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Abstract
The following abstract showcases the research conducted by undergraduate students from a wide range of healthcare-based disciplines presented at the 2026 Canadian Undergraduate Conference on Healthcare Research Competition hosted at Queen's University. The conference theme, "*Many Paths, One Purpose: Exploring Contrasts in Healthcare"*, aims to highlight the diversity of healthcare across populations and environments as well as their shared foundations to supporting patient health and well-being. Abstracts are organized into two sections: 1) Oral Presentations and 2) Poster Presentations. For more information, please visit: https://www.cucoh.com/.

Keywords: CUCOH; research; healthcare; CUCOH 2026; undergraduate

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Conference Abstracts

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Oral Presentations

Mir-375 as a Diagnostic and Regulatory Marker in Common Neuroendocrine Neoplasms

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Introduction: Neuroendocrine neoplasms (NENs) are a diverse group of tumors and cancers that originate from neuroendocrine cells distributed throughout the body. Their marked heterogeneity poses a challenge in developing reliable and accessible diagnostic tools for timely detection and treatment. microRNAs (miRNA) are short, non-coding RNA molecules that negatively regulate gene expression and play critical roles in numerous physiological processes. Some miRNAs are disease-specific, making them promising biomarkers. The Renwick Lab recently found that miR-375 is elevated in NEN tissues and plasma of NEN patients.
Methods: To assess miR-375 as a marker of neuroendocrine differentiation, we stained 122 non-neoplastic and 191 neoplastic tissue samples for miR-375 and established neuroendocrine markers (CgA, SYP, INSM1).
Results: miR-375 positively identified neuroendocrine cells in the digestive tract, lungs, endocrine organs as well as in less common sites such as the breast, prostate, testis, and bladder. In neoplastic tissues, miR-375 was positive in 86% of NENs across organ systems, and negative in all non-NENs. To evaluate miR-375 as a potential circulating NEN marker, we measured miR-375 in blood samples from 73 NEN patients and 47 healthy and disease controls. Patients with both lung and digestive NENs showed significantly elevated miR-375 levels compared to controls ($p < 0.0001$).
Conclusion: These results indicate that miR-375 is a general marker of neuroendocrine differentiation and promising clinical marker for NEN diagnosis. This research is significant as it will help develop tools to enable earlier NEN diagnosis, potentially improving survival outcomes.

A Laser-Based Method to Diagnose Bacterial Meningitis

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Introduction: Current methods for diagnosing bacterial meningitis can take several days, but delaying treatment increases the risk of unfavourable outcomes by up to 30% per hour. This study presents laser-induced breakdown spectroscopy (LIBS) as a novel rapid diagnostic technique for bacterial infection in cerebrospinal fluid (CSF). Ultimately, LIBS could be developed into a technique for real-time diagnosis of bacterial pathogens in clinics.
Methods: Escherichia coli, Staphylococcus aureus, and Mycobacterium smegmatis were placed in aCSF (artificial cerebrospinal fluid) to simulate samples of CSF obtained via spinal tap from patients with bacterial meningitis. Samples with different bacterial titers were deposited onto nitrocellulose paper filters via a custom 3D-printed centrifuge insert. LIBS spectra were obtained using a 1064 nm Nd:YAG laser and analyzed through partial least squares discriminant analysis (PLS-DA) and principal component analysis with an artificial neural network (PCA-ANN).
Results: PLS-DA distinguished aCSF spiked with bacteria from sterile aCSF with 100% specificity and 99.8% sensitivity. To identify the bacterial species, PCA-ANN yielded nearly 100% specificity and sensitivity for M. smegmatis, and overall 81.7% specificity and 90.9% sensitivity. Ongoing tests aim to improve clinical relevance by determining the lowest detectable bacterial titer and investigating more common meningitis causative pathogens, such as Streptococcus pneumoniae.
Conclusion: LIBS can accurately determine the presence of bacteria in aCSF. The data suggest that LIBS could be an efficient diagnostic tool for bacterial infection, requiring minimal sample preparation (no genetic amplification or culturing), thus significantly reducing the wait time for diagnostic results.

Automated Segmentation of Fascial Structures in Ultrasound Imaging Using a Convolutional Neural Network

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Introduction: Fascial imaging is essential in the study of musculoskeletal disorders, but manual assessment of ultrasound images is time-consuming and subjective by physician. The current study designed a convolutional neural network (CNN) model to automatically segment fascia tissue from muscle and enhance the reliability of ultrasound analysis.
Methods: Grayscale ultrasound images of the trapezius muscle were taken from patients diagnosed with trigger points at the Toronto Rehabilitation Institute. A U-Net architecture with an EfficientNetB3 encoder, pretrained on ImageNet, was implemented to design a CNN based on the data collected. A total of 443 images were divided into three sets, 60/20/20 for training, validation, and testing, respectively. The model was trained for a total of 75 epochs using the Adam optimizer with a learning rate of 0.0001 and a batch size of 8. The Albumentations library was used for data augmentation including shifts, scales, and rotations ($p = 1.0$), contrast adjustments ($p = 0.9$), as well as Gaussian noise and perspective distortions ($p = 0.2$-0.5).
Results: The model achieved a training IoU of 0.9508 and Dice coefficient of 0.9747, with validation scores of 0.9410 and 0.9694, respectively. Loss was defined by 0.0677 for training and 0.0815 for validation, indicating stable learning with minimal overfitting.
Conclusion: The CNN showed a high segmentation accuracy and strong generalization across validation data. These results highlight the potential for automated ultrasound segmentation of fascial structures and the possibility of standardized imaging-based diagnostic techniques.

Follistatin-Mediated Modulation of the Tgfβ Superfamily Improves Vascular Homeostasis and Promotes Browning of Perivascular Adipose Tissue in Essential Hypertension

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Introduction: Essential hypertension (HTN) is characterized by sustained elevated blood pressure (≥140/90 mmHg) of unknown origin. It affects 1 in 5 Canadians, and one-third of cases remain uncontrolled. The TGFβ superfamily, structurally similar endogenous proteins, plays a role in vascular dysfunction and endothelial regulation. Follistatin (FST), an endogenous binding protein, modulates and neutralizes many members of this superfamily; therefore, it has the potential to manage HTN symptoms. Additionally, FST is associated with browning of perivascular adipose tissue (PVAT), a process linked to the improvement of HTN. This study investigated the role of FST in regulating oxidative and nitric oxide-related biomarkers of essential HTN and its effect on the expression of PVAT browning markers.
Methods: Mesenteric PVAT was isolated from spontaneously hypertensive male rats (SHR) and treated ex vivo with FST or controls for 3 days. Reactive oxygen species (ROS) and NO bioavailability were quantified using Amplex Red and Griess fluorometric assays, respectively. Browning protein expression was evaluated via immunohistochemistry (IHC).
Results: FST treatment significantly reduced ROS levels in PVAT of SHRs. It was also determined that inhibition of specific TGFβ superfamily members, activin A and B, increased NO bioavailability. Finally, FST upregulated browning markers, suggesting that it enhanced thermogenic activity.
Conclusion: These findings indicate that FST provides protective vascular effects in HTN by reducing ROS, enhancing NO availability, and promoting browning in PVAT. FST has potential as a complementary therapy to standard HTN treatments. Additional research on the chronic effects of FST and sex related differences must be explored.

Design and Construction of a Temperature Modulation Arena for Neurogenetic Studies in Drosophila Melanogaster

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Introduction: Temperature modulation is a key experimental tool in Drosophila Melanogaster neurogenetics, as temperature-sensitive alleles such as $TRPA1^{ts}$ and $shibire^{ts}$ enable precise neuronal activation and silencing. These tools allow

researchers to selectively manipulate neural colonies and study the circuits underlying social proximity and behavior. The objective of this project was to design and construct a low-cost, Raspberry-Pi-controlled temperature modulation arena capable of switching between 20 °C (control) and 30 °C (activated) to drive or inhibit neural activity in Drosophila.
Methods: An acrylic cubic chamber (1 ft^3) was constructed with foam insulation and a uniform aluminum floor plate. Two thermoelectric Peltier modules (TEC1-12715) mounted beneath the plate provided bidirectional heating and cooling. A Raspberry Pi 4 controlled temperature via digital DS18B20 sensors and Python-based bang-bang control with ±0.5 °C hysteresis. N-channel MOSFETS and relays enabled rapid current switching, while heat sinks and CPU fans managed thermal waste.
Results: The system maintained stable setpoints at 20 ± 1 °C and 30 ± 1 °C, achieving rapid transitions (<2 min) and uniform temperature distribution across the arena floor.
Conclusion: This low cost, programmable arena offers an accessible and precise method for manipulating temperature-sensitive neuronal activity in Drosophila. Its design provides a scalable platform for mapping dopaminergic and other neural circuits involved in social behavior, supporting future applications in neurogenetic and behavioral neuroscience research.

Advancing Psychedelic Neurotherapeutics Through Brain-Targeted Solid Lipid Nanoparticles

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Introduction: Psychedelic tryptamines such as psilocybin/psilocin, dimethyltryptamine, lysergic acid diethyl amide, and bufotenin show promise for treating major depressive disorder, substance use disorders and neurodegenerative diseases, yet their rapid oxidative degradation, low solubility in serum, and limited blood–brain barrier (BBB) permeability hinder clinical translation. Current routes like injection or inhalation are invasive and impractical for routine use, emphasizing the need for stable, non-invasive formulations capable of efficient BBB penetration.
Methods: We utilized lipidic bufotenin esters and encapsulated them within solid lipid nanoparticles (SLNs) using emulsification methods like high-shear mixing and high-pressure homogenization. The resulting colloidal suspensions were characterized for stability, particle size, zeta potential, encapsulation efficiency, and cell uptake/cytotoxicity studies.
Results: The optimized SLNs displayed nanoscale particle size, high drug loading, improved resistance against stressors. SLNs also offer several advantages, including, controlled drug release, protection against drug degradation, complexation and solubilization in surfactant solutions, modified biodistribution, and improved bioavailability.
Conclusion: Our SLN system demonstrates promise as a next generation neurotherapeutic delivery vehicle. Ongoing work focuses on surface functionalization with BBB targeting peptides to achieve receptor-mediated transcytosis to cross the BBB and improve central nervous system bioavailability. These developments aim to expand the clinical utility of psychedelic compounds as precision medicines in neuropsychiatric care.

Evaluating Meaningful Change After ACL Reconstruction Using the Knees-Acl Questionnaire

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Introduction: The Knee Numeric-Entity Evaluation Score (KNEES-ACL) is a patient-reported outcome measure (PROM) tailored to patients who have had an ACL injury or ACLR. The KNEES-ACL has 6 domains (Problems with Daily

Activities, Mental Impact, Stability, Strength and Control, Pain, Sport and Physical Activity). To date, no thresholds of clinical relevance have been established for the KNEES-ACL. This study calculated the Patient Acceptable Symptom State (PASS) thresholds for each KNEES-ACL domain in ACLR patient's pre-operative to 2 years post-operative.
Methods: We classified patients into those who indicated that the current state of their knee was satisfactory versus those who did not use the Patient Acceptable Symptom State (PASS) and then used a receiver operating characteristic (ROC) curve to find Youden's Index for each domain at several time points along the recovery curve (2 and 6 weeks, 3, 6, 12, 24 months).
Results: A total of 188 unique patients were included in the study (age: 34.1 ± 13.1 years, 52.7% female, 44% injured while participating in sports). In general, PASS thresholds were higher at later post-operative timepoints for each domain of the KNEES-ACL. Pain PASS thresholds improved more rapidly in the early stages, while Sports and Physical Activity PASS thresholds showed more gradual increase across time.
Conclusion: A higher score was required on the KNEES-ACL as recovery progressed to achieve an acceptable symptom state following ACLR. PASS thresholds should be used alongside patient-reported goals, functional testing, and psychological assessments to provide a complete picture of ACLR recovery.

Investigating Novel Biomarkers (Bmp-9 and Bmp-10) in Atrial Fibrillation Pathophysiology

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Introduction: Atrial Fibrillation (AF) is the most commonly sustained form of arrhythmia, affecting 350,000 Canadians annually. Its incidence is projected to increase by over 2-folds over the next 40 years and studies have shown its association with heart failure, stroke, and morbidity. Current treatment involves anti-coagulants and catheter ablation; however, a major limitation exists in that no pathophysiological diagnostic and therapeutic approaches exist. Our lab previously conducted a high-throughput SomaScan® proteomics analysis which revealed BMP-9/10 to be elevated in patient plasma. The signalling pathway involves the release of BMP-9/10 from hepatic stellate cells and the right atrium, respectively, binding to the ALK1 and BMPRII complex lining the blood vessels. This causes a SMAD phosphorylation cascade that maintains endothelial quiescence. The aim is to investigate the mechanisms of BMP-9/10 release and their potential underlying roles in AF pathophysiology.
Methods: Western blots (WB) were done for both AF patient (permanent and persistent) serum and atrial appendage from an ongoing AF biomarker discovery study. All analyses were done using GraphPad Prism. Statistical tests involving unpaired students t-test were used.
Results: All components of the BMP-10 signalling pathway: BMP-10, ALK1, and SMAD1/5 were significantly elevated in AF patient atrial appendage following a WB quantification analysis (see Figure 1.0).
Conclusion: Overall, these results highlight for the first time that the BMP-10 signalling pathway is significantly elevated in AF patient atrial appendage. Further investigation will aim to assess if BMP-10 has a protective or harmful role in AF.

The Impact of Noncanonical D-Amino Acid Incorporation on β-Lactam Resistance in Methicillin-Susceptible and Resistant *Staphylococcus Aureus*

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Introduction: Antibiotic resistance in *Staphylococcus aureus*, particularly methicillin-resistant strains (MRSA), remains a major clinical challenge. β-lactam antibiotics inhibit bacterial cell wall synthesis by targeting penicillin-binding proteins (PBPs), but MRSA circumvents this through altered PBPs. PBPs assemble peptidoglycan (PG), the structural polymer responsible for cell wall rigidity. Incorporation of noncanonical D-amino acids (NCDAAs) such as D-methionine (D-Met) into PG can disrupt its architecture and influence antibiotic susceptibility. This study investigates how the NCDAA incorporation affects β-lactam resistance and β-lactamase activity in MRSA and methicillin-susceptible *S. aureus* (MSSA).
Methods: MRSA and MSSA cultures were treated with varying concentrations of NCDAAs and exposed to β-lactam antibiotics. Minimum inhibitory concentrations (MICs) were determined by broth microdilution. Extracellular β-lactamase activity was quantified via nitrocefin hydrolysis and validated by western blotting to confirm enzyme secretion. Serial dilution assays combining NCDAAs and β-lactams were used to assess potential synergistic effects.
Results: Nitrocefin assays revealed an increase in extracellular β-lactamase activity in MRSA upon D-Met treatment, potentially suggesting altered PG structure that affects enzyme regulation or secretion. Certain amino acids also demonstrated

synergistic interactions with β-lactams, although the mechanism behind this is not completely studied yet. These effects were absent in MSSA, indicating strain-specific differences possibly linked to PBP function.
Conclusion: Incorporation of NCDAA into the bacterial cell wall modulates β-lactam susceptibility and β-lactamase activity in MRSA but not MSSA. NCDAAs may thus serve as adjuvants to restore β-lactam efficacy by destabilizing PG integrity and altering PBP-mediated resistance mechanisms.

Poster Presentations

Clinical Outcomes of Children in High-Risk Screening Groups for Celiac Disease: Insights From Celiacconnect, Canada's First Pediatric Celiac Disease Registry

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Introduction: Children at increased risk of celiac disease (CeD), including those with trisomy 21, type 1 diabetes (T1D), and first-degree relatives of CeD patients, are recommended for screening even when asymptomatic. However, the long-term health outcomes of different diagnostic pathways remain unexplored. We aimed to compare the clinical outcomes of children identified with CeD through screening to symptom-diagnosis, using CeliacCONNECT, a multi-centered prospective registry of Canadian children with CeD.
Methods: We included patients enrolled in the CeliacCONNECT registry, comprising CeD children from McMaster Children's Hospital and SickKids. The high-risk group underwent serological testing due to predisposition, while the comparator group was tested based on symptoms. The primary outcome was gluten-free diet (GFD) adherence at follow-up, defined as 5 or 6 on the 6-point GF-EATS scale. Symptoms at follow-up were a secondary outcome. Logistic regression calculated proportional odds ratios (pOR), adjusting for age, non-biopsy diagnostic approach, and asymptomatic presentation.
Results: The cohort included 168 patients (mean diagnosis age 6.6±3.5 years). The high-risk group (n=21) was significantly more likely to present asymptomatically (28.6% vs. 6.8%; p=0.002) than the comparator group (n=147). GFD adherence was higher in the high-risk group (pOR=2.35; 95% CI: 0.93–5.93; p=0.070), specifically amongst children with T1D (adjusted effect estimate=7.13; 95% CI: 1.77–28.26; p=0.005).
Conclusion: Although many high-risk screened children screening are asymptomatic at diagnosis, they showed better GFD adherence. Future research should explore customized interventions to support adherence across diagnostic pathways.

Report of Ethnic and Geographic Origins in Scientific Papers on Mitochondrial MS Mimickers: A Literature Review

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Introduction: The mention of a patient's ancestry is crucial in genetics since it provides researchers with genetic variation indications and helps future researchers to compare between different population groups. However, key terminologies such as "race", "ethnicity" and "ancestry" lack a consensus definition in scientific research. Race is widely acknowledged to be a social rather than a biological construct (e.g. White, Asian). Ethnicity is a construct that encompasses common cultural characteristics including language, religion, dietary practices, and nationality; it may also reflect common ancestry or geographic origin (e.g. German, Italian, Canadian). Ancestry can be defined geographically, genealogically, or genetically (e.g. Southern Norway). The interchangeable use of these terms can result in misclassification of research participants and mislead genetic association. As part of a larger literature review study on genetic mitochondrial disorders mimicking multiple sclerosis, our project aims to assess the rate to which ethnicity and ancestry are reported in scientific papers on these rare disorders.

Methods: We performed a literature review by screening a total of 182 articles in MEDLINE, Scopus, ProQuest and Web of Science under the supervision of McGill Librarians. 44 articles were excluded since they were qualitative reviews. Any mention of race, ethnic, ancestry, and publication years was recorded. In the final analysis, mention of race was excluded because it did not provide genetic insights into patients' backgrounds. Statistical analysis including the Pearson correlation coefficient was calculated to assess if there was a linear increase or decrease in reporting ethnic origin over time.
Results: Out of the 138 included articles on Mitochondrial MS mimickers, 61 articles contain mention of ethnic or ancestral origin of the patient. 77 articles do not mention any type of origin. Pearson correlation test indicates that ancestry reporting is on the rise in recent years.
Conclusion: The growing number of publications citing ancestry and geographic origin of subjects with Mitochondrial MS Mimickers underscores a growing interest in the importance of these factors in genetic research. To enhance accuracy of genetic research, standardizing ethnic and geographic origins reporting is essential.

Effects of Estrogen Treatment on Bewo Choriocarcinoma

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Introduction: β-estradiol treatment of various cells results in the over-expression of *c-MYC,* which induces proliferation when cells are exposed to growth-factor-rich environments but induces apoptosis when cells are exposed to growth-factor-poor environments. However, the effects of β-estradiol-mediated *c-MYC* over-expression have not been well characterized in human cancers, including choriocarcinoma. Choriocarcinoma cells treated with β-estradiol should exhibit higher rates of proliferation in high growth-factor environments, higher rates of apoptosis in low growth-factor environments, and higher expression of *c-MYC* overall.
Methods: BeWo choriocarcinoma cells [n = 5] were grown in media supplemented with either 10% fetal bovine serum (FBS) or 2% horse serum (HS) and treated with either 0.5 or 2 μM treatments of β-estradiol. Gene expressions of *c-MYC, KI-67, & BAX* were then determined relative to a *YWHAZ* reference gene, using real-time quantitative PCR data.
Results: When choriocarcinoma cells were grown in 10% FBS, representing a growth-factor rich environment, β-estradiol increased *c-MYC* gene expression 24 and 48 hours after treatment with a 0.5 μM dose and decreased *KI-67* expression after 48 hours of treatment under a 2 μM dose, relative to a control. When cells were grown in 2% HS media, representing a growth-factor deprived environment, cells exhibited decreased *c-MYC* expression under a 2 μM β-estradiol treatment. Under both culture media conditions, treatment had no statistically significant effect on *BAX* gene expression.
Conclusion: This investigation confirms that β-estradiol treatment mediates *c-MYC* & *KI-67* expression, while showing no statistically significant relation to *BAX* expression. Thus, we have found evidence conflicting with prior theoretical models describing estradiol's effects on cancer.

Comparing the Normalized Rate of Glioma Cancer Incidence in St. Michael's Hospital Cohort to Literature Observations

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Introduction: Gliomas are the most common type of malignant brain tumor. The purpose of this study is to compare the trends of glioma incidence in St. Michael's Hospital cohort to that of literature.
Methods: Identifying differences in glioma incidence across demographics, including sex differences, may provide an understanding of the risk of glioma development and help to identify high-risk groups. Pathology reports from St. Michael's hospital database were reviewed. Based on the 2021 fifth edition of the WHO classification of tumors of the central nervous system (CNS), cases were classified into Glioma subtypes: Glioblastoma, Astrocytoma, Oligodendroglioma, and Diffuse Glioma. To compare the rate of glioma incidence in St. Michael's hospital cohort to literature, values were normalized to the population of each demographic in Toronto, ON.
Results: Overall glioma trends observed in St. Michael's Hospital cohort followed trends reported in a 2022 study published in the journal of NeuroOncology by Gi-Ming Wang et al. Trends showed a positive correlation between Glioblastoma incidence and age in both St.

Michael's Hospital cohort and literature, however, there was a negative correlation between incidence of Oligodendroglioma and age in both sources. Literature data exhibited a positive correlation between the incidence of Astrocytoma and age, but St. Michael's Hospital cohort depicted a negative correlation. Literature showed a higher incidence of Gliomas in males compared to females for each subtype. Conversely, there was a greater incidence of Oligodendroglioma in females and Astrocytoma in 30–39-year-old females compared to males in St. Michael's Hospital cohort.
Conclusion: Future studies should be conducted in analyzing genetic data to provide insight on genetic predisposition that contribute to the observed trends in glioma incidence across demographics, thus informing public health policies for the city of Toronto, ON.

Correlation Between Neck Proprioception and Patient-Reported Pain and Disability: A Meta-Analysis Review
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Introduction: Neck pain (NP) is a common and costly musculoskeletal condition that adversely affects proprioceptive functioning. Proprioception refers to the body's ability to sense position, movement, and orientation in space without visual input. However, the strength of correlation between neck proprioception and patent-reported outcome measures (PROMs) for pain and disability remains unclear. This study aims to synthesize the correlation between neck proprioception and patient-reported pain and disability in adults with NP.
Methods: A systematic literature search was conducted in MEDLINE, Embase, PsycINFO, and Cochrane databases to identify full-text studies reporting correlations between neck proprioception and PROMs in adults with NP. Studies including adults with chronic (> 3 months) or acute (< 3 months), idiopathic or traumatic NP were eligible. Cross-sectional or observational studies reporting correlation coefficients were included. Risk of bias was evaluated using an adapted version of the National Institutes of Health (NIH) Quality Assessment Tool.
Results: 13 studies were included (3 low risk of bias, 7 moderate risk, and 3 high risk). No statistically significant association was found between any neck proprioceptive movement and pain intensity ($p > 0.05$). A greater proprioceptive error during extension and flexion-extension movements was positively correlated with higher disability ($p < 0.05$).
Conclusion: Evidence indicates that greater proprioceptive error during extension and flexion-extension movements is positively correlated with higher disability in adults with NP. This highlights that proprioception in the sagittal plane may be clinically relevant. Clinicians could consider targeting sagittal plane proprioceptive training in NP rehabilitation to improve function and reduce disability.

Indigenous Children, Youth, and Adults' Experiences in Quebec's Colonial Dental System: A Rapid Review
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Introduction: Oral health inequities in Indigenous communities across Quebec reflect the enduring impacts of colonial policy, systemic neglect, and cultural exclusion. Programs such as the Non-Insured Health Benefits plan provide coverage on paper but deliver care that is fragmented and crisis-oriented. Elevated rates of untreated decay, early tooth loss, and reliance on temporary fly-in providers highlight a system where oral health remains marginalized. This rapid review examines how Indigenous children, youth, and adults experience these inequities, and how communities are advancing their own models of care**.**
Methods: A rapid review of peer-reviewed literature (2005–2025) was conducted across Scopus, JSTOR, Indigenous health bibliographies, and Government of Canada sources. Eligible studies addressed oral health among Indigenous populations in Quebec, with attention to systemic barriers, intergenerational experiences, or Indigenous-led models. Qualitative, ethnographic, and community-based approaches were prioritized. A thematic synthesis identified recurring patterns and innovations.
Results: Four themes emerged. First, cultural safety was critical: avoidance of care was frequently linked to judgment and exclusion in clinical settings. Second, disruption of intergenerational knowledge limited oral health transmission, though culturally grounded family practices offered strategies for renewal. Third, geographic isolation and reliance on emergency fly-in services entrenched gaps in access and trust. Finally, Indigenous-led systems reframed oral health within broader philosophies of balance, kinship, and community governance.

Conclusion: Oral health in Indigenous Quebec is more than a clinical concern; it is tied to equity, identity, and self-determination. Progress requires centering Indigenous governance, embedding cultural safety, and recognizing oral health as integral to the right to health.

Understanding the Role of Assistive Technologies in Alleviating Caregiver Burden Across Neurodegenerative Diseases

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Introduction: Neurodegenerative diseases such as Alzheimer's disease (AD), Parkinson's disease (PD), and amyotrophic lateral sclerosis (ALS) impair brain and motor functions, leading to long-term care dependence. Assistive technologies aim to preserve autonomy, but face challenges associated with caregiver burden and sustained use. This scoping review aimed to identify knowledge gaps to optimize the implementation of assistive technologies that ease caregiver burden.
Methods: A scoping review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. Peer-reviewed, English-language journals published between 2010-2025 were searched across 8 databases and 4 journals. Eligible studies examined primary research on assistive technologies for adults with AD, PD, or ALS, focusing on caregiver strain. Using the PICOS framework, data on usability, disease stage, study design and source characteristics was extracted and screened in Microsoft Excel.
Results: From 147 total records, 25 articles were analyzed, with 16 on AD, 5 on PD, and 4 on ALS. Technologies clustered into five domains: communication, mobility, medication management, environmental interaction, and caregiver support. Validated scales and qualitative interviews revealed that ALS and AD interventions were associated with reduced caregiver burden, while PD technologies yielded mixed results. The Zarit Burden Interview was the most prevalent tool, appearing in 10 studies.
Conclusion: Assistive technologies for AD, PD, and ALS show promise in reducing caregiver burden, but greater automation is required. Future research should use more diverse samples and standardized caregiver burden scales to improve generalizability and evaluation consistency.

Automated Adaptive Language Mapping Pipeline

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Introduction: Presurgical planning for neurological conditions such as brain tumors, epilepsy, and Parkinson's disease requires precise localization of functional brain regions to minimize postoperative deficits. Language mapping is especially critical, as damage to eloquent cortical areas can cause severe communication impairments. Traditional behavioral assessments determine language dominance but lack spatial precision. Functional MRI (fMRI) provides a non-invasive, high-resolution approach for identifying language areas but is often limited by the complexity and cost of data analysis.
Methods: This study builds upon the recently developed Adaptive Language Mapping paradigm from Wilson and colleagues, which uses semantic matching and word generation tasks to identify language-related brain regions. The current abstract focuses on developing a specialized fully automated fMRI analysis pipeline implemented entirely in MATLAB and based on SPM12 toolbox. The pipeline is meant to be effortlessly usable by clinical neurophysiologists, assuming no prior knowledge of fMRI analysis. It includes standardized preprocessing steps such as data conversion, realignment, slice time, coregistration, and smoothing, followed by statistical modeling using a general linear model to localize activation patterns associated with language processing.
Results: This pipeline automates the fMRI preprocessing and analysis workflow. It generates clear, individualized activation maps of language-related cortical regions efficiently and accurately. The automated structure reduces processing time and the barrier for users to generate a brain language map .
Conclusion: This accessible and efficient fMRI pipeline enables automated Adaptive Language Mapping for clinical use, supporting neurosurgeons in identifying critical language regions and minimizing postoperative deficits, ultimately improving surgical precision and patient outcomes.

Allele Frequency Model Development Targeted to Identify Genetic Variation in the Stress Receptor Gene FKBP5

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Introduction: The human genome is one of humanity's greatest mysteries. The human population has a nearly identical genomic sequence; however, alleles account for the genotypic and phenotypic differences. Single Nucleotide Polymorphisms (SNPs) are a common form of genetic variation drastically affecting the efficiency of the stress receptor gene *FKBP5* in *Homo sapiens*. This project aims to produce a proof-of-concept for an allele frequency model using the outcomes of genetic variation in FKBP5. It aims to increase the accuracy of statistical analysis of allele frequencies and provide patients with greater insight into SNPs, making healthcare one step easier.
Methods: A proxy FKBP5 genetic database was generated using randomly produced 50-nucleotide sequences with SNP positions modeled on rs1360780, rs3800373, and rs9296158 and weighted according to published allele frequencies. A Python-based program then analyzed these sequences to identify user-selected SNP variants, report corresponding population prevalence and symptom descriptions, and update the database with user-inputted sequences to improve population accuracy over time.
Results: The allele frequency model functions as expected, utilizing an author-generated database that acted as a proxy for FKBP5 due to data accessibility barriers. Various difficulties, including open-source genetic databases and biodata accessibility, were faced.
Conclusion: This project highlights the need for open-source genetic databases, as no conclusive DNA sequences with identified SNPs and clinical outcomes were located, posing a major limitation during the scientific process.

Investigating the Role of Pdgf-B in the Regulation of Known Fibrosis Markers

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Introduction: Fibrosis is characterized by excessive extracellular matrix deposition, ultimately leading to tissue scarring and organ dysfunction. Platelet-derived growth factor-B (PDGF-B) and transforming growth factor-β (TGF-β) are central profibrotic mediators that converge on shared downstream effectors such as Rho, Akt, and MAPK. While TGF-β is well established as a master regulator of fibrosis, the role of PDGF-B in modulating fibrotic signaling is less defined. This study compared the effects of PDGF-B and TGF-β on classical fibrosis markers (COL1A1, COL3A1, COL4A1, ACTA2) and YAP/TAZ-inducible genes (ANKRD1, CTGF, CYR61, PAI1) in NRK49F fibroblasts.
Methods: NRK49F cells were treated with TGF-β, PDGF-B, or vehicle control. RNA was extracted and converted to cDNA using reverse transcription PCR, followed by qPCR to quantify expression of fibrosis and YAP/TAZ target genes. GAPDH served as the housekeeping gene for normalization.
Results: Both growth factors induced fibrotic gene expression but displayed distinct profiles. TGF-β strongly upregulated COL1A1 (~2.8-fold) and PAI1, whereas PDGF-B induced a moderate COL1A1 response (~1.7-fold) and downregulated PAI1. COL4A1 was upregulated by both, but PDGF-B uniquely suppressed COL3A1. In YAP/TAZ signaling, PDGF-B more strongly induced ANKRD1 and TAZ, while TGF-β favored YAP and TEAD4 upregulation.
Conclusion: PDGF-B and TGF-β, while both activating fibrogenic pathways, differentially regulate downstream genes, suggesting overlapping but divergent mechanisms of fibrosis. Future work will investigate NUAK1 as a potential regulatory node in PDGF-B-mediated fibrosis, with implications for novel anti-fibrotic therapies.

Systematic Review of Diagnosis and Prognosis of Coronary Artery Disease (Cad) Using Artificial Intelligence (AI) and Nuclear Cardiology Including Single Photon Emission Computed Tomography (Spect) and Positron Emission Tomography (Pet) Testing

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Introduction: SPECT and PET studies use noninvasive radiotracer imaging to assess myocardial perfusion. We compared performance of machine learning (ML) to conventional non-ML methods for predicting presence of obstructive CAD and risk of cardiovascular events in patients undergoing SPECT/PET testing.
Methods: Following PRISMA guidelines, we systematically reviewed MEDLINE, EMBASE, and Cochrane databases from inception to October 2024. Eligible studies included primary research articles comparing ML and non-ML methods for predicting obstructive CAD and risk of cardiovascular events in adult patients undergoing SPECT/PET testing. Invasive coronary angiography was the gold standard for obstructive CAD diagnosis. Studies on prognosis included any cardiovascular event, such as major adverse cardiovascular events, revascularization, and mortality.
Results: Of 2,976 articles identified, including 22 studies on diagnosis and 14 on prognosis were included (28 SPECT and 8 PET studies). ML methods included neural networks (n=24) and gradient/boosted ensemble algorithms (n=12). Non-ML methods included expert interpretation (n=17), semi-quantitative (n=16), and logistic regression (n=3). For diagnosis (N=10,349 patients), 5,813 (56.2%) had obstructive CAD on ICA. Compared to non-ML methods, ML improved diagnostic sensitivity by 2.1%, specificity by 4.3%, accuracy by 1.3%, and AUC by 2.5% for CAD detection. For prognosis (N=59,727 patients), 9,079 (15.2%) had a cardiovascular event. ML improved cardiovascular outcome prediction compared to non-ML with an increase in AUC by 5.9%.
Conclusion: AI methods can integrate clinical and imaging data, and can assist physicians who interpret SPECT/PET tests. ML integration with nuclear cardiology imaging can improve disease diagnosis and outcome prediction.

Registered Nurse Prescribing in Ontario: Learners' Perspective

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Introduction: In response to the demand for accessible patient care, eight Canadian provinces have expanded registered nurses' (RNs) scope of practice to include medication prescribing. Ontario is the latest province to authorize RN prescribing, allowing RNs who complete one of four College of Nurses of Ontario (CNO) approved programs to prescribe from a limited formulary of medications. Given the recent introduction in Ontario, it is essential to assess educational outcomes.
Methods: This quality improvement project (QIP) evaluated learners enrolled in the University Consortium RN Prescribing Program through pre- and post-course surveys administered via Qualtrics XM. Data collected included demographics, motivations for enrolment, employment intentions, familiarity with CNO Practice Standards, and confidence to prescribe safely within the RN prescribing scope. Composite scores reflecting participants' overall familiarity and confidence were compared using Mann-Whitney U tests to assess pre-course and post-course changes.
Results: A total of 194 pre-course and 136 post-course survey questionnaires were completed. The greatest motivators for enrolment were career advancement and personal goals. Median familiarity increased significantly from 2.50 to 3.0 ($U = 4141.5$, $z = -10.93$, $p < 0.001$), while confidence scores rose from 80.5 to 85.0, but were not statistically significant ($U = 11629$, $z = -1.843$, $p = 0.065$).

Conclusion: Learners in the University Consortium's inaugural RN prescribing program reported increased familiarity with the scope of practice and confidence in their ability to prescribe safely post-course. Introducing safe RN prescribing in Ontario can significantly advance healthcare by optimizing resource use, improving care accessibility, and enhancing patient-centred care.

Integrating M1 Neuromodulation With Rehabilitation to Reestablish High-Precision Motor Control in Athletes and Musicians

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Introduction: Elite athletes and professional musicians rely on highly precise motor control supported by adaptable neural representations in the primary motor cortex (M1). Following injury or overuse, these representations can destabilize, resulting in impaired proprioception, increased co-contraction, and erosion of fine motor accuracy. Standard rehabilitation improves strength and movement capacity, yet many individuals never return to their former performance level because it does not directly address the cortical mechanisms that make skilled movement possible.
Methods: A targeted integrative review was conducted using PubMed and clinical neuroscience databases to identify studies on M1 neuromodulation, motor cortex plasticity, proprioceptive retraining, and high-precision motor performance. Findings were synthesized by neural mechanism and functional outcome to evaluate how these approaches may restore fine motor control and performance capacity in athletes and musicians following injury or overuse.
Results: Anodal M1 stimulation raises corticospinal excitability to 140–150% of baseline, whereas cathodal reduces it to 60–75%, with lasting effects maintained when NMDA-dependent plasticity is intact. Greater improvements occur when stimulation is paired with slow, precise, proprioceptively focused movement. Combining M1 stimulation or high-intensity NMES with structured retraining improves joint-position accuracy by 2–12° and restores smoother, more efficient force control in recovering athletes. Musicians demonstrate a greater bidirectional plasticity range, and in focal dystonia, bihemispheric stimulation paired with constrained motor retraining re-establishes timing and fluency that remain stable at follow-up.
Conclusion: Combining neuromodulation with structured retraining enhances adaptive cortical plasticity and drives a more robust acceleration of fine-motor recovery, enabling individuals to regain higher levels of functional performance.

Healthcare Inequality and Impacts on Health Outcomes in Childhood Stroke

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Introduction: Pediatric arterial ischemic stroke (AIS) is a rare yet severe neurological disorder associated with substantial long-term morbidity and mortality. Despite advances in medical care, marked disparities persist in pediatric stroke outcomes, frequently driven by socioeconomic and systemic inequities. Health literacy and healthcare accessibility are critical determinants of these outcomes; however, their intersection within pediatric populations remains insufficiently examined.
Methods: A comprehensive literature synthesis was performed using PubMed, a searchable database of biomedical literature provided by the U.S. National Library of Medicine, and Google Scholar to identify English-language studies addressing healthcare inequality, health literacy, and healthcare utilization in pediatric stroke. Relevant studies on adult stroke and other neurological conditions were included when offering comparative or contextual insights.
Results: Nine studies were identified as directly pertinent. The evidence demonstrated that limited health literacy and structural barriers substantially exacerbate disparities in healthcare access and neurological outcomes. Material deprivation, socioeconomic status, and racial inequities were consistently associated with diagnostic delays, reduced healthcare utilization, and poorer recovery trajectories. The Levesque framework emerged as a valuable model for conceptualizing multidimensional access, encompassing approachability, acceptability, availability, affordability, and appropriateness, along with guiding equity-oriented interventions.
Conclusion: Advancing health literacy and equitable healthcare access is essential to mitigating disparities in pediatric stroke outcomes. The integration of frameworks such as Leveque's within healthcare policy and practice can inform targeted interventions, promote timely care delivery, and foster systemic equity across pediatric neurology.

Harsh and Melodic Alarms Elicit Differential Cardiovascular Responses Independent of Perceived Distress: An Experimental Study

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Introduction: Repeated alarms are cardiovascular (CV) stressors, yet few studies analyze their effects on CV parameters. This study aims to reduce cumulative strain from repeated daily exposure by investigating whether harsh and melodic alarms elicit different CV responses and examine their association with perceived distress.
Methods: A randomized cross-over study with two interventions (a harsh and melodic alarm) was conducted. To establish baseline, participants listened to white noise for five minutes. Afterwards a Subjective Units of Distress Scale (SUDS) was administered to assess perceived distress in response to the intervention. Baseline was established as the mean of 3 consistent blood pressure (BP) and heart rate (HR) readings. The first alarm was played at 70 dB. Four automated CV readings were taken over four minutes, followed by a SUDS. After a washout period, the protocol repeated with the second alarm. A post-study questionnaire collected further data on participants' experiences. Statistical analysis was conducted using GraphPad Prism 10.
Results: Relative to baseline, rate-pressure product (systolic × HR) increased 22.5% during the harsh alarm ($p = 0.006$) and decreased 6.01% during the melodic alarm ($p = 0.0039$), with the responses between the alarms differing significantly ($p = 0.0055$). These changes occurred independently of SUDS scores (harsh: $p = 0.6981$, $r = -0.1016$; melodic: $p = 0.8969$, $r = 0.0343$), and prior alarm exposure did not influence the magnitude of change ($p = 0.9117$).
Conclusion: Harsh alarms elicit stronger CV responses than melodic ones, independent of perceived distress, suggesting unconscious, non-habituating reactions that could pose health risks with repeated exposure.

Investigating the Role of Collaborative Care and E-Consults in the Management of Diabetes and Osteoporosis: 2 Scoping Reviews

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Introduction: The Canadian Medical Association has issued a call to action for the integration of more team-based care into medical systems. This need for collaboration is especially true for diabetes and osteoporosis, which are among the most prevalent chronic diseases in Canada. Electronic-consultations (e-consults) are an innovative tool for fostering collaboration among primary care physicians (PCPs) and specialists. This study synthesized and evaluated knowledge surrounding collaborative care, case conferencing, and e-consults in the management of diabetes and osteoporosis.
Methods: We conducted two scoping reviews of the medical literature. The reviews were anchored in the Knowledge-to-Action (KTA) framework, which aims to synthesize, interpret, and apply knowledge to improve patient care. The reviews included primary qualitative and quantitative studies investigating the impact of e-consults, case conferencing, and collaborative care in the management of diabetes and osteoporosis. PubMed was searched for articles from January 2009 - December 2024. Thematic analysis was conducted for both reviews to extract emerging themes and present a narrative account of the findings.
Results: The database search yielded 353 studies, of which 12 were included in the diabetes review and 13 were included in the osteoporosis review. Studies revealed that collaborative care tools facilitated positive impacts on patients, such as improved health outcomes and better access to healthcare. There were perceived benefits for healthcare professionals as well, including increased access to specialists.
Conclusion: Canadian healthcare requires innovative collaboration in order to improve patient and provider experiences. Future work will include studying the effectiveness of collaborative care and e-consults in the co-management of diabetes and osteoporosis.

Delivering Pain Neuroscience Education Through an Empathetic Lens: Enhancing Patient Outcomes and Equity in Chronic Pain Management

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Introduction: Chronic pain remains a complex and multifactorial condition influenced by biological, psychological, and social factors. Pain Neuroscience Education (PNE) is a non-invasive approach that reframes pain as a neurophysiological process rather than a structural one, helping patients understand central sensitization and reduce maladaptive pain beliefs. The effectiveness of PNE depends heavily on clinician communication and empathy. Delivering PNE with an empathetic focus that includes active listening, emotional attunement, and perspective-taking can strengthen the therapeutic alliance, enhance patient engagement, and reduce fear-avoidance behaviours. This study examines how embedding empathy within PNE can improve patient understanding, promote resilience, and foster equitable, compassion-centered pain care.
Methods: A pilot PNE intervention was developed combining standard PNE modules with empathy-focused metacognitive exercises. Participants engage in reflective journaling, group discussions, and neuro education on pain and emotional regulation. Pre/post measures include Pain Catastrophizing Scale (PCS), Self-Compassion Scale (SCS), and Visual Analogue Scale (VAS) for pain.
Results: Preliminary findings indicate that empathy driven PNE enhances patient understanding of pain neurobiology and fosters cognitive and emotional reappraisal. Empathetic communication activates shared neural pathways, improving trust, self-efficacy, and adherence to treatment. Patients exposed to empathetic PNE report lower pain intensity, decreased catastrophizing, and improved functional outcomes.
Conclusion: By combining the neurobiology of empathy with the cognitive framework of PNE, clinicians can enhance patient outcomes, foster resilience, and promote equity in pain management. These findings underscore the need for empathy-based communication training in patient treatment to ensure that pain care is not only evidence-informed but also compassion-driven.

Beyond Behaviours: Exploring Syndemics, Minority Stress, and Intersectionality Among Gay, Bisexual, Transgender, and Other Men Who Have Sex With Men in Southwestern Ontario, Canada

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Introduction: Structural violence has been a significant influence on the health and well-being of gay, bisexual, transgender and other men who have sex with men (GBTMSM), currently and historically. To date, most projects exploring the health inequities facing GBTMSM have focused on intrapsychic and behavioural factors as most related to poor health outcomes. Few studies to date have identified how both overlapping health burdens (mental health, substance use, HIV) and intersecting identities (race, HIV status, rurality) manifest in the lives of GBTMSM. This study seeks to push beyond the one-dimension view of queer health by emphasizing the compounded effects of marginalization.
Methods: Across Southwestern Ontario, 30 GBTMSM (5 per region) with diverse ethnoracial identities, gender identities, HIV statuses, and ages were purposively sampled through local AIDS service organizations (ASOs), other agencies and services who serve GBTMSM, and through social media platforms, including Instagram and Facebook. Semi-structured/narrative blended interviews were implemented to characterize how systems and policies serve as barriers and facilitators to wellness.
Results: Participants described how structural, policy, and community-level factors intersect to shape the wellbeing of GBTMSM in Southwestern Ontario and highlight how laws and policies intended to promote equity often fail to translate into practice, particularly for racialized GBTMSM. Also, intersecting identities lead to compounding discrimination and exclusion from each respective community.
Conclusion: Overall, the findings from this study highlight how the intersecting identities of race, HIV status, and rurality amplify overlapping health burdens. Additionally, the findings contribute to a more holistic understanding of GBTMSM health.

Health of Collegiate Athletes - An Investigation Into Symptoms Associated With Low Energy Availability

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Introduction: Chronic low energy availability (LEA) describes inadequate energy intake relative to expenditure and underlies Relative Energy Deficiency in Sport (REDs), impairing physiological health and athletic performance. This study examined relationships between body composition, cardiovascular function, and sleep quality in collegiate athletes with LEA-associated symptoms.
Methods: A total of 109 collegiate athletes (♂ = 43, ♀ = 66) underwent body composition analysis (BOD POD), resting cardiovascular assessment, and Pittsburgh Sleep Quality Index (PSQI) questionnaire. Mann-Whitney U-tests assessed sex differences in cardiovascular function, anthropometry, and sleep quality. Spearman rank correlations (ρ) evaluated associations between body composition indices and cardiovascular and sleep outcomes.
Results: Males exhibited greater body composition measures ($p < 0.01$) and blood pressure ($p < 0.001$) than females. Global PSQI scores indicated poor sleep quality in both sexes (males: 5.9 ± 2.7; females: 5.7 ± 2.4), with no significant sex differences. In females, body composition positively correlated with blood pressure ($p < 0.01$). In males, body composition positively associated with blood pressure and resting heart rate ($p < 0.05$). Clinically low %BF affected 19% males and 29% females; bradycardia 49% males and 47% females; hypotension 16% males and 55% females; poor sleep quality 67% males/62% females.
Conclusion: LEA and associated symptoms are prevalent in male and female collegiate athletes and suggest the need for closer monitoring to ensure athletes optimal health and performance.

Infection of Lung Organoids and Treatment With Oseltamivir: Towards an Accurate, High-Throughput Drug Testing Model

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Introduction: Organoids have become an attractive research field for drug discovery and development. They can possibly complement animal studies to reduce the number of animals required, while being cost-efficient. They can also model stem cell fate determination, biomechanics and anatomic changes throughout their development and maturity. A previous study has shown that IMR-90 and CFBE cells could form lung organoids when co-cultured with extracellular matrix proteins. The organoids could be infected with Influenza A. The present study focuses on the testing of a widely used drug in Influenza A treatment, oseltamivir (Tamiflu™) on mature, three-week-old organoids made as suggested in the aforementioned study.
Methods: RT-PCR and qPCR were used to assess the presence of viral particles and apoptosis factor in organoid cell lysate and supernatant after infection. Plaque assay was used to determine viral titers in the supernatant after infection.
Results: Results showed no difference between the levels of H1N1 NP in the samples that had received the drug and the negative control. The number of samples was however not large enough to accurately determine the effect of oseltamivir on the organoids.
Conclusion: The results constitute first steps towards the demonstration that IMR-90 and CFBE - derived organoids can be used in the early stages of drug development.
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Clinical-Grade Genomic Analysis of a 99-Patient Cohort for the Identification of Therapeutic Targets

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Introduction: Several large-scale studies have implemented holistic bioinformatics pipelines for comprehensive detection of genomic drivers, typically using whole-genome (WGS) or whole-exome sequencing (WES). However, a standardized approach for efficient analysis of small-scale targeted genomic sequencing (TGS) studies remains lacking. Here, we describe

the application of Illumina's TruSight 170 panel, combined with data aggregation from five major databases (ClinVar, COSMIC, TCGA, GTEx, and DGIdb), to elucidate underlying genetic drivers across a 99-patient cancer cohort.
Methods: A bioinformatics pipeline was developed using R and Python to analyze the TGS dataset. Initial gene reporting identified 133 candidate genes spanning 13 cancer types. Extensive DNA mutation profiling and clinical significance analysis enabled stratification of highly pathogenic genes, including TP53. Variant frequencies and distributions were mapped via COSMIC, and MAFtools analysis was performed to characterize somatic mutation patterns, mutation classes, and co-occurrence of genomic drivers.
Results: TP53, CHEK2, BARD1, ATM, and NOTCH1 were the most frequently mutated. Over 95% of identified genes co-occurred across the dataset ($p<0.05$), suggesting application of double-target therapies. Notably, novel pathogenic evidence was identified for the FLT2 gene. Single-target treatment propositions included PARP inhibitors (Olaparib, Veliparib) for BRCA1/2 mutations and RTK-RAS pathway inhibitors (Afatinib, Lazertinib) for EGFR alterations. Double-target combinations included BRCA1-BRCA2, MSH3-KMT2A, and TP53-BARD1, highlighting multi-oncogenic mechanisms.
Conclusion: The development of this efficient genomic pipeline enables rapid detection of driver genes in small-scale TGS studies. These insights support precision medicine strategies, guide novel driver discovery and inform prognostic modeling, contributing to improved therapeutic outcomes for cancer patients.

Developing Peptide Drugs to Address Autoimmune Disorders: A Research Study
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Introduction: Rheumatoid arthritis (RA) is an autoimmune disorder characterized by the aberrant recognition of self-peptides presented by Human Leukocyte Antigen (HLA) molecules, leading to chronic inflammation and joint damage. Previous peptide-based approaches have shown limited success, as they rely solely on natural amino acids, which restrict binding affinity and specificity. This project seeks to develop HLA Blockers (HLABs) containing non-natural amino acids with exceptional affinity to HLA-DRB1*0401, which can outcompete self-antigens and block T-cell activation without compromising the entire immune system.
Methods: We have developed multiple assays to evaluate the binding affinity of our synthesized peptide to the HLA molecule. The first is a cell-free fluorescent peptide binding assay using purified HLA-DR4 incubated with FITC-labeled peptides on agarose beads. The second is a cell-based assay using HEK-293 cells expressing membrane-bound HLA-DR4 to assess binding affinity under physiological conditions.
Results: The cell-free assay showed a concentration-dependent increase in fluorescence intensity, confirming peptide binding to HLA-DR4. Membrane expression of HLA-DR4 was confirmed in HEK293 cells, and flow cytometry results revealed increased fluorescence after peptide incubation. We will eventually perform T-cell inhibition assays to evaluate whether the peptides are able to displace self-peptides from HLA DR4 and inhibit T cell activation.
Conclusion: In this study, RA serves as a model for other major histocompatibility complex class-II associated autoimmune disorders, however, the results can be applicable to several diseases such as type-1 diabetes, multiple sclerosis, etc. This novel approach has the potential to revolutionize the treatment of autoimmune disorders, that impact millions of individuals worldwide.

Plants vs. Zombies: Maximizing Fisetin in Strawberries Using Uv: A Research Study
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Introduction: Fisetin is a naturally occurring flavonoid found in many fruits and vegetables, with strawberries identified as the richest source in many studies. In particular, this compound has been recognized for its numerous health benefits, especially as the most potent senolytic that eradicates senescent (zombie) cells. This reduces chronic inflammation in tissues, lowering the risk of diseases and promoting longevity. Recent studies in mice found that fisetin could extend their lifespan by a shocking 10%. However, the supplement is expensive, so it is important to explore affordable methods. Therefore, this experiment aimed to investigate how fisetin concentration varied across different forms of strawberries to identify a cost-effective option for maximizing its consumption.
Methods: Four samples were tested: organic, frozen, UV-exposed, and freeze-dried strawberries. Fisetin was extracted with methanol as the solvent, followed by liquid-liquid extraction. The colourless solution obtained was then quantified.

Results: It was revealed that UV-treated strawberries contained the highest flavonoid concentration (62 mL), whereas freeze-dried strawberries had the lowest concentration (25 mL).
Conclusion: Therefore, these findings suggest that exposure of strawberries to UV radiation, either pre- or post-harvest, can naturally enhance flavonoid synthesis as a cost-effective way for everyone to get this supplement. Additionally, UV treatment offers the added benefit of reducing microbial contamination, thereby improving strawberry safety and shelf life.

Beyond the Medical Gaze: The Lived Experience of Polycystic Ovary Syndrome (Pcos)

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Introduction: Polycystic ovary syndrome (PCOS) is a complex endocrine disorder affecting one in ten women globally. Although frequently defined through hormonal and metabolic criteria, biomedical frameworks overlook how PCOS is lived, negotiated, and understood by those affected. This study explores how women experience PCOS through medical, emotional, and social dimensions, revealing how limited medical understanding leads to dismissal and self-advocacy.
Methods: Six women aged 22–33, clinically diagnosed with PCOS, participated in semi-structured interviews conducted in person or via Zoom. Interviews (20–40 minutes) were analyzed using thematic analysis informed by feminist theory and Foucault's concept of the medical gaze to understand how medical authority shapes women's experiences.
Results: Three major themes emerged: (1) Dismissal as response to medical uncertainty, where limited physician knowledge led to generic prescriptions and oversimplified advice; (2) Emotional and social burdens, where misunderstanding from both doctors and family produced shame, isolation, and self-blame; and (3) Self-advocacy as resistance, where participants turned to online platforms and communities to find validation and knowledge.
Conclusion: Findings demonstrate that over-simplified solutions in medical spaces reflect deeper epistemic and structural limits in women's healthcare. Recognizing patient knowledge and fostering clinical reflexivity are essential to counter dismissal and reimagine care as a collaborative process between medical practitioners and patients.

Efficacy of Cognitive Behavioural Therapy on Fatigue in Persons With Multiple Sclerosis: A Systematic Review and Meta-Analysis

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Introduction: Multiple sclerosis (MS) presents with fatigue. Cognitive behavioural therapy (CBT) is a treatment used for different medical conditions. We assessed the efficacy of CBT in reducing fatigue in adults with MS.
Methods: We searched Medline, Embase, Web of Science, CENTRAL, and ClinicalTrials.gov up to September 1, 2025, for randomized controlled trials (RCTs) comparing CBT with pharmacological, non-pharmacological treatments, or control groups. Outcomes included short- and long-term fatigue, adverse events, and quality of life. We used the Cochrane Risk of Bias 2 tool to assess the bias risk, performed meta-analyses, and applied the GRADE approach to rate the certainty of evidence.
Results: We included 20 studies enrolling 2,696 participants. Seventeen studies contributed to the primary comparison meta-analysis (CBT versus control groups). Using random-effects models, CBT showed a reduction in short-term fatigue (SMD -0.59, 95%CI: -0.99 to -0.18) but not in long-term fatigue (-0.10, 95%CI: -0.26 to 0.40), with a very low certainty. CBT resulted in no clinically meaningful difference in adverse events (RR, 0.82; 95%CI, 0.45-1.51; very low certainty). CBT may have little to no effect on quality of life (SMD 0.15, 95%CI -0.09 to 0.39), with very low certainty.
Conclusion: The included RCTs suggest CBT may have limited or uncertain effects on fatigue, quality of life, and adverse events, with high bias risk. Future research should address these study limitations to better understand CBT's role in managing MS fatigue.

When the Air We Breathe Affects the Guts We Treat: How $Pm_{2.5}$ Pollution Might Be Fueling C. Difficile in u.s. Hospitals

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Introduction: Clostridioides difficile infection (CDI) is a leading cause of healthcare-associated gastrointestinal illness, primarily arising when gut microbiota are disrupted. While antibiotic exposure is the most recognized trigger, $PM_{2.5}$ has been shown to alter gut microbiota composition in animal models and is known to vary significantly across U.S. states due to geographic and industrial differences. Given that C. difficile spores are also capable of surviving in airborne dust and hospital environments, this study investigates whether state-level $PM_{2.5}$ levels are associated with CDI incidence across different U.S. hospital settings.
Methods: 2019's $PM_{2.5}$ data was extracted from the HDPulse environmental database. 2019 CDI rates across four hospital types—acute care hospitals (ACH), critical access hospitals (CAH), inpatient rehabilitation facilities (IRF), and long-term acute care hospitals (LTACH)—were obtained from the CDC's National Healthcare Safety Network. Spearman correlation and simple linear regression were used to assess associations between $PM_{2.5}$ levels and CDI incidence. An ANCOVA interaction model tested whether association strength varied across hospital types.
Results: A significant positive correlation was observed between $PM_{2.5}$ levels and CDI rates in acute care hospitals ($\rho = 0.680$, $p < 0.001$), explaining 37.8% of variance ($R^2 = 0.378$). No consistent associations were found in other hospital types. The ANCOVA interaction model confirmed a statistically significant difference in the $PM_{2.5}$-CDI relationship across hospital categories ($F_{7,147} = 42.32$, $p < 0.001$).
Conclusion: This study presents novel evidence linking ambient $PM_{2.5}$ levels to CDI incidence in acute care hospitals, where patients may be more susceptible to pollution-induced microbiome disruption and airborne spore exposure. The absence of a similar association in other hospital types suggests that environmental and operational differences moderate infection risk. These findings highlight the importance of considering air quality as a factor in healthcare-associated infections and support future research on pollution's role in microbial health. Integrating environmental metrics into infection control strategies may offer a new frontier for improving patient outcomes.

Exploring the Influence of Maternal Mental Health on the Development of Children's Food Allergies: A Narrative Literature Review

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Introduction: Food allergies occur when the body's immune system reacts abnormally to a specific food protein. Their development in childhood has been attributed to numerous physiological mechanisms, but their immediate relationship to maternal factors remains underexplored. This narrative literature review aims to analyze the biological, behavioral, and nutritional impacts of prenatal and postnatal anxiety and depression on children's food allergy risk in order to identify strategies to reduce allergy incidence and severity.
Methods: A comprehensive literature search was completed using PubMed and Web of Science databases. Keywords included "maternal mental health," "maternal anxiety," "maternal depression," and "food allergy." Articles written after 2015 and in English were included.
Results: The literature search resulted in 13 relevant articles which were analyzed narratively, identifying interconnected biological, behavioral, and nutritional pathways by which prenatal and postpartum maternal mental health influences food allergy development. Biological mechanisms include impacts on fetal immune development, the gut microbiome, the HPA axis, and steroid imbalance. Affected behavioural patterns include parenting attitudes, mother-child relationships, and feeding difficulties. Nutritional factors consist of weaning diets, elimination diets, and breastfeeding.
Conclusion: Evidently, prenatal and postnatal mental health significantly influence childhood food allergy development. Increased attention to the mental health of expecting and new mothers must be addressed to implement strategies that diminish the likelihood and severity of food allergies in children. Future research should explore stress-induced physiological mechanisms impacting fetal immune responses, as well as how maternal anxious/depressive behaviours may propagate children's allergies.

Mental Health Barriers and Structural Inequities Affecting Missing and Murdered Indigenous Women, Girls, and 2SLGBTQ+ Peoples in Canada

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Introduction: While gender-based violence against Indigenous peoples has been widely studied, far less attention has been given to mental health service inequities and the limitations of Western therapeutic models in supporting Indigenous women and gender-diverse peoples. These challenges contribute to significant mental health challenges, including chronic stress, anxiety, and cultural isolation. This research examines why MMIWG2S+ cases continue to occur and explores how structural inequalities—including judicial bias and systemic racism—shape the mental well-being of Indigenous communities.
Methods: A sociological and trauma-informed approach was used to analyze intergenerational trauma, stigma, and mental health inequities faced by Indigenous communities. Secondary sources—including academic literature, government inquiries, and Indigenous-led reports—were reviewed. A thematic analysis was conducted to identify gaps between Western mental health services and the root causes of trauma within Indigenous nations.
Results: Findings indicate that despite efforts by rural communities and First Nations organizations to decolonize mental health services, major gaps remain. Experiencing unresolved stigma linked to colonial policies, and discrimination. These experiences shape identity, limit help-seeking behaviour, and create persistent social barriers. Survivors often face challenges in seeing themselves as empowered agents of healing rather than victims of colonial history.
Conclusion: Ongoing cases of missing and murdered Indigenous peoples reveal deep structural inequities beyond policing and justice systems. While "Calls for Action" offer guidance, the pragmatic model requires Indigenous-led mental health support, culturally grounded healing frameworks, and safety protections for community. Supporting mental wellness is essential to preventing further violence and empowering long-term Indigenous liberation and dignity.

Investigating the Relationship Between the Muscle Pain Produced and the Maximal Voluntary Contraction of the Exercised Leg Among Young Males and Females With and Without Type 1 Diabetes.

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Introduction: Healthy skeletal muscle tissue plays a key role in glucose uptake; thus, preserving muscle mass is crucial for metabolic health. Exercise is important for maintaining healthy muscle tissue; however, in individuals with Type 1 Diabetes (T1D), muscle recovery differs from that in individuals without T1D.[2] Individuals with T1D incur more muscle damage and recover more slowly than non-T1D individuals after the same exercise protocol. Therefore, there is a need to better understand muscle recovery in T1D to inform exercise guidelines. The purpose of this study is to assess the relationship between muscle soreness and muscle force, to provide insight into recovery time, and to test muscle soreness as a non-invasive measure of muscle recovery.
Methods: Participants will undergo an exercise protocol consisting of 300 eccentric contractions of the right leg. Muscle force, measured as the maximal voluntary contraction (MVC), and muscle pain/soreness, measured via an algometer, will be recorded prior to the exercise protocol, immediately after, and at 24, 48, and 72 hours post-damaging protocol. Data analysis will use paired t-tests to compare MVC and soreness recovery over time between the T1D and control groups.
Results: Based on previous research, the MVC in T1D participants will take longer to return to baseline than controls. No studies have yet assessed a measure of muscle pain or delayed-onset muscle soreness in individuals with T1D. Given the delay in regaining muscle force in the Dial et al. paper, there will also be a longer time to reduce pain/soreness in T1D participants compared to the control group.
Conclusion: Working towards a better understanding of exercise-induced muscle damage and recovery in T1D contributes to the growing body of research aimed at informing and improving exercise guidelines for T1D patients. Additionally, establishing muscle soreness as a non-invasive measure of muscle recovery is useful for future studies.

Applying Machine Learning for Early Detection of Autism Spectrum Disorder From Maternal Microbiome Data

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Introduction: Recent research has shown that those who have an inherited predisposition to autism spectrum disorder (ASD) demonstrate a strong association between gut microbiome dysbiosis and brain development through the gut-brain axis. Several bacterial strains acting as biomarkers in the maternal gut microbiome have been shown to be conserved in the child. Utilizing maternal gut microbiome biomarkers in adjunct with genetic screening could provide a non-invasive screening tool potentially enabling timely risk detection, facilitating early interventions that improve developmental outcomes and reduce parental anxiety.
Methods: To achieve this, we leverage random forests, a supervised machine learning algorithm that has been shown to accurately classify microbiome samples as originating from children with ASD or neurotypical children. Additionally, the bacterial species Bacteroides, Lachnospira, Anaerobutyricum, and Ruminococcus torques have been identified as strong biomarkers for ASD.
Results: The aim of the study is to evaluate the predictive accuracy of maternal gut microbiome data for pre screening for children with ASD, and validate whether previously identified biomarkers for ASD are conserved in maternal gut microbiome samples.
Conclusion: Using samples from a mother's gut microbiome to determine risk could revolutionize early ASD identification and diagnosis. Considering the connection between genetics and microbiome composition, this approach strengthens traditional genetic screening, offering a more comprehensive risk assessment. Further, by preparing parents earlier in their pregnancies, they can sooner explore supportive therapies, adjust prenatal and postnatal care, and access support systems. This proactive strategy could ultimately improve developmental outcomes, reduce diagnostic delays, and contribute to the understanding of ASD's environmental and biological influences.

Are Markers of Socioeconomic Disadvantage (Income, Insurance Status, Neighborhood Deprivation) Associated With Worse Clinical Outcomes (Seizure Control, Ed Visits, Hospitalizations, Mortality) in People With Epilepsy?

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Introduction: Socioeconomic disadvantage may shape epilepsy outcomes through barriers to specialty care, cumulative deprivation, and comorbidity. This brief synthesis asks whether markers of income, insurance, or neighborhood deprivation relate to seizure control, acute-care use, and mortality in people with epilepsy.
Methods: We conducted a conventional literature search using Boolean strategies across PubMed, Embase, and CINAHL. Search terms combined concepts for epilepsy ("epilep*," "seizure disorder"), socioeconomic disadvantage ("income," "insurance," "deprivation," "socioeconomic status"), and clinical outcomes ("seizure control," "hospitalization," "mortality," "quality of life"). Studies were eligible if they included people with epilepsy, reported at least one SES measure, and examined clinical outcomes. Titles, abstracts, and full texts were screened, and data were extracted using a standardized template.
Results: Several observational studies met criteria (total n≈1,084). In a Canadian pediatric surgery cohort (n=284) lower neighborhood income predicted longer time-to-surgery (β=0.121, p=0.044) and markedly lower odds of post-surgical seizure improvement (OR=0.262, p=0.046), though seizure-freedom rates were not linked to income. In an adult pharmacoresistant temporal-lobe cohort (n=800), greater area deprivation (ADI) showed dose-response decrements in IQ (~1 SD between extremes) and 0.3–0.9 SD losses across cognitive domains, plus higher depression/anxiety; adjusting for ADI attenuated race-associated cognitive disparities.
Conclusion: Available evidence (two studies) consistently links neighborhood socioeconomic disadvantage to poorer surgical access/outcomes and to large neuropsychological burdens in epilepsy. Major gaps remain: effects on ED visits, hospitalizations, and mortality are unaddressed. Future work should broaden outcomes, use individual+area SES measures, and evaluate interventions to reduce structural barriers.

Assistive Reach Mechanism (a.r.m.) – Designing an Open-Sourced, Low-Cost, Above-Elbow Prosthetic With Patient-Centric Designs

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Introduction: Myanmar's (Burma's) ongoing civil conflict has resulted in millions of displaced individuals seeking refuge and health care in Thailand. The Burma Children's Medical Fund (BCMF) provides 3D printed prosthetics to those with traumatic limb loss. However, there remains a shortage of accessible, body-powered above-elbow designs that BCMF can access open-sourced, limiting options for above-elbow amputees. The 3D printable Assistive Reach Mechanism (A.R.M.) was developed to address this need, optimized for low-cost production and local maintenance.
Methods: The A.R.M. design was based on the open-sourced Kwawu Arm 2.0 model, downloaded from Thingiverse, which comes with a custom size modification user interface. An integrated upper-arm and socket was designed on Autodesk Fusion 360, the Kwawu forearm was modified, and interchangeable terminal devices were added. A harness was designed to move the arm with control wires. Components are 3D printed with PLA, and control wires, fasteners, and padding are off-the-shelf components readily found at BCMF.
Results: The A.R.M. was optimized for affordability, adaptability, and local maintenance using BCMF's existing resources. Its elbow and gripping mechanisms operate through independent shoulder-controlled motion. BCMF was satisfied with the gripper mechanism upon testing, while the elbow function is being iteratively refined as informed by BCMF's feedback.
Conclusion: Future development will focus on enhancing movement efficiency, reducing strain, and improving comfort based on user feedback. By utilizing the knowledge of students, this initiative supports BCMF's mission to expand prosthetic accessibility and improve long-term rehabilitation and quality of life for displaced individuals in need.

The Relationship of Negative Music and Major Depressive Disorder Through Behavioural Analysis in Fmri

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Introduction: With functional magnetic resonance imaging (fMRI), it is possible to investigate the contrast of certain neural responses to music in individuals diagnosed with Major Depressive Disorder (MDD) when compared to those in never-depressed controls (ND).
Methods: Utilizing the OpenfMRI dataset and analyzing via the behavioural analysis plug-in in the MANGO software, the research focused on the somatosensory cortex as a region of interest to quantify differences in emotional reactivity to negative/sad music (characterized by slow-tempo, minor-key classical instrumental tracks). The study included 40 participants split between diagnosed and healthy controls, who underwent fMRI while exposed to musical stimuli designed to elicit varied emotional responses.
Results: Quantitative analysis of the data revealed differences in BOLD (Blood Oxygen Level Dependent) responses, indicating significantly heightened emotional sensitivity in the MDD group across parameters of anxiety, intensity, negativity, and sadness.
Conclusion: These differential responses suggest that individuals with MDD exhibit altered neural processing listening to music. Findings suggest potential for non-invasive quantitative diagnosis—eliminating the suppression of emotion (at the patient's discretion). Comparing quantitative measures of brain activity during an fMRI scan may bring stronger acceptance of MDD in communities where mental illness is highly stigmatized, if further research is conducted.

Effects of Lampricides on Non-Target Species, Northern Clearwater Crayfish *(Faxonium Propinquus)* and Ribbon Leeches *(Erpobdella Obscura)*

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Introduction: Sea lamprey (*Petromyzon marinus*) are invasive to the Laurentian Great Lakes. Various methods are used to control their population in the environment. One method is the treatment of tributaries with lampricides, a mitochondrion inhibitor. The lampricides TFM (3-trifluoromethyl-4-nitrophenol) and niclosamide (2',-5dichloro-4'-nitrosalicyanilide) are commonly used. TFM or a mixture of TFM and niclosamide are used at twelve-hour treatments. Quantities of each lampricide are dependent on the volume, pH, and alkalinity of the water being treated. Described as selectively harmful, lampricide effects on non-target species remain understudied.
Methods: The invertebrates northern clearwater crayfish (*Faxonium propinquus*) and ribbon leeches (*Erpobdella obscura*) were studied due to their overlapping environment to sea lamprey larvae in river system substrates. Behaviour of leeches and crayfish were recorded using two-armed choice chambers using a food cue and blank cue. Behaviour was measured after twelve-hour exposure, two-day depuration, and nine-day depuration.
Results: TFM had no noticeable effects on ribbon leeches. A mixture of TFM and niclosamide was shown to inhibit movement, and ability to differentiate blank cue from food cue in choice chambers. One of 30 leeches in this group died. No other leech deaths were recorded. Crayfish are currently being tested.
Conclusion: Lampricides have been shown to have mainly non-lethal effects on ribbon leeches.

Characterizing Burnout Prevention Methods in Canadian Residency Training: A Scoping Review

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Introduction: Physician burnout is a significant issue in medicine and is particularly relevant for residents, who face long work hours and challenges balancing professional and personal responsibilities. Although research on burnout and its prevention is expanding, Canadian studies remain fragmented, and no systematic efforts have been made to map existing knowledge or identify critical gaps. This scoping review characterizes available approaches, identifies gaps in knowledge, and informs future research on promising interventions.
Methods: Following PRISMA reporting guidelines, six databases were searched for primary research published after 2015, restricted to studies with Canadian residents, with no limitations placed on intervention type. Studies were excluded if they did not describe a specific intervention, used an inappropriate design, or were ongoing trials. The TIDieR checklist was applied to guide reporting and ensure consistent intervention descriptions.
Results: Out of 210 studies screened, seven met the inclusion criteria, with four studies containing 40 or more participants. Of these, three used an official burnout assessment tool to evaluate intervention impact, with two reporting reductions in burnout symptoms post-intervention. Interventions included duty hour and scheduling changes (n = 3), group or individual counseling (n = 2), mentorship (n = 1), and physical activity (n = 1).
Discussion: Studies on duty hours and scheduling report conflicting results, underscoring the need for further research on their effectiveness. Physical wellness programs, such as yoga, offer a potentially valuable avenue for promoting physician wellness given their feasibility and positive outcomes. Future studies should assess interventions with validated burnout scales and comparative designs to generate more transferable and generalizable findings.

Risk Factors Associated With Delayed Speech-Language Development in Preterm Infants: A Scoping Review

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Introduction: Though scientific and technological advancements in perinatal and neonatal care have increased survival rates amongst preterm infants, infants born preterm remain at heightened risk of delayed speech-language development due to organs and system immaturity at birth. Speech-language impairment is the most prevalent neurodevelopmental impairment in extremely preterm (EP) infants, yet the relationship between developmental trajectory, infant morbidities, environmental factors, and language outcomes remains unclear. The aim of this scoping review is to assess risk factors associated with delayed speech-language development in infants born preterm (<37 weeks' gestation).

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guideline was applied. Articles had to be published in peer-reviewed journals between 2020 and 2025, have a study population of preterm infants with speech-language delay, and assess biologic and environmental risk factors associated with delayed speech-language development in children born preterm. A total of 307 articles were sourced across CINAHL, Cochrane, EMBASE, Ovid Medline, and PsycInfo databases, with 122 duplicates removed through Covidence.
Result: After abstract and full-text screening, 14 articles meeting the inclusion criteria were included in this study. Findings identified biological factors including gestational age and birthweight as significant risk factors, and environmental factors including family income, toy availability, breast milk, and insurance as potential risk factors for speech-language delay in preterm infants.
Conclusion: Speech-language development in preterm infants is not only explained by biological risk factors (gestational age, birthweight, sex), but also environmental risk factors (family income, toy availability, maternal factors).

Comparing Machine Learning Classification and Ssvep Response Between Aperiodic Hat Tile and Square Stimuli in Bci Systems

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Introduction: Brain-computer interfaces (BCI) utilize machine learning classifiers to categorize specific brain signals into recognizable commands. These signals are typically recorded using electroencephalography (EEG) that measure various neural responses such as steady-state visually evoked potentials (SSVEPs). SSVEP signals are brain responses primarily generated in the visual cortex, where neural activity synchronizes with the frequency of continuously flickering visual stimuli. These signals are processed and classified using machine learning algorithms, with classification accuracy measured. A major challenge in SSVEP-BCIs is visual fatigue, prompting research to enhance signal strength and accuracy while maintaining user comfort. Previous studies on optimal stimulus parameters have yielded conflicting results, often involving trade-offs between stronger responses and user comfort. In this study, we investigate whether a novel aperiodic shape, the hat tile, can improve SSVEP signal to noise ratios (SNR) and classification accuracy compared to a square stimulus. We hypothesized no significant differences.
Methods: We tested this by collecting EEG data from seven participants (ages 18–56) during an SSVEP visual attention paradigm. Participants fixated centrally while attending to one of two white stimuli, a square and a hat-tile shape, flickering at 10 Hz and 12 Hz. We compared SSVEP amplitudes across conditions and evaluated classification accuracy using canonical correlation analysis (CCA).
Results: Our findings refute our hypothesis; the square yielded higher SNR and accuracy.
Conclusion: Given limitations such as small sample size, electromagnetic interference, non-normally distributed data, and not testing a checkerboard-like stimuli, further research is warranted to explore the potential of aperiodic stimuli in SSVEP-BCI applications.

When Adolescents Look At Their Bodies: Individual and Social Explanations for the Dissatisfaction With What They See

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Introduction: Poor body image perception, such as overestimating or underestimating size, aligns with low self-esteem, poor mental health, and unhealthy behaviors like disordered eating. While girls consistently report greater dissatisfaction with their bodies than boys, the factors underlying these perceptions remain unclear for both. This cross-sectional study examines individual, social, and environmental factors influencing adolescent body image perception and whether these vary for girls and boys.
Methods: Data were collected via an online survey of 802 youth aged 13-18, assessing body image and possible influences including social relationships, social media engagement, physical characteristics, and behavior. Principal component analysis (PCA) identified latent factors underlying body image ratings. Sampling adequacy was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity.

Results: Forty-three percent of boys rated their body image positively compared to twenty-three percent of girls. Negative body image correlated with poorer self-rated physical and mental health, particularly among girls. PCA revealed three domains associated with body image perception: social relationships, personal behaviors, and media comparison. Boys emphasized behaviors such as fitness and self-confidence, while girls focused on social comparisons, peer comments, and media portrayals. KMO measures were greater than 0.80, confirming sample adequacy, and Bartlett's test supported the three-common factor solution to explain correlations.
Conclusion: Overall, only a minority of youth have positive body images. Perceptions are shaped by an interplay of social, behavioral, and environmental factors, with clear differences between both groups. Recognizing these influences can guide the development of tailored interventions that promote a positive body image for youth.

Determinants of Homecare Use: A Meta-Analysis of Quantitative Studies

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Introduction: Homecare services are essential for supporting older adults to age in place. A preceding systematic review revealed physical and social determinants influencing homecare utilization. This meta-analysis aimed to quantify the effect of those determinants, providing insight into barriers and safeguards pertaining to health service use in later life.
Methods: Data regarding exposure to homecare use determinants from 72 primary studies was extracted onto review-managing software (RevMan). Pooled estimates and forest plots were generated for formal and informal homecare using DerSimonian-Laird random effect models and inverse-variance weighting. I^2 statistics were used to denote heterogeneity between studies.
Results: The effects of 17 homecare determinants were quantified as pooled estimates. Overall, physical and social factors both significantly influenced formal homecare use, with physical factors exerting relatively stronger effects. Dementia was the strongest predictor (RR = 2.77, 95% CI [2.18, 3.53]), followed by older age (RR = 1.78, 95% CI [1.38, 2.29]) and being unmarried (RR = 1.78, 95% CI [1.42, 2.22]). Social factors such as female sex (RR = 1.40, 95% CI [1.11, 1.76]) and being unmarried (RR = 1.72, 95% CI [1.06, 2.79]) were among the only significant predictors of informal homecare use.
Conclusion: A complex interplay of physical conditions and social determinants of health influences homecare use patterns among older adults. Appreciating the protective or detrimental nature of such determinants is crucial to reducing disparities in health service use and promoting healthier aging trajectories.

Inequities in Access to Long-Term Care Among Older Adults in Canada, a Scoping Review and Quantitative Intersectionality Analysis

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Introduction: Canada's rapidly aging population has intensified demand for long-term care (LTC) services, yet evidence indicates that access to LTC remains inequitable despite universal health coverage. While prior research has identified individual social determinants associated with LTC access, limited attention has been given to how these determinants intersect to produce compounded inequities. This study aimed to synthesize existing Canadian evidence on social inequities in access to LTC among older adults and to examine how intersecting social determinants collectively shape these inequities.
Methods: A scoping review was conducted following the Arksey and O'Malley framework to map the current state of evidence on inequities in LTC access among Canadians aged 65 years and older. Searches were performed in Google Scholar, PubMed, ScienceDirect, and Statistics Canada databases for peer-reviewed English-language studies published from 2016 onward. Studies focusing on non-LTC settings, COVID-19-specific contexts, or younger populations were excluded. Fourteen studies meeting inclusion criteria were synthesized thematically. Building on the identified determinants, a subsequent quantitative phase is planned using Canadian Community Health Survey data, applying Multilevel Analysis of Individual Heterogeneity and Discriminatory Accuracy (MAIHDA) to quantify intersectional inequities in LTC access.
Results: The included studies employed diverse qualitative, quantitative, and mixed-methods designs and examined populations including immigrants, racialized older adults, rural residents, and 2SLGBTQ+ seniors. Three interconnected themes emerged: (1) structural barriers, including long waitlists, staffing shortages, geographic disparities, and limited availability of culturally specific LTC facilities; (2) social and economic inequities, whereby income and socioeconomic status influenced the quality, timeliness, and type of LTC accessed; and (3) cultural, identity-related, and discrimination

barriers, including culturally unsafe care environments, language barriers, and fear of discrimination among racialized and 2SLGBTQ+ older adults. These barriers were frequently experienced simultaneously, compounding disadvantage across multiple social position.

Conclusion: Access to long-term care in Canada is shaped not solely by health need, but by intersecting structural, socioeconomic, and cultural factors embedded within broader systems of inequality. The scoping review demonstrates that inequities in LTC access are multidimensional and mutually reinforcing, disproportionately affecting marginalized older adults. Intersectionality-informed quantitative analysis is necessary to further explain how combinations of social determinants produce unequal LTC outcomes. Findings from this study highlights the need for equity-oriented LTC reforms that address not only individual determinants but their intersections. By informing targeted interventions and future quantitative analyses, this work contributes to advancing a more equitable and truly universal long-term care system for Canada's aging population.

Conflicts of Interest

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

Authors' Contributions

AMVR: Served as a planning committee for the conference, assisted authors with their abstract submissions, drafted the conference abstract booklet, and gave final approval of the version to be published.
AB: Served as a planning committee for the conference, assisted authors with their abstract submissions, drafted the conference abstract booklet, and gave final approval of the version to be published.
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