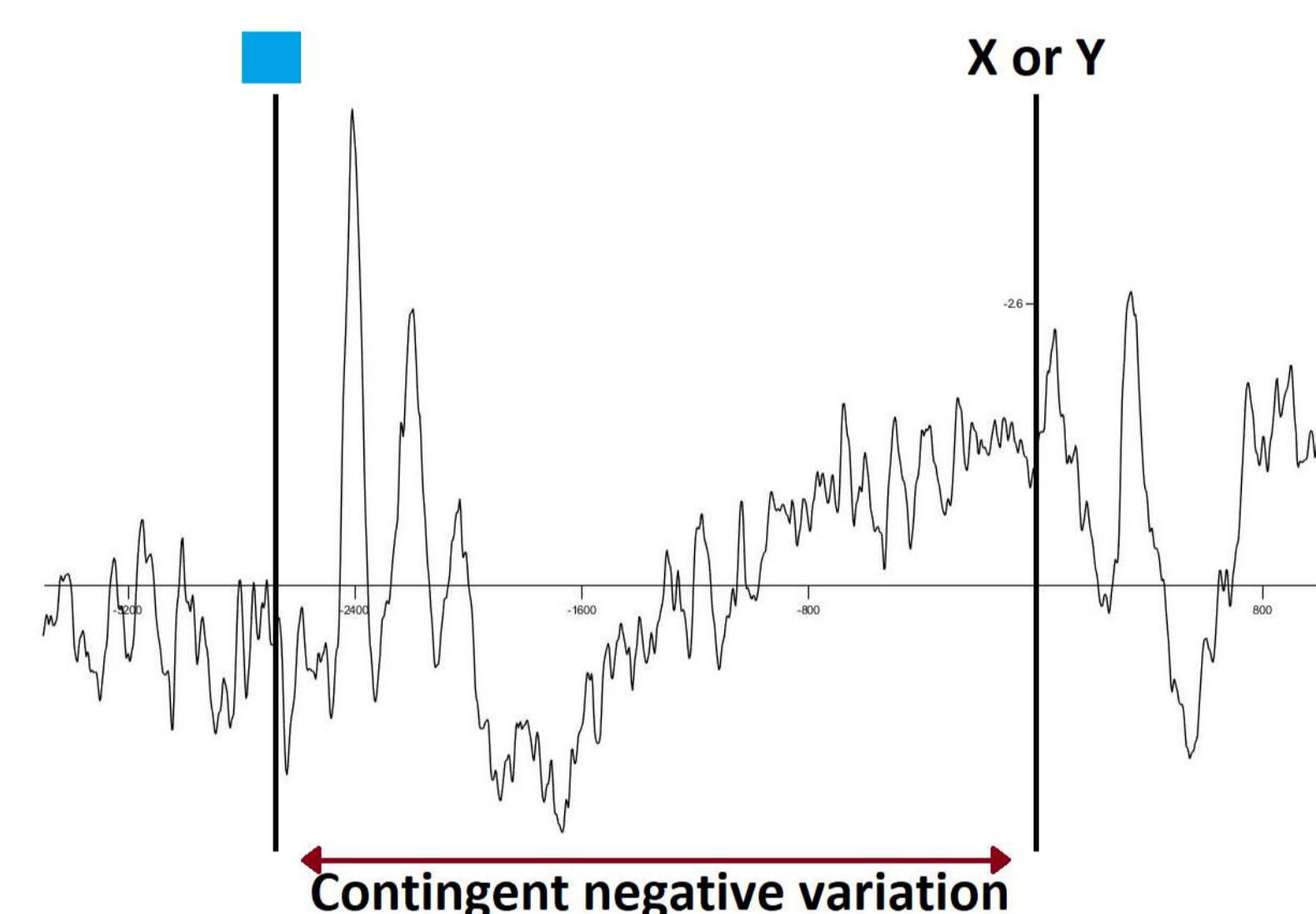
- Averaged 3 consecutive 20-s segments (after 1<sup>st</sup> 10 s)
- Measures: sway area, path length, SD (mediolateral and anteroposterior)

## Machine learning and the Contingent Negative Variation (CNV) Task

- Responded to X by pressing a button to indicate which side
- Withheld response to appearance of Y



### ERPs



- CNV differs between people with neurodegenerative diseases and controls
- Measured here with a 64-electrode BioSemi system

### Methods

- Data high-pass filtered (0.03Hz) and low-pass filtered (35Hz)
- Automatic artifact and electrode rejection
- Removed electrodes interpolated, ICA applied
- Data epoched and average ERPs calculated
- Data classified using a Support Vector Machine algorithm

### Results

11 People with PD correctly classified	4 People with PD incorrectly classified	14 People with PD correctly classified	0 People with PD incorrectly classified
4 Controls incorrectly classified	8 Controls correctly classified	1 Controls incorrectly classified	12 Controls correctly classified

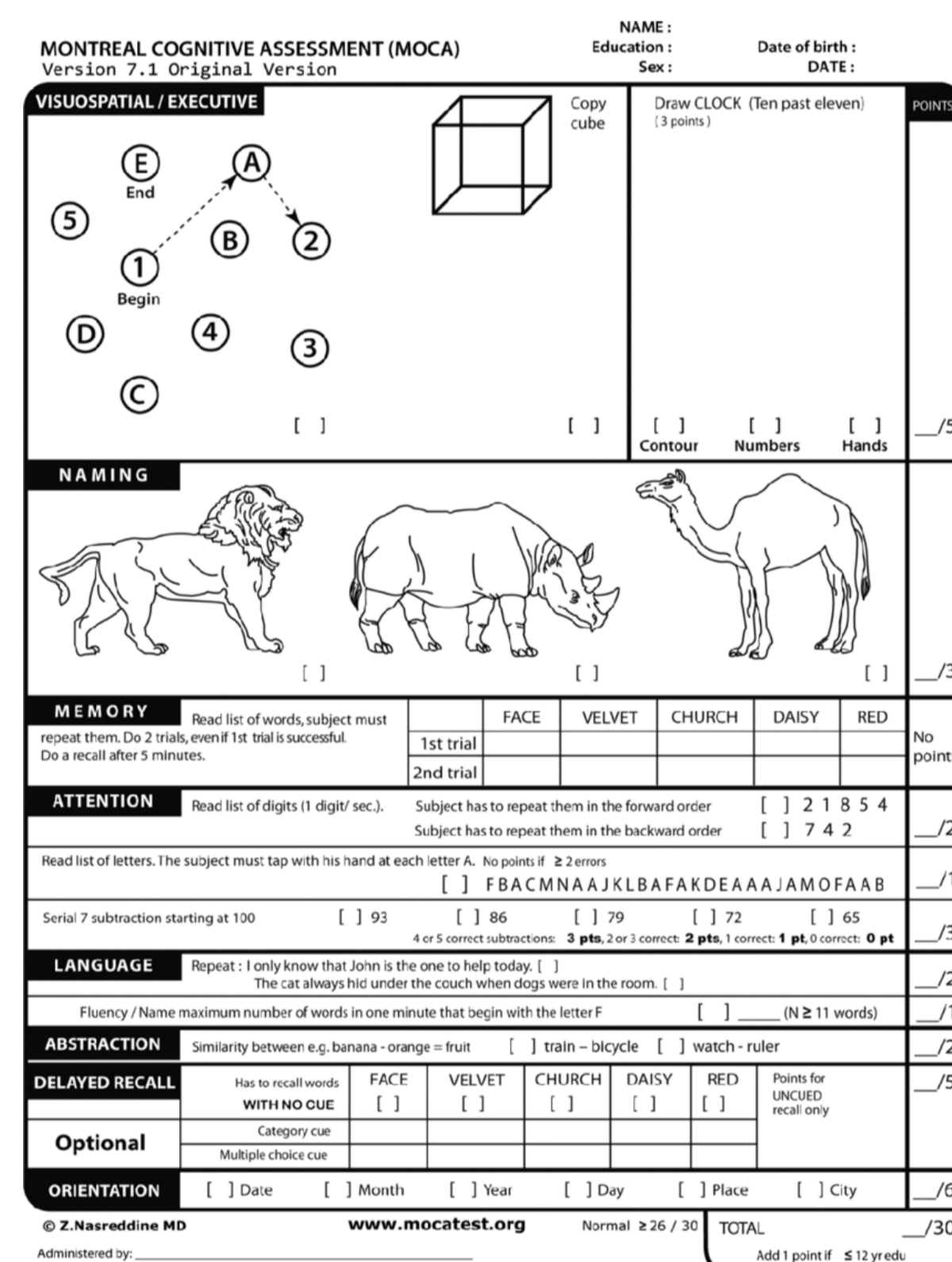
Classification using conventional ERP measures

Classification using PCA and 8 components

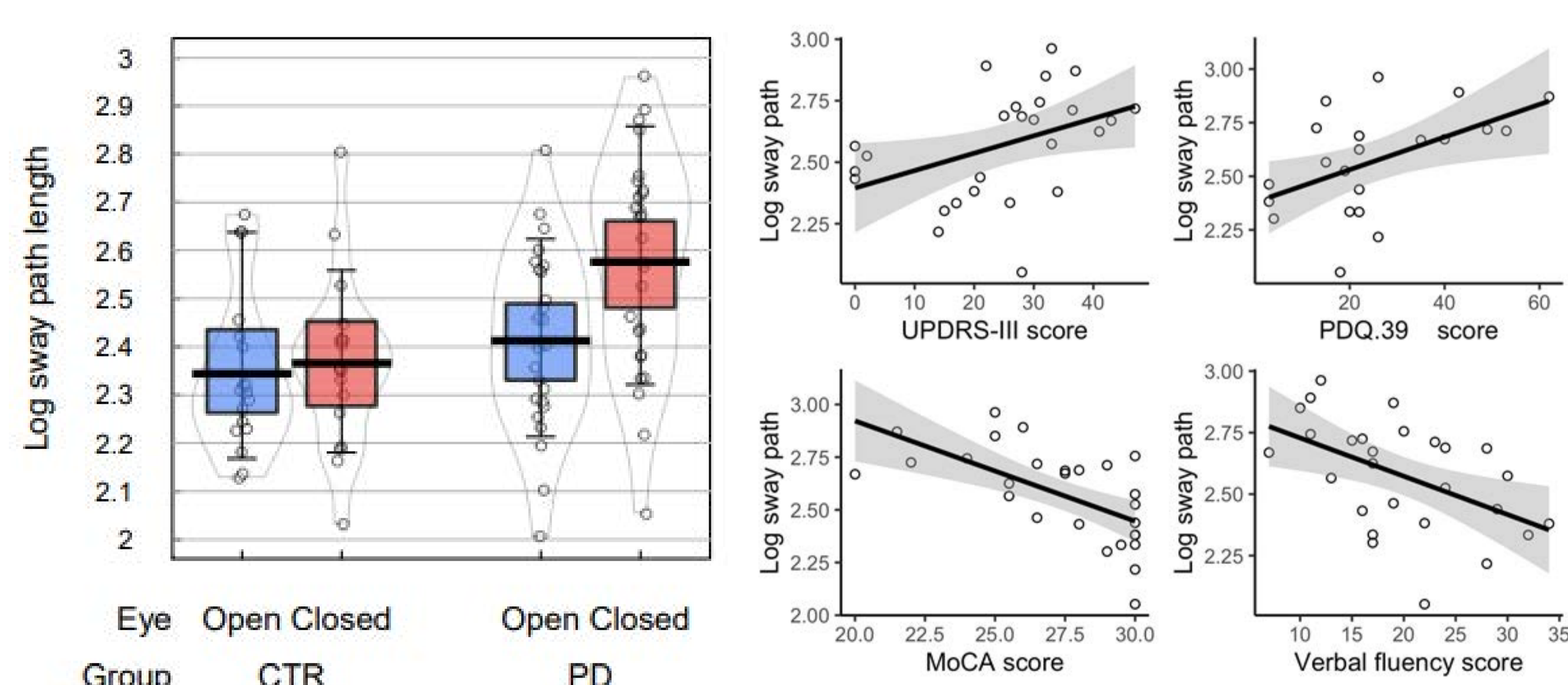
'Machine learning and the contingent negative variation for the classification of people with Parkinson's disease and controls'  
Robin Vlieger, Hanna Suominen, Elena Daskalaki, Deborah Apthorp, Christian J. Lueck

## Cognitive and clinical measures

- Montreal Cognitive Assessment (MoCA)
- Neuropsychiatry Unit Cognitive Assessment (NUCOG)
- Parkinson's Disease Questionnaire (PDQ-39) (for patients)
- MDS-UPDRS-III (motor component)



### Results



## 'Postural sway correlates with cognition and quality of life in Parkinson's disease'

Deborah Apthorp, Alex Smith, Susanne Ilschner, Robin Vlieger, Chandi Das, Christian Lueck, & Jeffrey C. L. Looi

The study is part of a larger project, the 'Our Health in Our Hands' ANU Grand Challenge, which aims to develop the application of personalised medicine.