



# Virtual, Physiological and Computational Neuromuscular Models for the NoTremor Predictive Treatment of Parkinson's Disease

## What is Parkinson's Disease

Parkinson's is a progressive neurological condition. People with Parkinson's don't have enough of a chemical called dopamine because some nerve cells in their brain have died. Without dopamine people can find that their movements become slower so it takes longer to do things. The main symptoms of Parkinson's are tremor, rigidity and slowness of movement.

Why me?

How did I get it?

Is there a cure?



Will my children get it?

**There's currently no cure for Parkinson's and we don't yet know why people get the condition.**

Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's disease and is expected to impose an increasing social and economic burden on societies as populations age.

## The project's approach

NoTremor will integrate computational models of the basal ganglia and brainstem into a unique **multi-scale parametric computational model** that can be subsequently simulated in the NoTremor simulation engine in a physics-based manner. NoTremor will revolutionize research in the pathophysiology of neurodegenerative movement disorders and provide a **novel approach for their analysis founded on a solid computational modelling basis** that links midbrain degenerations to motor behavior. The computational models will be quantified and validated through **test campaigns** with a very large cohort of PD patients.

## How We will Do this?

### Everyone Is Different

One of the biggest challenges for treating Parkinson's is the individual and unpredictable nature of the condition.



**Parkinson's affects everyone differently – people may experience a wide range of symptoms and the condition progresses in different ways in different people.**

The topic of personalised medicine is increasingly becoming a key area for medical experts and researchers to focus on. The NoTremor project is part of this field of research.

Research will focus on improving the understanding of low-level functions of the basal ganglia, striatum, the substantia nigra and the interaction of these systems with motor cortex and the brainstem control of the musculoskeletal system.

The specific objectives of NoTremor are:

- **Objective 1: Provision of novel patient-specific parametric computational models**
- **Objective 2: Coupled cognitive-motor simulation engine**
- **Objective 3: Inverse simulation for clinical state assessment and progress monitoring**
- **Objective 4: Analytics and new metrics for simulated evaluation and monitoring of medical treatment**
- **Objective 5: Test campaigns with beneficiaries**



## Seeing the Future with NoTremor

"Claire Bale, Research Communications Manager at Parkinson's UK, said:

"We're delighted to be a partner in this innovative and ambitious project because it could have a profound impact for people living with Parkinson's and their families.

"The tools they plan to develop really could help us to see into the future of people with Parkinson's – something that is often a source of uncertainty and worry.

"This would not only give us the chance of providing the best possible care for each individual, but would also give us the opportunity to try and prevent certain symptoms that may appear further down the line."

\*See more at: <http://www.parkinsons.org.uk/news/3-february-2014/new-project-launches-predict-parkinsons-progression>



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