

Mind in Motion

Advancing digital neuro-rehabilitation

N-CODE Hot Topic Workshops

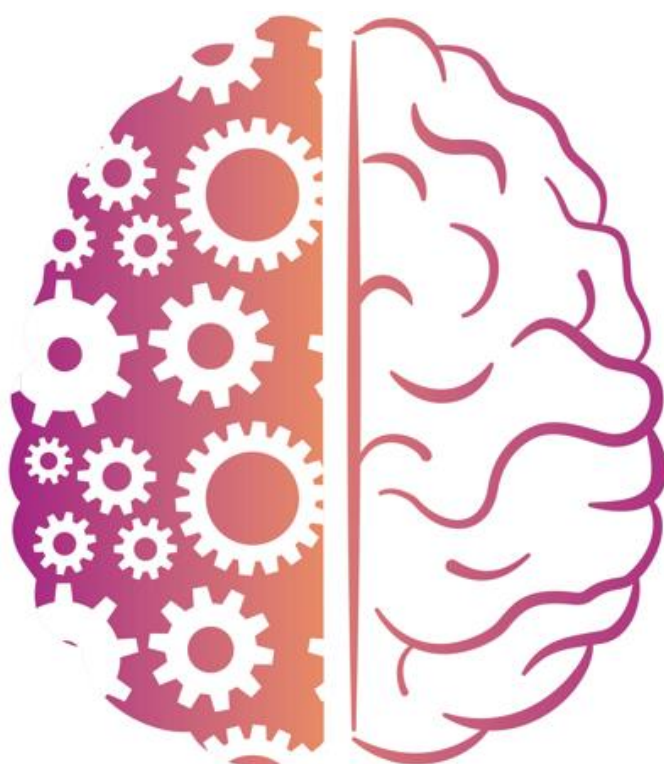
Monday 30 September

University of Birmingham

N·CODE

UNIVERSITY OF
BIRMINGHAM

CHBH
CENTRE FOR HUMAN BIODIVERSITY HEALTH



Workshop Brochure

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ORGANISING COMMITTEE

Chair and Lead Organiser:

- Dr Katja Kornysheva, Centre for Human Brain Health and School of Psychology, University of Birmingham

Co-organisers:

- Dr Dave Punt, Physio for Stroke, Centre for Movement and Wellbeing, School of Sports and Exercise Sciences, University of Birmingham
- Dr Ned Jenkinson, Centre for Human Brain Health and School of Sports and Exercise Sciences, University of Birmingham
- Martin Geiger, Centre for Human Brain Health and School of Psychology, University of Birmingham (ECR)

Supported by:

This workshop is funded by the **EPSRC/MRC N-CODE Network+** and the **College of Life and Environmental Sciences, University of Birmingham**.

VENUE

Edgbaston Park Hotel
53 Edgbaston Park Road
Birmingham
B15 2RS

The workshop will take place at Edgbaston Park Hotel, which is a short walk from our University Train Station.

The hotel is marked as G23 in the green zone on the campus map, which is available to view/download [here](#).

The workshop will be held in the Lloyd suite (opposite the main hotel building).



WORKSHOP PROGRAMME

08.30-09.00	Registration and refreshments
09.00-09.15	Introduction to the “Mind in Motion” workshop Dr Katja Kornysheva, (Centre for Human Brain Health, University of Birmingham)
Neuro-rehabilitation: status quo and challenges	
09.15-09.45	Half a world away: is stroke rehabilitation research running to stand still? Dr David Punt (University of Birmingham & Birmingham Community Healthcare NHS Trust)
09.45-10.15	Challenges of arm rehabilitation after stroke Dr Ulrike Hammerbeck (King's College London)
10.15-10.45	Neurorehabilitation in movement disorders Dr Ben Wright (Queen Elizabeth Hospital Birmingham/University Hospitals Birmingham)
10.45-11.15	Refreshment break
11.15-11.45	Challenges and opportunities in continuing rehabilitation after spinal cord injury Dr Shin-Yi (Chloe) Chiou (University of Birmingham)
11.45-12.15	Overcoming the invisible consequences of spinal cord injury using neurotechnology Dr Tom Nightingale (University of Birmingham)
12.15-12.45	Recovery: lived experience of post stroke improvement via involvement in stroke research trials Brin Helliwell (Independent Stroke Research Advisor)
12.45-14.00	Lunch and networking
Neuro-rehabilitation tomorrow: pathways for innovation through digital neurorehab	
14.00-14.30	Rhythms of Recovery: brain activity as a marker for post-surgical cognitive health Dr Ali Mazaheri (University of Birmingham)
14.30-15.00	What is really happening when we train the damaged nervous system? Dr John Krakauer (Johns Hopkins University)
15.00-15.30	Refreshment break
15.30-16.15	Industry blitz-talks and demos (Industry R&D representatives leading hands-on activities)
16.15-16.45	Discussion Panel: the future of neuro-rehabilitation - priorities for research and practice Dr John Krakauer (Johns Hopkins University) Dr Dave Punt (School of Sport, Exercise and Rehabilitation, University of Birmingham) Dr Ulrike Hammerbeck (King's College London) Dr Benjamin Wright (Queen Elizabeth Hospital Birmingham/University Hospitals Birmingham) Dr Joe Galea (University of Birmingham) Chair: Katja Kornysheva (Centre for Human Brain Health, University of Birmingham)
16.45-17.00	Close

SPEAKER INFORMATION

(in programme order)

Half a world away: is stroke rehabilitation research running to stand still? Dr David Punt, Associate Professor/Honorary Physiotherapist, University Of Birmingham & Birmingham Community Healthcare NHS Trust

Abstract:

Over the last 30 years, there has been a huge increase in stroke rehabilitation research including hundreds of randomised controlled trials and systematic reviews; and in the UK, we are now on the 6th edition of clinical guidelines. There have also been multiple initiatives designed to enable stroke survivors to benefit from the explosion in neuroscience research that has taken place during the same period. But are stroke survivors today better off as a result? I will discuss my own perspectives on the progress made in stroke rehabilitation during my career to date and consider priorities for the future.

Biography:

Having qualified as a physiotherapist in 1990, Dave spent the first decade or so of his career working in the National Health Service (NHS) specialising in stroke rehabilitation. He also spent a year working as a physical therapist (stroke rehab) in the American Midwest. An interest in the neglect syndrome following stroke led him to undertake a PhD exploring neglect-related movement problems. Since then, he has mainly worked in the university sector but remains clinically active in the NHS. His research is mainly concerned with conducting lab-based experimental studies exploring movement and cognition, typically with implications for the rehabilitation process. For the past five years, he has led the physiotherapy programme at the University of Birmingham. He has recently established a student-staffed 'Physio for Stroke' service at the university, funded by an award from NHS England.

Challenges in arm rehabilitation after stroke Dr Ulrike Hammerbeck, Lecturer, King's College London

Abstract:

Arm recovery after stroke remains poor with most stroke survivors making an incomplete recovery. In this talk Ulrike Hammerbeck will aim to summarise the current understanding of the underlying reasons for this poor discovery. By considering the underlying mechanisms of impairment and recovery she will outline current best practice and the potential of new therapeutic targets for arm rehabilitation. She will conclude by considering high priority future research areas to advance the field and outcome for stroke survivors.

Biography:

Ulrike Hammerbeck is a Lecturer in Neural Control of Human Movement in the Centre for Human and Applied Physiological Sciences at King's College London. She is interested in recovery mechanism of function after neurological insult. Her

research investigates the effect of training not only on the control of movement but also on cortico-spinal connectivity. Her special interest is to compare arm recovery between ischaemic stroke and intracerebral haemorrhage survivors.

Neurorehabilitation in movement disorders

Dr Ben Wright, Consultant Neurologist, University Hospitals Birmingham NHS Trust

Abstract:

Movement disorders describe a group of conditions which affect how people move. These can broadly be split into conditions which cause too little movement and conditions that cause too much movement. This talk will give an overview of these using examples from the Neurology clinic. This will highlight the different rehabilitation issues that arise in different people even if they have the same condition.

Biography:

Ben is a Consultant Neurologist in Birmingham. His sub-specialist interest is in Parkinson's disease, dystonia and other movement disorders. Ben graduated from University College London. He completed postgraduate training in Cambridge and Birmingham.

Challenges and opportunities in continuing rehabilitation after spinal cord injury

Dr Shin-Yi (Chloe) Chiou, Associate Professor, University of Birmingham

Abstract:

In the UK, approximately 105,000 people live with spinal cord injuries (SCI), with 4,400 new cases each year - equating to one person becoming paralysed every two hours. SCI can happen to anyone at any age, and can arise from various causes, including road traffic accidents, workplace incidents, and surgical complications. Regardless of the cause, SCI is life-altering, profoundly affecting functions such as movement, sensation, and bladder and bowel control. Exercise interventions play a critical role in recovery; however, there is currently no NHS provision for community-based SCI rehabilitation services following discharge from acute inpatient care. Additionally, private rehabilitation services are expensive and inaccessible for many. Multiple barriers hinder individuals with SCI from engaging in exercise and physical activity, which in turn impacts their recovery and overall health. My group has been researching accessible exercise interventions aimed at enabling individuals with SCI to continue their rehabilitation outside of a hospital setting. Our goal is to promote both physical and psychological well-being among people with SCI. In this talk, I will discuss the common barriers to accessing rehabilitation and exercise for individuals living with SCI and share insights from our work on home-based and community-based arm cycling exercise programme designed for these individuals.

Biography:

Dr Shin-Yi's research focuses on neural control of human movement using state-of-the-art movement sensors, 2-D video cameras, and electrophysiological variables.

Her aspiration is to increase accessibility of rehabilitation services and subsequently improve patient outcome, particularly in individuals with spinal cord injury (SCI) and older people. To achieve this, Shin-Yi uses her training in science and physiotherapy to develop rehabilitation interventions that are innovative, mechanistic-based, and low-cost so that individuals can be in control of their own journey of recovery.

**Overcoming the invisible consequences of spinal cord injury using neurotechnology
Dr Tom Nightingale, Assistant Professor in Clinical Exercise Physiology, University of Birmingham**

Abstract:

Spinal cord injury (SCI) is a complex and devastating neurological condition that results in pervasive invisible consequences. This talk will focus on how damage to the spinal cord disrupts signals from the brain to the sympathetic nerves that are essential for involuntary control of the cardiovascular system. As such individuals with cervical and upper thoracic SCI commonly have low resting blood pressure and are not able to adapt appropriately to an acute bout of upper-body exercise, often resulting in premature fatigue, which can hinder rehabilitation efforts. The disrupted physiological responses to exercise probably explain why longer-term exercise training yields minimal returns on investment in this population. Dr Nightingale will briefly describe developments in the burgeoning field of spinal cord stimulation to treat various autonomic dysfunctions and discuss its application to augment exercise capacity in individuals with SCI. He will conclude by considering the challenges for implementation of spinal cord stimulation into practice and the potential of this neurotechnology to improve the health and wellbeing of individuals living with SCI.

Biography:

Tom is an Assistant Professor in Clinical Exercise Physiology at the University of Birmingham, School of Sport, Exercise and Rehabilitation Sciences. He is interested in understanding the impact of physical activity on cardiometabolic and cerebrovascular health outcomes in individuals with neurological conditions. Primarily, Tom's research has focused on the efficacy of therapeutic interventions (exercise and neuromodulation) to improve the health and wellbeing of individuals living with a spinal cord injury. Prior to starting at Birmingham, Tom worked as a Postdoctoral Research Fellow in the Faculty of Medicine, Division of Physical Medicine and Rehabilitation at the University of British Columbia. During this time, he also worked as an external research collaborator at the Hennepin Healthcare Research Institute in Minneapolis on the 'Epidural Stimulation After Neurologic Damage (E-STAND)' clinical trial. Tom maintains an ongoing affiliation with the world-renowned International Collaboration On Repair Discoveries (ICORD) spinal cord injury research centre in Vancouver, Canada.

Recovery: lived experience of post stroke improvement via involvement in stroke research trials

Brin Helliwell, Independent Stroke Research Advisor

Abstract:

This presentation is designed to inform attendees about the nature of living with a trauma induced stroke, and the way in which the use of well-developed PPI in your research and therapeutic work, can support the individual to improve as a form of active self-managed therapy. The presentation is a summary of 19 years of engagement with clinical academics in the development and delivery of over 150 RCTs and first-hand experience of neuroplasticity in action. Attendees will also get some guidance regarding how to avoid making the most common mistakes in order to optimise participation rates and the retention of research trial participants.

Biography:

Following a trauma induced ischaemic stroke in 2005, Brin was forced to take early retirement from his teaching and Senior Management roles at The Sixth Form College Solihull in 2008. After volunteering to participate in a stroke Rehabilitation trial in 2006 he was quickly recruited to several other research trials in Birmingham joining the WMSRN in 2009 and the National SRN Lay forum in 2010 where he sat on the Rehabilitation Clinical Studies group.

In 2010 he also joined the BBC CLAHRC and BBC Stroke and Cardiac Network. In the past 19 years he has continued to support Stroke Research trials as an advisor/collaborator/Co-applicant or member of trial steering groups across the U.K. He is a member of the NIHR HSRC and a lay reviewer for NETSCC.

His current research activity is focused upon supporting Prof. Christine Roffe's Hyper Acute research in Stoke on Trent, Prof. Fiona Rowe's Vision in Stroke research in Liverpool, Prof. Grace Turners stroke fatigue research at Bham Sport Ex and Prof Audrey Bowen's post stroke Psychological rehabilitation research in Manchester.

He has given conference presentations for both regional and National Conferences which focus upon the important role that appropriate PPI can have to improve the quality and relevance of research for both patients and clinicians. He has presented and co-chairs sessions at UKSF and regularly gives presentations on living with stroke to undergraduate and postgraduate students at Birmingham, Keele and Manchester University.

Rhythms of Recovery: brain activity as a marker for post-surgical cognitive health **Dr Ali Mazaheri, Associate Professor, School of Psychology, Centre for Human Brain Health, University of Birmingham**

Abstract:

The brain's neurons consistently generate rhythmic electrical activity, which can be detected non-invasively at the scalp. In this presentation, I will present evidence showing that specific features of brain rhythms—both at rest and during cognitive tasks—may serve as indicators of an individual's resilience to developing chronic

pain or dementia following surgery. Additionally, I will explore future directions for this research, focusing on its implications for both fundamental neuroscience and translational applications in neuro-rehabilitation.

Biography:

Ali holds a B.Sc. and M.S. from the University of Toronto and completed his Ph.D. at the Donders Institute in the Netherlands. He is currently an Associate Professor at the School of Psychology, University of Birmingham, and a Principal Investigator at the Centre for Human Brain Health.

Ali's research focuses on understanding, from a neurobiological perspective, why certain individuals are more vulnerable than others to developing disorders such as postoperative delirium, chronic pain, and dementia. His work is currently supported by the Wellcome Leap.

What is really happening when we train the damaged nervous system?

Dr John Krakauer, Johns Hopkins University

Abstract:

The neuroscientific framework that has been used for neurorehabilitation is marked by an emphasis on the ideas of learning, plasticity and reorganization. These ideas, when applied in the context of recovery from neurological conditions, are problematic and confused. I will try and make the case that all this needs to be rethought.

Biography:

Dr. Krakauer is currently John C. Malone Professor, Professor of Neurology, Neuroscience, and Physical Medicine and Rehabilitation, and Director of the Brain, Learning, Animation, and Movement Lab (www.BLAM-lab.org) at The Johns Hopkins University School of Medicine. He is also an External Professor at the Santa Fe Institute and a Visiting Scholar at The Champalimaud Centre for the Unknown. He is Chief Medical Advisor to MindMaze. His areas of research interest are: (1) Experimental and computational studies of motor control and motor learning in humans (2) Tracking long-term motor skill learning and its relation to higher cognitive processes such as decision-making. (3) Prediction of motor recovery after stroke (4) Mechanisms of spontaneous motor recovery after stroke in humans and in mouse models (5) New neuro-rehabilitation approaches for patients in the first 3 months after stroke. (6) Philosophy of mind, philosophy of neuroscience.

Dr. Krakauer is also co-inventor of an immersive animation technology created at Johns Hopkins University in the Department of Neurology predicated on the idea that animal movement based on real physics is highly pleasurable and that this pleasure is hugely heightened when the animal movement is under the control of our own movements. In this way, patients can practice in an immersive environment while being cognitively and cardiovascularly challenged and acquiring a skill. A simulated dolphin and other cetaceans led to a therapeutic game that has been interfaced with an exoskeletal robot in a multi-site rehabilitation trial for early stroke recovery, and with motion tracking for cognitive therapy in the normal aged. The

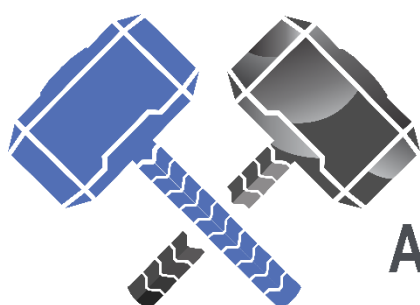
technology was licensed to MindMaze and is available commercially as MindPod Dolphin. Dr. Krakauer was profiled in the New Yorker in 2015 and his book, "Broken Movement: The Neurobiology of Motor Recovery after Stroke" was published by the MIT Press in November 2017. He is slowly working on a new book on the mind and intelligence for Princeton University Press.

SPONSORS

Our sponsors will have an exhibition stand in the Lloyd Suite. They have chosen to sponsor this event because they believe their products and services may interest you. We encourage you to visit each exhibition stand during the breaks.



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