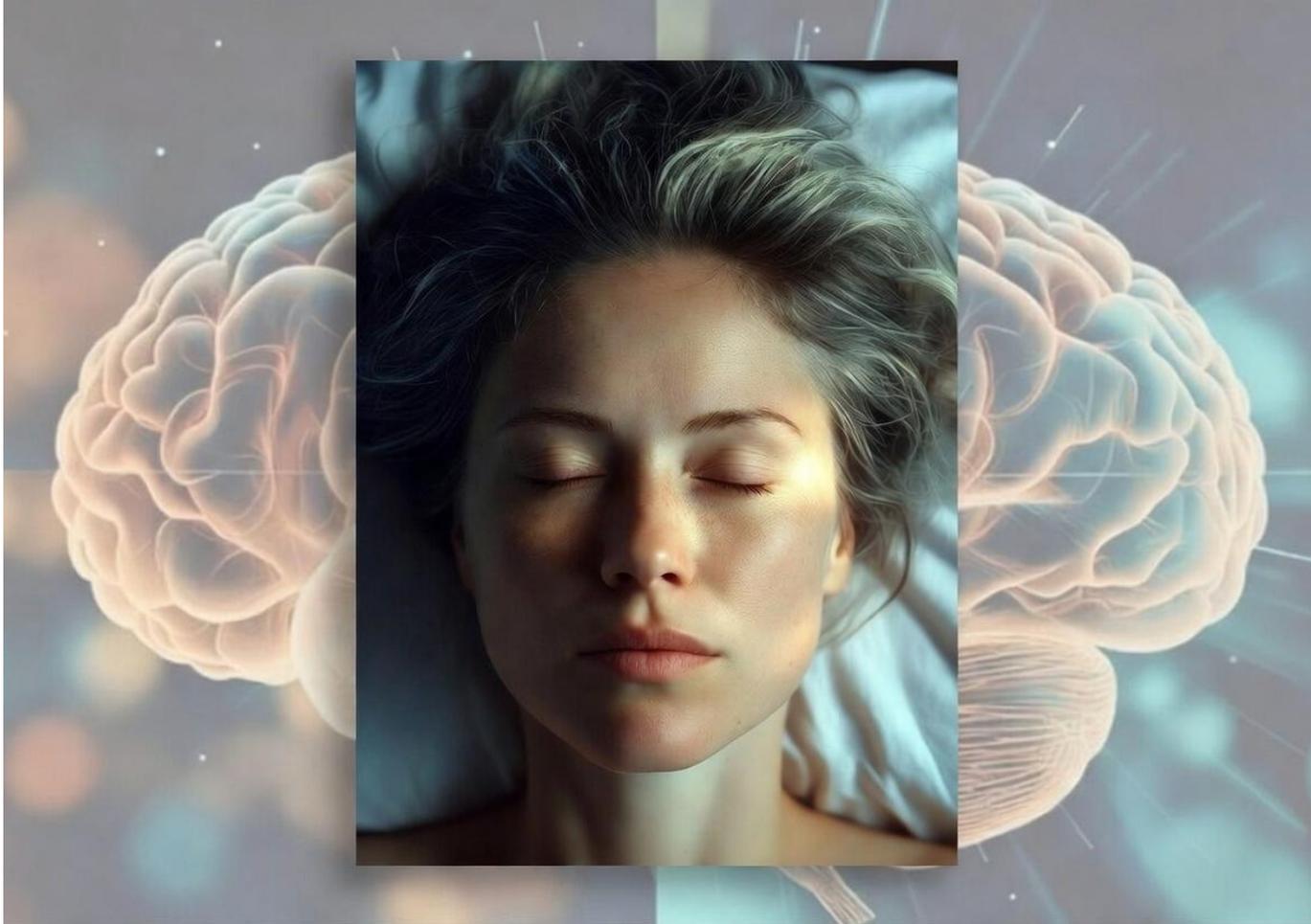


Newsletter



- **Prof. Arnold Wong's research highlights the direct, independent impact of insomnia on worsening chronic low back pain in women.**
- **New at UBSN: Small-animal Transcranial Magnetic Stimulation (TMS) is now available.**
- **"UBSN Best Paper" Award 2026 Is Now Open for Application!**



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Double Trouble: Neural Network Disruptions in Chronic Low Back Pain Patients Suffering from Insomnia

Jeremy R Chang, Arnold YL Wong

Chronic low back pain (CLBP) is a leading cause of disability globally and a major driver of healthcare utilization. Sleep disturbance, particularly insomnia, is a common comorbidity, affecting over 70% of individuals with CLBP. Insomnia not only worsens pain perception and functional impairment, but also predicts poorer long-term outcomes. Despite a strong association between CLBP and sleep, the neurophysiological mechanisms linking these two conditions remain poorly understood.

To bridge this gap, our team utilized standardized quantitative sensory testing (QST) to quantify pain perception and resting-state electroencephalography (EEG) to capture spontaneous brain activity. We examined four characterized groups of age-matched female participants: those with CLBP with comorbid insomnia (CLBP+I), CLBP alone (CLBP+), Insomnia alone (Insomnia+), and healthy controls.

Our QST results indicated that females with CLBP+I had significantly lower mechanical and pressure thresholds in both painful and non-painful areas compared to healthy controls. Moreover, CLBP+I demonstrated reduced pressure pain thresholds at the back and more pronounced impairment in the descending pain pathway relative to the CLBP+ group. Our EEG analysis further revealed increased theta-band functional connectivity across key brain networks in CLBP+I compared to other three groups, including the salience, default mode, and frontoparietal networks.



Prof. Arnold Wong

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Research Institute for Smart Ageing, The Hong Kong Polytechnic University



Prof. Arnold Wong is a Professor at The Hong Kong Polytechnic University and a renowned leader in spinal pain research. Integrating AI and advanced technologies, his work on low back pain and scoliosis has earned him prestigious honors, including the 2026 ISSLS Prize and recognition among Stanford's Top 2% Scientists. With over 180 publications, he is a dedicated mentor and serves in key leadership roles for international organizations like the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment and the European Spine Journal.



Dr. Jeremy R Chang

Department of Rehabilitation Sciences, The Hong Kong Polytechnic University

Institute for Musculoskeletal Health, The University of Sydney

Dr. Jeremy Chang is a Postdoctoral Research Fellow at the University of Sydney's Institute of Musculoskeletal Health. Awarded his PhD from The Hong Kong Polytechnic University in 2025, his doctoral thesis received the Faculty Distinguished Thesis Award. He has published over 10 peer-reviewed articles in leading journals including PAIN, Journal of Pain, Sleep Medicine Reviews, and JAMA Network Open. Dr. Chang collaborates with multidisciplinary teams across Australia, Europe, North America, and Asia to translate pain and sleep research into clinical rehabilitation.



Q: Your study really shows how insomnia seems to 'turn up the volume' on back pain—even in distant body parts. What surprised you most when you saw those results?

“These results are not entirely surprising, as prior evidence—including our own systematic reviews and meta-analyses [1,2]—has alluded to this association. However, the true novelty of our study lies in quantifying the aberrant pain perception and functional brain connectivity in individuals with comorbid chronic low back pain and insomnia. Furthermore, we advocate for a bidirectional model: while pain undeniably disrupts sleep, emerging evidence suggests that sleep disturbance is an even more robust predictor of future pain intensity and persistence.”

Q: The study only enrolled age-matched female participants. Are there any known sex/gender differences in pain perception or insomnia management?

“Although our study restricted enrollment to females to minimize the confounding effects of hormonal fluctuations, we hypothesize that the fundamental neurobiological mechanisms linking insomnia and pain sensitization are conserved across sexes. Nevertheless, existing literature highlights sex-specific differences in prevalence, pain sensitivity, and sleep deprivation-induced hyperalgesia that necessitate future comparative research [3,4]. Regarding intervention strategies, our prior network meta-analysis identified cognitive behavioral therapy for insomnia (CBT-I) as having the highest clinical efficacy, though exercise, mind-body interventions, and repetitive transcranial magnetic stimulation (rTMS) also show significant promise [5].”

Q: After controlling pain intensity and psychological factors (such as anxiety or depression), insomnia still independently predicted greater mechanical pain sensitivity and abnormal brain network patterns. What does this finding tell us about the direct neurobiological influence of sleep disturbance on pain processing?

“This finding—that insomnia predicts pain sensitivity even after controlling for anxiety and depression—points directly to Central Sensitization and the dysfunction of the Descending Pain Modulatory



System. It suggests that sleep loss is not just a psychological stressor, but a neurobiological one that physically alters how the brain filters sensory input.”

Q: How do you think accessing UBSN's equipment could help expand or enhance your future research in this area?

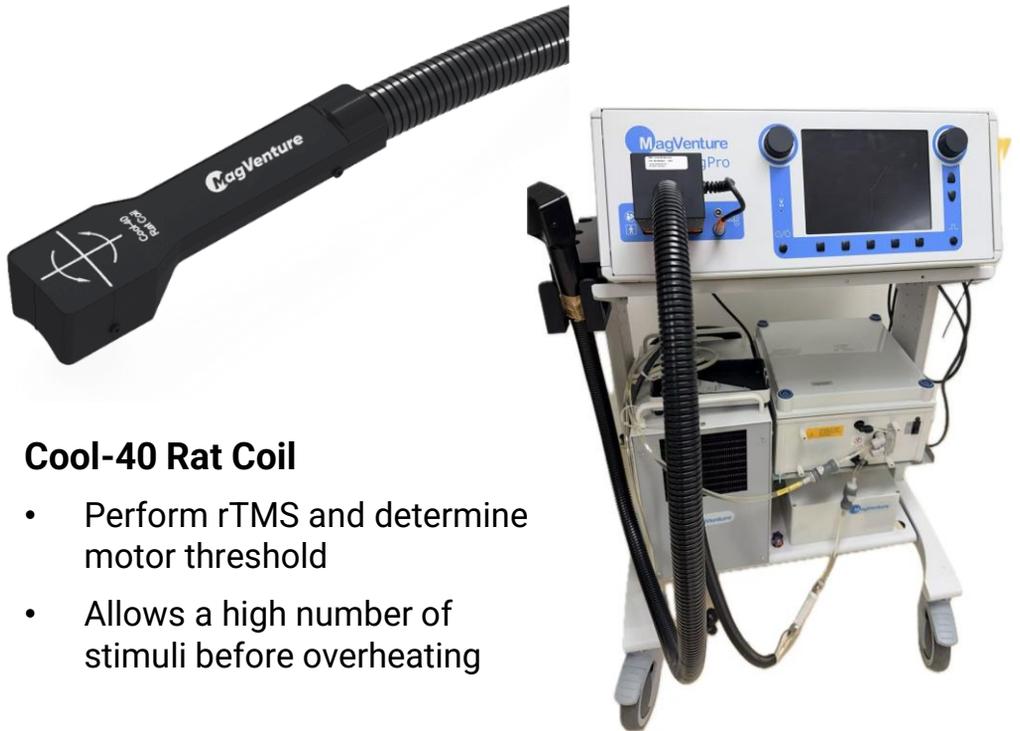
“Given the established link between impaired descending inhibitory control and dysregulated neural oscillations in individuals with comorbid chronic low back pain and insomnia, targeting these aberrant circuits via non-invasive brain stimulation (NIBS) offers a promising therapeutic avenue. Our future study will examine the effects of NIBS on neurophysiological function and patient-reported clinical outcomes. To address the inherent spatial limitations of our initial EEG findings regarding functional connectivity, a multimodal approach integrating MRI will be utilized to provide high-resolution validation of the identified cortical and subcortical dysfunctions.”

References:

1. Chang JR, Wang X, Lin G, Samartzis D, Pinto SM, Wong AYL. Are Changes in Sleep Quality/Quantity or Baseline Sleep Parameters Related to Changes in Clinical Outcomes in Patients With Nonspecific Chronic Low Back Pain?: A Systematic Review. *Clin J Pain*. 2021 Dec 22;38(4):292-307. doi: 10.1097/AJP.0000000000001008.
2. Chang JR, Fu SN, Li X, Li SX, Wang X, Zhou Z, Pinto SM, Samartzis D, Karppinen J, Wong AY. The differential effects of sleep deprivation on pain perception in individuals with or without chronic pain: A systematic review and meta-analysis. *Sleep Med Rev*. 2022 Dec;66:101695. doi: 10.1016/j.smrv.2022.101695.
3. Bartley EJ, Fillingim RB. Sex differences in pain: a brief review of clinical and experimental findings. *Br J Anaesth*. 2013 Jul;111(1):52-8. doi: 10.1093/bja/aet127. PMID: 23794645; PMCID: PMC3690315.
4. Olia K, Goldstein MR, Engert LC, Besedovsky L, Dang R, Bertisch SM, Sethna N, Haack M. Spontaneous Pain and Pain Sensitivity in Response to Prolonged Experimental Sleep Disturbances-Potential Sex Differences. *Eur J Pain*. 2025 Mar;29(3):e4789. doi: 10.1002/ejp.4789. PMID: 39902776.
5. Chang JR, Cheung YK, Sharma S, Li SX, Tao RR, Lee JLC, Sun ER, Pinto SM, Zhou Z, Fong H, Chan WW, Zheng K, Samartzis D, Fu SN, Wong AY. Comparative effectiveness of non-pharmacological interventions on sleep in individuals with chronic musculoskeletal pain: A systematic review with network meta-analysis. *Sleep Med Rev*. 2024 Feb;73:101867. doi: 10.1016/j.smrv.2023.101867.



Transcranial Magnetic Stimulation (TMS) system for animal models



Cool-40 Rat Coil

- Perform rTMS and determine motor threshold
- Allows a high number of stimuli before overheating

Transcranial magnetic stimulation (TMS) provides a non-invasive method to stimulate the brain and modulate brain functions. The magnetic field could pass through the scalp, cranial bone, meninges, and cerebrospinal fluid layer and is able to induce an electric field sufficient to depolarize superficial axons and to activate neural networks in the brain cortex.

Applications:

- Translational research focuses on understanding human neurological and psychiatric disorders.
- Studies involve examining neuronal connectivity, synaptic plasticity, cortical organization, and molecular mechanisms related to TMS efficacy.



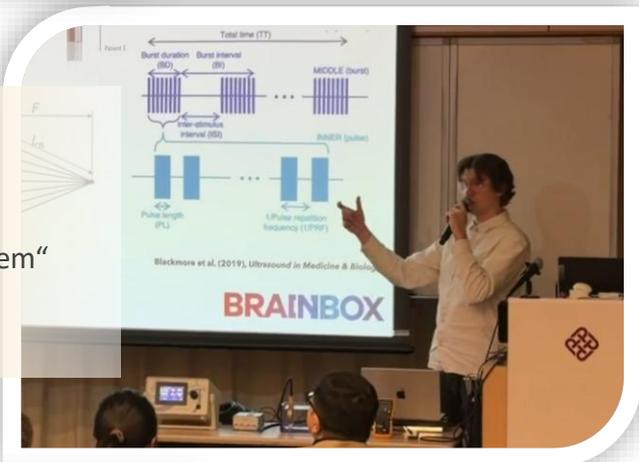
UBSN Research Seminars and Specialized Training Workshops



Prof. Sonata Suk-yu Yau

“Immediate Alleviation of Depressive Mood by Physical Exercise”

Mr. Callum Charman
"Transcranial Focused Ultrasound Stimulation System" workshop



Dr. Martin Tik

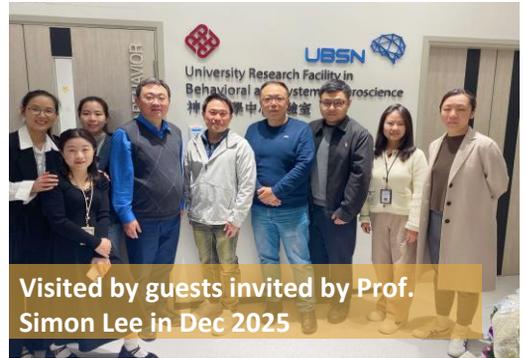
“Spatiotemporal Mapping in Health and Disease: A Chronometric Interleaved TMS-fMRI Approach”



Visits by universities' or other organizations' delegations



Visited by the Huazhong University of Science and Technology in Dec 2025



Visited by guests invited by Prof. Simon Lee in Dec 2025



Visited by Prof. Olivia Monteiro and Prof. Daniel Baptista-hon from Macau University of Science and Technology on 15th Jan 2026



In late December 2025, UBSN had the honor of hosting distinguished visitors from Huazhong University of Science and Technology, as well as esteemed guests invited by Prof. Simon Lee from the Department of Food Science and Nutrition (FSN) at PolyU.

In January 2026, UBSN welcomed Prof. Olivia Monteiro and Prof. Daniel Baptista-Hon from the Faculty of Medicine at Macau University of Science and Technology (MUST). The visitors toured UBSN's state-of-the-art laboratories, including facilities for animal electrophysiology, brain stimulation, behavioral neuroscience, and magnetic resonance imaging. The visit fostered productive discussions on potential collaborations and communication in behavioral and systems neuroscience.



Recent Events

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Visited by Tuen Mun Hospital Neuroscience Centre on 27th Jan 2026



Visited by students from Zhejiang University on 28th Jan 2026



Hands-on workshops on UBSN stereotaxic frame and EEG recording



In late January 2026, UBSN welcomed a delegation of distinguished visitors from the Neuroscience Centre at Tuen Mun Hospital. The visit provided a platform for dialogue between clinical neuroscience practitioners and UBSN's research teams, exploring synergies in translational neuroscience, neurophysiology, and brain stimulation techniques.

UBSN also hosted a group of talented students from Zhejiang University for an in-depth laboratory tour. The visit included hands-on workshops focused on UBSN's stereotaxic frame systems and high-resolution EEG recording methodologies.



Apply Now!

UBSN has established an annual **“UBSN Best Paper”** award 2026 to acknowledge and honor UBSN users for their outstanding papers published in academic journals in the past year.



Gold Award (1 awardee)

2000 HKD*

(If the group plans to use Human MRI with an approved project, it will be upgraded to \$16000)

Silver Award (1 awardee)

1000 HKD*

(If the group plans to use Human MRI with an approved project, it will be upgraded to \$8000)

Bronze Award (1 awardee)

500 HKD*

(If the group plans to use Human MRI with an approved project, it will be upgraded to \$4800)

* The prizes, equal to the monetary value listed above, are provided in the form of allowance to use on UBSN equipment.

** Read more on our website for more application form and details on the award.

*** For any enquiries, please contact Dr. Eva YU (E-mail: wx.yu@polyu.edu.hk),
Tel: 2766 5380

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Events Ahead

MARK YOUR CALENDAR

30 March 2026, 2:30–3:30 pm

Seminar: "Electrophysiology of Retinal Circuits and Beyond: Patch Clamp and Multielectrode Array Techniques in Neuroscience Research"

Speaker: Prof. Feng PAN

School of Optometry, The Hong Kong Polytechnic University

Mid of April 2026 (please stay tuned!)

Capacity Building Scheme Inbound Scheme

Speaker: Prof. Yang YANG

State Key Laboratory of Cognitive Science and Mental Health, Institute of Psychology, Chinese Academy of Sciences, Beijing, China

27, 28 June 2026 (Full day)

UBSN Neuroscience Conference and Workshops 2026

Seminars, Poster Session & Lab Tour

Join and win UBSN souvenirs!

University Research Facility in Behavioral and Systems Neuroscience

UBSN Neuroscience Conference and Workshops 2026



 **27 & 28 June 2026** (Sat & Sun)

 **9:30 - 18:30**

 **Block Z,
The Hong Kong Polytechnic University**

- 2/F Podium **Exhibits**
- Room Z209, Z211 **Seminars**
- ZB216-ZB218 **Lab Tour**

Program Highlights

- ▶ Seminars from Keynote Presenters
- ▶ Seminars from Plenary Presenters
- ▶ Full-day Workshops with Certificate
- ▶ UBSN Poster Presentations
- ▶ UBSN Lab Tours introducing various equipment, e.g. Human 3T MRI, Mock MR, Human and Animal Electrophysiological and Behavioral equipment
- ▶ Vendor booths
- ▶ UBSN Best Paper Award, Best Poster Award
- ▶ UBSN Souvenirs (Fan, USB Drive, Travel Adaptor, etc)

Keynote Speakers



Prof. Yoshihiro NODA

Department of Neuropsychiatry, Keio University School of Medicine, Shinjuku-ku, Tokyo, Japan
Key Interests: Neuromodulation, Clinical Neurophysiology, TMS-EEG and rTMS Research for Psychiatric Disorders



Prof. Sheng HE

Principal Investigator (Adjunct), IBP Academic Deputy Director
State Key Laboratory of Cognitive Science and Mental Health, Institute of Biophysics, Chinese Academy of Sciences
Key Interests: Cognitive Neuroscience (Visual Attention & Consciousness), Integrating Psychophysics, Neuroimaging, Noninvasive Brain Stimulation



Prof. Bing ZHANG

Professor, Vice President of Nanjing Drum Tower Hospital, the affiliated hospital of Nanjing University Medical School, the Director of the Medical Imaging Center and the Director of the Brain Science Research Institute at Nanjing University, China
Key Interests: Molecular & AI Neuroimaging (Neurodegenerative Diseases, Brain Function, Cerebrovascular Conditions, Fetal Brain Development, Brain Tumor)

Plenary Speakers



Prof. Sonata Suk-Yu YAU

Associate Professor, Department of Rehabilitation Sciences,
The Hong Kong Polytechnic University,
Hong Kong, China



Prof. Ran TAO

Assistant Professor, Department of Language Science and Technology,
The Hong Kong Polytechnic University,
Hong Kong, China



Register Now

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Organisers:



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