24th ANNUAL NEUROPSYCHOLOGY DAY

Program Booklet

May 1, 2023

Jeanne Timmins Amphitheatre
The Neuro (Montreal Neurological Institute-Hospital)
3801 University Street, Montreal, Quebec

Index

Brenda Milner

BRENDA MILNER, CC, GOQ, DSc, PhD

Dr. Brenda Milner is Canada's pre-eminent neuropsychologist, having pioneered research into the human brain. Many consider her a founder of the field of clinical neuropsychology and cognitive neuroscience. She is the Dorothy J. Killam Professor at the Montreal Neurological Institute and Hospital, and a professor in the Department of Neurology and Neuro-surgery. Her contributions revolutionized our understanding of how brain structures govern different learning, memory, and speech functions, and she has received numerous major awards and honours. Her career spans more than 70 years – 60 of those years as a member of the McGill and Neuro communities, where she directed the Neuropsychology Laboratory at The Neuro and taught in the Department of Neurology & Neurosurgery. She celebrated her 100th birthday on July 15, 2018; and continues to teach and conduct research at The Neuro.

2023 Annual Neuropsychology Day & Brenda Milner Lecture
The Neuro, McGill University
(Jeanne Timmins Amphitheatre and Foyer)

May 1, 2023

Program

12:00   **Lunch & Poster Session #1** (Jeanne Timmins foyer)

2 - 3:45 **Oral Presentations**

    Welcome – Xiaoqian Chai
    Montreal Neurological Institute-Hospital (The Neuro)

4:00   **Keynote Talk: Functional Specializations in the Cortex in Humans:
Which, When, and Why?**

    Welcome – Lesley Fellows
    Montreal Neurological Institute-Hospital (The Neuro)

    Nancy Kanwisher, B.S., PhD
    Investigator, McGovern Institute for Brain Research
    Chief, Behavioral Neurology, Department of Neurology
    Walter A. Rosenblith Professor of Cognitive Neuroscience
    Neuroscience, Brain and Cognitive Sciences, McGovern Institute, Cambridge, USA

5:15   **Cocktail Reception & Poster Session #2** (Jeanne Timmins foyer)

Brenda Milner Lecture - Keynote Speaker

Nancy Kanwisher, B.S., PhD
Investigator, McGovern Institute for Brain Research
Chief, Behavioral Neurology, Dept of Neurology
Walter A. Rosenblith Professor of Cognitive Neuroscience
Neuroscience, Brain & Cognitive Sciences, McGovern Institute, Cambridge, USA

Talk Title: Functional Specializations in the Cortex in Humans: Which, When, and Why?

Talk Abstract: The last 20 years of human brain imaging research has revealed a set of cortical regions specifically engaged in particular mental tasks from the perception of faces and speech sounds to understanding the meaning of a sentence or thinking about another person's thoughts. Each of these regions is present, in approximately the same location, in virtually every normal person. I like to think of this initial rough sketch of the functional organization of the brain as a diagram of the major components of the human mind, a kind of picture of who we are as perceivers and thinkers. But at the same time this new map is just the barest beginning, revealing a vast landscape of unanswered questions. What other specialized regions exist in the cortex, and what are they specialized for? How do these regions arise in development, and how much of the organization of the brain is specified at birth? Perhaps most fundamentally, why, from a computational point of view, is the brain organized the way it is, with this combination of highly specialized brain regions, along with very general-purpose systems? These open questions are much harder to answer, but I will mention a few tantalizing glimmers that are beginning to emerge from labs around the world.

Biography: Nancy Kanwisher received her B.S. and Ph.D. from MIT, working with Professor Molly Potter. After a postdoc as a MacArthur Fellow in Peace and International Security, and a second postdoc in the lab of Anne Treisman at UC Berkeley, she held faculty positions at UCLA and then Harvard, before returning to MIT in 1997, where she is now an Investigator at the McGovern Institute for Brain Research, a faculty member in the Department of Brain & Cognitive Sciences, and a member of the Center for Minds, Brains, and Machines. Kanwisher uses brain imaging and other methods to discover the functional organization of the human brain as a window into the architecture of the mind. Kanwisher has received the Troland Award, the Golden Brain Award, the Carvalho-Heineken Prize, and a MacVicar Faculty Fellow teaching Award from MIT, and she is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

Oral Presenters

Yigu Zhou
Functional Fingerprints of Dorsomedial Frontal Sulci are Materalized Markers of Behavior.
Yigu Zhou is a final-year BSc Neuroscience student at McGill University, entering the MD-PhD program following graduation. Yigu studyed structure-function relationships in the brain in two laboratories at the Montreal Neurological Institute. With Professor Michael Petrides, she studied functional neuroanatomy at the macro- and microscopic scales; with Professor Nathan Spreng, she explored network-based approaches for mapping brain functions from neuroimaging. Combining her passion for anatomy and imaging, Yigu am interested in implementing structural knowledge in the examination of functional imaging data, and brain-behavior relationships.

Alex Wiesman
Cortical Alpha-band Deviations Reflect Degeneration of The Locus Coeruleus in Parkinson's Disease.
Alex is a Postdoctoral Fellow with Professor Sylvain Baillet at The Neuro. His research combines time-resolved recordings of brain activity with measures of neurochemistry, brain structure, and cognitive function to understand clinical variability in patients with Parkinson's disease (PD). Alex completed his PhD with Professor Tony Wilson at the University of Nebraska Medical Center in the United States, where he focused on neuroimaging of patients with age-related neurological disorders.
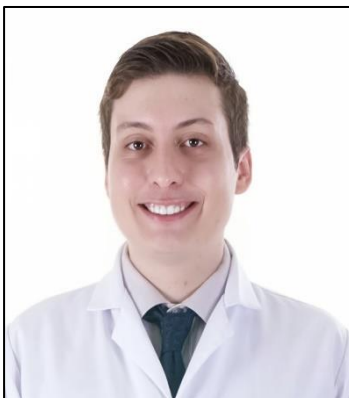
Gabriel D. Pinilla-Monsalve
Predicting Alzheimer's Disease Pathophysiology: Are Word-Finding Complaints a More Reliable Indicator than Objective Naming Tests?
Dr. Pinilla is a neurologist and population neuroscientist, currently serving as a postdoctoral fellow at the Montreal University Institute of Geriatrics. His research is focused on detecting early clinical manifestations associated with neurodegeneration in Parkinson's and Alzheimer's disease.

Marie Anick-Savard
Attention to Music Modulates Physiological Reactions to Trigger Sounds in Misophonia
Marie-Anick is a first-year PhD student in the Psychology (Research) program at Concordia University (Montréal, QC), where she also obtained her B.A. in Psychology. She is currently co-supervised by Dr. Emily Coffey (Coffey Lab: Audition, Sleep & Plasticity) and Dr. Mickael Deroche (Laboratory for Hearing and Cognition). Her research focuses on misophonia, a disorder involving extreme sensitivity to selective sounds which cause significant distress and a negative emotional state. Specifically, she uses neurophysiological measures to assess the impact of higher-level cognitive processes on responses to trigger sounds in individuals with misophonia.

Kep Kee Loh
Comparative Sulcal-Cytoarchitectonic Organization of Motor Areas in the Human and Chimpanzee Paracentral Cortex.
Kep Kee Loh is a cognitive neuroscientist who is curious about what makes our brains special compared to other primates. Brains are highly complex structures that can vary in many ways: they can differ in their overall or regional sizes, cortical folding patterns, connectivity, and underlying cellular organisation. As such, Kep Kee employs a combination of MRI-based and histological techniques to compare different aspects of brain organization across individuals and primate species. At the Petrides laboratory, Kep Kee is currently investigating the relations between sulcal morphology, cytoarchitecture, and white matter connectivity in the medial frontal cortex across humans, chimpanzees and macaques.

Dane Malenfant
Shaping AI With Indigenous Knowledge
Dane Malenfant is a recent computer science with psychology graduate from McGill University and incoming MSc student in the Linc lab at Mila in collaboration with the Montréal Neurological Institute. As a Métis citizen of Métis Nation — Saskatchewan, Dane is interested in challenging AI systems with traditional concepts to reject cognitive imperialism and centre Indigenous knowledge. He is also currently interested in Neuro-AI, human feedback and sparse representation. Outside of research, he works as a program coordinator in Branches at McGill University by designing and facilitating professional and research development programs tailored to Indigenous students.

Alexander Bailey

The Role of Nucleus Basalis of Meynert Degeneration in Cognitive Function in Early-Stage Parkinson's Disease

Alex is a second year MSc. Neuroscience student at McGill University, studying under the supervision of Dr. Madeleine Sharp. He is interested in bridging the domains of cognitive neuroscience and neuroimaging. His research examines the relationship between markers of structural integrity in the deep gray matter nuclei of the brain to the cerebral cortex in Parkinson's Disease. Prior research has noted that several neurotransmitter systems are affected early in Parkinson's Disease, but it remains unknown how anomalies in brain connections relate to distinct cognitive symptoms. Alex is also the co-host of the neuroscience podcast, *BrainStorm: Exploring Minds and Behaviours*."

Nasri Balit

Bringing the Lab to the Home: Feasibility of Large Scale Online Neurocognitive Testing in Parkinson's Patients

Nasri Balit is a research assistant at the Sharp Lab in the Department of Neurology and Neurosurgery at McGill University. Previously, he has completed a Master's and a Bachelor's in the Department of Physiology at McGill University. Nasri is currently exploring the variability in cognitive symptoms of Parkinson's patients and is interested in identifying whether clinically-actionable clusters of traits can be found within this variability, and what that can reveal about potential risk factors of Parkinson's progression.

Veronique Latreille

Scalp and Hippocampal Sleep Correlates of Memory Function in Adults with Drug-Resistant Temporal Lobe Epilepsy

Véronique Latreille is a neuropsychologist with subspecialty training in neurological and neurodegenerative disorders. She is a member of the Order of Psychologists of Quebec (OPQ) and an OPQ-certified neuropsychologist. She did her Ph.D. in clinical neuropsychology at the Université de Montréal and two postdoctoral fellowships (Brigham and Women's Hospital/Harvard Medical School and McGill University/Montreal Neurological Institute-Hospital), where she studied the relationships between sleep physiology and cognitive functioning in adults with Parkinson's disease and epilepsy.

Vaishali Mutreja

Slow Spindle Trains are Associated with Improved Declarative Memory Consolidation in Healthy Young Adults Vaishali Mutreja is a Ph.D. Candidate at Professor Julien Doyon's SPINDL lab at The Neuro. She completed her MSc. in Clinical Psychology in India. Her research focuses on the sleep spindle mechanisms underlying declarative memory consolidation. Vaishali has presented her research at various National and International conferences. She has received doctoral awards and fellowships from Healthy Brains, Healthy Lives (HBHL), and The Jeanne Timmins Costello Award to support her work. Her ultimate goal in the field of research is to provide the basis for developing non-invasive brain stimulation techniques that can improve memory consolidation when its capacity is impaired by aging and neurodegeneration.

Lidia Panier

Dysphagia Post-Traumatic Brain Injury: Associations with Treatment Response and Functional Outcomes

Lidia is a third-year PhD student in Clinical Psychology, and a neuropsychology practicum student at the Traumatic Brain Injury clinic at the Montreal General Hospital. She assessed TBI patients at bedside, noting differences in injury and outcome, resulting in this study supervised by Drs. Maude Laguë-Beauvais and Judith Marcoux. She is also interested in the effects of stress on EEG correlates of reward processing, in predicting the onset of internalizing disorders. This will form her dissertation research supervised by Dr. Anna Weinberg.

Session #1

Toward Real-World Applications of Cognitive Neuroscience: From Laboratory Tasks to Virtual Reality to Cave Exploration

Anita Paas[1], Arnaud Brignol[2], David St-Onge[3], Giovanni Beltrame[4], Emily B. J. Coffey[4]

1. Concordia University
2. Concordia University and Polytechnique Montreal
3. Ecole de Technologie Superieure
4. Polytechnique Montreal

Cognitive neuroscience has the potential to improve human performance, but successful attempts to transfer knowledge of cognition and its physiological correlates from laboratory studies to real-world applications are limited. We explore applications of test platforms that can be used to create naturalistic environments, while maintaining experimental control in the context of safety-critical operations (e.g., exploration, controlling robotics). Cognitive workload (CW; i.e., mental resources required to perform a task) can be used to predict and improve operator performance and safety. Our research goals are to investigate if portable physiological sensors effectively measure physiological responses to CW across simple and complex tasks and experimental settings (i.e., from lab to naturalistic).We present an overview of our research program in which we progress from a controlled lab experiment, to an intermediate virtual reality platform, and end with a real-world cave exploration field test with the sensors.

Functional Networks of Multisensory Integration In Marmosets

Tyler Cook, Justine Cléry

McGill University, Montreal Neurological Institute

The constant integration of multiple senses is essential for navigating our environment. Those with an altered ability to integrate their sensory environment, such as individuals with autism spectrum disorders, demonstrate maladaptive traits like hypo- or hyper-sensitivity, impaired decision-making, hallucination, or synesthesia. Developing new therapies for these disorders requires better knowledge of the neurodevelopment of higher-order sensory processing systems. The common marmoset has become a promising non-human primate model for translational research due to their genetic and behavioral homology with humans. Using an interactive primate testing chair attached to the animals' home cage, we are using touchscreen-based tasks for testing marmoset's capacity for distinguishing visually similar stimuli associated or not with auditory or tactile cues. In addition, we habituate marmosets to the MRI environment (noise, animal holder, head restrain) to then perform awake functional magnetic resonance imaging pre- and post-task to measure changes in brain networks, synaptic plasticity and myelination.

Verbal Encoding, Consolidation and Retrieval Scores Differentially Relate to Tau and Atrophy in Early and Late Stages of Alzheimer's disease

Jaime Fernandez Arias[1], Joseph Therriault[1], Cecile Tissot[1], Stijn Servaes[1], Yi-Ting Wang[1], Arthur Macedo[1], Peter Kunach[1], Kely Quispialaya[1], Nesrine Rahmouni[1], Seyyed Hosseini[1], Tahnia Nazneen[1], Jenna Stevenson[1], Alyssa Stevenson[1], Firoza Lussier[2], Etienne Aumont[3], Gleb Bezgin[1], Vanessa Pallen[1], Sulantha Mathotaarachich[i4], Paolo Vitali[1], Gassan Massarweh[5], Serge Gauthier[1], Tharick Pascoal[2], Pedro Rosa-Neto[1]

1. McGill University
2. University of Pittsburgh
3. UQAM
4. Cerebrum Analytics
5. Montreal Neurological Institute
6. University of Pittsburgh

Encoding, consolidation and retrieval deficits are associated with tau accumulation in aging and early stages of the Alzheimer's disease spectrum, where most participants are cognitively unimpaired. While encoding and consolidation deficits relate to tau accumulation in right entorhinal and transentorhinal cortices and surrounding areas, retrieval deficits are related to tau load in the right hippocampus. Consolidation deficits are also associated with brain volume in bilateral hippocampus at these early stages, while encoding deficits relate to tau load in the cingulate cortex. By contrast, memory deficits associate to tau accumulation in the neocortex in late stages of the Alzheimer's disease spectrum, encompassing large swaths of the left temporal, parietal and frontal cortices for encoding deficits, bilateral parietal regions for consolidation deficits and some areas of the left prefrontal cortex for retrieval deficits.

Lesions Affecting the Dorsomedial Frontal Cortex Impair Error-Based Motor Learning, but not Reinforcement-Based Learning

Dimitrios Palidis, Lesley Fellows
McGill University

During motor learning and adaptive control, neural activity in the dorsomedial frontal cortex (DMF) commonly signals sensory errors and performance outcomes. Sensory errors drive adaptation of feedforward control, as well as adaptive changes to the gains of feedback corrections. Positive performance feedback drives reinforcement-based learning, while negative performance feedback increases exploratory motor variability. Because DMF signaling related to performance monitoring is associated with multiple distinct behavioral processes which are often correlated and co-occurring, the specific causal role of the DMF is unclear. In the present study, we administered a battery of behavioral tasks involving adaptive control of reaching arm movements to people with focal lesions affecting the DMF and healthy controls. We found that people with lesions affecting the DMF were selectively impaired in adaptation of feedforward control in response to sensory errors, but not in reinforcement-based motor learning nor modulation of feedback gains in response to errors.

Spontaneous Auditory-reward Network Connectivity Predicts Cegree of Pleasure to Music

Kazuma Mori, Robert Zatorre
McGill University

Music can evoke pleasurable and rewarding experiences. Past studies have examined task-related brain activity, revealed individual differences in musical reward sensitivity traits, and linked them to interactions between the auditory and reward systems. However, state-dependent fluctuations in spontaneous neural activity in relation to music-driven rewarding experiences have not been studied. Here, we used functional MRI (N=49) to examine whether the coupling of auditory-reward networks during a silent period immediately before music listening can predict the degree of musical rewarding experience. We used machine learning models and showed that the functional connectivity between auditory and reward networks, but not others, could robustly predict subjective, physiological, and neurobiological aspects of the strong musical reward of chills. Specifically, the auditory-striatum/orbitofrontal connections were related to neural positive arousal responses, whereas the auditory-amygdala connection was associated with physiological arousal. Moreover, the predictive model of auditory-reward network derived from one sample of individuals replicated in an independent dataset. The current study reveals the role of pre-task brain state in efficiently connecting sensory and reward systems leading to an intensely rewarding experience.

MEG Frequency-Tagged measures of Binocular Rivalry with Interocular Grouping

Eric Mokri, Jason Da Silva Castanheria, Janine D. Mendola
McGill University

Binocular Rivalry (BR) is a visual phenomenon where perception alternates between two non-fusible images. It is robust in that alternations between percepts remain, even when the image is

divided and presented in complementary patches across the eyes, termed Interocular Grouping (IOG). During MEG stimuli-based frequency-tagging of BR and IOG, we observed oscillatory changes in the power of the fundamental frequencies that were predictive of behavioral reports during dominant and suppressed percepts. Fluctuations in the power were band-passed at the fundamental frequencies of the rivalrous tags using Hilbert time-frequency analysis, and time-locked to participant reports of perceptual alternations. The oscillatory dynamics observed to be in counterphase with one another were obtained from both occipital (i.e., beyond V1) and parietal regions, and differed in their time-courses. Differences in the power and topography of the tagged frequencies were present between IOG and classic BR, as well as between different grouping conditions.

Bayesian Estimates of Periodic Neural Spectral Power

Luc Wilson, Jason Da Silva Castanheria, Sylvain Baillet
McGill University

Macroscopic neural signals are composed of both rhythmic (periodic) and arrhythmic (aperiodic) components. Both components are linked to individual behaviour, health, and disease. Recent methodological advances have enabled the quantification of these components as distinct spectral features. We build on these methods using Bayesian Information Criterion to generate parsimonious, data-driven estimates of periodic activity. We apply our approach on a lifespan dataset (age: 18-88; N = 606) to generate normative trends in a/periodic spectral features across healthy aging. We also derive estimates of Bayesian evidence (i.e., Bayes factor) for the presence of periodic brain activity, finding the highest evidence for periodic activity in the cuneus and the lowest evidence in the subcentral gyrus and sulcus. We conclude that our approach offers critical insight to the localization of periodic brain activity and is directly relevant for disambiguating changes in periodic and aperiodic activity in healthy aging.

Optimizing Fiber Photometry to Image Multiple Neural Populations during Flexible Decision Making

Albert Pelinovsky, Niharika Dighe, Jonathan Britt
McGill University

Flexible decision making relies on making choices based on the value of their outcomes. This strategy is impaired after chronic drug use, resulting in maladaptive, habitual behaviour. The dorsomedial striatum (DMS) is potentially involved through complementary value encoding in D1 and D2 receptor populations, however this hypothesis has been complicated by inconsistent results. To begin testing DMS involvement, an assay simultaneously recording the two neuron populations in vivo would be advantageous, which can be accomplished by using two genetically encoded calcium indicators (GECIs) that target separate neurons. This assay has been conducted by other groups but has yet to be accomplished in our laboratory. We demonstrated that GECI signal can be recorded from both D1 and D2 receptor neurons in behaving mice, confirming prior research. This technique will be used to explore DMS involvement in flexible decision making and how this can be impaired with long-term cannabis consumption.

What Makes Bilinguals Feel Different Depending on The Languages They Speak: Cultural Entrenchment or Social use?

Emi Emin, Marco S. G. Senaldi, Debra Titone
McGill University

Existing evidence suggests that bilingual speakers might perceive their personality differently depending on the language they are speaking. Across different theories, this relationship between language and personality has been linked to historical factors, like speakers' cultural entrenchment in a language, or to speakers' current language use across social contexts. In this study, we investigated the effect of cultural entrenchment and social use of language on the relationship between language and personality. In an off-line survey, 61 multilingual participants were asked if they perceived their personality and emotionality to change based on the languages they spoke. As well, they provided information on their distribution of daily language use and the

degree of language entrenchment in their families. Results from logistic and linear regression analyses revealed that bilinguals' self-perceived change in personality and emotionality can be predicted from their degree of language entrenchment and social language use.

Longitudinal Inference of Multiscale Markers in Psychosis - From Hippocampal Centrality to Functional Outcome

Jana F. Totzek[1], M. Mallar Chakravarty[1], Ridha Joober[1], Ashok Malla[1], Jai L. Shah[1], Alexandra L. Young[2], Dennis Hernaus[3], Martin Lepage[1], Katie M. Lavigne[1]

1. McGill University
2. King's College London
3. Maastricht University

Multiscale neuroscience characterizes aberrant interactions between distinct biopsychosocial scales as the root of psychiatric disorders. We propose a multiscale model of psychosis in which deteriorations of hippocampal-cortical connectivity precede impaired episodic memory and social cognition, resulting in higher negative symptoms and poor functional outcome in a subgroup of patients. We applied SuStaIn, a machine-learning algorithm which integrates disease progression modeling and clustering, to the patient data of two cross-sectional samples (163 psychosis patients, 117 non-clinical controls). SuStaIn identified two disease subtypes. Subtype 1 showed impaired episodic memory, social cognition, negative symptoms and functional outcome and progressed from deteriorated memory to social cognition, negative symptoms, functional outcome and connectivity. Subtype 2 showed impaired hippocampal connectivity and progressed from reduced connectivity to memory and social cognition, functional outcome and negative symptoms. These distinct multiscale trajectories show that biomarkers other than morphometric hippocampal-cortical connectivity might drive cognitive and functional impairments of psychosis.

White Matter Correlates of Episodic Memory at Midlife in Females: Assessing the Impact of Menopause

Rikki Lissaman[1], Sricharana Rajagopal[2], Emily Goard Jacobs[3], Mengdi Zhu[1], Stamatoula Pasvanis[2], Maria Natasha Rajah[1]

1. McGill University
2. Douglas Research Centre
3. UCSB

Age-related decline in spatial context memory begins in midlife, a period of the lifespan in which females undergo substantial neuroendocrine change as part of the menopausal transition. Despite this, little research has directly investigated the impact of menopause on spatial context memory and its neural correlates. Here, we examined menopause-related differences in spatial context memory and associated changes in white matter microstructure – assessed using diffusion tensor imaging – in 107 middle-aged females (29 pre-menopausal, 34 peri-menopausal, 44 post-menopausal). At the behavioral level, there was no effect of menopause independent of age, although females did show a different age trajectory to middle-aged males (n = 30). At the neural level, multivariate analysis identified a pattern of white matter microstructure that was associated with spatial context memory accuracy only in the peri-menopausal group. Although preliminary, these results underscore the importance of considering menopause (and sex) in research on midlife and neurocognitive aging.

Two Subtypes of Autism with Transcriptomic Signatures Derived from Morphometric Similarity Networks

Hongxiu Jiang, Boris Bernhardt, Xiaoqian Chai

McGill University

There is high heterogeneity among individuals with autism spectrum disorder (ASD), which hinders the discovery of its neurobiological mechanisms, thus motivating subtyping efforts. We used MSNs, morphometric similarity networks (MSNs), which measure the inter-regional morphometric similarity of multiple morphometric features, and clustering methods to identify

subtypes of ASD and applied partial least square regression (PLSR) to link the brain-based differences and genetic signatures. Based on MSNs, two potential subtypes of ASD were identified which showed distinct patterns from each other in lateral frontal, temporal regions and visual regions, and have different functional biological processes and cell types. Specifically, Compared to TD, subtype-1 has more positive values in regions where the values of TD are positive and more negative values where the TD values are negative. Subtype-2 has more attenuated MSN values in these regions. Our results support the existence of different neuroanatomical subtypes in ASD.

Transfer Effects from Language Processing to Visual Attention Dynamics: The impact of Orthographic Transparency

Antonio Iniesta[1], Daniela Paolieri[2,] Marta Rivera[2], Teresa Bajo[2]
1. McGill University
2. University of Granada

The consistency between letters and sounds varies across languages. These differences have been proposed to be associated with different reading mechanisms (lexical vs. phonological), processing grain sizes (coarse vs. fine) and attentional windows (whole words vs. individual letters). This study aimed to extend this idea to writing to dictation. For that purpose, we evaluated whether the use of different types of processing has a differential impact on local windowing attention: phonological (local) processing in a transparent language (Spanish) and lexical (global) processing of an opaque language (English). Spanish and English monolinguals performed a writing to dictation task followed by a global–local task. The first key performance showed a critical dissociation between languages: the response times (RTs) from the Spanish writing to dictation task was modulated by word length, whereas the RTs from the English writing to dictation task was modulated by word frequency and age of acquisition, as evidence that language transparency biases processing towards phonological or lexical strategies. In addition, after a Spanish task, participants more efficiently processed local information, which resulted in both the benefit of global congruent information and the reduced cost of incongruent global information.

Modulation of Theta Oscillations in Frontotemporal Networks and Musical Pleasure

Albert Leon[1], Robert Zatorre[1], Joseph Marco-Pallarés[2]
1. McGill University
2. Universitat de Barcelona

A principal goal of the brain is to predict rewarding events, and the strongest response occurs to outcomes that are better than expected. It has been shown that the relationship between the information content of melodies and liking, follows an inverted-U shape, such that music of intermediate complexity is preferred. As there is an empowerment in the theta band while listening to pleasant music, in this study we aimed to causally test this model by modulating the theta oscillatory activity in the auditory cortex using tACS. We predicted that theta tACS to the auditory cortex will modulate the theta connectivity resulting in a change in the relationship between complexity and liking. We found that tACS increased the liking on those melodies with low complexity, probably as a consequence of an increase in the ability to surprise the listener and become more rewarding.

Physiological Measures of Vocal Emotion Processing

Cassandra Neumann, Mickael Deroche
Concordia University

Cochlear implant (CI) users have an impaired ability to detect vocal emotions. This research aims to find objective markers of these difficulties using pupil, heart rate, and skin conductance recordings to measure the autonomic nervous system processing of vocal emotions. To do so, we are currently collecting data and validating these measures in normally-hearing undergraduate students. Participants are presented with audio recordings of sentences with either matched or mismatched semantic and prosodic cues to emotions and are asked to choose the expressed

emotion. Shortly after the onset of the sentence, the pupil dilates, the heart rate becomes more regular, and the phasic driver of the skin conductance increases. However, these effects vary by emotion and trial type (congruent vs. incongruent). We plan to collect data on CI users in the Montreal community to uncover signs of abnormal processing in the affective domain that may not be necessarily expressed behaviourally.

White Matter Integrity and Verbal Memory Following a First Episode of Psychosis: A longitudinal Study

Joseph Ghanem[1], Jana Totzek[1], Katie M. Lavigne[1], Charlie Henri-Bellemare[1], Delphine Raucher-Chene[1], Gregory Kiar[2], Raihaan Patel[3], Ridha Joober[1], Ashok Malla[1], M. Mallar Chakravarty[1], Jai Shah[1], Martin Lepage[1]

1. McGill University, Douglas Mental Health University Institute
2. Center for the Developing Brain, Child Mind Institute, New York
3. University of Oxford

Studies of white matter differences in psychotic disorders have reported lower fractional anisotropy (FA) in schizophrenia patients compared to controls, but others failed to observe these findings in first-episode psychosis (FEP) samples. Notably, the few longitudinal studies of white matter change in FEP consist of short follow-ups that do not investigate changes in cognition despite verbal memory deficits in this population. Here, FEP patients recruited from a psychosis clinic and demographically matched controls were followed over 18 months, scanned for diffusion-weighted images, and evaluated on verbal memory at four timepoints. Following preprocessing, FA will be computed by fitting a diffusion tensor model at each voxel. FA differences between FEP and controls and changes in verbal memory will be compared using Tract-Based Spatial Statistics (TBSS) and linear mixed-effects models. This study is one of the first to investigate progressive white matter changes and their association with verbal memory in FEP.

Individual Differences in the Effect of Lapses of Attention on Subsequent Spatial Context Memory

Gabriela Velez Largo, Abdelhalim Elshiekh, Sricharana Rajagopal, Toscane Hamaide, Stamatoula Pasvanis, M. Natasha Rajah

McGill University

Thirty-eight young adults (20–34 years, 21 females, mean education = 16 years) completed a task fMRI study that investigated how trial-by-trial fluctuations in attention at encoding affected subsequent spatial context memory and related brain activation. Participants encoded photographs of common objects and their left/right spatial location. In addition, they were required to respond as quickly as possible to a fixation cross that expanded in size at a random duration after each trial. Response times (RTs) to the fixation cross were hypothesized to reflect individuals' attention levels. Results indicated that slower RTs following the object offset predicted poorer spatial context memory (b = -0.30, SE = 0.10, z = -3.01, p = .0026). This effect was mediated by the medial/superior frontal gyri and modulated by executive and attention-related factors. Our results support the conclusion that the ability to sustain attention at encoding may contribute to individual differences in episodic memory performance.

Cognitive Neuroscience Knowledge Exchange for Clinical Translation

Kaija Sander[1], Anna Weinberg[2], Maiya Geddes[1], Krystle Van Hoof[3], Jess Malz[4], Lesley Fellows[1], Madelaine Sharp[1]

1. Cognitive Neuroscience Unit, Department of Neurology and Neurosurgery, McGill University
2. Department of Psychology, McGill University
3. Healthy Brains for Healthy Lives, McGill University
4. INBO Consulting

Cognitive neuroscience has the potential to create meaningful change in people's lives, but discoveries rarely reach the populations they intend to benefit. The COgnitive Neuroscience kNowledge Exchange for Clinical Translation (CONNECT) project is a novel initiative aiming to

develop and study new approaches to enhance interdisciplinary collaboration and integrate end-users to increase the clinical and societal impact of cognitive neuroscience. Here we describe the first cycle of CONNECT. Drawing inspiration from creative problem-solving methods well-established in industry, we designed a series of workshops that assisted researchers from various disciplines to form novel teams and develop project proposals which were subsequently "pitched" for funding. The workshops guided participants through key steps: collaborative brainstorming, identification of end-users and articulation of their needs, and solution prototyping. Preliminary results will be presented.

Unravelling the Neuropsychological Profile of Patients with Chronic Pain

Erika Gentile[1], Eugene Borokhovski[2], Benjamin Haward[1], David Pickup[2], Isabelle Plante[3], Mathieu Roy[1]

1. Department of Psychology, McGill University
2. Centre for the Study of Learning and Performance, Concordia University
3. Department of Education, Université du Québec à Montréal

People with chronic pain commonly report cognitive impairment, and while these complaints have been objectified, methodology limitations still exist in obtaining a comprehensive neuropsychological profile. This study used meta-analytical methods to analyze 68 articles that compared cognitive functioning between groups with and without chronic pain using performance-based and self-reported measures. Results indicated a moderate effect estimate in favor of better performance by healthy controls ($g = -0.524$, 95% CI: -0.57 to -0.48), with no significant difference found across evaluated domains, although subjective deficits were significantly greater than objective impairment ($Q(1) = 60.88$, $p = 0.000$). Meta-regression analyses identified sociodemographic, pain, and psychosocial moderators that may explain the observed heterogeneity. Our study provides valuable insights into the cognitive impairments associated with chronic pain, indicating a transdiagnostic rather than disease-specific profile. These findings can guide future research on the underlying mechanisms of these impairments in pain and improve treatment options and outcomes.

Behavioral and Eye Gaze Patterns in Political Decision Making

Shahd Fares, Dietlind Stolle, Signy Sheldon, Lesley K. Fellows

McGill University

Voting choices are fundamental to modern democracy. Personal and policy traits of political candidates likely influence the evaluations and choices of individual voters. Such choices are complex, requiring consideration of multiple attributes. Cognitive neuroscience has studied the behavioural mechanisms and brain basis of multi-attribute economic decision making. Leveraging insights from the study of complex object recognition, recent work provides evidence for distinctions between holistic (configural) and additive (elemental) valuation processes, revealed by different behavioural and gaze patterns during deliberation and supported by distinct brain circuits. Whether this distinction holds for political choice is not known. We are investigating this question with a simple voting choice experiment. We are analyzing behavioural (reaction time, choice) and eye-tracking (gaze fixations and transitions) patterns in healthy eligible voters choosing between two candidates per trial. We hypothesize that manipulating the information presented (characterizing the candidate by both their personal and policy attributes or solely using their policy attributes) will predispose individuals to prioritize configural or elemental valuation processes, betrayed by distinct information acquisition patterns.

Enhanced Option Generation is Associated with Increased Physical Activity in Cognitively Normal Older Adults

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Introduction and objectives: Theoretical models of motivated decision making suggest option generation is an early component process in action initiation. Further, there is mixed evidence that links option generation to behavioural apathy. The aim of our study was to examine the relationship between option generation and objectively measured real-world physical activity engagement in healthy older adults.

Methods: We developed a novel paradigm to assess option generation for short- and long-term physical activity goals. Twenty-seven healthy older adults (mean age = 69.32 years, 24 female) generated different solutions and motivations to concrete ("how", short-term) and abstract ("why", long-term) goals. Sedentary behaviour was measured via thigh-worn monitors to estimate levels of inactivity, and step count was measured with wrist-worn accelerometers. Levels of apathy were captured using the Apathy Evaluation Scale.

Results: Higher levels of physical activity were significantly related to increased option generation. Phonemic fluency was positively associated to option generation but was not related to sedentary behaviour. We did not identify significant effects between option generation and apathy.

Conclusions: These preliminary findings suggest option generation may be uniquely related to real-world physical activity engagement in cognitively normal older adults.

Development of Self-Referential Encoding in Autism Spectrum Disorder

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Autism spectrum disorder (ASD) is associated with a diminished self-concept, contributing to impaired episodic memory. This impairment may contribute to social cognitive deficits due to the necessity of recalling previous interactions to infer mental states of social partners. It remains unclear how self-referential encoding is supported in the brain in children with ASD. Eighty 8- to 12-year-olds with and without ASD participants judged if adjectives described themselves or someone else while undergoing MRI and were later tested on adjective recognition. Neurotypicals showed expected activations in mPFC and precuneus for self-referential processing, while the ASD group only showed the anterior activations. Neurotypicals had subsequent memory activations in the mPFC and posterior cingulate, while the ASD group had activations in the posterior hippocampus. These preliminary findings suggest a reduced self-referential processing in children with ASD associated with diminished midline cortical activation, which can inform interventions to improve self-relational processing and social cognition.

Neural Mechanisms of Sensorimotor Integration in Speech Perception

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Speech perception is an active and flexible process which can be influenced by the listening context and inputs beyond audition. In this study, we employ a categorical speech perception paradigm and manipulate participants' articulatory configuration by expanding their lip surface area. This perturbation influenced perception of French vowels: shifting participants' perceived boundary between phonemes. Furthermore, the perturbation was accompanied by changes in oscillatory brain activity: posterior regions showed a decrease in alpha power (8-12 Hz), whereas

beta power (15-25 Hz) was expressed differentially in temporal and frontal regions. Interestingly, perturbation-induced changes were correlated in both oscillatory activity and perception at the group level. The observed neural dynamics are consistent with theories of predictive motor-to-auditory signalling occurring via mu rhythm (8 – 30 Hz) dynamics. These findings highlight the importance of sensorimotor brain systems in the active perception of speech; suggesting that articulatory representations activated during listening may guide phonemic processing.

Spindle Trains are Associated with Cognitive Performance in Patients with Parkinson's disease

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Sleep spindles have been associated with cognitive performance across the lifespan and disease and might serve as a marker of cognitive state. In patients with Parkinson's disease (PD), changes in sleep spindles have been associated with cognitive decline. Recently, trains of sleep spindles (i.e., ≥ 2 spindles within 6 seconds) have been proposed to play a role in sleep-dependent memory consolidation. Whether spindle trains are reduced in PD patients, and whether they are associated with cognitive performance remains unknown. PD patients (n=58) and a preliminary sample of healthy older adults (n=15) underwent a comprehensive neuropsychological assessment and overnight polysomnography. In preliminary analyses comparing spindle trains between PD patients and controls, number of trains, size of trains and proportion of spindles in trains were significantly decreased in PD compared to controls. In patients, lower number of trains during NREM-2 was associated with lower scores on composites of attention and executive function.

The Role of Incongruent Episodic Encounters in Updating Social Schemas

Juliette Dupertuys, Daria Lisus, Signy Sheldon

McGill University

Making predictions in everyday life involves schemas, or generalized knowledge about the world. It is thought that schemas are altered when encountering information incongruent with these predictions. Our study investigated this assumption in the context of person schemas – expectations of an individual's behaviour. University-age participants completed a three-phase experiment. First, participants developed positive, negative, or neutral schemas associated with six targets (individuals). Second, they completed a behavioural likelihood task to estimate schema strength, and encoded narratives that involved each target engaging in either schema-congruent or incongruent behaviours. Third, participants completed the behavioural likelihood task to estimate schema change. Participants updated positive and negative schemas in accordance with incongruent narratives, but this updating was greatest for negative schemas. The extent to which positive schemas were updated was determined by memory for narratives. Our results provide new insights into the role of incongruent information and emotion in updating schemas in social contexts.

Identifying the Shared and Distinct Cognitive Mechanisms Underlying Mood and Behvioural Symptoms in Parkinson's Disease using a Reward Learning Task

Sophie Sun, Madeleine Sharp

McGill University

Apathy, anhedonia, depression, and impulsivity are prevalent symptoms of Parkinson's disease (PD) linked to impairments in reward learning and dopamine dysfunction. However, these symptoms manifest variably across patients despite a common link to the uniformly affected dopamine system. We tested 65 PD patients and 37 controls on a standard reward learning task. We used a reinforcement learning-drift diffusion model to extract performance parameters

reflecting different processes. Participants also completed questionnaires measuring apathy, anhedonia, depression, and impulsivity. PD patients had slower drift rates than controls. Separate regressions predicting each mood symptom severity revealed that apathy, depression, and impulsivity, but not anhedonia were each negatively associated with positive learning rate. Additionally, impulsivity was negatively associated with drift rate and positively associated with decision boundary.These results suggest that mood symptoms in PD relate to different cognitive mechanisms of reward learning. Future directions involve relating performance to neuroimaging measures of the dopaminergic system.

Effectiveness of Sleep Spindle Auditory Stimulation on Declarative, Procedural and Complex Learning in Older Adults

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Concordia University

Closed-Loop Auditory Stimulation (CLAS) of slow-oscillation (SO) up-states in sleep elicits additional SOs, enhances memory consolidation, and induces sleep spindles (transient bursts of brain activity in the sigma frequency range, ~11-16 Hz). However, CLAS of spindle up-states is more technically challenging due to their shorter duration and higher frequency range. To address this issue, we developed the Portiloop device, capable of real-time stimulation of endogenous sleep spindles. The current study stimulates sleep spindles to compare the physiological and behavioral effects of stimulation between younger and older adults. Forty younger (18-40) and 10 older (60-75) healthy adults were divided between unstimulated sleep and spindle stimulation conditions. Participants learned and were tested pre-/post-sleep on three randomly ordered cognitive tasks assessing declarative (Grid-Location), procedural (Motor Sequence Learning), and complex auditory-motor memory (piano-learning, an ecologically valid measure of integrated memory). We hope to advance the field of CLAS of brain events, improving their specificity, towards potential interventions.

Morphological Variability of the Inferior Frontal Sulcus in the Chimpanzee (Pan troglodytes) Brain

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There has been considerable interest in the neuroanatomical similarities of the homologue of Broca's region in nonhuman primates to further understanding of the evolution of language. The inferior frontal sulcus (ifs) is a critical landmark below which lie language production areas. We, therefore, examined the morphology and variability of the ifs in the chimpanzee (Pan troglodytes) brain. Cortical surfaces were reconstructed from 50 in-vivo MRI scans (3T) from the National Chimpanzee Brain Resource, which permitted 3D investigation of the sulcal contours and fundus. The ifs was manually labelled and the variability in its morphology and relationships to adjacent sulci (e.g., the inferior precentral sulcus, diagonal sulcus and rectus sulcus) were examined. The frequency of the morphological patterns and connections of the ifs to neighbouring sulci will be presented. Defining the morphology of the ifs may provide insight into the structural blueprints that permit the development of language in human brains.

Development of an Open-source, Community-driven, Digital Neurocognitive Battery for Flexible Use

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2. UQAM

Neurocognitive assessments are being increasingly used in remote settings, yet current neurocognitive measures are either poorly validated, costly, or are limited in their scope. We

introduce an open-source, community-driven neurocognitive battery through the PsychoPy/Pavlovia platform to improve accessibility to researchers and clinicians and facilitate neurocognitive assessments in various settings. Our in-development battery (1) assesses 7 traditional neurocognitive domains (verbal fluency, attention, processing speed, working memory, verbal memory, visual memory, executive function) in English and French, (2) incorporates touchscreen and speech recording features, and (3) is flexible across various digital devices (smartphone, tablet, computer), settings (remote, neuroimaging), and longitudinal designs. Through iterative community development and upcoming validation studies, we aim to incorporate new features, including additional language support, neuroimaging integration, and automated speech transcription for verbal tasks. This initiative represents a shift towards open and citizen science in neuropsychology and has the potential to transform current practices in the field.

Exploring the Role of Socially-based Contextual Diversity in Idiom Processing

Marco S. G. Senaldi, Debra Titone, Brendan Johns

McGill University

Corpus-based models of the lexicon have revealed that contextual and semantic diversity, which reflect a principle of likely need, are better predictors of language behavior data than frequency, which encodes a principle of repetition. While most of this evidence has been observed for single words, corpus-based data suggest that most of our linguistic production is actually composed of conventional multiword and idiomatic structures. In this work, we investigated if contextual diversity is a better predictor of language processing also at the level of multiword language. Using a 55-billion-word corpus of Reddit comments, we computed contextual and semantic diversity measures, as well as frequency, for 210 English idioms taken from Libben & Titone's (2008) norms and compared their performance in predicting human-elicited ratings of idioms' familiarity and on-line phrasal decision latencies. Results suggest that contextual diversity and likely need drive lexical organization also at the level of multiword units.

Fingerprints are forever: Neurophysiological Fingerprints No Differ in Accuracy, but in Content Across the Adult Lifespan

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Brain fingerprinting is a novel tool that allows us to understand inter-individual diversity in brain activity across health and disease. We derived neurophysiological fingerprints of 606 individuals based on frequency-defined features of eight-minute magnetoencephalography recordings to explore neurophysiological changes throughout healthy ageing. Our ability to differentiate individuals in this cohort was not related to age. Younger adults (18-45 years old) remain as differentiable (92%) as older adults (93%; 65-90 years old), even when using short data segments of 30 seconds. The most differentiating features used for fingerprinting, on the other hand, change across the lifespan along a posterior to anterior gradient. We demonstrate that regions where we can decode cognitive abilities of participants colocalize with the age-related fingerprinting features. Together our study showcases the robustness of fingerprinting across the adult lifespan and demonstrates the relevance of neurophysiological fingerprinting for mapping individual differences in cognition.

Meta-Analysis and Systematic Review of the Relationship between Negative Symptoms and Neurocognitive Functioning in Schizophrenia Spectrum Disorders

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Negative symptoms are a core symptom domain in schizophrenia spectrum disorders. Although their underlying mechanisms are not well understood, a promising area is the relationship negative symptoms have with neurocognition, as both represent trait-like entities. The aim of this systematic review was to determine whether the relationship between neurocognition and negative symptoms in schizophrenia spectrum disorders is driven by specific neurocognitive domains (e.g. verbal memory) or a general neurocognitive factor. To that end, we compared the strength of correlations between negative symptoms and the six MATRICS neurocognitive domains from studies using a battery that captured all six domains of interest. Nineteen eligible studies were included (n = 3,302). All neurocognitive domains had small significant relationships with negative symptoms (r = -0.15 to -0.21, ps <0.0005) with poorer cognitive performance being associated with greater negative symptoms severity across all cognitive domains. Moderating effects of the relationship were also identified.

Association between Grey Matter Volume and Social Network Size among Older People Living with HIV

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The social brain hypothesis suggests that primates developed a larger brain to meet the social complexities of living in a group. Social group size has been shown to correlate with volumetric changes in several brain regions among both macaques and healthy humans. Here, we tested for a relationship between grey matter volume and social network size in a sample of older people living with HIV in Canada. Fifty-eight HIV-positive participants drawn from the Positive Brain Health Now cohort underwent structural brain MRI as part of a pilot neuroimaging study. Social network size was measured using Dunbar's Social Network Questionnaire. Grey matter volumes were assessed with Voxel Based Morphometry, focusing on 7 regions of interest We observed a correlation between social network size and grey matter volume in the regions of interest, with statistically significant effects in left anterior cingulate cortex and left anterior temporal cortex, controlling for gender, age, and education. However, the direction of the correlation was in the opposite direction to that predicted: those with larger social networks had smaller grey matter volumes. We sought to explain this effect by considering additional variables, including chronic stress, and current and nadir CD4 counts. The negative correlation was more striking in those with CD4 counts < 500, whereas current self-reported stress was not related to grey matter volumes in these regions. This preliminary study found a negative relationship between social network size and grey matter volume among older people with chronic HIV infection, most striking in those with low CD4 cell counts. Further work is needed to replicate this effect and explore the underlying mechanisms.

Identification of EEG biomarkers of Post COVID-19 Condition Symptoms

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COVID-19 can cause over 200 symptoms affecting around ten physiological systems. Effects on the brain have shown grey matter loss and decreased excitability. Over 30% of people infected with COVID-19 will experience symptoms beyond 12 weeks, defined as Post COVID-19 condition (PC19). Six months post-infection, the three most common symptoms are fatigue, brain fog, and post-exertional malaise (PEM). This study's objective is to quantify abnormal brain oscillatory patterns present in PC19 and their association with the three main lingering symptoms. Fifteen PC19 and fifteen healthy individuals will be recruited. All participants will undergo clinical tests to assess fatigue, cognitive functions, PEM, and one electroencephalography session. We hypothesize that the PC19 group will report higher levels of fatigue, brain fog and PEM and that these symptoms will be associated with abnormal brain patterns. This study's results could

ultimately contribute to developing diagnostic techniques and targeted treatments for PC19 symptoms.

The Influence of Generativity on Purpose in Life is Mediated by Social Support and Moderated by Prefrontal Connectivity between the vmPFC and dlPFC in Older Adults at Risk for Alzheimer's disease

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Objectives: Generativity is the desire and actions to improve the well-being of younger generations. Generativity is associated with purpose in life, with both being shown to independently improve cognition in older adults. Our aims were to identify the neural substrates supporting generativity and determine the mechanism underlying the relationship between generativity and purpose in life in older adults.

Method: Forty-three older adults (Mage = 70.33, 79.1% female) at risk for Alzheimer's disease underwent resting-state functional magnetic resonance imaging and completed questionnaires assessing generativity, social support, and purpose in life. Seed-to-voxel analyses examined if resting-state functional connectivity (rsFC) of the ventromedial prefrontal cortex (vmPFC) and ventral striatum, key nodes at the intersection of subjective valuation and self-transcendence, were associated with generativity. Moderated mediation models examined if social support or rsFC mediated or moderated the association between generativity and purpose in life, respectively.

Results: Generative desire was associated with enhanced rsFC between the vmPFC and right dorsolateral prefrontal cortex (rdlPFC). Affectionate social support fully mediated the relationship between generative desire and purpose in life, and rsFC between the vmPFC and rdlPFC significantly moderated this association.

Discussion: This study is the first to examine the rsFC underlying generativity and provides mechanistic insight into how purpose in life is enhanced through generative desire. Generative desire is supported by rsFC implicated in value-based social decision making and is associated with purpose in life through enhanced love and affection from others. This knowledge contributes to future developments of personalized interventions that promote resilience in at-risk aging.

Effects of Early Language Exposure on Speech Category Learning

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International adoptees (IA) from China experience early but discontinued exposure to their original birth language, Chinese, during infancy, prior to being adopted and acquiring the language of their new adopted family. This can result in maintained neural traces of Chinese phonology (Pierce et al., 2014). We examine in what way IA from China can leverage their early Chinese phonological representations to exhibit a re-learning advantage for the perception of Chinese tones in adulthood. We recruited 1) IA from China, adopted into French-speaking families, 2) French monolinguals (FM) without prior exposure to Chinese, and 3) French-Chinese bilinguals. Participants performed a Chinese lexical tone categorization task while in an MRI scanner. Preliminary examination of brain activation patterns revealed differences in initial tone-categorization learning strategies between the IA and FM groups. The behavioural and

neural activation results are discussed in the context of theories of language development, the sensitive period hypothesis, and neuroplasticity.

Language Co-activation for Interlingual Homographs During Sentence Processing: The Impact of Semantic Bias and Individual Differences in Language Entropy

Esteban Hernandez Rivera[1], Karla Tarin-Murillo[1], Veronica Whitford[2], Debra Titone[1]

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Bilingual adult readers fixate longer on words that straddle multiple languages (interlingual homographs, ILHs; e.g., CHAT in French/ English) indicating language co-activation (Libben & Titone, 2009; Pivneva et al., 2014). Interestingly co-activation decreases when con- texts biases target-language ILH meanings (English sentence about conversations). Unclear is whether contexts biasing other-language meanings (English sentence about cats) increase coactivation, and whether reading habits play a role. Across two studies, bilinguals read ILHs in English sentences. In Study 1, 87 bilinguals read ILHs when contexts biased target language meanings (CHAT=talking). Here, global ILH interference (i.e., co-activation) emerged across contexts for late-, but not early-stage measures, irrespective of reading habits (language entropy). In Study 2, 80 bilinguals read ILHs when contexts biased non-target language meanings (CHAT=cat). Here, language entropy increased ILH interference globally for early but not late measures, only for L2-readers. These results suggest that language co-activation is multi-determined by text- and person-related factors.

Session #2

The Heritability of Brain Fingerprints: A Twin Study

Jonathan Poli, **Jason Da Silva Castanheira**

Montreal Neurological Institute, McGill University

Brain-fingerprinting is a novel approach to understanding the nature of the inter-individual diversity of brain activity in relation to complex behavior.Here we studied how much of the variance of brain-fingerprints can be attributed to genetic factors. We investigated the heritability of the neurophysiological brain-fingerprint derived from task-free recordings of 89 individuals with magnetoencephalography (MEG). We derived the individual brain-fingerprints of 19 pairs of monozygotic (MZ) twins, 13 pairs of dizygotic (DZ) twins, and 25 non-related participants. We confirmed that individuals can be differentiated based on their spectral fingerprints. MZ twin pairs—sharing 100% of their genetics— can be differentiated from the cohort of individuals based on their respective sibling's brain-fingerprint with significant accuracy (> 55%). DZ twin pairs, sharing 50% of their genetics, however, fail to match their sibling's brain-fingerprint. Together, our results demonstrate that the genotype shapes the expression of spontaneous brain activity as a differentiating individual phenotype.

BOLD Alterations in Working Memory after Mild Traumatic Brain Injury versus Concussion: A fMRI Study

Sarah McCabe, Ekaterina Lunkova, Jen-Kai Chen, Alain Ptito, Rajeet Singh Saluja,

McGill University

Mild traumatic brain injury (mTBI) and concussion are used interchangeably. The lack of a uniform definition for each term, however, has created controversies across disciplines. With the concussion definition, patients do not need one of the objective clinical signs (e.g., loss of consciousness), but instead only post-concussive symptoms, whereas all are essential in the mTBI definition. Using a working memory task, we compared fMRI activations between individuals

fitting the mTBI definition, those fitting the concussion definition but lacking mTBI criteria, and controls. Our results showed differences in altered fMRI activation patterns between concussion and mTBI groups, despite performing as well as controls on the task. Specifically, the mTBI group showed significantly reduced fMRI activations when compared to concussion and control groups. It may therefore not be appropriate to combine these two injuries under one banner. TBI may need to be considered a spectrum, with concussion being less severe than mTBI.

Robustness of Differential Neurophysiological Effects between Parkinson's disease and Healthy Control Groups

Yueyue Sapphire Hou, Jason da Silva Castanheira, Alex Wiesman, Sylvain Baillet
McGill University

The robustness of patient-healthy group differences against the duration of neural recordings must be proven to assure clinical validity. To that end, we examined the minimal length of resting-state MEG recording required to differentiate between patients with Parkinson's disease (PD) and age-matched healthy controls (HC). We defined time-to-stability indicator (T2S) as the length required beyond which less than 1% change is observed over the next 30s in between-group effects. By simulating real MEG recording to instantiate varying sample and effect sizes, we estimated T2Ss of disease-relevant contrasts. Then, by using empirical MEG from PD (N=79) and HC (N=54), we verified that between-group differences in spectral peak amplitude stabilized within 240s, and peak shifts did not stabilize within data availability. We propose a framework for testing the robustness of clinical neurophysiological effects by leveraging simulation and empirical data, which can inform replicability of clinical research designs with other modalities like EEG.

Testing the Mediating Role of the Nucleus Accumbens in Musically Induced Analgesia

Elise Desbarats, Mathieu Roy, Robert Zatorre, Alain Dagher, Etienne Vachon-Presseau
McGill University

How does music relieve pain? This project will use fMRI to examine the neurobiological mechanisms underlying music-induced analgesia (MIA). Studies have shown that the most effective music for pain relief is appraised as pleasant or preferred, outperforming relaxing music, non-musical sound, and placebo. Furthermore, the nucleus accumbens, a structure that is indispensable to our sense of musical pleasure, also significantly contributes to pain cognition represented by the SIIPS pain neurosignature. To investigate the NAc as a potential mediator of MIA, participants will listen to songs they find highly pleasurable and "scrambled" control versions of these songs in the MRI scanner, half of which will be paired with painful stimulations. Participants will continuously rate the pleasure experienced in response to the music, allowing us to investigate how changes in these ratings and dynamic NAc activity predict changes in subjective pain ratings and expression of the SIIPs pain neurosignature.

Trade-off between Cognitive Effort and Physical Pain (replication study)

Vanessa Krohn, Zoha Deldar, Yasmine Bouberaouat, Todd Vogel, Ross Otto, Mathieu Roy
McGill University

Background: We aimed to examine whether participants would experience an instinctual withdrawal response before choosing a highly painful stimulus vs. a highly cognitively demanding task. The present findings build upon data from a published study from our laboratory (Vogel et al., 2020).

Methods: 128 healthy volunteers performed an economic choice task. This task was designed for participants to choose between receiving different levels of painful thermal stimuli or exerting different difficulty levels of a cognitive task.

Results: Our results showed that participants avoided a cognitively demanding task, even when the alternative was painful. We found that cognitive effort can be traded off for physical pain.

Conclusion: As the cognitive level increased, participants were more likely to avoid effort and choose pain. These findings support the notion that cognitive effort is indeed aversive but may not share the same Pavlovian avoidance influences as more primary aversive stimuli.

A Network Approach to Interrelations Between Generalized Anxiety Disorder Symptoms and Anhedonia among Patients with Chronic Pain

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Chronic pain patients often have generalized anxiety disorder (GAD) symptoms, which frequently co-occurs with depression. It's unclear whether specific features associated with GAD play a predominant role in patients or are more likely to underlie the comorbidity with depression. This study aimed to characterize GAD symptom profiles and its interrelations among chronic pain patients. The study also examined GAD features differentiating patients with and without anhedonia, a key feature of depression. This study included 729 chronic pain patients referred for psychiatric evaluation, who were interviewed based on the Diagnostic and Statistical Manual of Mental Disorders. Network analyses using the Ising package showed excessive worry, lack of control over worry/anxiety, and restlessness as the most influential features of GAD, and excessive worry as the main GAD feature differentiating anhedonia patients. This suggest that a subset of cognitive-affective factors play a predominant role in GAD and anhedonia among patients with chronic pain.

The Impact of Gamified Performance Feedback on Motor Learning

Kaicheng Yan, Dimitri Palidis, Lesley Fellows

McGill University

During motor learning, binary feedback (success or failure) is crucial to facilitating learning and improving performance. Previous studies have shown when paired with monetary incentives, success feedback leads to further enhancements in performance. These results suggest that the effects of feedback for learning depend on how motivated or incentivized we are to perform. Video games utilize various motivational elements that significantly impact behavior, and it remains unknown whether integrating such game design features into regular binary feedback could enhance motor learning and performance. To address this issue, we conducted an experiment on a visuomotor interception learning task. Subjects were randomly assigned to one of two versions of the motor learning task: a gamified version composed of scores, a leaderboard, game-like sound and auditory effects, and a regular non-gamified version. Our objective aims to examine the extent to which gamified performance feedback, compared to regular feedback, improves motor task accuracy.

Effect of Maternal Factors on Infant Functional Brain Network Development

Anna Walls, Simon Morand-Beaulieu, Anna Weinberg

McGill University

Maternal depression is an internalizing disorder linked to reducing the development welfare of offspring. Additionally, correlations exist between maternal depression and negative infant temperaments. Yet the associations between these variables are still poorly understood. The current study examined the relationship between maternal depressive symptoms, negative infant temperaments, and functional connectivity strength of infant brain networks during a 6-minute resting-state task. Functional connectivity— statistical dependencies between spatially separated brain regions— was recorded using electroencephalography in 82 6-month-olds in the alpha band (6-9 Hz) and across the Whole-Brain. Network-based statistics were applied to analyze global

networks and to identify alpha connectivity strength. Overall, the results of this study may suggest that maternal depressive symptoms have distinct impacts on infant functional brain development and affective dispositions. Thus, analyzing infant functional connectivity could point to potential neural risk markers in infants of mothers with depressive symptoms, allowing early intervention measures to be established.

The Effect of Biological Sex and Natural Menopause on Cortical Thickness and Executive Function in Middle-Aged Adults

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Healthy midlife aging is linked to decreased performance on neuropsychological tests of executive function (e.g. Wisconsin Card Sorting Task (WCST)). Additionally, this age-related performance decline has been associated with cortical thinning in the dorsolateral prefrontal cortex (dlPFC). At midlife, females experience menopause, yet little research has considered the effect of biological sex and menopausal status on executive function at midlife. The present study investigated the effects of biological sex and menopause status on WCST performance in middle-aged adults. Additionally, we tested the hypothesis that these behavioral effects would be mediated by the cortical thickness of dlPFC. Adults aged 39 – 65 years (n = 155) performed the WCST and underwent T1-weighted structural magnetic resonance imaging (MRI). Investigating the nuanced effects of biological sex and female reproductive stages in midlife aging is necessary to advance holistic models of neurocognitive aging, and to help support early detection and intervention of cognitive decline.

Validity of Corpus-Based Measures of Idiom Processing in English and Mandarin Chinese

Michelle Yang, Marco S. G. Senaldi, Junyan Wei, Brendan Johns, Debra Titone

McGill University

Idioms are expressions whose meanings differ from that of their component words (e.g., kick the bucket). According to recent psycholinguistic findings, idioms are processed both holistically and compositionally over different time courses. We aimed to understand how previously underexplored corpus-based indices of lexical strength and semantic compositionality can model cognitive measures of idiom processing in English and Mandarin Chinese. Thus, we propose the use of frequency- based corpus measures and meaning-based measures to predict subjects' judgements of idioms. We predict that greater frequency and contextual diversity of an idiomatic expression will positively correlate with subjective familiarity judgements. Similarly, greater semantic similarity and neighbourhood overlap between component words of an idiomatic expression should positively correlate with decomposability. This work will shed light on the cognitive reliability of corpus-based measures and the interplay of formal and semantic factors on idiom processing, and whether current models of idiom processing hold across languages.

Effects of frontopolar Brain Stimulation on the Adjustment of Mental effort Expenditure to the Average Reward Rate of the Environment

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The frontopolar cortex (FPC) supports cost-benefit decisions underlying cognitive control. It may further substantiate the idea that this structure could be important in severe forms of reduced motivation, such as apathy. Recent work has shown that the FPC may motivate effort exertion in

situations when people choose between two behavioral options with clearly defined cost/benefit propositions. Whether this generalizes to cases where information about effort and reward is less explicit. Here, we administered sham and anodal transcranial direct current stimulation (tDCS) over the FPC to healthy adults in a two-day within-subject design. Participants completed a task probing foraging behavior in high vs. low-effort contexts. In this task, the optimal strategy for effort exertion does not depend on trial-specific incentives but on the average reward rate of the environment. We found a significant reduction in exit threshold between effort levels on the foraging task for anodal compared to sham stimulation.

Cognitive and Affective Theory of Mind in Young and Elderly Patients with Multiple Sclerosis

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Theory of mind (TOM) deficits have been reported in patients with multiple sclerosis (pwMS). However, most studies have used non-ecological tasks that do not distinguish between cognitive ToM (CToM) and affective ToM (AToM) and none has investigated older pwMS. We recruited 13 young healthy controls (HC), 14 young pwMS, 14 elderly HC and 15 elderly pwMS. ToM was measured using an adaptation of the Conversations & Insinuations task (Ouellet 2010). We found significant effects of group (pwMS<HC), age (older<younger) and condition (CToM<AToM), with no interaction. Elderly pwMS showed the largest discrepancy between their CToM and AToM (CToM<AToM). TOM was associated with global cognitive abilities and executive functions, but not with facial emotion reading. This study highlights both cognitive and affective ToM deficits in pwMS, and particularly in cognitive ToM in elderly pwMS. These impairments could be underlied by cognitive and executive difficulties, but not by core social cognitive impairments.

The influence of Exercise Habits on Acute Stress Responses in Parkinson's Patients and Healthy Older Adults

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Parkinson's patients have reported using exercise to reduce stress but whether exercise influences the physiologic stress response in Parkinson's disease is unknown. The goal of this study was to determine whether higher levels of self-reported physical and mental exercise are associated with lower susceptibility to acute stress. Fifty patients and fifty older adults underwent an in-lab acute stress manipulation. Physiological measures of the acute stress responses included pre- and post-stress salivary cortisol and systolic blood pressure measurements. Self-reported affect was also measured pre- and post-stress. Participants provided information about the duration and frequency of physical exercise and about the frequency of mental exercise, which were used to derive a composite for overall exercise levels. Planned analyses will examine the association between exercise level and physiologic and affective susceptibility to stress. Our results could suggest possible methods of alleviating the effects of stress in Parkinson's patients and older adults.

Frequency-Tagged MEG Responses from Perceptual Shifts in a Monocular Pattern Rivalry Task

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Monocular pattern rivalry (PR) is a form of bistable perceptual competition where perceptual alterations occur between rivalrous patterns that are superimposed onto one image. As opposed to binocular rivalry (BR) which is a form of between-eye rivalry, PR represents within-eye rivalry since both eyes are exposed to the same image. Previous PR studies have not robustly investigated the neural activity associated with perceptual alteration between rivalrous patterns. This study used MEG with pattern-specific frequency tagging, where each pattern flickers at a distinct frequency that can be isolated in evoked responses. Participants indicate their perceptual alterations via button press. Analysis revealed increased tagged activity in several retinotopic visual areas (notably V3A) when a rivalrous pattern becomes perceptually dominant, whilst activity specific to the suppressed pattern frequency is decreased. These results are similar but distinct from those obtained with a comparable BR task in the same subjects, and will be discussed.

Psychophysiological Correlates of Absorption State During Music Perception

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This research project aims to explore the induction and psychophysiological correlates of the state of absorption during music perception. This is an under-explored area of research. We will explore techniques that will allow us to capture both subjective and physiological aspects of the absorption experience and understand their linkage better. Our measurements will include absorption-related trait measurements using the Tellegen Absorption Scale, absorption state measurements using the Phenomenology of Consciousness Inventory, moment-by-moment absorption state sampling using a self-report slider indicator, personality trait measurement, physiological measures (ECG, heart rate, and respiration), EEG, and eye-related parameters (eye-position and movements, pupillary diameter and blinks). By identifying measurable parameters that correlate with absorption, we hope to build a framework that connects absorption to other mental states and personality traits. Our research has the potential to significantly advance our understanding of the relationship between music and absorption, leading to improved interventions for better mental health.

The Role of OLM Interneurons During Spatial Navigation

Salodin Al-Achkar, Lorène Penazzi, Jean-Bastien Bott, Sylvain Williams
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Oriens-Lacunosum Moleculare (OLM) hippocampal interneurons regulate information flow to CA1 pyramidal cells by gating input from entorhinal cortex and hippocampal CA3. Evidence shows that OLM interneurons are implicated in locomotion and fear learning. However, how they are implicated in spatial navigation, a hippocampus-dependent process, is underexplored. This project aims to determine whether OLM interneurons are required to form spatial reference memories. OLM interneurons in chrna2-cre mice were chemogenetically inhibited using DREADD hM4Di and the ligand compound 21. To evaluate anxiety and locomotion side effects, the elevated plus maze and the open-field task were used. To study spatial navigation, the star maze task was employed. DREADD inhibition of OLM interneurons resulted in significantly more errors during the first 2 days of the star maze. OLM inhibition altered spatial navigation but not locomotion or anxiety. OLM interneurons are required to reach optimal performance during the initial phase of spatial reference memory formation.

Group size Affects the Perception of Social Interactions

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Humans are faster at locating facing dyads (groups of two) than non-facing dyads in visual search tasks. Real-life events, however, feature groups larger than two, with humans often congregating in groups of four or less. We investigated if search advantage also exists for such larger groups, and if this advantage is modulated by group size. Participants searched for a facing or a non-facing group (among non-facing and facing distractors, respectively). Group size varied from two to seven individuals. Overall, participants found facing groups faster than non-facing ones, but this advantage was greater for groups of two and three individuals and diminished for larger one. It suggests that the perceptual advantage for group interactions is not specific to dyads but also extends to larger groups, and that this advantage is constrained by group size. This further indicates that the human visual system is fine-tuned to detect complex social interactions.

Characterizing the Behavioral Signatures of the Marmoset Model through DeepLabCut, a Deep Learning Program

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As a small primate, the common marmoset has been proposed as an ideal preclinical model for human diseases, such as Parkinson, to bridge the gap between rodent research and clinical trials. As changes in the behavior can reflect early biomarkers of disease onset and progression, our goal is to assess and quantify the behavior in healthy animals first. For this, we are using DeepLabCut, a deep learning program for noninvasive animal behavior tracking in laboratory uses. In our lab setting, we use cameras in the animals' cages to record their daily activity and movements, then we use DeepLabCut to build a skeleton with spatially labeled body parts to detect the typical behavioral components of marmosets. This project represents the first step of marmoset behavioral analysis to develop diagnostic and prognostic biomarkers for Parkinson's Disease, which can be eventually translated into use in human diagnosis and future clinical care.

Effect of Vascular Burden and Menopause Status on Episodic Memory

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Literature shows that menopause and vascular burden (VB) are associated with age-related decreases in memory and cognitive functioning in some females (Armstrong et al., 2019; Marchant et al., 2022). Yet, the link between these variables has not been directly investigated. In the present study we tested females (n=128, age=19-64) on an episodic memory task and collected blood samples to assess VB. We ran multiple linear regressions to determine if menopause, VB, and their interaction predicted episodic memory. Results revealed that menopause, VB and age significantly predicted episodic memory, $F_{(10,117)} = 4.88$, $p < 0.001$, $r2 = 0.29$, 95% CI [0.11, 0.38]. There was an interaction such that post-menopause * VB was a significant predictor ($\beta = -0.054$, $p = 0.042$). Our results support that VB and menopause interact to affect memory such that for postmenopausal women, higher VB predicted lower episodic memory performance.

Beta modulation in Premotor Cortex during Observation of Non-biological Visual Events

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This study investigated the possible contribution of PMd to embodied sensorimotor functions and cognitive decision-making. We used magnetoencephalography (MEG) to investigate if PMd is

activated by observation of arbitrary non-biological visual stimuli that either respect or violate a simple stimulus-response association rule and whether this activation can occur before or only after the subjects learn to associate those stimuli with specific hand movements.

The subjects learned the task rules through either active hand movements or by passive observation while a computer performed the task correctly or incorrectly. We showed that PMd beta activity is modulated during the passive observation condition in both subject groups but lacks a major positive response component as seen in the active performance condition. Additionally, PM was found to be involved in the appraisal of observed sensory events, even when they are arbitrary and non-biological, and had not yet become associated with any particular motor actions.

Isodendritic Core Integrity Relates to White-matter Microstructure in Adults at Risk for Alzheimer's disease

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The earliest sites of tauopathy in Alzheimer's disease (AD) are the neuromodulatory projection nuclei of the isodendritic core (IC). Given its wide-ranging projections, we hypothesized that variation in IC microstructural integrity (measured using multiparametric mapping) would explain variation in whole-brain white-matter microstructure (measured using neurite orientation dispersion and density imaging) in a cohort of older adults at increased risk for AD.

Using partial least squares analysis, we identified distinct patterns of white matter microstructure variation that were broadly associated with IC integrity. For example, greater R1 in the IC was associated with greater orientation dispersion and lower neurite density in brainstem efferent tracts, and the opposite pattern in limbic tracts.

This spatial pattern of orientation dispersion also displayed non-linear associations with brainstem tau load. This suggests biphasic changes in white-matter integrity at the earliest stages of AD, which are likely critical to understanding early pathophysiology and progression of AD.

Neural Oscillations Associated with Pleasure and Motor Learning in Music

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Music is a multi-faceted phenomenon that recruits a broad neural network, including reward areas, auditory cortex, and motor networks. However, the neural mechanism by which these areas interact with each other remains unclear. It is believed that synchronicity of brain rhythms may be the underlying mechanism by which these areas communicate, with faster oscillations facilitating local connections and slower frequencies supporting networks containing more distant brain areas. Ara and Marco-Pallares (2020) found that subjective enjoyment predicts phase synchronization between right frontal and temporal areas during music listening. The proposed research extends this finding to motor learning. Participants will listen to and give liking ratings for piano melodies while EEG is recorded. They will then learn to play the endings of the melodies. The relationship between synchronization across electrodes, liking ratings, and performance will be assessed. We expect synchronization at frontal and temporal areas to be associated with increased liking and improved performance.

Exploring the Potential of Oculomotor Metrics as Biomarkers for mTBI: A Study Using fMRI

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The objective diagnosis of mild traumatic brain injury (mTBI) remains a challenging problem. While fMRI has demonstrated promising results, its limited accessibility calls for alternative diagnostic approaches. One such alternative is to evaluate oculomotor function deficits, which are frequently seen in mTBI cases. Given the overlap of brain regions responsible for eye movement and those affected by mTBI, visual impairments are expected to occur. We investigated whether oculomotor function assessment could serve as an alternative diagnostic tool for mTBI. We used eye-tracking tests and fMRI to evaluate oculomotor function in 24 concussed subjects and 24 healthy controls. The concussed subjects showed impaired anti-saccades and optokinetic nystagmus on eye-tracking tests. Compared to healthy controls, they demonstrated increased BOLD signal during these tasks in the middle occipital gyrus, cingulate gyrus, and superior frontal gyrus. These findings suggest that oculomotor function assessment may be a useful diagnostic tool for mTBI.

Systematic Review of Validated and/or Norm-referenced Cognitive Tests for the Older Francophone Canadian Population

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Using cognitive tests that are validated and norm-referenced for the target population is essential, since cultural and linguistic differences between the population for which the test has been validated/norm-referenced and the target population can significantly affect the results. This systematic review aims to describe the cognitive tests (including tests, questionnaires, and observation checklists) that are validated and/or norm-referenced on the elderly French-speaking Canadian population. In total, 46 articles were selected. This review identified 9 validated tests, 20 norm-referenced tests and 18 validated and norm-referenced tests, covering the majority of cognitive domains (memory, attentional, executive, perceptualmotor and language functions), except social cognition. Almost all the study samples were recruited in Quebec. The selected tests mostly presented satisfying psychometric indices, as well as norms that generally considered age, sex and education. This systematic review will allow clinicians and researchers from Canada to optimize their choices of cognitive tests for the elderly population.

Effects of Anticholinergic Burden on Verbal Memory Performance in First-Episode Psychosis

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Antipsychotics are widely used to treat first-episode psychosis but can have an anticholinergic burden (a cumulative effect of medications that block the cholinergic system). Studies suggest that a high anticholinergic burden negatively affects verbal memory, a core feature of the disease. Our study, therefore, sought to replicate this in first-episode psychosis patients. We expected that patients would exhibit poorer verbal memory compared to controls. We hypothesized that patients' verbal memory performance would improve over time but remain inferior to controls.

Patients (n=311) and controls (n=128) completed a neurocognitive battery at months 3 and 12. Cross-sectionally, patients in the highest anticholinergic burden group had the poorest performance in verbal memory when compared to the other groups. Longitudinally, verbal memory performance of all groups improved over time. However, patients' performance remained poorer than controls. These findings highlight the importance of considering the anticholinergic burden when prescribing medications in early psychosis.

Modulating Emotions in Theatre Performance: The Effect of Attentional Techniques on Physiological Arousal

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Actors move their audiences through the delivery of emotional narratives, a practice that could impact their mental health. We studied the emotional experience of actors who listened to pre-recorded testimonies of sexual violence through headphones and delivered the words live. We measured heart rate variability (HRV), skin conductance response (SCR) and pupil diameter while neurologically healthy actors delivered emotional and neutral narratives using 'technical' (focusing on the articulation) or 'content' (imagining being the narrator) instructions. Lower HRV, and greater SCR and larger pupil diameter are expected when performing emotional compared to neutral narratives. We expect to see lower emotional arousal with technical than content instructions, demonstrating that listening strategies could modulate physiological reactions. Finally, we predict that actors will remember more details from the emotional than the neutral narratives on a memory questionnaire. Our findings may contribute to safer acting practices, and be useful for professionals such as emergency dispatchers.

Neural Mechanisms of Implicit Theory of Mind in the Right Temporoparietal Junction

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There is much debate over whether implicit and explicit cognition, including Theory of Mind (ToM), rely on the same neural mechanisms. While numerous functional imaging studies have examined the neural substrates of explicit ToM, few have investigated neural bases for implicit ToM and with mixed results. The right temporoparietal junction (rTPJ) is thought to be a key contributor in a network of brain regions related to ToM and has been studied extensively in explicit ToM. In this study we will apply transcranial magnetic stimulation (TMS) to the rTPJ while participants engage in an implicit ToM task. The first aim is to determine if the region is causally implicated in implicit ToM, which would provide evidence that implicit and explicit ToM have shared neural mechanisms. The second aim is to determine what role the RTPJ plays in the behavior: does it represent mental state information or does it aid in perspective taking?

The Effects of Daily Variability in Sleep Quality on Cognitive Fluctuations in Older Adults

Randa El Chami, Hugo Jourde, Marie-Anick Savard, Emily BJ Coffey

Concordia University

Over half of older adults report experiencing sleep problems, leading to insufficient sleep quality and quantity due to age-related changes or physiological conditions. Poor sleep has been linked to cognitive impairment and an increased risk of developing neurocognitive disorders. However, most sleep and cognition studies have been cross-sectional, making it unclear how daily fluctuations in sleep quality affect cognitive performance. This pilot study aimed to investigate the association between sleep quality and day-to-day variations in cognitive function in older adults.

Ten participants wore an EEG headband for 14 nights and completed computerized cognitive tasks daily. Changes in cognitive performance were correlated with neurophysiological measures of sleep, including frequency and duration of wake after sleep onset and REM sleep duration. The study aimed to assess the feasibility of multi-day in-home recordings using EEG and cognitive tasks, with a view to larger studies and finer characterization of sleep-performance relationships in older adults.

The Influence of Sensory-Motor and Predictive Mechanisms on the Frequency Following Response

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This study aims to better understand improvements in auditory perception related to music training by examining an auditory neurophysiological response called the frequency following response (FFR). FFRs are recorded on the scalp with electroencephalography [EEG]. They provide a measure of the quality of the neural representation of periodic sounds (speech, music). Musicians show correlated enhancements between their FFR and perception skills related to the amount of training. How these enhancements are achieved remains unclear. Our hypothesis is that auditory-motor integration and top-down predictability mechanisms affect the FFR. Our protocol compares FFRs of highly-trained pianists and nonmusicians while they play a short melody on a digital organ and while they hear the same sounds passively. The next day, this task is replicated with the feet on the pedal keyboard of the organ, to measure possible transfer learning effects. We predict that active conditions will result in enhancements of the neural encoding.

Mind Reading: Intentional Gaze Shifts are Predicted Better than Random-Generated Ones

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Humans discern where others look quickly and spontaneously. It remains unknown however what processes drive this social process – directional information of the eye gaze position or the mentalistic inference of a gazer's mind. To address this, we asked participants to predict which location an actor was going to look at before they initiated the gaze shift. Critically, the actors' gaze shifts were either self-initiated or computer instructed, with participants unaware of this manipulation. Participants were reliably faster at predicting the location of gaze when the actors chose to look at a location compared to when they were instructed to look at a location. Thus, humans can reliably predict the location of self-generated gaze shifts in others. This suggests that gaze following critically includes a mentalistic component or the ability to 'read' the minds of others and does not solely rely on processing the directional information from the eye gaze position.

Mind-Heart Connection: A research Proposal Investigating the Interplay of Polycystic Ovary Syndrome and Heart Rate Variability on Cognitive Function in Females

Alicia Duval, Blaine Ditto, Charlotte Usselman

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Polycystic ovary syndrome (PCOS) is associated with detrimental changes in cardiovascular autonomic function and cognitive performance. Heart rate variability (HRV) is an index of autonomic activity and is largely reduced in PCOS. Critically, HRV is a promising physiological

correlate of cognitive ability in various populations but has yet to be studied in PCOS. The proposed study will investigate the interaction between PCOS and HRV on cognitive performance in females. We will recruit 30 females (18-40yrs) with and without PCOS (n=30/group), matched for age and education. To assess cognitive outcomes, participants will undergo a comprehensive neuropsychological battery. HRV will be measured using a 5-lead electrocardiogram. We expect that females with PCOS and reduced HRV will have significantly lower cognitive performance compared to their non-PCOS counterparts. The study findings will highlight the need to investigate the underlying mechanisms of cognitive changes in females with PCOS and inform the development of targeted interventions.

Relationship between Self-reported Mood Symptoms of Parkinson's Disease and their Presumed Underlying Cognitive Mechanisms

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Mood symptoms of Parkinson's disease greatly impact patients' lives, yet their underlying cognitive mechanisms are not well understood. The project aims to examine the relationship between self-reported mood symptoms of Parkinson's Disease and their presumed underlying cognitive mechanisms. Parkinson's patients (n=200) and healthy controls (n=200) are being recruited online and in-person to complete the appropriate scales to provide information about their self-reported anhedonia and impulsivity. They then perform the corresponding computer-based tasks, which will serve as a measure of the cognitive mechanisms. Statistical analyses such as correlations and regression models will be carried to examine the relationships between performance on the cognitive tasks and severity of self-reported mood symptoms. Identifying cognitive mechanisms underlying the mood symptoms in Parkinson's disease would allow us to follow-up with neuroimaging to identify the neural substrates of these cognitive mechanisms. This could eventually provide new therapeutic targets to support the development of new therapies.

Verbal fluency in Patients with Frontal Lobe Lesions: Using Quantitative Measure of Semantic Space

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Semantic fluency (SF) is a widely used task to measure executive function and semantic memory. It is often included in the neuropsychological assessment battery for frontal lobe damage patients. There is lack of in-depth quantitative measures of SF and clinicians often rely on total word count. In this study, the SF data was retrieved from MCNRR1 for three groups: ventromedial frontal lobe damage (VM,14), lateral frontal lobe damage (LF,13), and Healthy Control (30). The results show that SF task is sensitive to frontal lobe damage based on measures of semantic space. Both HC and LF groups tended to initiate the search process with words closer in semantic space to the target word, with a gradual increase in semantic distance. However, search process in VM group indicate production of items farther in semantic space. These results suggest that the ventromedial frontal lobe may play a role in navigation of semantic space.

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