

CONFERENCE ABSTRACT BOOK OPEN ACCESS

WISE National Conference 2021: Connections - Together from Afar



Sandy Dai, BAsC Student [1], Khadija Rana, BAsC Student [1], Kris Choi, BSc Student [1]*, Ziting Xia, BAsC Student [1]



[1] Women in Science and Engineering, University of Toronto, Toronto, Ontario, Canada M5S 0C9

*Corresponding Author: conference@wiseuoft.org

Abstract

Our goal at Women in Science and Engineering – University of Toronto Chapter is to support and empower all women in STEM fields and to help them achieve their full potential as future engineers, entrepreneurs, scientists, and leaders. Since its inception in 1999, the organization has developed into one of the largest and highly regarded campus organizations with over 1500 members to champion gender equity, counter biases, and build confidence in all STEM fields. Our annual National Conference aims to empower and inspire individuals to pursue their passions, explore new opportunities, and to make meaningful, lasting connections. One of the events we hold at the conference is the 3 Minute Thesis (3MT) competition, which challenges undergraduate and graduate delegates to present their research in 3 minutes with one static slide to a non-specialist audience. This abstract book features the research that some of the 3MT competitors presented at the WISE NC 2021.

Keywords: 3MT; competitions; conference; gender equality; STEM; WISE; non-specialist audience

Table of Contents

3MT Abstracts..... pg. A01-A04

Conference Abstracts

Note: These abstracts have been reproduced directly from the material supplied by the authors, without editorial alteration by the staff of the URNCST Journal. Insufficiencies of preparation, grammar, spelling, style, syntax, and usage are the authors.

3MT Abstracts

Error-related negativity and the COVID-19 pandemic: An examination of the effect of error-monitoring and stress-exposure for the development of anxiety symptoms

*Chloe L. White, BA Student [1], Iulia Banica, PhD student [1], Anna Weinberg, PhD [1]
[1] Department of Psychology, McGill University, Montreal, Quebec, Canada H3A 0G4*

The error-related negativity (ERN), a neural response to errors, is enhanced in anxious individuals, as well as individuals who are vulnerable to anxiety. However, not everyone with a large ERN goes on to develop anxiety, suggesting this vulnerability marker may require a catalyst. Indeed, research suggests that an enhanced ERN may interact with stress exposure to increase anxiety. Recently, the world has been exposed to a potent stressor in the form of COVID-19. This study examined whether ERN measured prior to the pandemic interacted with stress exposure during the pandemic to predict anxiety symptoms. Fifty undergraduate students completed a measure of anxiety (Inventory of Depression and Anxiety (IDAS-II)) and visited the lab within the first month and half of their first year to complete an arrow flanker task while connected to electroencephalogram to record their ERN. Participants were then recontacted six times throughout the first five months of the pandemic in North America (April – August). We hypothesize that those with a larger ERN at baseline will exhibit increased anxiety symptoms in response to stress exposure, in comparison to those with a smaller ERN. These data will provide a unique opportunity to investigate how neural responses to errors modulate stress response.

Population centers and seasonality of birth oscillations of Canadian prairie provinces

Khaysa Osmanli, MSc Student [1]

[1] Department of Mathematics and Statistics, University of Regina, Regina, Saskatchewan, Canada S4S 3C3

The temperature and its temporal and spatial dynamics have been considered in research as possible determinants of certain demographic processes. In some of the studies on birth seasonality, researchers often use the value of temperature averaged over a territory. Perhaps for cases where the territory represents a relatively small portion of a larger territory, the temperature is homogenous over the whole area, and the spatial averaging of the temperature can be found reasonable. In the case of Canada and most of the Canadian provinces, where the temperature difference between the south and north is much greater than in many other countries, the spatial averaging of temperature over such large geographical areas leads to a significant increase in the uncertainty of the temperature measurement. The use of temperature values measured at the centers of the populations could significantly increase the accuracy of the birth vs. temperature correlation. In the present study we explain data and procedures to determine the centers of the populations of the Prairie provinces of Canada. This information will be used in a series of future studies examining the environmental determinants of birth seasonality oscillations in Canada and the provinces in contemporary and historical contexts.

Artificial Intelligence of Things (AIoT): Our insightfully connected future

Lavanya Mehndiratta, BAsC Student [1]

[1] Faculty of Applied Science and Engineering, University of Toronto, Toronto, Ontario, Canada M5S 2E4

AI and IoT are the two most advanced technologies that have emerged in recent years. Artificial Intelligence of Things (AIoT), still in its infancy, is the fusion of AI and IoT. Without AI capabilities, IoT devices and the enormous data they produce have limited value. Some reports project there will be ~80% AI-enabled enterprise IoT projects by 2022, ~55 billion IoT devices by 2025 and ~38% increase in profitability of AIoT-enabled businesses by 2035. For this, AIoT needs to overcome certain challenges. The biggest challenge is data security, while technical challenges are bandwidth, latency, scalability and cloud limitations. 5G could solve the bandwidth problem and act as a catalyst for the proliferation of AIoT. Edge Computing is expected to solve the remaining issues. The leading chip manufacturers are moving the processing capabilities on devices itself in order to eliminate AIoT's dependency on cloud, thus reducing the chances of data security breaches. At the same time, moving away from cloud may solve the latency and scalability problems. AIoT connects with all aspects of life and will make our lives more convenient and more intelligent. Industry leaders will need to work in collaboration to expand the AIoT ecosystem and make it successful.

The structural basis of AIDA1 autoregulation

Zune Ahmad, MSc Student [1], Logan Donaldson, PhD [1]

[1] Department of Biology, York University, Toronto, Ontario, Canada M3J 1P3

The focus of this research is a neuronal protein called AIDA1 (amyloid precursor protein intracellular domain associated 1). In addition to other proteins in neurons, AIDA1 mediates the processing and localization of a protein involved in the progression of Alzheimer's Disease called amyloid precursor protein (APP). AIDA1 does not have any enzymatic activity, rather it serves as a scaffold that brings proteins together. Previously, Donaldson lab solved the structure of the AIDA1 PTB (phosphotyrosine binding) domain and determined the binding affinity of the PTB domain for APP. Furthermore, a splice variant of AIDA1 (AIDA1b) also contains exon 14, a 23 amino acid sequence capable of binding to PTB. PTB of AIDA1b is inhibited from binding to APP. Exon 14, being unique to AIDA1b, has thus been suggested to cause this auto-inhibition. Therefore, this research aims to (1) determine precisely how the PTB domain binds to APP and (2) determine how AIDA1b cannot bind APP through an autoinhibitory mechanism. Concurrent to the structure determinations, binding studies with APP and exon14 derived peptides will also be performed. The findings from this research have implications in understanding the etiology of not only Alzheimer's Disease but other neurological diseases ranging from addiction to autism.

Comparing risk-taking behaviour and impulsivity among cannabis users and non-users

Jane Jomy, BHSoc Student [1], Herry Patel, PhD Candidate [1], Katherine Naish, PhD [1], Michael Amlung, PhD [1-3]
[1] Peter Boris Centre for Addictions Research, St Joseph's Healthcare Hamilton, McMaster University, Ontario, Canada L9C 0E3
[2] Department of Psychiatry and Behavioural Neurosciences, McMaster University, Ontario, Canada L9C 0E3
[3] Department of Applied Behavioral Science, University of Kansas, Kansas, USA 66045

Individuals with substance use disorders display greater risk-taking tendencies compared to non-substance-using individuals. Reducing risk-taking behaviour could enhance an individual's capacity to reduce or abstain from substance use. Neuromodulation can moderate risk-taking and impulsivity by modulating the excitability of neurons in the dorsolateral prefrontal cortex. Transcranial direct current stimulation (tDCS) is a neuromodulation technique involving the application of a weak electrical current over the scalp. While studies suggest heightened risk-taking among cannabis users, results in the literature are mixed and therefore warrants additional investigation. This thesis uses preliminary data from a larger tDCS study to compare baseline differences between cannabis users and non-substance users in delay discounting, impulsivity and risk-taking tendencies. Data was obtained from 45 participants comprising cannabis users and non-users. To be eligible, participants must not have any tDCS contraindications (e.g. epilepsy), must currently use cannabis recreationally at least 3x per week (cannabis users), or have used cannabis no more than 5x across lifetime and not all in the past month (non-users). Analysis of variance was used to compare cannabis users and non-users on the Risk Task, Monetary Choice Questionnaire (MCQ), and UPPS-S Impulsivity Scale. Cannabis users displayed higher risk-taking on average compared to non-users based on performance on the Risk Task. Based on MCQ and UPPS-S scores, cannabis users also displayed higher impulsivity on average, aligning with the current literature. Better understanding behaviours associated with cannabis use such as heightened risk-taking and impulsivity provides insight into the neurobiology of addiction for clinical applications.

Autonomic cardiac modulation measured with a noninvasive device during psychophysiological preparation predicts flow state during piano performance: A pilot study

Jha S. BMus [1], Stogios N. BSc [2], Sarmiento de Oliveira A. PhD [3], Thomas S. PhD [4], Nolan R. PhD, CPsych [2,5,6]
[1] Faculty of Music, University of Toronto, Toronto, Ontario, Canada
[2] Institute of Medical Science, University of Toronto, Toronto, Ontario, Canada
[3] Heart Institute (InCor), University of Sao Paulo Medical School, Sao Paulo, Brazil
[4] Faculty of Kinesiology and Physical Education, University of Toronto, Toronto, Ontario, Canada
[5] Cardiac eHealth and Behavioural Cardiology Research Unit, University Health Network (UHN), Toronto, Ontario, Canada
[6] Department of Psychiatry, University of Toronto, Toronto, Ontario, Canada

The aim of this study was to use noninvasive monitoring of heart rate variability (HRV) as a physiologic indicator of autonomic-cardiac activity and its association with peak flow. We recruited individuals between age 15-22 who had at least a Royal Conservatory of Music Grade 8 piano certification. Participants performed Johann Sebastian Bach's Prelude No. 1 in C Major, Erik Satie's Gymnopédie No. 1, and a piece of their choice while heart rate data were measured during, before, and after performance. They then filled out the 36-item Flow State Scale (FSS). The highest level of flow was observed for the Bach performance. Decreased HRV was observed during the performance of the piece, which indicated increased sympathetic activity or vagal withdrawal. Flow state during the pre-performance phase was independently and positively associated with parasympathetic activity pre-performance and inversely associated with sympathetic activity during performance. Therefore, flow state may be as much a consequence of physiological preparation prior to performance as it is a physiologic response during the performance itself. Evidence of this correlation between autonomic modulation of the heart and achievement of flow state may pave the way for further research on enhancing musical performance through HRV-based interventions.

Unravelling the role of monocytes in infection and inflammation

Fatima Saleem, BHSc Student [1], Rachel M. Kratofil [2,3], and Paul Kubes [2,3]

[1] Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada T2N 1N4

[2] Department of Physiology and Pharmacology, University of Calgary, Calgary, Alberta, Canada T2N 4N1

[3] Calvin, Phoebe, and Joan Snyder Institute for Chronic Diseases, University of Calgary, Calgary, Alberta, Canada T2N 4N1

Monocytes are leukocytes that arise from progenitors in the bone marrow and migrate through the blood to sites of infection, differentiating into macrophages and dendritic cells. Recruitment of monocytes is crucial for host defence against bacterial, viral, fungal and protozoal infections. The traditional view is that monocytes serve antimicrobial roles to clear pathogens; however, we are challenging this current dogma and proposing that recruited monocytes serve important functions beyond phagocytosis and pathogen clearance. Our rationale is that there are ten times as many neutrophils recruited to infection sites than monocytes, and neutrophils are the primary immune cell to kill pathogens. Recent technological advances in imaging, fate-mapping and single cell genomics have improved our understanding of monocyte fate and function during infection. To that end, we have written a review article that describes the functional role of monocytes during infection. We found that recruited monocytes are highly plastic immune cells that respond in various ways to infectious stimuli including limiting inflammation, inducing immune memory to the pathogen, and tissue repair. Some pathogens can hijack the monocyte and hide within the cell, which helps the pathogen to survive in the host. Ultimately, monocytes are key players in the immune response to pathogens.

Mosaic genome-wide paternal uniparental disomy: A molecular analysis of the 19th case

Bushra Haque, BSc Student [1], Daria Grafodatskay, PhD [2], Darci Butcher, PhD [2]

[1] Department of Biochemistry and Biomedical Sciences, University of McMaster University, Hamilton, Ontario, Canada L8V 2X5

[2] Department of Pathology and Molecular Medicine, University of McMaster University, Hamilton, Ontario, Canada L8V 2X5

Mosaic genome-wide paternal uniparental disomy (mGWpUPD) is a genetic disorder with only 18 reported cases of live born individuals. This report outlines the molecular analysis of CpG methylation beta values of the 19th reported case of mGWpUPD using the Illumina Infinium MethylationEPIC BeadChip technology. Clinically relevant CpG sites of imprinted differentially methylated regions were investigated, including PLAGL1, KCNQ1, H19, SNURF and GNAS imprinted genes. The mosaicism levels within blood, buccal, fibroblast and two placenta samples obtained from our patient were calculated using the beta CpG values. While fibroblast and both placenta samples were confirmed with high levels of mosaicism, the results did not correspond to mosaicism results using quantitative fluorescence-PCR. This was most prevalent for our placenta #2 sample which was initially reported to have no mosaicism by QF-PCR and later determined to exhibit highest mosaicism (~50%) by the BeadChip microarray. This discrepancy further elucidated the Illumina BeadChip as a promising platform for molecular diagnosis of mGWpUPD, as its sensitivity is capable of capturing the biological variation of DNA methylation. As a result, we were able to gain a better understanding of varying levels of mosaicism exhibited within different tissues of our patient for development of future treatment plans.

Conflicts of Interest

The author(s) declare that they have no conflict of interests.

Authors' Contributions

SD, KR: served as Co-Chairs for the conference and gave final approval of the version to be published.

KC: served as Co-Director of Competitions for the conference, assisted authors with their abstract submissions, ensured that the authors adhered to correct formatting standards, drafted the conference abstract booklet, and gave final approval of the version to be published.

ZX: served as Co-Director of Competitions for the conference and gave final approval of the version to be published.

Acknowledgements

We would like to acknowledge the rest of the WISE 2019-2020 Conference Team for putting together an amazing conference, as well as the executive team and volunteers who helped run the conference. As well, special thanks to our 3MT judges, who graciously volunteered their times also for Workshops and Panels to inspire and guide WISE NC 2021 delegates. Finally, we would like to thank our sponsors and delegates, who made our inaugural virtual conference such a success.

Funding

Funding for WISE National Conference 2021 was supported by Qualcomm, Rogers, Advanced Micro Devices, Bell, Trojan Technologies, EQ Bank, P&G, CIBC, Shopify, PWC, Rotman, SSENSE, Zynga, Intel, Isaac, Sensibill, Tetra Tech, TRANE TECHNOLOGIES, and Canadian Bank Note.

Article Information

Managing Editor: Jeremy Y. Ng

Article Dates: Received Jan 31 21; Published Feb 17 21

Citation

Please cite this article as follows:

Dai S, Rana K, Choi K, Xia Z. Wise National Conference 2021: Connections - together from afar. URNCST Journal. 2021 Feb 17; 5(2). <https://urncst.com/index.php/urncst/article/view/242>

DOI Link: <https://doi.org/10.26685/urncst.242>

Copyright

© Sandy Dai, Khadija Rana, Kris Choi, Ziting Xia. (2021). Published first in the Undergraduate Research in Natural and Clinical Science and Technology (URNCST) Journal. This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in the Undergraduate Research in Natural and Clinical Science and Technology (URNCST) Journal, is properly cited. The complete bibliographic information, a link to the original publication on <http://www.urncst.com>, as well as this copyright and license information must be included.



URNCST Journal
"Research in Earnest"

Funded by the
Government
of Canada

Canada

Do you research in earnest? Submit your next undergraduate research article to the URNCST Journal!

| Open Access | Peer-Reviewed | Rapid Turnaround Time | International |

| Broad and Multidisciplinary | Indexed | Innovative | Social Media Promoted |

Pre-submission inquiries? Send us an email at info@urncst.com | [Facebook](#), [Twitter](#) and [LinkedIn](#): @URNCST

Submit YOUR manuscript today at <https://www.urncst.com>!

