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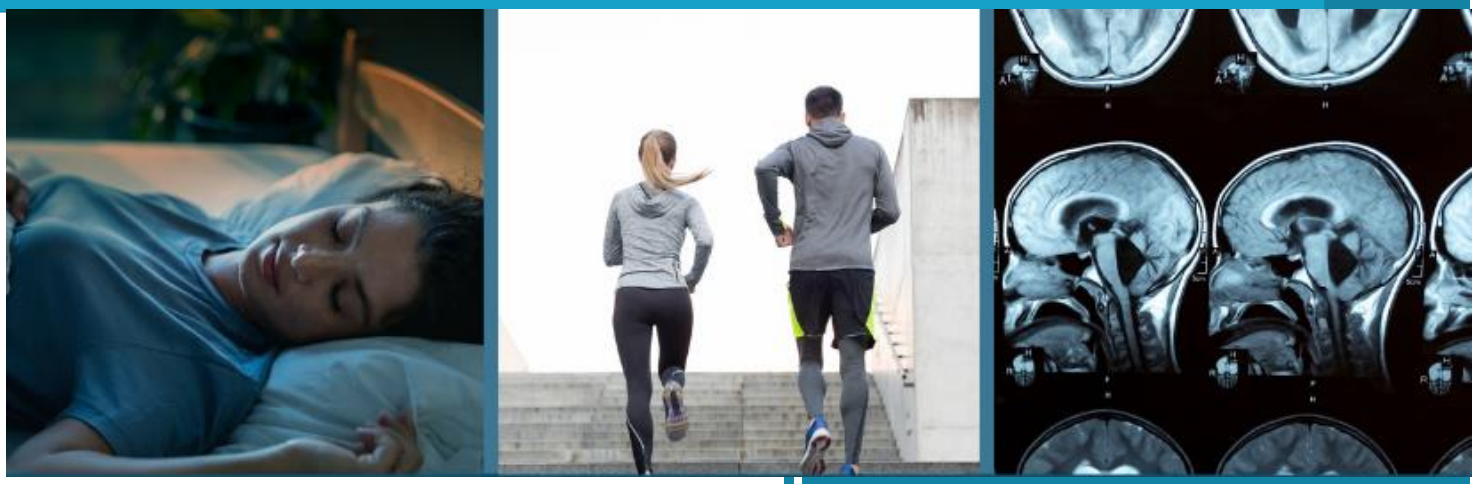
OHBM

2023

NOVEL APPLICATIONS OF NEUROIMAGING TO STUDY THE EFFECTS OF SLEEP AND LIFESTYLE FACTORS ON COGNITIVE HEALTH



Satellite symposium

of OHBM 2023 –

CRIUGM

We would like to sincerely thank our sponsors for their generous support of our event

Table des matières

Welcome & Opening

08:30 - 08:45

O. Monchi, **University of Montreal (UdeM)**
Scientific Director, Research Centre
Institut universitaire de gériatrie de Montréal (CRIUGM)

T. Dang-Vu (Chair), Concordia University
Professor, Neurologist
Associate director for clinical research, CRIUGM
Director, Sleep, Cognition & Neuroimaging Laboratory (SCNLab)

Session 1: New neuroimaging methods to study lifestyle and cognition

08:45 - 10:15

Moderators: H. Benali, Concordia University & A. Badhwar, University of Montreal

Stage -and pathology- dependent brain network breakdown underlying cognitive decline

Juan Helen ZHOU, Ph.D, National University of Singapore
Associate Professor, Principal Investigator
Multimodal Neuroimaging in Neuropsychiatric Disorders Laboratory
Centre for Sleep and Cognition, Yong Loo Lin School of Medicine &
Director, Centre for Translational MR Research, Yong Loo Lin School of Medicine & Department of Electrical and Computer Engineering

Dr. Juan Helen ZHOU is an Associate Professor at the Centre for Sleep and Cognition, and Director, Centre for Translational MR Research, Yong Loo Lin School of Medicine, National University of Singapore (NUS). She is also affiliated with NUS Medicine Human Potential Translational Research Program, Department of Electrical and Computer Engineering at School of Design and Engineering, and Duke-NUS Medical School at NUS.

Her laboratory studies selective brain network-based vulnerability in aging and neuropsychiatric disorders using multimodal neuroimaging, psychophysical techniques, and machine learning approaches. She is well-known for her pioneering brain connectome work in the framework of network-based neurodegeneration.

Helen received bachelor's and Ph.D. from School of Computer Science and Engineering, Nanyang Technological University, Singapore. She did a post-doctoral fellowship at the Memory and Aging Centre, Department of Neurology, University of California, San Francisco, and in the Computational Biology Program at Singapore-MIT Alliance. She was also an associate research scientist at Department of Child and Adolescent Psychiatry, New York University.

Helen has served as a Council Member and a Program Committee member of the Organization of Human Brain Mapping. She serves on the advisory board of Cell Reports Medicine and as an Editor of multiple journals including Elife, Human Brain Mapping, NeuroImage, and Communications Biology. She has received research support from National Medical Research Council, Biomedical Research Council, National Research Foundation, Ministry of Education, Singapore, the Royal Society, UK, and NIH, USA.

Vascular and metabolic contributions to cognitive decline

A. Badhwar, MSc, PhD, University of Montreal
Assistant Professor
Department of Pharmacology and Physiology
Faculty of Medicine, University of Montreal
Fonds de recherche du Québec Santé - Chercheur boursiers Junior 1

Dr. AmanPreet Badhwar is an early career Assistant Professor at the University of Montreal, Faculty of Medicine, Department of Pharmacology and Physiology, the Institute of Biomedical Engineering, as well as the Centre de recherche de l'Institut universitaire de gériatrie de Montréal. She directs the Multiomics Investigation of Neurodegenerative Diseases (MIND) Lab. Her research focuses on integrating observations from in-vivo imaging and molecular 'omics' in the study of age-related dementias, with the goal of discovering new biomarkers and therapeutic targets, and improving methods to speed drug discovery.

Dr. Badhwar holds a PhD from McGill University, where she integrated brain imaging, quantitative proteomics and measures of neurovascular coupling to study the interaction of neuronal and neurovascular damage in Alzheimer's disease (AD), and the impact of therapeutics on these two components. Elements of Dr. Badhwar's postdoctoral work sought to characterize the heterogeneity in AD cohorts using resting-state functional MRI connectivity, an emerging biomarker of synaptic or network dysfunction in AD. Another important aspect of Dr. Badhwar's postdoctoral work was focused on establishing a biomarker roadmap for the Canadian Consortium for Neurodegeneration in Aging, where she

and her colleagues proposed an analytic framework for generating multiomics biomarkers from imaging, genomics, metabolomics and other modalities.

Dr. Badhwar is the incoming Council-Secretary (2023-2024) for the Organization for Human Brain Mapping (OHBM), and has served as Chair for several of OHBM's Committees and Special Interest Groups (Diversity & Inclusivity, BrainArt, Student & Postdoc). In addition, she co-leads the pan-Canadian Vascular Training Platform that focuses on multi-disciplinary approaches to investigating vascular contributions to cognitive decline. She is also a member of the Canadian Consortium on Neurodegeneration in Aging and chair's the Data Access Committee. Dr. Badhwar has held several prestigious scholarships, awards and grants over the years. Recently she was awarded the Diversity & Inclusivity Champion Award (2022) by OHBM, which recognes of members who have made significant contributions to increasing diversity and inclusivity within the field of human brain mapping.

Simultaneous EEG/fNIRS as a new tool to investigate sleep in physiological and pathological conditions

C. Grova, PhD, Concordia University
Physics Dpt and PEFORM Centre, Concordia University
Biomedical Engineering Dpt, McGill University

Christophe Grova is Associate Professor affiliated to the Department of Physics of Concordia University and a research member of PERFORM center since July 2014, while remaining adjunct Professor affiliated to Biomedical Engineering Dpt and Neurology and Neurosurgery Dpt at McGill Faculty of Medicine. He received his Engineering and Master degrees in biomedical engineering at the University of Technology of Compiègne (France) in 1998, followed by a Ph.D. in biomedical neuroimaging at University of Rennes (France). From 2003 to 2008, his postdoctoral studies at the MNI were focussed on EEG source imaging of epileptic discharges and the correspondence with EEG/fMRI results, while acting as part time research associate for the set-up of the MEG centre of Université de Montreal (2006-2008). Since 2008, he is the director of the "Multimodal Functional Imaging Laboratory" (MultiFunkIm) which is now located on both McGill and Concordia campus. His areas of expertise are EEG/MEG source localization, multimodal data fusion involving EEG/MEG, fMRI and fNIRS, for application in epilepsy and sleep research. His team is also handling the development and validation of two software packages: MEM in Brainstorm for EEG/MEG source localization and NIRSTORM for fNIRS data analysis.

Session 2: Neuroimaging of sleep, sleep disorders and cognition

10:45 - 12:15
Moderators: O. Monchi, University of Montreal & T. Dang-Vu, Concordia University

Imaging neural, vascular, and cerebrospinal fluid dynamics of the sleeping brain

L. Lewis, Boston University
MIT and Massachusetts General Hospital

Laura Lewis is the Athinoula A. Martinos Associate Professor in IMES and EECS at MIT. She completed her Ph.D. in Neuroscience, and conducted postdoctoral work in neuroimaging, at the Athinoula A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital and the Society of Fellows at Harvard University. Her research develops multimodal approaches for imaging the human brain, and applies them to study the neural circuitry that controls sleep, and the consequences of sleep for brain function. Her work has shown that fast fMRI can measure subsecond neural dynamics, and discovered waves of cerebrospinal fluid flow that appear in the sleeping human brain. Her research has been recognized by awards such as the Peter and Patricia Gruber International Research Award, the Sloan Fellowship, the McKnight Scholar Award, and the Pew Scholar Award.

Sleep, memory and neuroimaging

Y. van der Werf, PhD, Amsterdam UMC
Professor of Functional Neuroanatomy,
Department Head Anatomy & Neurosciences,
Amsterdam UMC, location VUmc, Amsterdam, The Netherlands
President Netherlands Sleep-Wake Research Organisation (NSWO)
President Executive committee of the Assembly of the National Sleep Societies (ANSS-ESRS)

Ysbrand D.Van Der Werf, Ph.D. is Professor of Functional Neuroanatomy at the Amsterdam UMC, The Netherlands and the Head of the Dept. Anatomy and Neurosciences. He obtained his MSc in both Biology and Psychology at the University of Groningen, The Netherlands, obtained his PhD from the Graduate School for Neurosciences in Amsterdam and has worked at McGill University in Montreal, Canada and the Netherlands Institute for Neurosciences. He currently supervises a team of postdocs, PhD students and research assistants at Amsterdam UMC, The Netherlands. He was elected into 'The Young Academy', a platform for young scientists in the Royal Netherlands Academy of Arts and Sciences. He serves as President of the Netherlands Organization for Sleep-Wake Research (NSWO) and of the

Assembly of National Sleep Societies (ANSS-ESRS), and is the author of a popular science book on sleep in Dutch. He is a frequent speaker for lay and scientific audiences and at international scientific meetings.

His work is primarily concerned with understanding cognitive functions of the brain, using a wide array of techniques: neuroimaging (structural and functional MRI, PET, EEG, MEG), neuropsychology and experimental therapeutic interventions (transcranial magnetic stimulation, light therapy, sleep therapy). A main line of research involves the investigation of disordered sleep in neurological and psychiatric disorders. He is the PI of an international multicenter imaging study on Parkinson's disease (ENIGMA-PD), and co-leads a research line on neuroimaging in hypersomnia.

Neuroimaging of sleep disorders

T. Dang-Vu (Chair), MD PhD FAASM, Concordia University
Professor, Neurologist
Associate director for clinical research, CRIUGM
Director, Sleep, Cognition & Neuroimaging Laboratory (SCNLab)
Vice-President (Research), Canadian Sleep Society
Concordia University Research Chair in Sleep, Neuroimaging and Cognitive Health (Tier 1)
Ctr for Studies in Behavioral Neurobiology & PERFORM Ctr
Dpt of Health, Kinesiology and Applied Physiology, Concordia University

Dr. Thanh Dang-Vu received his M.D. in 2004 from the University of Liège, Belgium. He then completed a specialization in neurology and a Ph.D. in biomedical sciences at the same university. He completed his first postdoctoral fellowship at the Department of Neurology at the Massachusetts General Hospital (Harvard Medical School) in Boston, and a second postdoctoral fellowship at the Centre for Advanced Studies in Sleep Medicine at the Hôpital du Sacré-Coeur in Montreal. He is the recipient of several scientific awards, including from the Canadian Sleep Society, the Sleep Research Society, the European Sleep Research Society, the Belgian Association for Sleep Research and Sleep Medicine, and the Belgian Neurological Society. He is currently Full Professor and Research Chair in Sleep, Neuroimaging and Cognitive Health at Concordia University, and is a FRQS Senior Scholar.

Dr. Thanh Dang-Vu is also Vice President (Research) at the Canadian Sleep Society and a member of the Royal Society of Canada's College of New Investigators. He is also a neurologist, researcher and Associate Director of Clinical Research at the Geriatric University Institute of Montreal, as well as an associate professor in the Department of Neuroscience at the University of Montreal. Dr. Dang-Vu's research activities focus on the pathophysiology of sleep disorders and the role of sleep in cognition, using tools such as EEG and brain imaging. To date, he has published over 100 peer-reviewed journal articles and over 30 book chapters. Dr. Dang-Vu is on the editorial board of several scientific journals, and is an associate editor of the journal SLEEP.

Lunch

12:15 - 13:30

Poster session

13:00 - 14:00

Session 3: Neuroimaging of lifestyle in relation to cognitive health

14:00 - 16:15
Moderators P. Rainville, University of Montreal & A. Gallagher, University of Montreal

Neuroimaging approaches to neurocognitive impacts of cardiovascular diseases and exercise

Dr. Louis Bherer, Ph.D., University of Montreal (UdeM)
Director of the EPIC Center, Montréal Heart Institute
Professor, Department of Medicine, UdeM

Dr. Louis Bherer is full professor at the Department of Medicine at University de Montréal and the director of the EPIC Center of the Montréal Heart Institute in Montréal, Canada. Bherer completed a Master's degree in Cognitive Psychology (Université Laval), a PhD in Neuropsychology (Université de Montréal) and a post-doc in Aging and Neurosciences at the Beckman Institute for Advanced Science and Technology (University of Illinois at Urbana-Champaign, USA). Before 2012, Dr. Bherer held the CIHR Canada Research Chair on Aging and the Prevention of Cognitive Decline at the University of Quebec at Montreal (UQAM). From 2012 to 2016, he was the inaugural Scientific Director of the PERFORM Centre at Concordia University in Montreal. His research program studies the effect of cognitive stimulation, physical activity and exercise on cognition and cognitive decline associated with aging and cardiovascular diseases.

Impact of Mindfulness Meditation on Whole-Brain Markers of Attentional Control

Ruchika Prakash, PhD., The Ohio State University
Professor of Psychology
Director, Center for Cognitive and Behavioral Brain Imaging
https://clinicalneurolab.org

Dr. Prakash is a Distinguished Professor of Psychology at The Ohio State University. She is the Director of the Center for Cognitive and Behavioral Brain Imaging; a *state-of-the-art* neuroimaging research facility housed in the Department of Psychology. Dr. Prakash received her doctoral degree at University of Illinois at Urbana-Champaign. Her research interests center around designing and evaluating methodologically-rigorous randomized controlled trials of exercise training and mindfulness meditation. She has published 84 peer-reviewed journal articles, with many of her papers published in top tier psychology and neuroscience journals such as *Psychology and Aging*, *Proceedings of the National Academy of Sciences, NeuroImage, Cerebral Cortex, and Developmental Psychology*. She received the "Rising Star Designation" given by the Association for Psychological Science in 2013 and the Springer Early Career Achievement in Research on Adult Development and Aging by American Psychological Association in 2016. Her research program is funded by the National Institutes of Health and the National Multiple Sclerosis Society.

Impact of infantile malnutrition on brain function: NIRS-EEG data of the Barbados Nutrition Study

A. Gallagher, Ph.D., University of Montreal
Neuropsychologue, Professeure agrégée, Département de Psychologie
Chaire de recherche du Canada en Neuropsychologie de l'enfant et imagerie cérébrale
Directrice, LION Lab, Centre de recherche CHU Sainte-Justine
www.lionlab.umontreal.ca

Anne Gallagher is a pediatric neuropsychologist and an Associate Professor at the Université de Montréal, where she is the co-director of cerebrum, a group of 30 researchers interested in neuropsychology and cognitive and computational neuroscience. She holds a Canada Research Chair in Child Neuropsychology and Brain Imaging and directs the Neurodevelopmental Optical Imaging Lab at Sainte-Justine University Hospital. Using NIRS-EEG, her research is dedicated to cognitive and brain development in clinical populations at high-risk for neurodevelopmental disabilities. Her work in epilepsy has pioneered the development of presurgical imaging techniques using NIRS-EEG. She led the implementation of these methods in clinical environments where they are now used with patients with severe epilepsy.

Alcohol and brain health

A. Topiwala, University of Oxford
Senior Clinical Researcher University of Oxford; Honorary Consultant Psychiatrist Oxford Health NHS Trust.

I qualified in Medicine from the University of Oxford and subsequently pursued specialist training in older adult psychiatry. My DPhil (PhD) in Psychiatry examined the relationship of moderate drinking on neuroimaging and cognitive outcomes in later life. My current research, based in the Neuroimaging Statistics group at the Big Data Institute in Oxford, uses population neuroimaging to study the impact of risk and resilience factors on psychiatric and cognitive disorders of later life. A particular interest remains the association of alcohol consumption, a lifestyle factor which is widespread and modifiable, with adverse brain outcomes including dementia. As a practicing clinician I hope my research will ultimately yield benefits in dementia prevention.
In 2019 I was awarded a Wellcome Trust Clinical Research Career Development Fellowship to investigate the effect of and mechanistic pathways through which alcohol consumption impacts brain health. Using huge databases, which contain lifestyle and clinical data on millions of people in the UK and US, and the largest brain imaging and genetic samples worldwide, I hope to clarify how alcohol affects brain structure and function. The research is conducted in collaboration with colleagues at the Universities of Oxford, Yale and London.

Roundtable with all speakers and moderators

16:15 - 17:00