

Parkinson's Research Outreach Network at the University of Hertfordshire

Report on 'PRONET PhD research sharing event: Parkinson's movement, the brain and beyond', Fielder Centre, University of Hertfordshire, Hatfield, 25 February 2026

PRONET

The Parkinson's Research Outreach Network at the University of Hertfordshire (PRONET at UH) aims to bring together people interested in research into Parkinson's to exchange information and discuss ideas. Importantly, the network provides a forum for exchanges in more than one direction, for researchers to talk with people with Parkinson's about their research findings, and for people with Parkinson's to talk with researchers about living with Parkinson's and the issues they would like research studies to investigate.

The focus of the present PRONET event was research relevant to Parkinson's undertaken by PhD students in the early stages of their research careers. PhD students typically study for around 3 or 4 years under the supervision of an experienced researcher, undertaking a series of research investigations on a specific topic and exploring that topic in some depth. The research findings are then written up in a thesis that is examined by two independent experts on that topic. The finished PhD theses are published on the University of Hertfordshire website and outcomes of the research studies may also be presented at conferences and published in scientific journals.

The PhD Research Sharing event

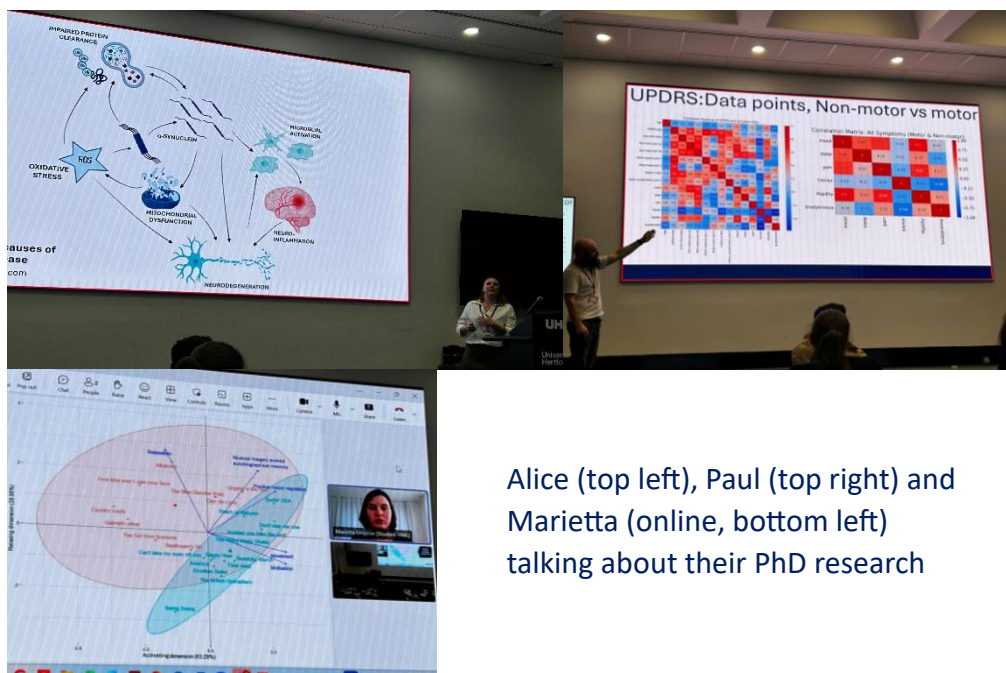
The event at the Fielder Centre, the University of Hertfordshire conference centre in Hatfield, and was attended by 51 people, including people with Parkinson's and their family members, PhD students and their research supervisors, other UH researchers and clinicians.

The PhD students displayed posters that summarised their research studies. Attendees asked questions and chatted with the PhD students about their research as they stood by their posters. This format gave the PhD students the opportunity to meet with and hear the views of people with Parkinson's, and for people with Parkinson's to learn about research underway at the University of Hertfordshire. Explaining their research by presenting a poster as they would at a scientific conference is useful experience for the PhD students.



A wide range of research topics were represented in the posters, some studies investigating novel drugs with the potential to become treatments for Parkinson's, and others aiming to better understand basic mechanisms underlying the control of movement and how genetic changes affect nerves and muscles. Some posters described the early stages of the PhD students' research, while others reported research findings from recently completed PhDs.

Three of the PhD students also gave short talks about their research: Alice Kingslake talked about processes involved in the death of dopamine neurons in Parkinson's and her research investigating drugs that may protect dopamine neurons; Paul Moran spoke about measuring microRNAs in the saliva of people with Parkinson's (microRNAs are small molecules that can modify the instructions from genes to produce proteins); Marietta Ungerer talked about her research investigating how imagining musical tunes may be a useful strategy to help people with Parkinson's move and feel better.



Alice (top left), Paul (top right) and Marietta (online, bottom left) talking about their PhD research

Summaries of the posters

1. CHRISTINE CAINE: The effect of resistance exercise on brain-related biomarkers, cognitive function and physical fitness in older adults

It is well known that exercise has many benefits for our overall health. Most research to date focuses on aerobic exercise such as running or cycling. I am investigating whether resistance-based exercise (lifting weights) can have a positive impact on our brains. Our blood contains many biologically active proteins, some of which are beneficial to our brains such as BDNF (brain derived neurotrophic factor, important for learning and memory), and others which may be detrimental such as alpha-synuclein which when it clumps up in the brain can lead to conditions such as Parkinson's or dementia with Lewy bodies. I plan to measure these proteins in older adults both before and after the weight training programme to see if the levels of these proteins change following the exercise.

2. WAEL MUSTAFA: Neuroprotection through anti-inflammatory action of an aryl-piperazine sulphonamide in a Parkinson's disease in vivo model

This study investigated whether a novel drug with the potential to protect brain cells, the aryl-piperazine sulphonamide APS 4207, can protect dopamine neurons in a model of Parkinson's. The research used a rat model of Parkinson's in which the neurotoxin 6-OHDA (6-hydroxydopamine) was used to destroy dopamine neurons on one side of the brain. Treatment with APS 4207 spared dopamine neurons and improved the rat's ability to use their paw on the affected side. The drug treatment also reduced inflammation in the brain caused by the neurotoxin, measured as reduced microglial and astrocyte activation, and decreased oxidative stress markers. These findings suggest that APS 4207 can protect dopamine neurons through anti-inflammatory mechanisms and may represent a promising therapeutic strategy for slowing the progression of Parkinson's.

3. WAEL MUSTAFA: Neuroprotective effect of an aryl-piperazine sulphonamide in an inflammatory model of Parkinson's disease

This research used lipopolysaccharide, a large molecule that activates the immune system, to damage dopamine neurons, modelling the inflammation thought to be involved in the loss of dopamine neurons in Parkinson's. The lipopolysaccharide was injected above the substantia nigra on one side of the brain in rats. The novel drug APS 4207, an aryl-piperazine sulphonamide, was given 30 mins before and 30 mins after the lipopolysaccharide to one group of rats, whereas another group of rats received control injections of saline instead. More dopamine neurons survived in the brains of the rats treated with APS 4207 compared with those given saline. There was also less inflammation, measured as fewer microglia and activated astrocytes, in the APS 4207 treated rats. This research shows the drug APS 4207 can reduce inflammation in the brain and potentially might slow the progression of Parkinson's.

4. KIANA HASSANKHANI: Effect of $\alpha 4\beta 2$ nicotinic acetylcholine receptors on L-dopa induced dyskinesia in 6OHDA rat model of Parkinson's disease

Dyskinesia (uncontrollable movement) is an unfortunate side effect of levodopa treatment, the drug commonly prescribed to alleviate the motor symptoms of Parkinson's. Nicotine has previously been shown to reduce the development of levodopa-induced dyskinesia. This study explored whether drugs specifically targeting $\alpha 4\beta 2$ nicotinic acetylcholine receptors could provide relief from levodopa-induced dyskinesia while avoiding adverse effects of nicotine. The drugs were tested in rats in which abnormal involuntary movements (equivalent to dyskinesia) were induced by levodopa after dopamine neurons had previously been destroyed by the neurotoxin 6-hydroxydopamine. Drugs acting on the $\alpha 4\beta 2$ nicotinic acetylcholine receptors were found to reduce the levodopa-induced abnormal involuntary movements.

5. ALICE KINGSLAKE: Effects of nicotine and varenicline on cognition in parkinsonian rats

Dopamine dysfunction contributes to cognitive impairments in Parkinson's. Since the drug nicotine has previously been shown to enhance cognitive performance, the effects of nicotine and varenicline (a drug that also acts on nicotine receptors and alleviates smoking cravings) on working memory and cognitive flexibility were examined in a rat model of Parkinson's. The

working memory task involved rats remembering scents cues to find hidden food rewards. The cognitive flexibility task required the rats to switch between poking their nose into one hole into a different hole for food reward. Neither nicotine nor varenicline improved performance on these tasks in the rats with dopamine loss.

6. ALICE KINGSLAKE: Neuroprotective properties of arylpiperazine-sulphonamides in *in vitro* models of Parkinson's disease

Treatments are needed that slow the progression of Parkinson's. Novel arylpiperazine-sulphonamide (APS) compounds were evaluated for their ability to protect neurons against damage in a cell model of Parkinson's. Cells in a dish (*in vitro*) were exposed to the neurotoxins MPP+ or lactacystin. These toxins disrupt mitochondria and impair protein clearance, respectively, processes implicated in the mechanisms underlying Parkinson's. The cells damaged by the toxins were also treated with a range of doses of four different APS compounds. The most effective APS compounds that protected cells against MPP+ and lactacystin mediated cell death were APS 4207 and APS 4133. Further studies will evaluate these compounds in animal models of Parkinson's (see Wael Mustafa posters).

7. WILL POWELL: The neuroprotective properties of NLX-112 in MPTP treated mice are mediated by inhibition of reactive microgliosis and upregulation of astrocytic GDNF

The drug NLX-112 (also known as befiradol) has been shown in a clinical trial to reduce dyskinesias in people with Parkinson's. The present research study investigated whether NLX-112 also has the potential to protect dopamine neurons against damage. The study used a model of Parkinson's in which mice were treated with the neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). MPTP caused a loss of dopamine neurons from the substantia nigra and dopamine fibres from the striatum. Treatment with NLX-112 rescued dopamine neurons and fibres from the damage caused by the MPTP. Inflammation was reduced and the growth factor GDNF increased in the brains of the mice treated with NLX-112, countering the damaging effects of the MPTP. These findings demonstrate NLX-112 has the potential to protect dopamine neurons in Parkinson's.

8. ABUL-AZIM HASSAN: Loss of KCNQ4 encoded K+ channel (Kv7.4) protein in the gastrointestinal tract of MPTP treated primate model of Parkinson's disease

Gastrointestinal issues like constipation are common in Parkinson's. This study investigated a potential underlying cause by examining the muscles of the digestive tract. We focused on the Kv7.4 protein, a potassium channel that helps regulate the contraction and relaxation of intestinal smooth muscle essential for moving food through the intestines. Using a marmoset model that mimics aspects of Parkinson's, the study found a significant reduction of Kv7.4 protein in the small intestine when compared to healthy animals. This loss suggests that the gut's muscle function may be impaired, potentially leading to the digestive slowdown experienced in the disease. As these initial findings are from an animal model, the next step is to determine if a similar change occurs in people with Parkinson's. Confirming this link could guide the development of new treatments aimed at improving gastrointestinal function.

9. PAUL MORAN: Salivary MicroRNA Signatures in Parkinson's Disease: Functional Role and Clinical Relevance

MicroRNAs are small molecules that can silence the expression of genes and hence disrupt the production of proteins. MicroRNAs do this by interfering with messenger RNA that carries information from the genes to the cell machinery that produces proteins. As microRNAs are present in the body, including in saliva, they may be a useful marker to detect disease processes. In the present study, microRNA levels were measured in saliva collected from people with Parkinson's to compare these with microRNA levels in people who do not have Parkinson's. The research identified two novel microRNAs present in the Parkinson's samples that were absent from the control samples, and two further microRNAs that were lower in the Parkinson's samples compared with controls. Interestingly, the levels of some of these microRNAs correlated with Parkinson's symptoms measured by the Unified Parkinson's Disease Rating Scale (UPDRS).

10. MARIETTA UNGERER: Musical imagery as a strategy to help people with Parkinson's move and feel better

Musical imagery refers to the mental representation of music in the mind in the absence of any external sound. People with Parkinson's were first interviewed to find out how they use musical imagery in their day-to-day lives. From these interviews, 5 uses were identified: personal memories, movement, mood, motivation, and relaxation. A larger group of people with Parkinson's, and older and younger adults, then rated a selection of 22 pieces of music on each of the 5 functions. For example, 'Don't stop me now' by Queen was rated highly for motivation and mood, 'Albatross' by Fleetwood Mac for relaxation, and 'Surfin' USA' by the Beach Boys for personal memories. Software tools were used to analyse musical characteristics of the 22 pieces of music, for example rhythm, loudness, energy. Relationships between these musical characteristics and the uses of musical imagery were identified using statistical modelling. The findings from this research can be used to help find music recommendations and create playlists appropriate for the needs of people with Parkinson's.

11. EMILI PLASTIRA: Targeting Charcot-Marie-Tooth (CMT) disease in the nematode *Caenorhabditis elegans*

My project focuses on Charcot-Marie-Tooth disease (CMT), a genetic condition that affects the nerves connecting the brain and spinal cord to the rest of the body. CMT can cause muscle weakness, problems with balance, changes in foot shape, and reduced sensation in the hands and feet. Around 2.5 million people worldwide live with CMT, and currently there is no treatment that can stop the disease from getting worse. To study CMT, I use a tiny worm called *Caenorhabditis elegans*. Even though it is very small, it has many of the same genes as humans. By creating worms with the same genetic changes seen in people with CMT, I can study how the disease affects nerves and muscles and explore possible directions for new treatments.

12. SAMAN RASHID: Dopamine Receptor D2 contributes to the phenotypic severity in a *C. elegans* model of spinal muscular atrophy

Spinal muscular atrophy (SMA) is a devastating neuromuscular disorder that mostly affects children. The disorder leads to reduced mobility and, in severe cases, infant death. During

development of the disease, autophagy - which is the body's recycling system, involved in protecting cells - is impacted. We used a tiny worm, known as *C. elegans*, to understand exactly how autophagy is affected in SMA. To do this, we first visualised autophagy in different parts of SMA worms. We then treated our worms with autophagy drugs and found that the ones which increased autophagy activity made the SMA worms move more and survive longer. Finally, we investigated how the drug that showed the best improvement of SMA symptoms, fluphenazine (a drug that blocks dopamine receptors), works within cells. Using this knowledge and our worm model, we can contribute towards improving SMA treatments further.

13. KHURRAM MUSHTAQ: A new wearable hand vibration glove to improve movement in people living with Parkinson's

My research is about a new wearable device designed to support people living with Parkinson's. The device gently delivers carefully coordinated vibration patterns to the back of the fingers, which aim to help reset abnormal brain activity linked to movement difficulties. By reducing the brain's over-synchronised activity, the goal is to improve overall movement, including slowed movement or episodes where walking suddenly freezes. Unlike Deep Brain Stimulation, this approach does not require surgery and uses gentle vibrations applied through the fingers. This project is currently awaiting ethics approval before starting to collect data.

14. EVA LESOVSKAYA AND CHRISTY GOODRO: Time-to-contact perception and navigation skills in autism: evidence from two virtual tasks

Previous research studying motion prediction and wayfinding in autism has found mixed results. Some studies suggest autistic people have difficulties in these areas, while others show strengths. To better understand this, we tested autistic and non-autistic adults on a video task estimating motion timing and playing a mobile navigation game. The motion timing task involved judging when a human avatar or a car would reach a red line, the background scene including rich environmental cues or a black background. The navigation task used the Sea Hero Quest computer game involving memorising a map and following a route. Overall, the findings suggest that autistic performance in motion prediction and navigation depends on the richness of environmental cues.



Khurram (left) and Saman (right) explaining their research at their posters

Feedback

Feedback gathered from the audience at the end of the session was in general agreement that the event was very informative and interesting, although some of the science was rather too technical. This is useful feedback for us to work on to make explanations of research clearer for a general audience. Specific comments included:

“Very informative event and useful to hear what PhD student are currently researching. Info was largely accessible to non-academics/experts”

“Very interesting, just a little too technical for us!! Great that so much research is taking place and results are very positive. Students explained in a simple way making things clearer.”

“Although very interesting, we did find the information very scientific and went ‘over our heads’. Full marks to all the students and good luck to them for their efforts and hard work.”

“Lovely to meet up with and make new “friends” with Parkinson’s. Well balanced with enough breaks giving the opportunity to chat. I find I learn something(s) new each time ...”

Thank yous

Thank you to all who attended and contributed to the ‘PRONET PhD research sharing event: Parkinson’s, movement, the brain and beyond’.

In particular, thank you to the PhD students for taking the time to create the posters and come to the event to talk about their research. Thank you also to the PhD students’ supervisors for their support.

We gratefully acknowledge funding from the Economic and Social Research Council (ESRC), part of UK Research and Innovation, through an award from the University of Hertfordshire’s ESRC Impact Acceleration Account that supports PRONET.

Dedication

This report is dedicated to Dr Ruth Herman, a founding member of PRONET and active member of our steering group. The ‘PhD research sharing event’ was partly inspired by Ruth’s suggestion of holding something like ‘speed dating’ event where members of the public and PhD students would sit down together and the students explain their research in plain words in just a few minutes. Ruth was passionate that it should be possible to explain scientific research in a straightforward way to be understandable by all. The present event gave PhD students the opportunity to practice this skill by explaining their research to members of the general public,

including people with Parkinson's and their family members, interested in finding out about research relevant to Parkinson's.

Future events

If you are not already on the PRONET mailing list and would like to receive information about future events, please contact pronet@herts.ac.uk to ask to join the mailing list.

If you are interested in a particular research topic relevant to Parkinson's and would like PRONET to focus on that topic at a future event, please contact the PRONET team by email at pronet@herts.ac.uk. We look forward to hearing from you.

For reports on past PRONET events and information about upcoming events, please see the PRONET website <https://www.herts.ac.uk/research/centres/psychology/movement-psychology-research-group/parkinsons-research-outreach-network-pronet>

This report was written Lucy Annett, on behalf of the PRONET steering group: Lucy Annett, Rosie Brewis, Becki Hadley, David Harris, Mahmoud Iravani, Vivienne Levy, Khurram Mushtaq, Mike Pye and Nada Yousif.

