Thank you for being one of our 1,358 participants across eight study sites in the UK, Denmark, the Netherlands, Spain, Germany and Italy.

Our studies focus on three different chronic health conditions: major depressive disorder, multiple sclerosis (MS) and epilepsy.

I hope you enjoyed our first edition of the RADAR-CNS newsletter. In this, our second edition, you will find out more about the work of our MS clinical research team, meet Julie Devonshire from our patient advisory board and get a chance to watch an animation raising awareness of depression.

We have continued our work across the project despite the ongoing worldwide COVID-19 pandemic. We are continually grateful for the contributions from our participants. Please continue to engage with RADAR as best you can during this time.

Since we were last in touch we have published more project results, taken part in virtual conferences and events and launched our public webinar series. We have also refreshed our website with more interviews and details of our engagement work.

Many thanks for being a vital part of our work. Your continued participation in our clinical studies feeds into the wider RADAR-CNS project and is helping to make a difference, and hopefully will improve treatments and quality of life, now and for future generations.

We wish you a happy 2021,

Matthew Hotopf, King’s College London
Vaibhav Narayan, Janssen Pharmaceutica NV

RADAR-CNS Project Co-Leads
Multiple sclerosis (MS) is a condition that can affect the brain, optic nerve and spinal cord, causing a wide range of potential symptoms, including problems with cognition, mood, vision, arm or leg movement, sensation or balance. It’s a lifelong condition that can sometimes cause serious disability, although it can occasionally be mild.

There is no cure for MS, however many disease modifying treatments have been developed that clearly improve the disease evolution. Management of the disease as best possible is fundamental to continue to live a normal life.

Our MS work package is led by Professor Giancarlo Comi. He is Honorary Professor of Neurology, at Vita-Salute San Raffaele University, Milan, Italy. Professor Comi says, “Our study focuses on the identification and validation of some Remote Measurement Technologies (RMT)-to monitor disease activity, disability progression and some major symptoms, such as depression and fatigue, in people with MS.” Professor Letizia Leocani who contributes to the coordination of the study says: “The results of some preliminary baseline analysis support the expectations of an important contribution of remote monitoring in MS.”

The team includes researchers, neurologists, psychologists, bioengineers, data managers operating in the three MS Centres of Vall d’Hebron Barcelona, Rigshospitalet Copenhagen and Milan San Raffaele Hospital.

We have completed the recruitment of our 400th participant to MS Disability study and most of the patients have already completed the one year follow up.

Dr Gloria Dalla Costa, co-ordinates the clinical study. She is a neurologist and researcher at San Raffaele Hospital, Milan, Italy. Gloria says, “My role is focused on reaching the target of patient numbers for both MS studies, and checking the data we are collecting are of good quality. We ensure that all our efforts will allow us to validate wearable sensor data by comparing it with data collected in clinical practice, which is critical for wearable devices to be used in everyday clinical practice.

“I like working on a project that I believe can have an impact on the future health of many people - wearable devices could improve the way patients are monitored and the accuracy with which we can take therapeutic decisions.

The RADAR system has shown that new technologies are vital, especially in unexpected circumstances such as this pandemic. For example, it was possible in a short time to implement a questionnaire for monitoring the occurrence of COVID-19 symptoms, and our patients responded through their devices giving us real-time information about their health status.”
Disability, although it can occasionally be mild. Problems with cognition, mood, vision, arm or leg movement, sensation and spinal cord, causing a wide range of potential symptoms, including Multiple sclerosis (MS) is a condition that can affect the brain, optic nerve of the study says: “The results of some who contributes to the coordination with MS.” Professor Letizia Leocani progression and some major symptoms, Measurement Technologies (RMT)-to says, “Our study focuses on the identi with MS.” Our MS work package is led by Professor research explores reality and has access about the points in a healthcare My symptoms have been sensory and not severe and so the impact on my life has been minimal, but I have changed my diet and exercise regime considerably to improve my gut health. I work at King’s College London and first heard about RADAR-CNS via their news channels. I really appreciate that patients are involved in the programme. I joined because I am interested in data and wearables and how these might assist discovery for health conditions. I’ve taken part in focus groups and feedback sessions. I believe patient views and input are important so that research explores reality and has access to a spectrum of experiences.” Julie Devonshire is on the Patient Advisory Board. She writes about her role with RADAR-CNS, her experiences with MS and why patient views are so important.

Julie Devonshire

Our Patient Advisory Board represents people with depression, epilepsy and multiple sclerosis, along with people from relevant support organisations to ensure that the views of people with conditions are considered. Their role as self-employed advisors is to provide feedback on the layout and content of research materials and to provide expert opinions on important decisions on the design of studies.

“I was diagnosed in March 2016 with relapsing-remitting multiple sclerosis (RRMS), a type of Multiple Sclerosis. RRMS is the most common type of MS, making up about 85 percent of diagnoses.

Julie Devonshire is on the Patient Advisory Board. She writes about her role with RADAR-CNS, her experiences with MS and why patient views are so important.

An interview with Dr Jake Andrews on clinical pathways and keeping well during the Covid-19 pandemic.

Dr Jake Andrews is a Research Fellow working on the Clinical Pathways Work Package 9 looking at how the RADAR-CNS remote measurement technologies (RMT) system could be integrated into clinical pathways. He’s based at University of Nottingham, UK.

The Clinical Pathways team’s work identifies the requirements of clinical stakeholders, such as healthcare professionals, managers, commissioners and payers, for integrating remote measurement technologies into care pathways for depression, epilepsy, and multiple sclerosis (MS) in different European healthcare systems.

What is the focus of your work within the RADAR-CNS project?

I’m currently working on a value proposition, detailing how and why the RADAR-CNS system we are developing has value to different groups of stakeholders working with people with depression, epilepsy, and MS.

We’re also considering the challenges of putting the system into practice including aspects of workflows and use of the devices which will need attention before the system can be used in everyday healthcare. For example, thinking about the points in a healthcare pathway at which RMT can be most effectively used, considering how this could work with technology and software that clinicians are already using, and which members of a clinical team should be tasked with managing different aspects of the management of the technology.

It can be challenging to understand the ins and outs of how health services work in different countries, as well as the laws and political pushes and pulls that are affecting the use of digital interventions in health.

What do you enjoy the most about working on the project?

I really enjoy working with team members from across the different countries and some of the biggest names in the fields we are working in. It’s a fantastic opportunity to do important and far-reaching work.

I have been interested in research since completing my dissertation in my Masters, where I explored the use of language learning as a therapy against cognitive decline in older adults. It was very enjoyable to design a study, collect data, analyse it and then generate some kind of insight based on the results. Since then, I have been very passionate about finding ways of predicting and preventing mental ill health.

I’m also putting to use the knowledge and skills gained in my PhD, where I explored the use of machine learning to predict depression in older people, and conducted studies with clinicians and older people to explore their needs in using technology to support mental health.

What do you think is the importance of the project for the wider field of wearable devices?

Wearables give us access to vast quantities of data from multiple tiny sensors. The people manufacturing these devices can be quite skeptical about how these devices should or could be used, and there is a huge amount of untapped potential for their use in healthcare.

We are conducting robust research studies to allow us to say confidently whether these devices are suitable to improve care for people with central nervous system disorders. If our studies show that there is potential for their use in the three conditions we’re looking at, the work we do could easily be expanded to look at other conditions. Some of this expansion work is already being done, with researchers in Nottingham looking at the potential of RADAR in bipolar disorder, among other areas.

How has the COVID-19 pandemic impacted your work?

I am working from home and running all meetings online. The current phase of work involves taking to RADAR-CNS colleagues from other institutions across Europe to make use of what we have learnt so far, and this work can all be done virtually.

The situation has reinforced the importance of the work we are doing - if more information can be gathered from patients using remote measurement technologies, there may be less need for patients to travel to healthcare settings where respiratory and other illnesses can be easily transmitted.

I’m keeping in regular contact with colleagues and friends via the phone and videochat, and I am getting outside for my daily exercise, which I find really important to keep me fit and well. Looking ahead I’m excited about the recent successes in vaccine development.
Watch a video on the evolution of the perception and treatment of depression

A three-minute animated film exploring how perceptions of depression have evolved over time has been created to engage people with the topic.

The film, curated, produced and narrated by Alina Ivan, a researcher in depression, was inspired by the research she works on. It has now been viewed 1,600 times and has been translated to multiple languages.

Watch the film: [www.youtube.com/watch?v=Imo-T4RVD-sU&ab_channel=kingscollegelondon](https://www.youtube.com/watch?v=Imo-T4RVD-sU&ab_channel=kingscollegelondon)

Alina worked with animator Sophia Ppali and musician Dan Wimperis on the story, creating a character to tell the tale. The film covers Babylonian blood-letting practices that lasted until the 17th Century and beyond, all the way to the present day when anti-stigma campaigns and mental health charities around the world have led more people to speak about mental health and seek help. The film explores how technological developments may help mental health through mobile phones and wearable devices.

Alina says, “I hope that the film will bring perspective, inspire hope and start conversations about mental health and will provide a springboard for viewers to reflect on depression through new exciting research with widely used technologies, but also maybe through other disciplines such as art, history and even activism.”

Collaboration with artist on audio-visual exhibition piece

Two members of our Data Analysis & Biosignatures team have provided their expertise to Sanela Jahić, a Slovenian artist, in preparing a piece about machines listening to our voices, with a particular focus on depression.

Dr Jude Dineley, University of Augsburg in Germany and Dr Nick Cummins, King’s College London, worked with artist Sanela Jahić on a piece called Pataka.

It was on display in Autumn 2020 in Ljubljana, Slovenia.

Pataka, which is part of Jahić’s Uncertainty-in-the-Loop exhibition, uses video and dynamic data visualisations to educate the viewer about the effects of depression in speech and how artificial intelligence can be used to detect them.

‘Pataka’ is a vocal exercise that can give valuable clues as to an individual’s health state.

The three-channel video shows four African grey parrots that were taught the trisyllabic sequence Pa-ta-ka, which is commonly used to test diadochokinetic rate (DDK). DDK is an assessment tool, used by speech-language pathologists, that measures how quickly an individual can accurately produce a series of rapid, alternating sounds. The tool emphasizes changes related to a lack of muscle control in speech affected by depression.

Visitors were able to experience the cacophony of the parrots’ sounds and variances in their speech, as they seemingly interact with and play off each other. They can learn more information regarding the particular vocal exercise, vocal biomarkers, machine learning,
Interdisciplinary dance performance Feedback Loops highlight of Science in the City Malta festival

The immersive performance, Feedback Loops, based on RADAR-CNS, brings together dance, music (generated from live human body data) and people's stories to share an insight into the relationship between mind and body.

It premiered in November 2020 at Science in the City, Malta's national science and arts festival.

“A lot of my symptoms are invisible and people find it hard to understand what I'm going through”. – a quote from one of the RADAR-CNS Patient Advisory board.

“Although these words are powerful, words alone can sometimes struggle to describe our inner thoughts. Seeing this problem, the Feedback Loops team wanted to see if wearable devices and the arts can join forces to reveal the unseen and help us learn more about being human,” says Alina Ivan who produced the work.

Feedback Loops is a collaboration between creatives, researchers, and technology experts, including Alina, dancer Anna Spink, musician Dan Wimperis, filmmaker Chris Scott, RADAR-CNS researchers based at King's College London (see our website for a full list), and with help from people with lived experiences of depression, epilepsy and multiple sclerosis from our patient advisory board lead by Dr Sara Simblett.

Professor Matthew Hotopf said “The piece is a really neat way of describing RADAR-CNS combining dance, music, text and a wearable device. The dancer responds to words from participants in our focus groups, as she does so the stream from the wearable (Empatica) changes the music being played, which in turn the dancer responds to. It's a beautiful metaphor for RADAR.”

Anna says, “With slow, forceful heaviness as an overriding movement quality throughout the piece, I have depicted some of the visible and invisible symptoms of depression.

I have included changes of focus, lower planes of motion and specific gestures to abstractly demonstrate guilt, difficulty making decisions and feeling "itchy" or uncomfortable in one's own skin.”

Dan adds, “Throughout the performance the dancer’s movements controls which notes are being played, the blood volume pulse (the graph on a heart rate monitor) is controlling the probability of notes being played and the volume of the notes (how hard a pianos key is pressed) and the electrodermal activity (the amount of sweat on their skin) is controlling how the notes sound, either bright or dark, far away or close etc.”

Watch one of the Feedback Loops events: https://fb.watch/24CntvF-b4

speech patterns and mental health, as well as the differences between academic and commercial research, by reading and scrolling through data animations presented on two displays installed with custom-made tripods in the gallery space.

Jude said, “It's been so much fun to learn about Sanela's work and collaborate with her on her Pataka piece. As a scientist, I found her analytical approach to the work - how she used the output of an algorithm to inform her vision - fascinating. Art is a powerful medium with which to communicate science and research to a wider audience.”

Nick added, “Sanela first approached me wanting to learn more about how depression affects the voice and how we can use machines to measure this. This topic directly relates to one of my core research aims within RADAR-CNS -- we collect voice samples from participants in all three study arms. Sanela's passion for the topic was obvious from the first time we spoke, so it has been a pleasure to answer her queries, supply her with materials from my research and offer feedback on piece as it has come together.”

Sanela says, “...I started researching how the state of your mental health leaves a fingerprint on speech production and your voice, and consequently met and worked with Nick and Jude. They provided me with insight into and materials from their research on this topic. It has also been amazing to experience Nick and Jude’s continuous support and feedback during the production of this work, which was made possible by their openness to help and collaborate with me.”

* Caption: Anna Spink in rehearsal by Chris Scott Studio www.chrisscottstudio.com

This newsletter appears in German, English, Spanish, Italian, Dutch and Danish. It is available on the website. You can also find more information about the project, latest news and tweets on our website: www.radar-cns.org

Our website includes regular updates about our presentations, papers and news. Follow us on Twitter @RADARCNS and on LinkedIn

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