



Better Sleep



# BETTER SLEEP MATTERS

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Winter 2023



## FROM THE EDITOR'S CHAIR

Greetings,

Welcome to the inaugural Better Sleep Matters newsletter! We are funded by NIHR Oxford Health BRC to leverage the latest sleep and circadian science for health advancements.

These quarterly updates spotlight some of the important and exciting work that is going on in Oxford and with our collaborative partners. Stay tuned for podcasts, blogs, and social media updates.

Why sleep? Because, like you, we recognize its significance. Sleep is a fundamental pillar for living a fulfilling life, akin to oxygen for breathing. Sleep underpins crucial functions, from metabolism, to immune response, to memory, to emotional regulation and much more. Yet we so often take sleep for granted and for that reason, amongst others, sleep and the circadian timing of our sleep-wake pattern has not had the attention it deserves in research



and in clinical practice. It's time to do better!

While sleep matters to everyone our primary focus is on "sleep and circadian disruption." This is where there are challenges obtaining sufficient sleep at appropriate times, prevalent in various physical and mental health conditions, as well as in societal contexts like shift work. Read on for more about our team, ongoing research, discoveries, opportunities for involvement and getting support for your own professional development, and more.

Sleep well!!

Colin Espie  
Professor of Sleep Medicine, University of Oxford

# MEET THE BETTER SLEEP TEAM

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We are delighted to have a strong interdisciplinary team leading the Better Sleep programme. Here is our Steering Group. We hope that the photographs suggest that we are well slept ourselves!! Throughout this and subsequent newsletters we will introduce our colleagues, fellows and students.



**Prof Colin Espie**  
Professor of Sleep Medicine, Nuffield Department of Clinical Neurosciences, Co-Director: NIHR Oxford Health BRC Better Sleep, University of Oxford



**Prof David Ray**  
Professor of Endocrinology, Oxford Centre for Diabetes, Endocrinology, and Metabolism, Co-Director: NIHR Oxford Health BRC Better Sleep, University of Oxford



**Prof Russell Foster**  
Professor of Circadian Neuroscience, Head of the Nuffield Laboratory of Ophthalmology, Director: Sir Jules Thorn Sleep and Circadian Neuroscience Institute, University of Oxford



**Prof Stuart Peirson**  
Professor of Circadian Neuroscience, Group Leader: Fundamental Neuroscience in Sir Jules Thorn Sleep and Circadian Neuroscience Institute, University of Oxford



**Prof Simon Kyle**  
Professor of Experimental and Clinical Sleep Medicine, NIHR Oxford BRC Senior Research Fellow, Director: Oxford Online Programme in Sleep Medicine, University of Oxford



**Prof Simon Archer**  
Professor of Molecular Biology of Sleep, University of Surrey



**Dr Kate Saunders**  
Associate Professor, Director of Medical Studies, Honorary Consultant Psychiatrist, Department of Psychiatry University of Oxford



**Dr Leah Holmes**  
Engagement and Involvement Specialist, PPIEP Lead: NIHR Oxford Health BRC Better Sleep, University of Oxford



**Dr Ma'ayan Semo**  
Research Coordinator: NIHR Oxford Health BRC Better Sleep, University of Oxford



**Dr Rachel Sharman**  
Principal Researcher: NIHR Oxford Health BRC Better Sleep, University of Oxford



# INTRODUCING THE NIHR OXFORD HEALTH BRC: BY PROF DAVID RAY

Innovative treatments and transformative therapies in brain health are on the horizon thanks to a £35.4 million award to the NIHR Oxford Health Biomedical Research Centre!

Better Sleep is a core component of the BRC, which aims to create a UK collaborating network that integrates research infrastructure and clinical services to deliver innovation in mental, cognitive and brain health research and care. Sleep and circadian science sit at the heart of that vision, and we are fully committed to delivering high quality experimental medicine research on new treatments and procedures for sleep and circadian problems. The ultimate goal is to improve people's lives. We are one of the eleven interacting themes in the BRC (see panel summary) under the overarching leadership of our Director, Prof John Geddes (Department of Psychiatry, University of Oxford) and Chair, Dr Nick Broughton (CEO, Oxford Health NHS Foundation Trust).

The work of the BRC has only just got underway, starting this year (2023), and we are excited about the progress we are already making in helping people to sleep better.

## Research Themes

### Summary

- Better Sleep
- Brain Technologies
- Data Science
- Dementia
- Depression Therapeutics
- Flourishing & Wellbeing
- Mental Health in Development
- Molecular Targets
- Pain
- Preventing Multiple Morbidities
- Psychological Treatments



## RESEARCH MATTERS: OUR BETTER SLEEP WORK PACKAGES

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Our BRC funding enables us to provide infrastructure support to progress work in the seven key areas listed here:



**Cognitive behavioural therapeutics  
(CBT and its component therapies)**



**The role of nutrition, cardio-metabolic  
factors and exercise**



**Understanding the stress response**



**The benefits of natural and artificial  
light interventions**



**Developing novel markers and  
outcome measures**



**Improved monitoring sleep and  
circadian processes**



**The application of data science  
methodologies at scale**

As you can see, we are interested in how we can improve measurement and monitoring of sleep, both at the individual level (e.g evidence-based wearable devices, and outcomes that matter to people) and at the population big data' level.

Improved precision in evaluation will help us to target therapeutics to more personalised profiles of needs and problems such as those posed by chronotypes of clusters of symptoms. There is also a wide range of intervention possibilities ranging from CBT, light therapy, timed nutrition, lifestyle and exercise.

# RESEARCH MATTERS: STUDY SPOTLIGHT

**NICE**  
National Institute  
for Health and  
Care Excellence

## Sleepio

In May 2022 NICE issued guidance on Sleepio as a cost-saving alternative to sleeping pills or sleep hygiene in primary care. Sleepio has now been tested in 14 Randomised Controlled Trials (RCTs). Co-founded by Professor Colin Espie, this intervention is used in many projects within the Better Sleep research theme.

One of these RCTs was led by Dr Melanie Fleming (Wellcome Centre for Integrative Neuroimaging, FMRIB, University of Oxford).



Sleep problems are very common following stroke, and understandably most people are looking for practical help to get their sleep back on track, rather than resorting to sleeping pills. Following an initial study where we explored possible wrap-around adaptations to the Sleepio digital CBT programme, to make it more easily usable and engaging for survivors of stroke with varying impairments, we conducted a Randomised Controlled Trial in 86 stroke patients (Fleming et al, Journal of Sleep Research 2023; e13971. Advance online publication). Results indicated significant improvements on the Sleep Condition Indicator-8 and a positive health economic profile for this approach.

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“Given the impact that sleep difficulties can have on stroke outcomes, it is promising to see that digital therapeutics such as Sleepio can improve sleep meaningfully in this population”

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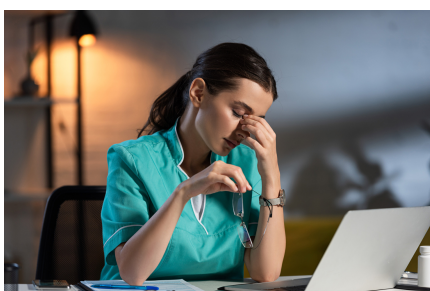


**NIHR** | National Institute for  
Health and Care Research

## RESEARCH MATTERS: NEW PROJECTS - SHIFTWORK STUDY

Shiftwork is prevalent and is a major challenge to the healthy circadian organisation of human behaviour. Shiftwork increases risk for multiple adverse physical and mental health outcomes, including changes in brain structure, depression, relationship breakdown, cancer, obesity, type 2 diabetes, stroke, and inflammatory diseases. The most common adverse consequence of shiftwork is shiftwork associated sleep disorder (SWD). This affects about 30% of shift workers, and is characterised by insomnia on rest periods, and impaired vigilance during work periods. There is currently no therapeutic option for the disorder, which is not widely recognised.

**Funded by the NIHR, we are about to embark on a five year programme of work addressing shiftwork sleep disorder, focussing on NHS workers**



We have worked on behavioural approaches for sleep disorders and have identified, and proven some manipulations that are scalable, and effective in improving sleep. We also know how to affect the phase of the endogenous circadian oscillator using ambient light, physical activity, and eating. Taken together we now have a toolkit of potential intervention strategies that we can apply to people with SWD.

This programme will begin by gaining valuable insights into the population through literature reviews, surveys, expert advisory groups, and analysis of large data cohorts. These approaches will help in the development of the intervention components and will also aid in their implementation.



## CONFERENCE WORLD

In October the Experimental and Clinical Sleep Medicine team attended the British Sleep Society meeting in Leeds. Team members Katrina Tse, Dr Emily Stanyer, and Prof. Simon Kyle presented their research as part of the oral symposium.

The team won several awards with Dr Emily Stanyer winning the best oral presentation and the Colin Sullivan Research Award. Further, Dr Rachel Sharman was elected to join the Executive Committee of the British Sleep Society. Here's what Emily had to say about the meeting:

“*I had the privilege of reconnecting with past colleagues and establishing new connections within the sleep research community, allowing the potential for future collaborations. It was also a valuable opportunity to present my own research. I was selected to give an oral presentation titled: “reduced susceptibility to migraine-related phenotypes in familial natural short sleep mice”.*



*This presentation was based on the final experiments from my PhD conducted at King's College London. My presentation was recognised as the “Best Oral Presentation 2023” at the conference. Additionally, I was honoured to receive the prestigious Colin Sullivan Award, which included a research grant of £1000. This award recognises the best submitted research proposal from an early career researcher and supports further research in the sleep field. The grant will be instrumental in funding my project, which aims to investigate the underlying mechanisms of sleep restriction therapy for insomnia in individuals with depression. This recognition and financial support will undoubtedly have a significant impact on my future research, and further contribute to our understanding of the role of sleep, and sleep interventions in mental health.”*



## TEAM MATTERS: TRAINING AWARDS & SMALL PROJECT FUNDING

Dr Bryony Sheaves, a research clinical psychologist based in the Department of Experimental Psychology has recently been awarded an NIHR development and skills enhancement personal award. This funding, supported by the NIHR BRC 'Better Sleep' theme, will allow her to spend some time considering how best to implement psychological sleep treatment techniques on psychiatric inpatient wards.



**Congratulations** to the three projects selected for this years small project funding. Better Sleep seek to support small projects that have the potential to lead to collaborative grants between team members and sleep researchers within the wider scientific community. Up to £12,000 per project is available. We wish to thank our external review committee of Professor Dieter Reimann and Professor Phyllis Zee for all their help.

Keep your eyes peeled for the 2024-2025 call, expected to be announced in the Spring Edition.



**Amanda Wall:** Clinical specialist physiotherapist and research assistant within the FMRIB Pain group -**The relationship between sleep disturbance, kinesiophobia and motor performance in fibromyalgia**



**Emily Stanyer:** Early career postdoctoral researcher in the SCNi -**The acute effects of sleep restriction therapy for insomnia on sleep physiology and emotional cognition in patients with depression**



**Simon Archer:** Professor of Molecular Biology of Sleep at the University of Surrey -**Longitudinal study of sleep, diurnal rhythms, and health and wellbeing in older adults living at home**





## TEAM MATTERS: INTERVIEW WITH JONATHAN THAM - GP

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My interest in sleep began during my intercalated degree in neuroscience at Cambridge. Despite there being no dedicated module, the central role of sleep was evident in many of the other subjects I chose: memory, emotional regulation, attention, the list goes on. During my years training in hospital, the importance of sleep was often dutifully expounded by well-meaning welfare administrators, shielded as they were from the brutalities of the night shift. Indeed, it was only after the night shifts ended and my GP training began, that I took steps to turn my interest into a practical skill.

Dr Hugh Selsick, a psychiatrist and lead for the sleep clinic at UCL, gave a talk to the GP trainees at St Thomas, and I was hooked. Chronic insomnia was fascinating to me: here was a problem whose impact became more and more clear with every day I spent in clinical practice, here was a problem whose most effective treatment was as good as inaccessible to most patients, here was a problem worth getting stuck into.

In 2021 learned to deliver CBTi myself. During COVID I sat in on a course of treatment, a Zoom-fly on the wall. I supplemented this with my own reading, which inevitably led me to Colin Espie's book 'Overcoming Insomnia'. Discovering Professor Espie's academic attachments, I made use of the study budget afforded to all GP trainees, and booked onto the SCNi CBTi masterclass. Here I had access not only to excellent teaching, but also the inspiration afforded by the multinational attendees, logging in from as far away as Scandinavia, Canada and Australia.

After the course, I got in touch with Dr Dimitri Gavriloff who advised me on what I would need to start my own CBTi clinic. All that was left now was funding. At the end of my GP training, I came across the Salaried Portfolio Innovation (SPIN) fellowship scheme, a program which rewards newly qualified GPs and General Practice Nurses who take permanent, salaried positions with funded portfolio sessions.

# TEAM MATTERS: INTERVIEW WITH JONATHAN THAM - GP

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I reached out to Prof. Simon Kyle, and there started a very fruitful relationship with the SCNi, who supported my fellowship. In my first year I established my CBTi clinic, serving patients registered at my practice. It was a steep learning curve, but a wonderful antidote to the ten-minute GP appointment, as my clinic afforded me the luxury and privilege of more time with my patients. Furthermore, even though I was a relative novice, their results were good. It was so rewarding.

***So, what has become of my London CBTi clinic?*** I have recently moved to Dorset and the fellowship is on hold for a time, awaiting funding. I miss it, and the situation frustrates me: on almost a daily basis, I see patients that would benefit from CBTi in some form. I hope to start again in April, but in the mean time, later this month I am delivering a lecture to my practice in which I will offer up some of the techniques I have been teaching over the last year. I also hope to reignite potential collaborations with colleagues in Australia and New Zealand around the future of CBTi in primary care, a task put on hold by that all too familiar dampener, life...



..or in my case, a new one, in the form of my daughter, Lyra. She is twelve weeks old now and seems not to value sleep as much as I do.

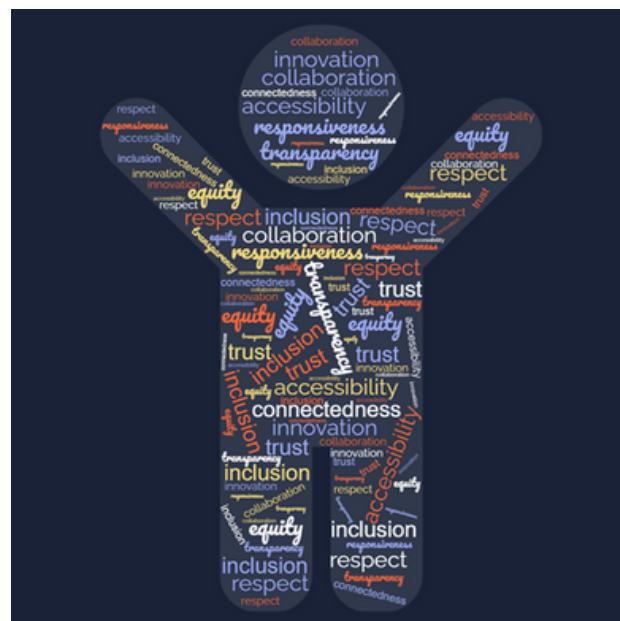
Although Lyra may not be aware of it yet, public awareness of CBTi is growing, with programmes and articles in print media, radio and television becoming more frequent. I dream of seeing this gold standard treatment not only recommended, but also readily available, and in many forms. I see my role as a bridge between research and clinical practice, someone who helps develop practical treatments in primary care, works to bring other clinicians up to speed, and fosters new passions in sleep and insomnia, in the same way that the SCNi fostered my own passion right at the start of my journey. It is such an exciting time for the sleep community, a community that I am so grateful to be a part of.



## PEOPLE MATTERS: INVOLVEMENT WITH OUR RESEARCH

The Better Sleep Team has been busy starting up our **Better Sleep Research Advisory Network** to involve people and patients across the UK in our work. So far we've welcomed 22 people to the network and together we have:

- Co-produced a set of values for our research culture, presented here as a **person word cloud**
- Found out about the lived experiences of people with sleep problems and long term health conditions to inform an application for a new MRC Centre of Research Excellence
- Reviewed our plans for how we work with people and patients
- Found out about the lived experience of NHS nightshift workers, and gathered advice on the best ways to get NHS nightshift workers to complete a survey



We're looking forward to continuing this work and getting to know our public partners over the next few sessions.

**Everyone has useful insights to offer about sleep!** You don't need to have research experience to take part. If you're interested in joining the Better Sleep Research Advisory Network please contact [leah.holmes@ouh.nhs.uk](mailto:leah.holmes@ouh.nhs.uk).

For researchers within the Oxford Health BRC Better Sleep theme: please do get in touch if you'd like to work with the Network.



## PEOPLE MATTERS: INVOLVEMENT WITH OUR RESEARCH

Despite dressing gowns being a poor choice of attire for the warm weather, the sleep research stand at the Oxford Biomedical Research Centre outreach day was a success.



Alongside various research groups spanning many fields, we ran a stall asking, 'How are you sleeping Oxford?' Interest in the stall was far reaching, including young families, teenagers, and older adults. All were interested in discussing sleep, how we can sleep better, and looking at the equipment we had on show – including a live polysomnography, chronotype questionnaires, and of course our lab mascot teddy bear Polly.



We asked visitors to briefly write a few words as to why sleep was important to them. Responses included improving memory, reducing stress, and feeling refreshed. Sharing insights into the world of sleep research with those attending the stall was great fun and highlighted the universal importance of sleep for all of us.

**Written by Lucy Jobbins (DPhil Student in Clinical Neurosciences)**

More information can be found at:  
<https://oxfordhealthbrc.nihr.ac.uk/westgate-centre-visitors-learn-about-oxfords-ground-breaking-research/>

# TRAINING MATTERS: TEACHING AND TRAINING

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## 'Step out of Programme'

Here we are able to fund clinicians to work within our BRC theme on a research topic of their interest. They will benefit from the existing research infrastructure, and mentorship of leading academics.

The objective is to give clinicians practical research experience, as this can be inspirational for building a strong research career. It is widely acknowledged that we need clinicians with research credentials if we are to drive transformational, research led change to healthcare, and our scheme is a simple, practical step towards such a change. We are currently formalising the application process. Please do reach out to us if you would like to be notified when these are open for application.

## CBTi Masterclass

Developed by Dr Dimitri Gavriloff and Prof. Colin Espie, this two-day, online, masterclass aims to give grounding in Cognitive Behavioural Therapy for Insomnia to healthcare professionals.

Better Sleep offers several funding scholarships to applicants working within the NHS who fulfil NIHR NMAHP criteria or those working in the NHS in a therapeutic role.

For more information on our next course, please visit: <https://www.scni.ox.ac.uk/study-with-us/oxford-online-programme-in-sleep-medicine/cognitive-behavioural-therapy-for-insomnia>



## Oxford Online Programme in Sleep Medicine - PGDip/MSc

Now in its 8th year, the well established Oxford Online Programme in Sleep Medicine has trained over 150 students from more than 35 countries.

The course offers two potential qualifications: Post-graduate Diploma (PgDip) and Masters (MSc). Students either enrol for a two-year PgDip or a two-year MSc. Students who complete the PgDip can apply to convert to the MSc after completion of a third year. Elements of the course can also be taken as short courses.

The course is almost fully online with a one-week in-person residential school between years 1 and 2. The course is a combination of self-led recorded lectures and small-group live seminars with peers and a course tutor/lecturer. These weekly live seminars are offered at two time points during the day to account for time zone differences.

Applications are now open for September 2024. To find out more please visit: [bit.ly/OxfordSleepMedicine](https://bit.ly/OxfordSleepMedicine) or email [sleepmedicine@ndcn.ox.ac.uk](mailto:sleepmedicine@ndcn.ox.ac.uk) and join one of our live online information sessions held 12th December at 7pm, 14th December at 12pm, or the 1st February at 12pm and 7pm.



## SLEEP MATTERS: IN THE CLINIC WITH PROF. COLIN ESPIE

Most of us will have observed somebody sleepwalking, and some of us may also have seen someone having a sleep terror (or night terror). Perhaps we have even had one or other of these experiences ourselves at some point? But what are these strange behavioural phenomena that occur in the small hours of the night when most people are asleep, and even... it seems, the sleepwalker is also still asleep?!

Let's take somnambulism first.

**Sleepwalking is characterised by an incomplete arousal out of the deepest portion of (non-REM) sleep.** This partial arousal is associated with behavioural activation. The person will sit up, get up, and start moving around, but the brain has not become fully awake. Indeed, the parts of the brain that are responsible for rational thinking and for memory formation are not working at all, so the person is engaged in automatic type behaviours, which are sometimes repetitive and stereotyped in their nature.

Of course, there is walking itself. But the sleepwalker may do things like put the light switches off and on, open and

**“Did you know that you can be asleep and awake at the same time?! We think of sleeping waking as opposites, but they sometimes overlap. In these non-REM parasomnias, we find that part of the brain wakens up while another part remains sound asleep”**

close doors, open and close drawers, and wander from room to room, or even try to go outdoors. The behaviours are often typical of the context. So, if the person goes into the kitchen, they may put the cooker or the kettle on..., and so we see there is a more disturbing side to sleepwalking, as well as at times a comical side.

Night terrors are similar in that they also occur as partial arousals out of deep sleep. The deepest period of sleep is usually the first couple of hours of the night, so that is the most common time for night terrors or sleepwalking to occur. The contrast with sleepwalking is that the compelling feature of a night terror is the person's physiological and emotional state. They appear extremely distressed, often hot and sweaty with their heart racing ... and usually frankly terrified.

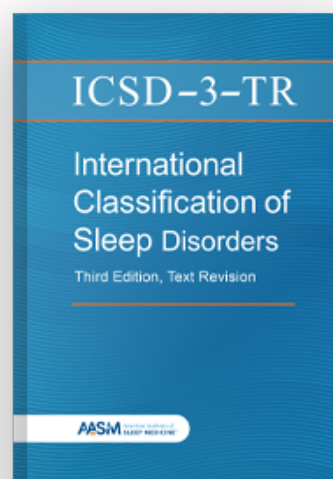
# SLEEP MATTERS: IN THE CLINIC WITH PROF. COLIN ESPIE

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They may appear to be hallucinating in response to something or someone in the room, and in both sleepwalking and night terrors, it is not uncommon for the person to be muttering things repetitively. It can be difficult to comfort or reassure someone during a night terror, just as it can be difficult to redirect the behaviour of a sleepwalker. This is because, in both cases, the brain is not fully awake, and although the individual may respond to you, they are usually unable to reason that they are still asleep. This is why we do not recommend that you should physically direct what people do, because this is when they can become even more upset, and you might get hurt.

## Our advice

- Try to avoid becoming sleep deprived. Extreme tiredness make sleepwalking and night terrors more likely to occur on subsequent nights
- Restrict alcohol intake, especially during times of vulnerability to sleepwalking and night terrors. The combination of sleep deprivation and drinking heavily can make these events more likely to occur
- Events can be precipitated by stress. Try to identify any stressors that might be there and deal with them more directly



- Sometimes the stressors may be of longer standing. Consider the possibility that you may not be dealing with an important emotional issue in your life as well as you thought you were. In our experience, sleepwalkers and those with night terrors can be the kind of people who “bottle things up a bit”
- Don't panic if you are trying to help someone who is sleepwalking or having a night terror. Speak to them reassuringly, don't touch them, and encourage them back to their beds. They will be able to hear you, and they can also see because their eyes are open. Make sure that they are safe and that you are safe too
- The person who has had the event normally will not remember it in the morning. Discuss what happened with them and try to agree a joint strategy for how to deal with any future events

If you need further help then speak to your doctor or other health professional and seek a referral to a sleep clinic

# COLLABORATION MATTERS: KAVLI CORNER



The Kavli Institute for Nanoscience Discovery (Kavli INsD) is an interdisciplinary science institute focused on nanoscience research. Established in April 2021, it is Oxford University's first institute spanning the life, medical, and physical sciences.

The Better Sleep Team are actively engaged within the Kavli institute with our main institute, the Sleep and Circadian Neuroscience Institute (SCNi), based within the Kavli INsD at the Dorothy Crowfoot Hodgkin Building, University of Oxford.

The dynamic and diverse team spreads across researchers with backgrounds in structural biology, biochemistry, pathology, chemistry, physics, physiology, and engineering. The Better Sleep team fall under the strategic aim of conducting cutting edge science exploration into the brain and mental health - of which sleep plays a fundamental role.



Researchers from the Department of Chemistry, housed in the Kavli INsD, have been awarded a multi-million-dollar, multi-year contract as part of Wellcome Leap's Multi-Channel Psych (MCPsych) program. The team, consisting of Kavli INsD Director Professor Dame Carol Robinson, Co-PIs Corinne Lutomski and Tarick El-Baba, complemented with -omics expertise from Di Wu, will investigate molecular mechanisms of anhedonia. Together the team will develop new mass spectrometry methods to investigate receptors and transporters in the blood brain barrier of patients affected by anhedonic depression.



Carol and her team are known for developing mass spectrometry tools that make it possible to track composition and interactions of proteins through changes in mass. Using these tools, the team will investigate how proteins found in the brain are modified during anhedonic depression. The team aim to contribute to improved diagnostic metrics and treatment regimens for this devastating form of depression.





Better Sleep

# BETTER SLEEP MATTERS

## UPCOMING RESEARCH PROGRAMMES

- **Wellcome Trust Mental Health Award - understanding how interventions for anxiety, depression, and psychosis work.** Professor Simon Kyle will lead a multidisciplinary team to elucidate how sleep intervention modifies sleep physiology, circadian timing, and emotion regulation to drive improvement in mental health in young adults.
- **Wellcome Trust Brain Networks Underlying Sleep and Circadian Rhythm Disruption (SCRD) in Mental Health** – Professor Stuart Peirson will lead a programme of work to explore the role of functional brain networks as key mechanisms underpinning SCRD and mental illness.

## SELECTED RECENT PUBLICATIONS

1. Bard, H. A., O'Driscoll, C., Miller, C. B., Henry, A. L., Cape, J., & Espie, C. A. Insomnia, depression, and anxiety symptoms interact and individually impact functioning: A network and relative importance analysis in the context of insomnia. [doi:10.1016/j.sleep.2022.12.005](https://doi.org/10.1016/j.sleep.2022.12.005)
2. Maurer LF, Sharman R, Espie CA, Kyle SD. The effect of sleep restriction therapy for insomnia on REM sleep fragmentation: A secondary analysis of a randomised controlled trial. [doi:10.1111/jsr.13982](https://doi.org/10.1111/jsr.13982)
3. Kyle SD, Siriwardena AN, Espie CA, Yang Y, Petrou S, Ogburn E, Begum N, Maurer LF, Robinson B, Gardner C, Lee V, Armstrong S, Pattinson J, Mort S, Temple E, Harris V, Yu LM, Bower P, Aveyard P. Clinical and cost-effectiveness of nurse-delivered sleep restriction therapy for insomnia in primary care (HABIT): a pragmatic, superiority, open-label, randomised controlled trial. [doi:10.1016/S01406736\(23\)00683-9](https://doi.org/10.1016/S01406736(23)00683-9)
4. Schiel JE, Tamm S, Holub F, Petri R, Dashti HS, Domschke K, Feige B, Goodman MO, Jones SE, Lane JM, Ratti PL, Ray DW, Redline S, Riemann D, Rutter MK, Saxena R, Sexton CE, Tahmasian M, Wang H, Weedon MN, Weihs A, \*Kyle SD, \*Spiegelhalder K. Associations between sleep health and grey matter volume in the UK Biobank cohort (n = 33 356). [doi:10.1093/braincomms/fcad200](https://doi.org/10.1093/braincomms/fcad200)


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