Cognitive Science Undergraduate Research Forum

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in Cognitive Science Undergraduate
Research Forum (CogSURF)

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Land Acknowledgement

We would like to acknowledge that McGill University (Tiohtiá:ke/Montreal), where our inaugural conference is held, is situated on the traditional territory of the Kanien'kehà:ka, a place which has long been, and continues to be, a site of meeting and exchange amongst many First Nations including the Kanien'kehá:ka of the Haudenosaunee Confederacy, Huron/Wendat, Abenaki, and Anishinaabeg. We recognize and respect the Kanien'kehá:ka as the traditional custodians of the lands and waters on which McGill resides. As settlers and global citizens, we have a shared responsibility to learn from the caretakers of this land, to partake in its preservation and conservation, and to actively strive for the success of future generations.

In the context of research, Indigenous ways of knowing offer incredibly valuable perspectives on cognition, yet they have often been overlooked in scientific discourse. We urge you to consider the power of mutual learning and the importance of integrating Indigenous knowledge systems into STEM fields to strengthen our collective understanding. After today's conference, we encourage you to continue to acknowledge the land you live on and how it provides for all of us, as well as your role in challenging and dismantling systems of oppression.

What is CogSURF?

Connecting Minds, Making Waves.

Cognitive Science is...

The interdisciplinary study of the mind and intelligent behaviour in humans, animals, and machines. By pooling insights from computer science, linguistics, neuroscience, philosophy, and psychology, cognitive science has already revolutionized the way we study language, memory, reasoning, and artificial intelligence. With its growing impact, the field is inspiring the next generation of forward-thinkers and pushing the boundaries of what we know about the mind.

About CogSURF

CogSURF is Montréal's largest undergraduate conference in cognitive science. The Forum brings together top undergraduate researchers in the city's heart to share discoveries, contribute perspectives, and network with leading industry professionals. Discover cutting-edge interdisciplinary research, hear from renowned experts, and connect with pioneers who are shaping the future of the field.

Our Mission

Breakthroughs in our understanding of the mind demands work at the intersection of the canonical disciplines. At CogSURF, we unite passionate undergraduate students from Montréal's leading universities to exchange ideas and tackle some of humanity's greatest unsolved questions.

Program

Time	Event
10:00AM	Opening Ceremony
10:30AM	Keynote Address
11:30 AM	Flash Talks Session I
12:00 PM	Lunch
12:45 PM	Poster Showcase
2:00 PM	Flash Talks Session II
2:30 PM	Afternoon Refreshments
3:00 PM	Panel Discussion
4:30 PM	Closing Remarks
5:00 PM	Networking Reception

Flash Talks

Dive into 3-minute thesis-style talks by undergraduates showcasing their discoveries

Keynote

One hour presentation about bleeding-edge research by a giant of the field: Dr. Nancy Kanwisher

Panel Discussion

Hear renowned academics across the canonical disciplines discuss hot topics

Poster Presentations

Explore 25 posters and demonstrations from the next generation of cognitive scientists

Keynote Address

Dr. Nancy Kanwisher

Professor Nancy Kanwisher received her B.S. and Ph.D. from MIT, working with Professor Molly Potter. After completing a postdoc as a MacArthur Fellow in Peace and International Security, followed by a second postdoc in the lab of Anne Treisman at UC Berkeley, she held faculty positions at UCLA and Harvard. She returned to MIT in 1997, where she is now an Investigator at the McGovern Institute for Brain Research and a faculty member in the Department of Brain & Cognitive Sciences.

Kanwisher uses brain imaging and various other methods to discover the functional organization of the human brain as a window into the architecture of the mind. She has received the Troland Award, the Golden Brain Award, the Carvalho-Heineken Prize, the Kavli Prize in Neuroscience, the António Champalimaud Vision Award, 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.

Panelists

Hear inspiring academics across the canonical disciplines of cognitive science discuss hot topics, from consciousness and neuroAI to language evolution.

Ian Gold
McGill University

Professor Ian Gold is the Canada Research Chair in Philosophy & Psychiatry and Chair of the Department of Philosophy at McGill University. He received his Ph.D. in Philosophy from Princeton University and completed postdoctoral training at the Australian National University. He held a faculty position at Monash University's School of Philosophy & Bioethics before coming to McGill University in 2006. Gold's research focuses on the theory of delusion in psychiatric and neurological illness and on reductionism in psychiatry and neuroscience. Together with his brother, psychiatrist Joel Gold, he co-developed the idea of the Truman Show delusion and published the book "Suspicious Minds: How Culture Shapes Madness". He leads the Neurophilosophy Lab at McGill, an interdisciplinary research group at the intersections of experimental psychology, philosophy of mind, philosophy of psychiatry, and social/cognitive neuroscience.

Stevan Harnad
Université du Québec à
Montréal, McGill University

Professor Stevan Harnad received his B.A. from McGill University, where he did his Honours thesis under McGill's renowned neuropsychologist Donald O. Hebb, before earning his M.A. in Psychology from McGill and his Ph.D. in Psychology from Princeton University. He is currently Professor of Psychology at Université du Québec à Montréal (UQAM), Adjunct Professor of Cognitive Science at McGill University, and Emeritus Professor of Cognitive Science at the University of Southampton. Harnad's research spans perceptual, psychophysiological, and computational approaches to cognitive science. He has written extensively on categorical perception, symbol grounding, the Turing test, and the evolution of language and consciousness. He is a prominent advocate for open access in scientific publishing, having founded Behavioral and Brain Sciences, Psycoloquy, CogPrints, and the American Scientist Open Access Forum. He is also an animal rights advocate and the Editor-in-Chief of Animal Sentience, which is an OA journal devoted to questions of consciousness in non-human animals.

Karim Jerbi
Université de Montréal, Mila

Professor Karim Jerbi obtained a PhD in Cognitive Neuroscience and Brain Imaging from Pierre & Marie Curie University and a biomedical engineering degree from the University of Karlsruhe. He is currently a Professor in the Department of Psychology at the University of Montreal, where he holds the Canada Research Chair in Computational Neuroscience and Cognitive Neuroimaging. Additionally, he is the director of the UNIQUE Centre, the Quebec Neuro-AI research center, and a member of the Royal Society of Canada's College of New Scholars, Artists, and Scientists. Jerbi's research lies at the intersection of cognitive, computational, and clinical neuroscience. His work aims to probe the role of large-scale brain dynamics in higher-order cognition and investigate brain network alterations associated with psychiatric and neurological disorders. Ongoing projects in his lab leverage electrophysiological brain recordings to examine large-scale brain network dynamics in cognitive processes and across different states of consciousness. He is strongly committed to promoting social justice and equity, diversity, and inclusion (EDI) in academia and has a keen interest in the convergence of brain science, AI, creativity, and art.

Panelists

Doina Precup
McGill University, Mila,
Google DeepMind

Professor Doina Precup earned her PhD in Computer Science from the University of Massachusetts Amherst, where she studied under the supervision of Richard S. Sutton. She is currently an Associate Professor in the School of Computer Science at McGill University, a core academic member at Mila, a Canada CIFAR AI Chair, a Research Director at Google DeepMind, a Fellow of the Royal Society of Canada, a Fellow of the CIFAR Learning in Machines and Brains program, and a senior member of the Association for the Advancement of Artificial Intelligence. Precup's research focuses on reinforcement learning, decision-making under uncertainty, and AI applications in areas of significant social impact, such as healthcare. Her work aims to improve AI algorithms to reason and plan effectively in complex environments. She heads the Montreal office of DeepMind, where leads a team of scientists, engineers, and ethicists dedicated to using AI to advance science and solve real-world problems. Beyond her research, she is a strong advocate for diversity and inclusion in AI. She co-founded the AI4Good Lab, a program dedicated to improving gender diversity in AI, and the Eastern European Machine Learning Summer School.

Charles Reiss
Concordia University

Professor Charles Reiss received his B.A. in Mathematics from Swarthmore College and his M.A. and Ph.D. in Linguistics from Harvard University. He is now a Professor of Linguistics at Concordia University and the Director of the Centre for Cognitive Science. A leading figure in theoretical phonology, Reiss coined the term "substance-free phonology," together with Mark Hale, a formal approach to phonological theory detailed in The Phonological Enterprise (2008), and expanded in Phonology: A Formal Introduction (2018) with Alan Bale. He also co-authored I-Language: An Introduction to Linguistics as Cognitive Science (with Dana Isac, 2013), which connects linguistic theory to questions about the nature of the mind and the biological underpinnings of language. At Concordia, he teaches "Language and Mind: The Chomskyan Program," where he introduces students to the cognitive revolution and explores topics such as finite state machines, unconscious knowledge, and ergativity.

CogSURF 2025
Host Institution

McGill

For over a century, McGill University has stood as a leading Canadian institution in the field of cognitive science. From the field's pioneers, like Wilder Penfield and Brenda Milner, to the groundbreaking expertise of the world-renowned Montreal Neurological Institute, McGill University and its vibrant student community welcome all who seek a deeper understanding of the mind!

Student Association of Cognitive Science

Neuroscience Undergraduates of McGill

Philosophy Students' Association

McGill Psychology Students' Association

Linguistics Undergraduate Association

Computer Science Undergraduate Society

Executive Board
2025

Meet the Directors!

Le Thuy Duong Nguyen
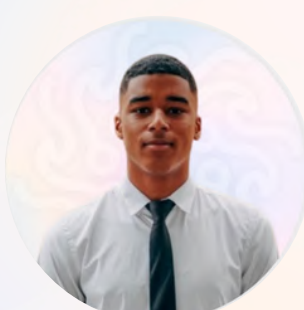**Chair**

Leatisha Ramloll
Director of Operations

Benjamin Lévesque Kinder
Co-Director of Partnerships

Maria Lagakos
Co-Director of Partnerships &
Student Relations

Aryan Chaturvedi
Web Developer

Lou Nkpa
Financial Coordinator

Rui Ying Liu
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Organizations

Science Undergraduate Society

Arts Undergraduate Society

Student Research Initiative

Concordia Undergraduate Psychology Association

Association Des Étudiant.es en Neurosciences de l'Université de Montréal

McGill Science Undergraduate Research Journal

Canadian Undergraduate Conference on AI

McGill Artificial Intelligence Society

McGill Students' Chapter for Scientista

Flash Talks

Cathy Fang - Psychology - Douglas Research Centre
Co-authors: Isabel Bacellar, Katie M. Lavigne

Impact of Open Science Practices- A Narrative Review

A growing number of institutions, government, and funding agencies are mandating or adopting Open Science (OS) principles to make science accessible to all. Numerous articles highlight many benefits of OS; however, empirical evidence supporting the general impact of OS is lacking. We reviewed research outputs reporting evidence-based effects of OS practices to: provide an overview of and identify knowledge gaps surrounding the impact of OS to guide future research. Our literature review (keywords: open science & impact/advantage/effect/benefits) spanned three databases: "OS in the Literature" repository (OSF), PubMed, and Academic Search Complete (EBSCO). Included references were in English and accessible via open access (OA) or institutional license. Papers were categorized by OS activity (preprint, registered reports, citizen science, open data, OA and open education) and area of impact (scholarly and societal). We found 161 relevant articles (2015-2024), of which 121 were included. 41 (45.1%) articles investigated OA in increasing research visibility. Fewer (3-13) were on other OS practices. Notably, we only found one paper on the societal impact of OS. Findings suggest OS activities investigated generally increase research visibility, credibility and community engagement. Future research investigating the impact of OS practices other than OA is needed.

Mélodie Leclerc - Psychology - McGill University
Co-authors: Maxime Montembeault

Development of a standardized stimuli set of famous faces in Quebec

Studies on familiar faces have spanned various fields, including face processing, psycholinguistics, perception, and memory. Using pictures of famous people, standardized datasets have been developed in France, Great Britain, Spain, and Portugal. Despite their relevance for psychological research, these datasets are constrained by the geographic and sociocultural contexts in which they were created. A standardized stimuli set of famous faces does not currently exist for the Quebec population. Therefore, we created a stimuli set of 240 locally and internationally known famous people across four categories (politicians, singers, actors, and athletes). People who were famous in different time periods were considered, with celebrities of different races, ethnicities, ages, and genders. Through an online survey on Qualtrics, adults aged 40 to 79 from Quebec are rating the famous faces according to different characteristics (distinctiveness, familiarity, valence, and name frequency). Measures of famous face recognition, naming, knowledge, and agreement are also collected. Descriptive statistics will be obtained for each famous face, and the standardized stimuli set will be available in open access once data collection is complete. Future directions for this study include the development of new cognitive tests for face processing impairments, notably in neurodegenerative disorders.

Flash Talks

Maxence Lapatrie - Electrical Engineering - Montreal Neurological Institute
Co-authors: Jason da Silva Castanheira, Sylvain Baillet

Extracting the Subcode of Individuality in Resting-State Brain Activity Using Diffusion Models

Individuals vary in countless subtle ways. Most traditional demographic surveys failing to capture this variability, often averaging it out or overlooking it entirely. Stable, individual-specific patterns of brain activity—here referred to as the subcode of individuality in brain activity—have the potential to explain variability across individuals who might otherwise be considered similar based on demographic categories alone. Brain fingerprinting is the name often given to the field studying this subcode, usually extracting it via functional connectivity (FC) and power spectral density (PSD) estimates. However, these model-free techniques rely on predefined transforms that restrict the analysis to a narrow subset of features, discarding much of the underlying complexity. Deep learning (DL) approaches that learn complex representations directly from raw time-series data use the high dimensionality of brain activity better and outperform model-free approaches when training data is abundant. However, this complexity comes at the cost of biological interpretability, limiting their scientific contribution. We propose a latent diffusion model architecture, novel to brain fingerprinting, to extract and explore the subcode. The first part, an autoencoder, learns a latent representation of the brain activity. We show that using Fisher Linear Discriminant Analysis, we can define a strongly clustered subspace that outperforms current model-free approaches while using a fraction of the dimensionality. The second part, a diffusion model trained on the auto-encoder's latent space, learns it's complex data distribution, enabling realistic unconditional sampling. Additionally, the diffusion model's bottleneck displays local linear structures which make vector arithmetic and modeling trajectories through the latent space possible, giving unprecedented insights into what features drive individual differentiation in DL approaches to brain fingerprinting. By combining our model's generative modeling with standard interpretability techniques, our architecture addresses key challenges in the field and offers a promising approach for improving cognitive profiling, subject-independent classification, and personalized brain-computer interfaces.

Mina Mahdi - Cognitive Science - McGill University

Bodily strains to schizophrenic brains: The integration of chlorpromazine in North American psychiatry

In the first published study on chlorpromazine (CPZ) in North America, Montréal psychiatrist Heinz Lehmann and his resident Gorman Hanrahan articulate a major therapeutic problem. They explain that psychiatry has, and should continue to be, concerned with controlling psychomotor excitement. In the first half of the twentieth century, the undesirable side-effects of current treatments and their effective lack of longevity problematized patient care. Improvement on sedatives was not considered meaningful in the same way that psychotherapy was. And the failure of sedatives to treat specific

neuroses or psychoses, or to induce long-term change, evinced a lacklustre attitude towards psychopharmaceuticals until CPZ came along. CPZ was thought to control psychomotor excitement while preserving higher psychological functions, a feat no treatment had yet accomplished. I will focus on the most important North American clinical trials on CPZ, the first modern antipsychotic, from its proliferation in the 1950s to its contribution toward the dopamine hypothesis of schizophrenia in the 1960s. I will unpack the historical thesis that CPZ was the harbinger of contemporary biological psychiatry. As such, I employ a historical analysis of clinical papers published in the '50s and '60s. Because no prior work has tracked the philosophical implications of CPZ's clinical usage, I will focus on the language that psychiatrists used to describe the drug's effects and how they employed it in practice. CPZ underwent an increasingly disease-specific demarcation from a general "sedative" to an "antipsychotic" most befitting schizophrenic patients. I propose that this narrowing of clinical utility was contingent on structural changes in the experimental design of clinical studies—changes which were spurred on by CPZ's integration in public mental health. I argue that CPZ's emergent status as an antipsychotic was borne more from the methodological changes established by those studying it than any increased knowledge about its psychological effects.

Noah Ksonzek - Behavioural Neuroscience - Concordia University
Co-authors: Emily Ah-Yen, Dallas Calvert, Katherine Krehbiel, Dr. Uri Shalev

The Effects of Chemogenetic Activation of the aPVT on Cue-Induced Heroin Seeking in Male and Female Rats

The paraventricular nucleus of the thalamus (PVT) is a brain area that is involved reward, stress, and drug-seeking. It comprises two distinct anatomical regions, the anterior PVT (aPVT) and the posterior PVT (pPVT). Our laboratory demonstrated that activating the pPVT attenuates food restriction augmentation of cue-induced heroine seeking in rats, while inhibiting the region has no effect. We now want to look at the involvement of the aPVT. Chemogenetic inhibition of the aPVT showed no significant effects. Thus, our present study sought to use chemeogenetic activation to further investigate the role of the aPVT in cue-induced heroin seeking in food-restricted rats. It additionally sought to provide us with information to investigate pathways from the aPVT. The rats underwent an IV catheterization surgery which allowed for self-administration, and were injected with a virus vector carrying an excitatory DREADD code into the aPVT. The rats were trained to self-administer heroin in operant conditioning boxes. They then underwent a forced abstinence period, with half of the rats being food restricted. The animals underwent a relapse-like test under sated and food restricted conditions; half were injected with the DREADD ligand, DCZ, to activate the aPVT and half were injected with vehicle. We found that that chemogenetic activation of the aPVT significantly inhibited heroin seeking in male rats, but not in female rats. Food restriction led to increased heroin seeking in both male and female rats. With these data we are able to proceed with an experiment inhibiting the pathway from the aPVT to the ventral cubiculum (vSUB), a pathway that does not exist from the pPVT. Our findings will contribute to better understanding of the brain mechanisms that underlie relapse to substance use, and might help in the development of better, research guided, treatment approaches, something that we see across cognitive science disciplines.

Flash Talks

Kobi Bernstein - Cognitive Science - McGill University
Co-authors: Jonas Mago, Kyle Greenway

The Reality Behind Visual Hallucinations: A Cognitive Computational Framework

Hallucinations are a hallmark of serotonergic psychedelics (SP), yet their causal mechanisms remain unknown. This paper presents a computational framework accounting for eidetic hallucinations, a type of hallucination where materials and textures appear more detailed thus seeming 'more real than reality'. This framework uses the Bayesian Brain Hypothesis and the Relaxed Beliefs Under Psychedelics theory (REBUS) to explore the possible ontological relevance of this fascinating phenomenon. The Bayesian Brain Hypothesis proposes that perception is an active process, shaped by both incoming sensory information and prior internal expectations. According to the REBUS theory, these internal expectations are weakened during SP. While previous explanations attribute hallucinations in SP to increased variability from the psychedelic state, our framework integrates REBUS by introducing an explicit hallucinatory mechanism: reduced perceptual filtering. We hypothesize that the details perceived in eidetic hallucinations may indeed be physically present yet are typically filtered out of our standard perception since encoding them is not ecologically useful. This internal filtering mechanism may be driven by our internal priors, thus making them a target for SP. The hypothesis that SP may increase perceptual detail is supported by empirical evidence. Two mouse studies found that knocking out genes responsible for certain inhibitory amacrine cells led to heightened visual sensitivity and detail compared to wild-type mice. Notably, these inhibitory amacrine cells contain the 5-HT2A receptor—the primary target of SP. We propose that SP weakens the influence of these inhibitory amacrine cells, contributing to the enhanced visual sensitivity observed in these experiments.Understanding SP-induced visual hallucinations extends beyond neuroscience, as SPs hold promise in clinical research for treating mental illness. SPs' therapeutic effects are linked to their capacity to influence perception and cognition, creating lasting mental health benefits. Advancing our knowledge of how SPs affect these processes is crucial for developing effective treatments and therapies.

Mira Saad - Psychology - McGill University
Co-authors: Audree Bujold, Tassew Woldehanna, Duc Le Thuc, Franscisco Diez Canseco, Lea Perret, Massimiliano Orri

Childhood Cognitive Skills and Adolescent Emotional Problems: a Longitudinal Study

Research Question: To what extent do childhood cognitive abilities predict emotional problems during adolescence in low-and-middle income countries? Background: Poor childhood cognitive abilities have been associated with emotional symptoms, such as persistent worries and/or unhappiness, later in life. Despite its importance for building good mental health and social capital, early cognitive

abilities are seldom explored as predictors of future emotional health – especially in low/middle-income countries. We examined whether childhood cognitive abilities, specifically intelligence, were linked to emotional problems in adolescents from Ethiopia, Peru, Vietnam, and India.

Methods: We analyzed the Young Lives longitudinal study involving 1000 Ethiopian children, 714 Peruvian children, 1000 Vietnamese children, and 1008 Indian children. Measures of fluid intelligence include Ravens Progressive Matrix (RCPM), reading tests, and mathematics tests. Measures of crystalized intelligence include the Peabody Picture Vocabulary Test (PPVT) and writing skills tests. The RCPM, numeracy tests, reading and writing tests were collected at 8 years, and the PPVT, mathematics, reading and writing tests were measured at 12 years. Emotional symptoms were self-reported using the Strength and Difficulties Questionnaire's at age 15. We used linear regressions to investigate associations between cognitive skills and emotional symptoms, adjusting for covariates, such as socioeconomic status, stunting, and school enrollment. Sex differences were analysed in interaction and stratified analyses. Preliminary

Results: Low intelligence scores were associated with higher emotional problems at 15 years in Peru, Vietnam, and India. Sex differences were found in Peru for PPVT, mathematics, RCMP, and writing tests, in Vietnam for mathematics, and both RCMP and writing abilities in India.

Implication: Insights into how socio-economic and cultural contexts shape early cognitive development and emotional well-being are valuable for anthropological fields. Our findings emphasize the key role of childhood cognitive skills on mental health, supporting the importance of early childhood programs promoting children's cognitive development in low/middle-income countries.

Mai-Vy Julia Nguyen - Psychology - McGill University
Co-authors: Caitlyn Antal, Brendan T. Johns

Catching a Glimpse: The Role of Features During Object Recognition

Abstract: Humans have a keen sense to recognise objects accurately within just a few milliseconds of presentation. During recognition, the brain transforms visual input into semantic information. However, our limited knowledge about this process motivates the question: how do we access semantic information in the brain? This study aims to understand how concepts are retrieved from the brain—whether objects are initially recognised as a whole, following object-based theories, or from their features, as suggested by feature-based theories. Eighty native English speakers were recruited from McGill University's Psychology participants pool and Montreal communities to complete this study. Using an ultra-rapid picture-primed lexical decision task, they were presented with a picture of an item (e.g., dog) for 18 ms followed by a mask and a lexical label which was either related (e.g., tail) or unrelated (e.g., table) to the picture for 60 ms. These words also had to represent one of four object properties: superordinate (e.g., animal), basic level (e.g., dog), high-salient feature (e.g., bark), and low-salient feature (e.g., tail). The participants had to identify whether the lexical label is a real word of English by pressing "yes" ("L" key) or "no" ("A" key) on the given keyboard (Antal & Almeida, 2024). By measuring the response time and accuracy of the presentation of different word probes, we could make an inference as to what is initially accessed in the brain when recognising an object at a glance. Preliminary results show that object-based word probes, targeting superordinate

and basic level properties, yield faster response times and are more accurate than feature-based word probes suggesting that humans recognise objects holistically. Insight on object recognition connects all disciplines of cognitive science from subjects such as perception, learning, memory, language, artificial intelligence and motivates the field to further explore new paradigms in theoretical and applied research.

Sophia Osborne - Cognitive Science - McGill University

Co-authors: Olivier Parent, Maria McGuinness, Alice Mukora, Manuela Costantino, Daniela Quesada Rodriguez, Gabriel A. Devenyi, Robert-Paul Juster, Mahsa Dadar, M. Mallar Chakravarty

Health Impacts of Gendered Lifestyles: Associations with Disease Outcomes

While sex is defined using biological factors and is often operationalized as a male/female binary, gender refers to socially constructed roles, behaviours and identities of individuals, often shaped by social norms. Gender and sex are often conflated in academic work, but the independent and interdependent influence of these variables is underexplored in the context of health outcomes. To address this, we employed a data-driven approach to operationalize gender as a continuous spectrum . We developed the Index of Gendered Lifestyle (IGL) using machine learning methods applied to the UK Biobank dataset (n = 216,079). This framework enabled the analysis of gendered lifestyle impacts on medical diagnostic outcomes. To develop the IGL, we selected 56 lifestyle variables encompassing physical activity, substance use, sleep, and social behaviours. Using an AutoML framework, an optimal classification algorithm was selected and trained to predict self-reported sex based on these variables. The classification probabilities were then extracted to define the IGL as a continuous spectrum representing gendered lifestyles. Our investigation revealed many significant associations between the IGL and diagnosis outcomes. Among females, a more masculine IGL was significantly associated with vascular dementia (β=2.06, p = 0.040) and sexual dysfunction not caused by organic disorders (B=-0.34, p = 0.015), suggesting that gendered behaviours influence neurological and cognitive health. Conversely, male subjects exhibited strong associations between depressive episodes and more feminine IGL scores (β=-0.32, p < 0.01). Additionally, alcohol-related mental and behavioural disorders were associated with a more masculine IGL in both males (β=0.272, p < 0.01) and females (β=0.273, p = 0.020), highlighting shared gendered lifestyle patterns influencing substance use across the sexes. These findings underscore the potential of the IGL to investigate sociocultural dimensions of health and disease.

Flash Talks

Rayan Daoudi - Neuroscience - University of Montreal
Co-authors: M.-J. Quinn, J. Otis, C. d'Aragon, A. Desautels, M. Vendette, E. Sanchez, J. Carrier, N. Gosselin, R. Robillard, B. Oliveira, N. Lazarovici, A.-A. Baril

YKL-40 as an inflammatory biomarker indicative of the severity of pathological insomnia

Introduction: Insomnia has been suggested as a pro-inflammatory condition linked to an increased risk of developing Alzheimer's disease (AD). YKL-40, a protein secreted by astrocytes and microglia during neuroinflammation, is an emerging biomarker associated with AD risk and neuroinflammatory processes. However, it's concentration has not been explored in the context of insomnia. This study aimed to investigate the relationship of insomnia and its severity with plasma levels of YKL-40, suggesting a pathway through which insomnia may act as a risk factor for AD.

Materials and Methods: The study included 40 participants with clinically diagnosed insomnia (61.18 ± 8.32 years, 25W) and 34 controls (64.44 ± 5.86 years, 12W). Plasma YKL-40 concentrations were measured by ELISA. Sleep metrics were obtained through polysomnographic recordings. Linear regressions were used to analyze the relationship between Insomnia Severity Index (ISI) scores and YKL-40 levels. Additionally, ANCOVAs were conducted to compare YKL-40 concentrations between different group separations ex. (1) diagnosed insomnia vs. controls, and (2) insomnia if ISI score ≥15, otherwise control.

Results and Discussion: In the full sample, no association was found between insomnia severity, insomnia status, nor any objective sleep metric and YKL-40 concentration. Among the participants diagnosed with insomnia, those with severe insomnia (ISI≥22, n=12) exhibited higher YKL-40 levels compared to participants with non-severe insomnia (ISI<22, n=28), and higher ISI scores were associated with higher YKL-40 levels. All analyses were adjusted for covariates such as age, sex, other sleep disorders, proinflammatory factors and medication usage.

Conclusion: Our findings suggest that insomnia severity in individuals diagnosed with insomnia, rather than insomnia status, is linked to YKL-40 concentrations. Inflammation, as indicated by YKL-40, may underlie the connection between severe insomnia and AD through an inflammatory pathway potentially impacting cognitive function associated with these conditions.

Poster Abstracts

[1] Encoding Fear Memories in the Basolateral Amygdala when Unconditioned Stimuli Modalities Differ

Faheem Abou Obeya - Psychology - Concordia University
Co-Authors: Sepideh Hosseini, Mihaela Iordanova

The Basolateral Amygdala (BLA) plays a key role in first order Pavlovian fear acquisition and expression. Previous research shows that the deletion of these memories will disrupt fear to a control cue when both target memory and control cue share the same sensory modality. On the other hand, when modalities differ at the conditioned stimuli (CS) level, there is reduced overlap in activated neuronal ensembles. This project explores the role of neuronal ensembles in the BLA responsible for fear discrimination, the ability to distinguish between threatening and non-threatening stimuli, when unconditioned stimuli (US) vary across modalities. Here, the conditioned stimuli are of the same modality (auditory) with one paired to a mild shock and the other to a siren. The Daun02 inactivation method is used on fos-LacZ transgenic rats to delete neuronal ensembles activated by one auditory cue allowing for behavioral observations of fear expression for the second cue. ß-galactosidase staining is also used to quantify neural activity and recognize the overlap of neuronal ensembles which encode fear for different modalities. The findings of this research contribute to our understanding of how neuronal ensembles in the BLA process multimodal fear memories, intern informing more targeted treatment approaches to disorders like post-traumatic stress disorder (PTSD).

[2] Assessing Cognitive and Sensory Accessibility for Students with Autism in Dubai's Private Schools

Dina Aslan - Cognitive Science - McGill University

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by significant social, communication and behavioral challenges (Centers for Disease Control and Prevention, n.d.). In the United Arab Emirates (UAE), ASD affects approximately 1 in 146 births, a prevalence that necessitates parents to make critical educational choices for their children between specialized autism centers and private schooling options (Al-Abbady et al., 2017). From 2018 to 2019, the number of students with autism enrolled in Dubai-based private schools increased by 3,500 students (Knowledge and Human Development Authority, 2019). The rising inclusion highlights the pressing demand for inclusive education frameworks. Research demonstrates a positive correlation between autism-sensitive building designs and enhanced inclusivity for students with autism (Ghazali et al., 2018). The Autism ASPECTSSTM Design Index, developed by researcher Magda Mostafa, outlines comprehensive design elements– Acoustics, Spatial Sequencing, Escape Spaces, Compartmentalization, Transitions, Sensory Zoning, and Safety– that support autism-friendly environments (Mostafa, 2015). This study sought to answer the research question: To what extent do private schools in Dubai accommodate their building design to support students with ASD based on the ASPECTSS design criteria? A mixed-methods research design was employed, incorporating surveys with students with autism and interviews with Learning Support Specialists (LSS) across six private schools. The study reveals that private schools in Dubai effectively implement four of the six

Poster Abstracts

ASPECTSS criteria: "Escape Space," "Compartmentalization," "Transitions," "Sensory Zoning," and "Safety." These criteria support essential neurocognitive processes, helping to reduce sensory overload and create predictable environments that help students with autism navigate their surroundings. The findings highlight the need to improve "Acoustics" and "Spatial Sequencing" to better support sensory processing and spatial awareness. Enhancing these elements is essential for creating school designs that meet the cognitive needs of students with autism, ultimately advancing inclusive learning environments that promote cognitive well-being.

[3] The Role of Androgen Receptors on the Regulation of Behavior in Mice

Sofia Benavides - Behavioral Neuroscience - Concordia University

Co-Authors: Amanda Szubinski, Andree Stevens, Carlos Alvarado, Miltiadis Paliouras, Andreas Bergdahl, Mark Trifiro, Konrad Schöttner, Shimon Amir.

Androgen receptors (ARs) are ligand-depended nuclear transcription factors that play a central role in reproductive, cardiovascular, metabolic, and neural processes. Male mice with a humanized androgen receptor genotype (AR-19Q) develop non-alcoholic fatty liver and metabolic syndrome (MetS)-like phenotypes, and preliminary work suggests that alterations in clock gene expression in tissues regulating metabolic homeostasis may be a contributing factor. Previous studies have shown that changes in clock gene expression may be linked to changes in behavior as well. We assessed anxiety-like behavior, motor function and memory performance in AR mutant male mice. AR mutant mice displayed increased anxiety-like behavior in the open field test, increased motor function in the rotarod test and decreases memory performance in the alternating T-maze test. These results suggest that AR may play a role in the regulation of behavior. We do not know yet if these behavioral changes are directly or indirectly caused by the AR mutation. Further research is needed to determine the connection between ARs, metabolism, circadian rhythms and behavior.

[4] Checkmate Pain: Modulation of Flow Experience and Pain Perception

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Pain alerts us of danger by drawing our attentional resources, yet it can be debilitating. Distraction can be effective at reducing pain as it redirects attention away from pain. This effect is especially seen in cognitively demanding tasks like the 2-back. However, the benefits of such tasks are often outweighed by the mental effort required, which in practice limits their effectiveness. Thus, it is necessary to have pleasurable distractors to maximize pain reduction. One such option is using intrinsically enjoyable tasks, which are linked to one's passion and foster flow experiences. Flow occurs when people are fully immersed in an activity. As such, passion-driven tasks could reallocate shared cognitive resources, leading to enhanced engagement and potentially greater pain reduction. Therefore, in this study, we investigated the relationship between intrinsically pleasant tasks and pain modulation. We recruited 200 novice and advanced chess players. The experiment involved 5

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conditions (2-back task, a pain trial devoid of distraction, as well as chess puzzles of varying difficulty: easy, flow, and difficult). Throughout all conditions, participants received painful thermal stimulation. They also completed questionnaires assessing game experience, flow, and passion. Results showed significant reduction in pain between novice and advanced players for the flow and hard games, as well as 2-back tasks. In terms of flow experience, advanced players reported higher levels of flow in chess puzzles, specifically in the flow game, while the 2-back task showed significantly less enjoyment and flow. Our findings provide a stepping stone into promoting new pain management techniques tailored to the individual and to what brings them intrinsic pleasure. Our research pools on insights from psychology and neuroscience as we investigate the link between flow experience that drives a reduction in pain perception.

[5] The Reality Behind Visual Hallucinations: A Cognitive Computational Framework

Kobi Bernstein - Cognitive Science - McGill University
Co-Authors: Jonas Mago, Kyle Greenway

Hallucinations are a hallmark of serotonergic psychedelics (SP), yet their causal mechanisms remain unknown. This paper presents a computational framework accounting for eidetic hallucinations, a type of hallucination where materials and textures appear more detailed thus seeming 'more real than reality'. This framework uses the Bayesian Brain Hypothesis and the Relaxed Beliefs Under Psychedelics theory (REBUS) to explore the possible ontological relevance of this fascinating phenomenon. The Bayesian Brain Hypothesis proposes that perception is an active process, shaped by both incoming sensory information and prior internal expectations. According to the REBUS theory, these internal expectations are weakened during SP. While previous explanations attribute hallucinations in SP to increased variability from the psychedelic state, our framework integrates REBUS by introducing an explicit hallucinatory mechanism: reduced perceptual filtering. We hypothesize that the details perceived in eidetic hallucinations may indeed be physically present yet are typically filtered out of our standard perception since encoding them is not ecologically useful. This internal filtering mechanism may be driven by our internal priors, thus making them a target for SP. The hypothesis that SP may increase perceptual detail is supported by empirical evidence. Two mouse studies found that knocking out genes responsible for certain inhibitory amacrine cells led to heightened visual sensitivity and detail compared to wild-type mice. Notably, these inhibitory amacrine cells contain the 5-HT2A receptor—the primary target of SP. We propose that SP weakens the influence of these inhibitory amacrine cells, contributing to the enhanced visual sensitivity observed in these experiments.Understanding SP-induced visual hallucinations extends beyond neuroscience, as SPs hold promise in clinical research for treating mental illness. SPs' therapeutic effects are linked to their capacity to influence perception and cognition, creating lasting mental health benefits. Advancing our knowledge of how SPs affect these processes is crucial for developing effective treatments and therapies.

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[6] Evaluating the putative effect of suicide prevention training on suicide stigma and attitudes in Asia

Michelle Cai - Psychology - McGill University

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Although Asia accounts for 60% of global suicides, research efforts on suicide in the region remain disproportionately limited compared to the West due to a lack of resources. Despite this, suicide prevention programs in Asia are in high demand and show significant potential for reducing suicides. While many Asian countries have implemented suicide prevention initiatives, most lack proper evaluation. A key objective of suicide prevention training is to reduce stigma and improve attitudes toward suicide. In Asia, many countries share the prevailing belief that suicide stems from personal weakness. Furthermore, social stigma surrounding suicide often discourages families from seeking help for individuals with suicideal concerns. However, the conversation surrounding stigma in Asia is nuanced. While suicide attitudes are generally negative, attitudes are more permissive in contexts such as restoring honour, addressing social disgrace, or social protest. Additionally, suicide in Asia is attributed less to psychiatric conditions and more to social factors.The aim of this project is to evaluate the impact of suicide prevention training on stigma and attitudes in Asia to clarify how attitudes and stigma are measured in Asian contexts. To answer these questions, we conducted a systematic review of 12 articles published since 2014. Descriptions of the attitude and stigma scales were charted and changes in attitude and stigma scores were compared pre- and post-training. Full results are expected in late January. This research can help elucidate the impact of suicide prevention training on attitudes and stigma in Asia and highlight cultural differences in measurement and conceptualization. The results of this study are also relevant to other cognitive science fields (e.g., linguistics) as many scales assessing stigma and attitudes were translated and adapted from English to Asian languages, which may affect the conceptualization of these terms.

[7] Rethinking Visual Processing: The Role of Extrafoveal Vision in Facial Identification

Yustine Alejandra Carruyo Soto - Psychology - McGill University

Co-Authors: Sunny Wang, Laurie Goulet, Luiza Passos Volpi, Dr. Reza Farivar.

Background: Extrafoveal vision, encompassing the parafovea and perifovea, has traditionally been undervalued in tasks requiring detailed visual processing, such as facial identification, due to its reduced acuity and susceptibility to crowding effects. However, emerging evidence suggests that extrafoveal regions may play a more significant role in facial identification than previously assumed. This study reevaluates the contribution of extrafoveal vision to facial recognition, particularly when faces vary in the amount of identity information presented. Methods: Participants performed a facial identification task using stimuli presented in their parafoveal and perifoveal vision. Faces were manipulated to include varying levels of identity information, and recognition accuracy was assessed across different stimulus sizes to evaluate the impact of size on performance.

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Participants reliably identified faces presented in extrafoveal regions, with larger stimuli significantly improving recognition accuracy. This effect was consistent across varying levels of identity information. These findings challenge the traditional fovea-centric perspective on visual processing by demonstrating that extrafoveal vision is capable of supporting accurate facial identification, particularly with appropriately scaled stimuli. This study highlights the underappreciated role of extrafoveal regions in visual perception, offering insights not only for vision science but also for related fields such as cognitive psychology and artificial intelligence, where understanding mechanisms of facial recognition can inform models of attention and pattern recognition.

[8] YKL-40 as an inflammatory biomarker indicative of the severity of pathological insomnia

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Introduction: Insomnia has been suggested as a pro-inflammatory condition linked to an increased risk of developing Alzheimer's disease (AD). YKL-40, a protein secreted by astrocytes and microglia during neuroinflammation, is an emerging biomarker associated with AD risk and neuroinflammatory processes. However, it's concentration has not been explored in the context of insomnia. This study aimed to investigate the relationship of insomnia and its severity with plasma levels of YKL-40, suggesting a pathway through which insomnia may act as a risk factor for AD. Materials and Methods: The study included 40 participants with clinically diagnosed insomnia (61.18 ± 8.32 years, 25W) and 34 controls (64.44 ± 5.86 years, 12W). Plasma YKL-40 concentrations were measured by ELISA. Sleep metrics were obtained through polysomnographic recordings. Linear regressions were used to analyze the relationship between Insomnia Severity Index (ISI) scores and YKL-40 levels. Additionally, ANCOVAs were conducted to compare YKL-40 concentrations between different group separations ex. (1) diagnosed insomnia vs. controls, and (2) insomnia if ISI score ≥15, otherwise control. Results and Discussion: In the full sample, no association was found between insomnia severity, insomnia status, nor any objective sleep metric and YKL-40 concentration. Among the participants diagnosed with insomnia, those with severe insomnia (ISI≥22, n=12) exhibited higher YKL-40 levels compared to participants with non-severe insomnia (ISI<22, n=28), and higher ISI scores were associated with higher YKL-40 levels. All analyses were adjusted for covariates such as age, sex, other sleep disorders, proinflammatory factors and medication usage. Conclusion: Our findings suggest that insomnia severity in individuals diagnosed with insomnia, rather than insomnia status, is linked to YKL-40 concentrations. Inflammation, as indicated by YKL-40, may underlie the connection between severe insomnia and AD through an inflammatory pathway potentially impacting cognitive function associated with these conditions.

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[9] Right Brain or Left Brain: The Impact of a Pseudoscientific Belief on Creative and Deductive Performance

Ryan Derfoul - Psychology - Université du Québec à Montréal

Despite having been refuted by the scientific community, the notions of "left brain" or "right brain" remain widespread in public discourse. The present study aimed to determine whether the arbitrary assignment of "hemispheric dominance" (left, right, or neutral) to participants (N = 249; M_age = 36.53, SD = 11.77) would influence their performance on logical reasoning (16 conditional syllogisms) and creativity (Alternative Uses Task), as well as their sense of self-efficacy in these two domains. After completing a fictitious psychometric test, allegedly 90% valid, each participant received a personalized "result" regarding their supposed hemispheric dominance, and then performed the reasoning and creativity tasks, each preceded by a self-efficacy measure (scale from 1 to 10). A one-way ANOVA revealed a small but significant effect of the experimental condition on reasoning scores, $F(2, 246) = 4.10$, $p = .018$, $\eta^2 = .032$. Specifically, the "left-brain" group (M = .646, SD = .172) scored higher than the neutral group (M = .575, SD = .157; p = .013), though it did not differ significantly from the "right-brain" group (M = .607, SD = .150; p = .273). In contrast, no significant differences were observed in originality ($F(2, 246) = 0.50$, $p = .607$, $\eta^2 = .004$) or in self-efficacy for reasoning (p = .337) and creativity (p = .635). Notably, the chi-square analysis ($\chi^2 = 17.82$, $p = .001$) shows that the experimental manipulation altered participants' reported belief in their own hemispheric dominance. This suggests that this kind of pseudoscientific labeling can influence self-perception without, however, resulting in marked changes in performance or self-efficacy. Overall, these findings underscore the importance of critical scientific communication to counter the spread of unfounded cognitive myths that may influence individual performance and beliefs, particularly in educational settings.

[11] Impact of Open Science Practices- A Narrative Review

Cathy Fang - Psychology - Douglas Research Centre
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A growing number of institutions, government, and funding agencies are mandating or adopting Open Science (OS) principles to make science accessible to all. Numerous articles highlight many benefits of OS; however, empirical evidence supporting the general impact of OS is lacking. We reviewed research outputs reporting evidence-based effects of OS practices to: provide an overview of and identify knowledge gaps surrounding the impact of OS to guide future research. Our literature review (keywords: open science & impact/advantage/effect/benefits) spanned three databases: "OS in the Literature" repository (OSF), PubMed, and Academic Search Complete (EBSCO). Included references were in English and accessible via open access (OA) or institutional license. Papers were categorized by OS activity (preprint, registered reports, citizen science, open data, OA and open education) and area of impact (scholarly and societal). We found 161 relevant articles (2015-2024), of which 121 were included. 41 (45.1%) articles investigated OA in increasing research visibility. Fewer (3-13) were on other OS practices. Notably, we only found one paper on the societal impact of OS. Findings suggest OS activities investigated generally increase research visibility, credibility and community engagement. Future research investigating the impact of OS practices other than OA is needed.

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[12] Empathy Avoidance and Cognitive Load: Insights from Temporal and Cognitive Mechanisms

Silvia Foute Nelong & Sarah Stanford - Psychology - McGill University

Co-authors: Alex Dion Parent, Saki Nozawa, Sofia Omobono, Yuanzhen Shao

Empathy is a cornerstone of prosocial behavior, yet individuals often avoid engaging in it due to its cognitive demands. This study aimed to replicate and extend previous findings on empathy avoidance by investigating the influence of cognitive load and time of day. We hypothesized that participants would exhibit greater empathy avoidance under high cognitive load and that time of day might moderate this tendency. Using Cameron's (2019) empathy selection task, 100 participants (91 female, 8 male, 1 other; M age = 20.57, SD = 1.75) completed 40 trials, choosing between an objective deck (detached observation) and an empathy deck (perspective-taking). Cognitive workload was measured using tools adapted from the NASA Task Load Index and the Multidimensional Fatigue Inventory. At the same time, time of day (morning vs. afternoon) and chronotype were examined as moderators. Participants selected the empathy deck 42.88% of the time (M = 0.4288, t = −3.59, p = 0.005), replicating previous findings that empathy is often avoided due to cognitive costs. However, no significant differences were observed between morning and afternoon groups (t = 0.77, p = 0.44), and fatigue scores did not significantly correlate with empathy-related decisions (r = −0.09). While these results reaffirm the robustness of empathy avoidance, the lack of significant time-of-day effects suggests this factor may not substantially influence empathy under the tested conditions. Limitations include reliance on a homogenous sample and self-reported measures, which may limit generalizability. These findings highlight the cognitive demands of empathy and suggest interventions like mindfulness meditation could help foster empathetic engagement in cognitively demanding environments.

[13] Decoding Decision-Making: Investigating the Impact of Loss Aversion and Gambler's Fallacy in Female Participants.

Maria Houdaifa, Loren Armstrong, Niama Fellh-Ghnimi - Psychology - McGill University

This study investigates how loss aversion (LA) and gambler's fallacy (GF) influence decision-making in non-gambling female participants, addressing a critical research gap in understanding gender-specific decision-making behaviors in non-pathological contexts. Grounded in Prospect Theory, which explains deviations from rational decision-making, the research examines whether non-gamblers exhibit risk-taking tendencies typically associated with pathological gamblers (PG). Eight female university students completed two tasks: the Loss Aversion Task (LAT) to measure sensitivity to losses versus gains and the Iowa Gambling Task (IGT) to assess preferences for risky or safe choices. Behavioral metrics, including LA scores and deck selection proportions, were analyzed using statistical methods to explore correlations between risk-taking, LA, and comorbid psychological symptoms evaluated through DSM-5 cross-cutting measures. Key findings revealed a significant negative correlation between LA scores and risky decision-making, indicating that individuals with lower sensitivity to losses are more likely to take risks.

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Unexpectedly, participants showed a preference for risky decks in the IGT, diverging from prior research on healthy populations. This suggests that even non-gambling females may be susceptible to GF under specific conditions. However, no significant correlation was found between DSM-5 scores and LA, emphasizing the limitations of general symptom measures in predicting decision-making tendencies. These findings provide novel insights into LA and GF as predictors of risk-taking in non-pathological contexts, offering a gender-specific perspective on cognitive biases. This research contributes to the field of cognitive science by deepening our understanding of decision-making processes and has implications for developing targeted interventions in gambling and addiction prevention. Future studies should explore these phenomena in real-world and longitudinal settings to better understand the interplay of gender, comorbidity, and decision-making behaviours across cognitive science disciplines.

[14] Emergency Room Presentation Rates as a Triage Tool in Functional Neurological Disorder

Eya Ibrahim - Neuroscience & Computer Science - McGill University
Co-authors: *Mohammed Gheis*

Functional Neurological Disorder (FND) and related conditions represent multifaceted illnesses that have long been associated with a guarded or poor prognosis. Historically, these disorders have not been the focus of acive psychiatric treatment due to perceived limited treatment response. The shift from long-term, open-ended, predominantly psychodynamic therapies to manualized short-term therapies, typically designed for depression and anxiety, has further complicated the inclusion of FND and related conditions in psychiatric care. Managing FND is challenging due to the disorder's significant heterogeneity. Patients with FND can present with a diverse array of symptoms, including motor, sensory, cognitive, and autonomic manifestations, complicating preliminary assessments of potential treatment response. Overlap with other conditions, such as somatization disorder and illness anxiety disorder, further complicates prognosis. The variability in symptoms and the overlap with other disorders limit screening for treatment inclusion and triage. Furthermore, the evolution of treatment consensus guidelines, spurred by the development of new explanatory models, has produced a dynamic environment where prognostic parameters may be changing rapidly. This study aims to examine whether the number of emergency room presentations in the period leading to patients referral could serve as a criterion for assessing which patients to triage into a long term treatment program for FND. This is a retrospective analysis of the outcomes of an ongoing service for people with FND, Somatic Symptom Disorder (SSD), and illness anxiety disorder. The findings of this study point to the possibility that the number of ER visits may serve as a useful selection criterion to include patients in treatment programs. Patients who present often to the ER seem to benefit more from such service, as indicated by a significant reduction in their ER visits. This approach has broader implications for the cognitive sciences, offering insights into predictive modelling and interdisciplinary care for complex neuropsychiatric conditions.

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[15] Évaluation de la flexibilité cognitive et de l'attention chez des souris avec délétion du gène CACNA1A

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Co-authors: *Aboubacrine Mahamane Touré, Siyan Wang, Yan Zaretsky, François Grenier, Elsa Rossignol.*

Introduction : La délétion du gène CACNA1A permettant l'activité du canal calcique CaV2.1 cause un éventail de symptômes neurocognitifs dont l'inattention, et les mécanismes sous-jacents ne sont pas entièrement compris. De récents travaux de l'équipe de Dre Rossignol ont démontré que les déficits cognitifs chez les souris porteuses de la délétion (PVCre;Cacna1ac/+) reflètent une dysfonction synaptique des interneurones inhibiteurs exprimant la parvalbumine, engendrant des troubles neurocognitifs dont la rigidité cognitive et l'inattention déterminée à l'aide de tests de comportement conventionnels. La présente étude vise à valider ces déficits cognitives via des tâches semi-automatisées rappelant les tâches utilisées chez les patients, notamment le temps de réaction en série à 5 choix (5-CSRT) et l'apprentissage probabiliste par inversion (PRL). Méthode : Dans le 5-CSRT, les souris adultes PVcre;Cacn1ac/+ et les contrôles sauvages apparentés doivent répondre à un bref stimulus visuel présenté aléatoirement dans l'un des 5 emplacements sur l'écran tactile pour recevoir la récompense. Dans le PRL, elles doivent répondre à l'un de deux emplacements, où un côté est désigné comme optimal (S+), avec 80% de chances d'obtenir la récompense, et l'autre comme sous-optimal (S-), avec 20% de chances d'obtenir la récompense. Après 5 réponses consécutives au stimulus optimal, les conditions de récompense changent. Le stimulus qui était S+ est maintenant S- et vice-versa (inversion). Résultats : La locomotion, le temps de réaction et la motivation semblent intacts chez les souris PVcre;Cacn1ac/+. En revanche, dans l'apprentissage probabiliste par inversion, elles font plus d'erreurs et tardent à apprendre la nouvelle règle lors du renversement de tâche, reflétant une rigidité cognitive. Conclusion et perspectives : Cette étude permet d'établir une plateforme translationnelle destinée à caractériser les déficits cognitifs associés aux mutations du gène Cacna1a et d'éventuellement faciliter le diagnostic et l'investigation de nouvelles thérapies, notamment dans le domaine de la psychologie.

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[16] The Effects of Chemogenetic Activation of the aPVT on Cue-Induced Heroin Seeking in Male and Female Rats

Noah Ksonzek - Behavioral Neuroscience - Concordia University
Co-authors: Emily Ah-Yen, Dallas Calvert, Katherine Krehbiel, Dr. Uri Shalev

The paraventricular nucleus of the thalamus (PVT) is a brain area that is involved reward, stress, and drug-seeking. It comprises two distinct anatomical regions, the anterior PVT (aPVT) and the posterior PVT (pPVT). Our laboratory demonstrated that activating the pPVT attenuates food restriction augmentation of cue-induced heroine seeking in rats, while inhibiting the region has no effect. We now want to look at the involvement of the aPVT. Chemogenetic inhibition of the aPVT showed no significant effects. Thus, our present study sought to use chemeogenetic activation to further investigate the role of the aPVT in cue-induced heroin seeking in food-restricted rats. It additionally sought to provide us with information to investigate pathways from the aPVT. The rats underwent an IV catheterization surgery which allowed for self-administration, and were injected with a virus vector carrying an excitatory DREADD code into the aPVT. The rats were trained to self-administer heroin in operant conditioning boxes. They then underwent a forced abstinence period, with half of the rats being food restricted. The animals underwent a relapse-like test under sated and food restricted conditions; half were injected with the DREADD ligand, DCZ, to activate the aPVT and half were injected with vehicle. We found that that chemogenetic activation of the aPVT significantly inhibited heroin seeking in male rats, but not in female rats. Food restriction led to increased heroin seeking in both male and female rats. With these data we are able to proceed with an experiment inhibiting the pathway from the aPVT to the ventral cubiculum (vSUB), a pathway that does not exist from the pPVT. Our findings will contribute to better understanding of the brain mechanisms that underlie relapse to substance use, and might help in the development of better, research guided, treatment approaches, something that we see across cognitive science disciplines.

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[17] Operationalizing Gender via Lifestyle Choices, and its Associations with Blood Biomarkers in the UK Biobank

Maria McGuinness - Cognitive Science - McGill University

Co-authors: Sophia Osborne, Olivier Parent, Alice Mukora, Manuela Costantino, Daniela Quesada Rodriguez, Gabriel A. Devenyi, Robert-Paul Juster, Mahsa Dadar, M. Mallar Chakravarty

Gender, a sociocultural construct, is known to influence health outcomes but remains underexplored in biomedical research. Traditional methods often conflate sex and gender, overlooking the different ways sociocultural factors shape physiological processes. This study addresses this gap by developing a novel, data-driven gender score derived from lifestyle variables – such as alcohol consumption, job satisfaction, and physical activity–using machine learning with data from 218,368 participants from the UK Biobank. The score is represented on a continuum and enables an unbiased examination of gender. After excluding individuals who did not have blood work done, we applied our framework and investigated associations between gender and 61 blood biomarkers (e.g., Urate, Apolipoprotein-A1, C-reactive protein) in 216,079 participants (116,793 females and 99,286 males). In females, 32 blood biomarkers significantly increased with higher masculinity scores, while 10 biomarkers increased with higher femininity scores. In males, 37 blood biomarkers significantly increased with higher masculinity scores, whereas 10 biomarkers were positively associated with higher femininity scores. Notably, serum urate and ApoA1 levels increased with higher masculinity scores, while testosterone levels showed differing trends by sex. Our framework provides a novel approach to quantifying gender as a complex construct, revealing how gendered behaviours influence physiological health: a more masculine lifestyle is associated with elevated markers such as Apolipoprotein A, Gamma-glutamyltransferase, and Cholesterol, while a more feminine lifestyle correlates with higher levels of IGF-1, Red Blood Cell Count, and Neutrophil Percentage.

[18] Computational Piloting: Optimizing Experimental Design for Better Decision-Making Models

Malek Medkour- Cognitive Science - McGill University

Co-authors: Paul Masset

In experimental design, determining the optimal number of trials and subjects is critical. Too few trials risk missing effects, while too many cause fatigue, particularly in human and animal studies. Additionally, integrating behavioral experiments with computational models requires sufficient data for reliable parameter inference. Traditional pilot studies help refine designs but demand substantial time and resources, raising ethical concerns in animal research. A Computational Pilot offers a cost-effective alternative, leveraging simulations to optimize task parameters before data collection. This approach provides pre-experiment diagnostics, ensuring robust parameter recovery while minimizing resource demands. By evaluating key task parameters, such as the number of trials and timing of delayed rewards, a Computational Pilot enhances statistical power, improves parameter estimation, and reduces uninformative outcomes. We applied this approach to temporal discounting, investigating how the brain makes choices between immediate and delayed rewards and how preferences shift with different delays. This Computational Pilot also tests which discounting model better captures decision-making behavior: the behavioral economics model, which assumes a constant discount rate (exponential function), or the behavioral psychology model, which describes

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discounting as a hyperbola-like function. A simulated agent performed trials with varied reward delays, making choices based on both discounting frameworks. A softmax decision rule computed the probability of selecting smaller, sooner (SS) or larger, later (LL) rewards based on exponentiated subjective values. A stochastic binary choice was then computed, generating synthetic behavioral data to compare model predictions. To determine the best-fitting function for observed choice behavior, we are testing various parametric models to identify which best captures decision patterns while also recovering key task parameters, such as the optimal number of trials and appropriate delay durations. Future work will assess the goodness-of-fit (R^2) to further evaluate model performance. In conclusion, this study demonstrates how a Computational Pilot refines experimental design, ensuring well-calibrated, efficient, and meaningful results. By optimizing task parameters and evaluating model recovery before data collection, this approach advances research into temporal discounting and provides a scalable framework for improving experimental design across diverse cognitive and neuroscience investigations.

[19] Catching a Glimpse: The Role of Features During Object Recognition
Mai-Vy Julia Nguyen - Psychology - McGill University
Co-authors: Caitlyn Antal and Brendan T. Johns

Humans have a keen sense to recognise objects accurately within just a few milliseconds of presentation. During recognition, the brain transforms visual input into semantic information. However, our limited knowledge about this process motivates the question: how do we access semantic information in the brain? This study aims to understand how concepts are retrieved from the brain—whether objects are initially recognised as a whole, following object-based theories, or from their features, as suggested by feature-based theories. Eighty native English speakers were recruited from McGill University's Psychology participants pool and Montreal communities to complete this study. Using an ultra-rapid picture-primed lexical decision task, they were presented with a picture of an item (e.g., dog) for 18 ms followed by a mask and a lexical label which was either related (e.g., tail) or unrelated (e.g., table) to the picture for 60 ms. These words also had to represent one of four object properties: superordinate (e.g., animal), basic level (e.g., dog), high-salient feature (e.g., bark), and low-salient feature (e.g., tail). The participants had to identify whether the lexical label is a real word of English by pressing "yes" ("L" key) or "no" ("A" key) on the given keyboard (Antal & Almeida, 2024). By measuring the response time and accuracy of the presentation of different word probes, we could make an inference as to what is initially accessed in the brain when recognising an object at a glance. Preliminary results show that object-based word probes, targeting superordinate and basic level properties, yield faster response times and are more accurate than feature-based word probes suggesting that humans recognise objects holistically. Insight on object recognition connects all disciplines of cognitive science from subjects such as perception, learning, memory, language, artificial intelligence and motivates the field to further explore new paradigms in theoretical and applied research.

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[20] Think Aloud Paradigm in Generating Bodily Maps of Emotion

Katherine Reed - Cognitive Science - McGill University
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Somatosensory experience is a relevant and informative component of emotion. Whether it be the weight of sadness or the warmth of joy, our physical experience of emotion helps us to understand, differentiate, and communicate our emotions. Bodily maps of sensation are a newly developed method of collecting self-report data regarding one's physical experience of their emotions. In this method, participants indicate where on their body they experience sensations of activation on one body silhouette and deactivation on another. In this study, we utilized a think aloud method to provide a real time first person signature of the bodily sensations participants (n=21) associated with 6 basic emotions and 4 social emotions (pride, shame, envy, contempt). The aim of this study was to evaluate which sensations were most associated with the separate labels "activation" and "deactivation" in order to further inform our interpretations of results generated by the body mapping method. We found that sensations most commonly described when indicating activation to be uncategorized increase, action, and tension and sensations most commonly described when indicating deactivation to be uncategorized decrease, inhibition, and weakness.

[21] Childhood Cognitive Skills and Adolescent Emotional Problems: a Longitudinal Study

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Research Question: To what extent do childhood cognitive abilities predict emotional problems during adolescence in low-and-middle income countries? Background: Poor childhood cognitive abilities have been associated with emotional symptoms, such as persistent worries and/or unhappiness, later in life. Despite its importance for building good mental health and social capital, early cognitive abilities are seldom explored as predictors of future emotional health – especially in low/middle-income countries. We examined whether childhood cognitive abilities, specifically intelligence, were linked to emotional problems in adolescents from Ethiopia, Peru, Vietnam, and India. Methods: We analyzed the Young Lives longitudinal study involving 1000 Ethiopian children, 714 Peruvian children, 1000 Vietnamese children, and 1008 Indian children. Measures of fluid intelligence include Ravens Progressive Matrix (RCPM), reading tests, and mathematics tests. Measures of crystalized intelligence include the Peabody Picture Vocabulary Test (PPVT) and writing skills tests. The RCPM, numeracy tests, reading and writing tests were collected at 8 years, and the PPVT, mathematics, reading and writing tests were measured at 12 years. Emotional symptoms were self-reported using the Strength and Difficulties Questionnaire's at age 15. We used linear regressions to investigate associations between cognitive skills and emotional symptoms, adjusting for covariates, such as socioeconomic status, stunting, and school enrollment. Sex differences were analysed in interaction and stratified analyses. Preliminary Results: Low intelligence scores were associated with higher emotional problems at 15 years in Peru, Vietnam, and India.

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Sex differences were found in Peru for PPVT, mathematics, RCMP, and writing tests, in Vietnam for mathematics, and both RCMP and writing abilities in India. Implication: Insights into how socio-economic and cultural contexts shape early cognitive development and emotional well-being are valuable for anthropological fields. Our findings emphasize the key role of childhood cognitive skills on mental health, supporting the importance of early childhood programs promoting children's cognitive development in low/middle-income countries.

[22] The role of medial prefrontal projections to the dorsomedial striatum in flexible decision-making

Robin Steedman-Braun - Psychology - McGill University
Co-authors: Niharika Dighe, Jonathan P. Britt

Flexible decision making is critical for navigating a changing and dynamic environment. This relies on making choices based on the value of their potential outcome and recent patterns of rewards. The dorsomedial striatum (DMS) plays a crucial role in action selection based on outcome values, particularly in an unpredictable environment. The DMS receives inputs from the medial prefrontal cortex (mPFC), which is presumed to encode action-outcome relationships and decision value. Impaired mPFC functioning is associated with difficulty navigating complex and changing environments, as well as inefficient behavioural flexibility. To test the effects of mPFC, specifically prelimbic cortex inputs, to the DMS, we developed a flexible decision-making task in which head-fixed mice were given the choice of licking two spouts placed in front of them, each having a varying probability of delivering a water droplet. Once stable decision-making behaviour was established, we delivered inhibitory DREADD injections thirty minutes prior to task completion, to observe the effects of inhibiting mPFC inputs to DMS on flexible decision- making behaviour. We found that mice receiving the inhibitory injection consistently exploit the option that they first learned was most valuable rather than updating the value of different options by reversing between spouts, indicating that the prelimbic cortex is involved in value updating during tasks. However, results show that the mice were not performing above chance in correct decision-making choices, suggesting that they may not have learned the task properly. This experiment can be repeated and will further inform studies to investigate the effects of Δ9-THC exposure, the primary psychoactive constituent of cannabis, on neural circuits involved in flexible decision-making, which may be an important factor in substance misuse problems.

Poster Abstracts

[23] Beyond the Binary: Ian Hacking and the Reconceptualization of Borderline Personality Disorder

Aimée Tran Ba Huy - Cognitive Science - McGill University

Borderline Personality Disorder (BPD), characterized by emotional instability, impulsivity, and relational challenges, has traditionally been viewed through either a medical model, emphasizing biological causes, or a social constructivist lens, which explains disorders as entirely products of social context. This research integrates these perspectives using philosopher Ian Hacking's theoretical framework, particularly his concepts of "natural" and "social kinds," the "looping effect," and "ecological niches." By examining the evolving conceptualization of BPD, this research demonstrates how biological and socio-cultural factors dynamically interact in shaping both the diagnosis and lived experiences of those affected. Through interdisciplinary analysis—including historical, philosophical, and sociocultural perspectives—this study critiques the polarized views that either attribute BPD solely to biological determinism or societal construction. The new account answers pressing questions that neither perspective alone can fully address, such as the significant connection between BPD and gender-based socio-cultural norms, the alleged gender disparity in diagnosis, and the historical association between BPD and hysteria, while still making room for biological underpinnings of the disorder. This approach reframes feminist critiques of BPD, situating them within a model that accommodates both biological and social dimensions. The findings underscore the necessity of holistic treatment strategies that validate patients' experiences while addressing both neurological and societal factors, advocating for a nuanced understanding that bridges medical and social models to transform mental health diagnosis and care.

[24] Reading Efficiency in Amblyopia, Assessed with Random Temporal Sampling

Dasha Vanichkina - Psychology - McGill University
Co-authors: Nicole Dranitsaris, Martin Arguin, Alexandre Reynaud.

Amblyopia, more commonly known as "lazy eye", is a condition where incoming visual information from one of the eyes is processed poorly and binocular combination is disrupted. It has previously been shown that reading is altered in amblyopia; individuals affected by this condition tend to have a slower reading speed and experience different eye movements when compared to controls. In our experiment, we used the novel method of random temporal sampling to compare brain activity of controls and participants with amblyopia. The goal of our study is to investigate whether there are differences in the reading efficiency along the temporal sampling domain of controls and amblyopic individuals. To quantify the reading efficiency of participants, we used the random temporal sampling technique at an accuracy level of 50%. The data was collected using a four-alternative forced-choice task. The target that we used in each trial was one of 800 three-to-six-letter words. These 800 words were equally divided into four categories. On every trial, participants had to read the presented word to the best of their ability, as a varying level of noise impeded their reading, and they had to sort the word into one of the four categories. As we anticipated, controls read more efficiently

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overall than amblyopic participants, and they were most efficient in the binocular condition. Amblyopic participants were unexpectedly most efficient when reading with their amblyopic (presumably weaker) eye. As we predicted, amblyopes struggled the most in the binocular condition. In conclusion, we can gather from our results that the reading patterns of controls and amblyopic subjects differ in meaningful ways, and this may be at least partially explained by differences in their neural activity. These results have implications for the development of treatments for amblyopia that specifically target brain activity.

[25] AHEI-2010 Scores, B-Vitamins, and Cognitive Performance in U.S. Women: A Cross-Sectional Study

Nadezhda Velchovska - Psychology - Concordia University
Co-authors: Thea Demmers, Yuka Kato, Amelie Mainville-Berthiaume, Guylaine Ferland, Tamara R Cohen, Shaneha Patel, Roxanne Bennett, Lisa Kakinami

Cognitive decline is a growing concern among aging populations. Lifestyle choices, such as diet, play a important role in slowing down or preventing impairment .This study investigates the relationship between diet quality, assessed using the Alternate Healthy Eating Index-2010 (AHEI-2010), and the intake of specific B-vitamins (B6, B9/folate, and B12) with cognitive function in a representative sample of U.S. adults aged 60 and older. Using cross-sectional data from 2,299 participants in the 2011–2014 National Health and Nutrition Examination Survey (NHANES), cognitive performance was evaluated through immediate and delayed recall (CERAD Word List), verbal fluency (Animal Fluency), and processing speed/executive function (Digit Symbol Substitution Test). Linear regression models were used to evaluate the association between AHEI-2010 scores and B-vitamins with the cognitive test measures in separate regression models. All models adjusted for sex, age, race, education, smoking status, body mass index (BMI), and health conditions and incorporated the complex study design and sampling weights. Models were additionally sex-stratified. Linear regression analyses revealed that higher AHEI-2010 scores, indicating better dietary adherence, were statistically significantly associated with better delayed recall, processing speed, and verbal fluency ($p<0.05$). Among B-vitamins, greater intake of vitamin B6 and folate showed strong positive associations with better cognitive performance, particularly in delayed recall and processing speed ($p<0.05$). These associations were more pronounced among females, showing potential sex differences in dietary impacts on cognition. This study combined dietary assessments and neuropsychological tests, providing an understanding of how diet influences cognitive health. Findings suggest that a diet aligned with AHEI-2010 guidelines, emphasizing fruits, vegetables, and whole grains, while ensuring adequate intake of B vitamins, may support cognitive function in older adults, particularly among females. These results contribute to nutritional epidemiology and extend additional insights for cognitive science disciplines exploring the interplay between lifestyle factors and brain health.

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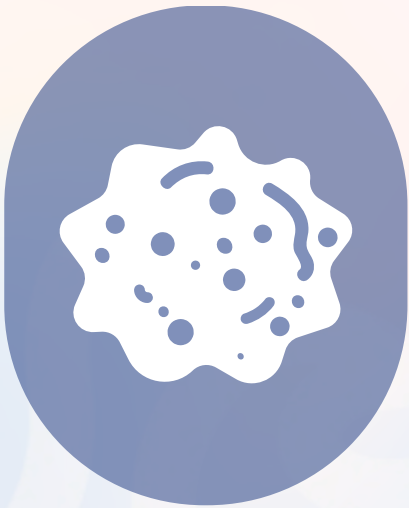## McGill's Science Undergraduate Society

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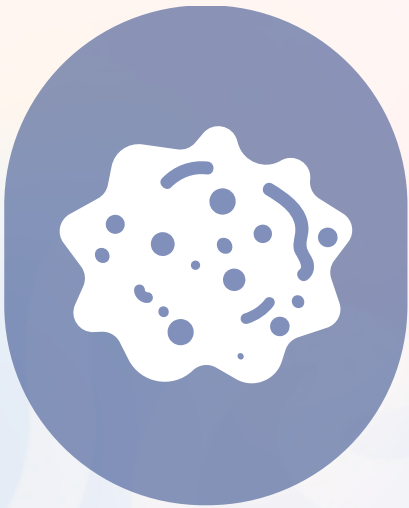
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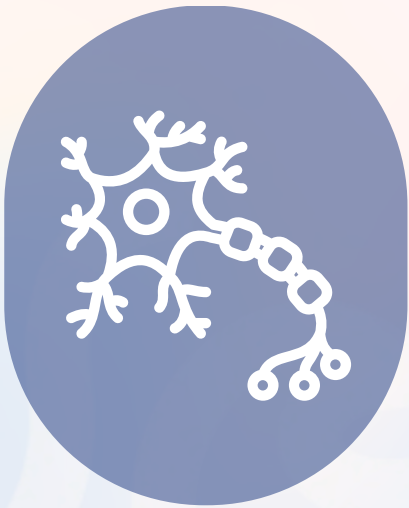
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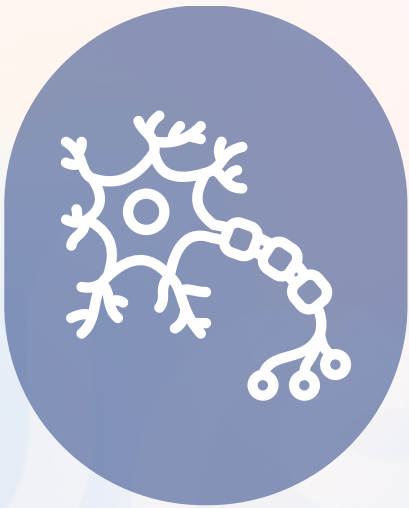## McGill's Integrated Program in Neuroscience and Perplexity

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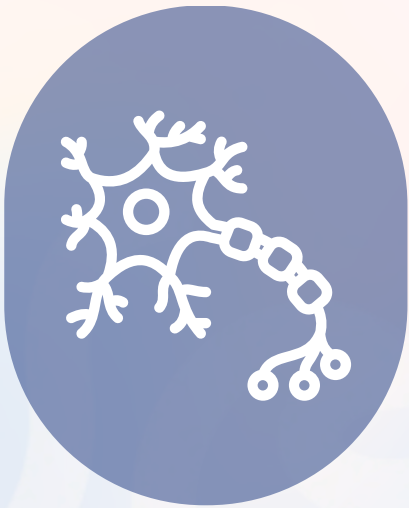## Gutsy Kombucha and McGill's Arts Undergraduate Society

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