ALL-IRELAND CONFERENCE

FOR UNDERGRADUATE RESEARCH (AICUR)

Centre for Transformative Learning

Book of Abstracts 2023

Contents

Welcome to the 10th All-Ireland Conference for Undergraduate Research (AICUR)

The AICUR conference is hosted by the Centre for Transformative Learning (CTL) in collaboration with internal and external stakeholders.

What is AICUR?

AICUR is the same as other academic conferences but what makes it special is that research contributions are delivered by undergraduate students showcasing research output as part of their undergraduate studies. The main aim of AICUR is to promote and applaud the fascinating and worthwhile research that is produced at undergraduate level. In multi-faceted ways, AICUR supports and recognises the development of UL's Graduate Attributes: curious, agile, courageous, responsible, and articulate.

The conference is designed to give undergraduate students (from first to final year) from Higher Education Institutions (HEIs) across Ireland the opportunity to present their research and discuss their creative accomplishments through posters, performances, and oral presentations. The goal is to give undergraduate students the opportunity to present their research work at an academic conference. This year's participants are exhibiting the highest standards of undergraduate research in Ireland and should feel themselves pioneers, exploring the parameters of what undergraduate research in higher education can achieve.

The AICUR programme is structured to create interdisciplinary and cross disciplinary themes so that papers from different fields of study can come together allowing for, and encouraging students, and attendees alike, to interact with and learn from their peers across the academy. Apart from creating academic opportunities, we want to provide opportunities for a dynamic exchange of ideas as this is really at the core of AICUR. This, in turn, will provide an insight into how other disciplines approach research problems.

'By heightening awareness and creating dialogue, it is hoped research can lead to better understanding of the way things appear to someone else and through this insight lead to improvements in practice.'

Barritt (1986: 20)

A note from the AICUR Chair 2023

The 10th All-Ireland Conference for Undergraduate Research (AICUR) is being hosted as an online conference by the University of Limerick in April 2023.

Students from Higher Education Institutions (HEIs) in Ireland were invited to participate in this conference and they responded with an enthusiasm clearly reflected in this *Book of Abstracts*. In addition to the live conference, there will also be a repository of conference contributions hosted on this year's AICUR [webpage.](#)

Student engagement and *student success* are terms used across the Higher Education sector, but how these broad terms apply to an individual student is multifaceted. The creation and annual hosting of AICUR provides a platform for students to share their undergraduate research, and experience the setting of an academic conference. The feedback from students about the developmental opportunity AICUR affords them makes this conference continually worthwhile. Being a delegate of AICUR facilitates a feeling of success for each student who is dedicated and brave enough to put themselves forward. Ideally, this sense of success is one all students should experience throughout their undergraduate programmes.

> "Enabling student success is critical to our national ambitions at an economic, societal and sectoral level…it is fundamental to maximising the transformative impact of higher education for our students."
>
> (*Understanding and Enabling Student Success in Irish Higher Education*, National Forum, 2019, p.1)

Many people make a conference happen, and to organise and host a conference online required the assistance of great colleagues. Special thanks to Oisín Hassan who kindly agreed to deliver the conference keynote address; the AICUR Committee who contributed to the planning and recruiting for the conference; the ongoing support from the Head of CTL, Dr Mary Fitzpatrick, and the CTL administrative team, particularly Rosaleen Archbold.

Without the support of our student and staff advocates within UL, and extended networks in other HEIs beyond UL, we wouldn't have such successful conferences.

Final recognition goes to all the students who took the time, and made the effort, often in time-pressured circumstances to present their work, a very well done to you all.

We look forward to AICUR 2024.

Sarah Gibbons, Centre for Transformative Learning
AICUR Chair, 2023

AICUR Committee 2023

Many thanks to the AICUR Committee 2023 for their valuable contribution and support.

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A special thank you to Karen McGrath and Joan Imray for administrative support.

Web: https://www.ul.ie/ctl/students/all-ireland-conference-of-undergraduate-research-aicur

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Oisín Hassan

Policy Executive – Lifelong Learning and Skills, Irish Universities Association (IUA)

Oisín Hassan is currently Policy Executive for Lifelong Learning and Skills with the Irish Universities Association (IUA), advocating on behalf of eight Irish universities to government and state bodies to ensure Ireland meets its ambitions to offer diverse learning experiences in our ever-changing society and world-of-work. Previously Oisín was the Programme Manager of the National Student Engagement Programme (NStEP), which was co-founded by the Higher Education Authority (HEA), Quality and Qualifications Ireland (QQI), and the Union of Students in Ireland (USI). Through this work Oisín spearheaded a national strategy to ensure students were able to act as partners with staff, that their voices were heard, and that they were able to advocate for and implement change within our higher education institutions to improve the student learning experience.

Oisín was previously the VP for Equality and Diversity (2015/16) and VP for Education (2016/17) in Queen's University Belfast Students' Union, before taking up the role of Deputy President and VP Academic Affairs (2017-2019) with the Union of Students in Ireland representing 374,000 students north and south. He is a previous Board member of Quality and Qualifications Ireland (QQI), the National Forum for the Enhancement of Teaching and Learning and is the current Co-Chairperson of the StudentSurvey.ie Steering Group. Oisín has just completed a term as an international board member for the Icelandic Quality Board for Higher Education, and is also a voluntary member of the strategy team for the Museum of Childhood Ireland. He holds an LLB Law with Politics from QUB and recently completed an MSc in Public Policy from Dublin City University.

Student Contributions

Live & Recorded Presentations
(Presented alphabetically by lead presenter.)

The Environmental issue of Plastics in Air, Water, and Soils. A Study of Polymer Degradation with Time

Beatrice Awe, University of Limerick

Abstract

The use of biodegradable plastic has been presented as one of the solutions for overcoming the prevalent issue of plastics in the environment. This investigation follows the degradation effects on two biodegradable bags exposed to different environmental conditions. The aim of this investigation is to determine the rate and the extent of biodegradation in the bags under various scenarios.

Bag 1 claims that the bags will biodegrade into, CO_2, water, and biomass at least 90% in 180 days in standard composting conditions and that no harmful residues will be left behind. Bag 2 claims that the bags will turn to compost within 4-6 weeks and that they are made from plant-based materials. The investigation involved firstly characterising these bags to see what they were made of before exposing them to different environmental conditions such as compost, soil, UV, high temperatures, and various pH.

The results of the investigation showed that the rate and the extent of biodegradation of the biodegradable bags varied significantly depending on the environmental conditions and that some of the results did not match their claims. Composting was found to be the most effective environment for biodegradation, with all samples showing significant weight loss and changes in chemical composition after a short period of time. In contrast, biodegradation was slow and limited when exposed to UV over a long time period.

Overall, the investigation of biodegradable bags exposed to different environmental conditions provides valuable insights into the effectiveness of biodegradable bags in reducing environmental impact. The findings from this study could be used to assist the development of more environmentally friendly materials and disposable methods for biodegradable bags.

Coin Counter Program Functionality Showcase

Jacob Beck, University of Limerick

Abstract

The Coin Counter Program is a piece of software that accepts a picture of several Euro coins and uses their sizes and the ratios between those sizes to determine the amount of money in the picture. This is done using the C++ languade and the external library 'OpenCV', which stands for 'Computer Vision', as it extends the C++ language to include image processing capabilities. The coins are sorted into three categories based off of their colour, bronze coins, gold coins and two-tone coins (one Euro and two Euro). The smallest coin (and its definite value) is determined and the ratios between it and every other coin present in the picture are calculated using the small coin as a baseline comparison (e.g: No matter how zoomed in a picture is, a ten cent coin will always be a certain fraction of the size of a fifty cent coin).

Improving Higher Education Students Mental Health Through Animal-Assisted Interventions: A Systematic Review and Meta-analysis

Emma Breen, University of Limerick

Abstract
The mental health of students in higher educational institutes in this country are met with constant obstacles between them and the support they need. Due to lack of funding and qualified counsellors, these needs remain unsatisfied. A vast amount of third level institutions around the world, predominantly in the US and Canada, have begun using animal-assisted interventions (AAI) to relieve student anxiety and stress as a cost effective and alternative approach to student counselling. The purpose of this study was to systematically review the effects of AAI on the mental health of higher education students. Five databases were searched to identify randomised controlled trials with the use of an animal to help improve mental health outcomes for higher education students. AAI was the sole intervention in these studies with most using a certified therapy dog. Of the 2170 articles pulled from the selected databases, 13 were included in the final analysis. After calculating the effect size (Hedge's g) and standard error (SE), an inverse- variance random-effects meta-analysis was conducted to determine the overall result of AAI on student's mental health. The meta-analysis showed that there was an overall reduction of anxiety (g= 0.53 [95% CI: 0.15, 0.90]) and perceived stress (g= 0.54 [95% CI: 0.16, 0.91]) compared to the controlled conditions. Likewise, there was also a significant reduction in homesickness (g= 0.37 [95% CI: 0.16, 0.58]). For subjective happiness, positive affect and negative affect, there was a small yet insignificant effect. Large methodological heterogeneity among these studies reduced the capacity to make concrete

conclusions on the benefits of AAI. In recent years there has been a rise in research in this area, thus there is a hope that recommendations could surface surrounding the characteristics of these interventions such as frequency of sessions, group vs individual, or structured vs unstructured but overall, there is simply not enough attention given to this field.

A Qualitative Study of Multidisciplinary Expert Perspectives on Falls Risk, to Inform the Development of a Standardised Multifactorial Screening Tool to Proactively Identify Falls Risk in Older Adults

Rebecca Brewer & Angela Joseph, University of Limerick

Abstract

Falls is the world's second leading cause of injury mortality, with 30% of adults over 65, and 50% over 80, falling at least once annually. Older adult falls are a life-changing and extremely costly event, which is set to soar exponentially, due to a multitude of factors including a drastically increasing global older adult population. The preventability of most falls is indisputable. Irish falls prevention and fragility-fracture interventions are heterogenous and in urgent need to come up to international standard. A sea of falls screens and assessments exist, making appropriate tool selection difficult; the entry point of which is usually a previous fall. From the literature, it is evident that secondary falls prevention is predominantly occurring.

This study aimed to gain perspectives of clinicians and academics from multiple disciplines both in Ireland and internationally, on multifactorial falls risks, attitudes towards falls prevention, the existence of standardisation and opinion on the ideal screening tool.

Braun and Clarke's (2006) thematic analysis was conducted on 15 expert interview transcripts from 10 disciplines.

The following themes emerged: falls risk factors, proactive versus reactive culture, standardisation and logistics of the ideal tool.

This study found a need for a nationally standardised, multidisciplinary falls screening tool for community-dwelling older adults, which would proactively identify and stratify risk, and streamline to appropriate interventions, to improve Irish primary falls prevention. Implications include potentially decreasing fall-related admissions, alleviating healthcare burden, as per Irish and international policies that aim to proactively recognise risk for the prevention of common causes of harm.

The effects of reminder and information letters on non-attendance to a diabetic retinopathy screening clinic for pregnant patients

Aditi Chaturvdi, University College Dublin

Abstract

Sight-threatening diabetic retinopathy may be asymptomatic. Pregnancy is known to accelerate diabetic retinopathy. [1] Regular attendance to a diabetic retinopathy screening programme (DRS) during pregnancy is essential to detect and manage retinal pathology. [1] This audit aims to review whether sending a reminder and information letter to pregnant women due to attend DRS has any impact on nonattendance rates.

This was a retrospective comparative analysis of pregnant patients who missed at least one DRS appointment (non-attenders). The groups were divided into those who did not receive a reminder or information letter between April and August 2019, and those who received a letter one week prior to their appointment between April and October 2022. A subset of this patient cohort was defined as never-attenders.

In 2019, 58 out of 127 patients (46%) did not attend their scheduled appointments. Following the introduction of a reminder and information letter in 2022, 15 out of 57 patients did not attend (26%). This finding achieved statistical significance (p=0.04). The mean age for both groups was 34 years. Non-attenders had a statistically significant lower median diabetes duration- those who had diabetes for longer were less likely to miss appointments (Figure 1). There was no significant difference in type of diabetes or distance to the screening centre. Reminder and information letters did not show any statistically significant impact on reducing the rate of never attendance.

The positive impact of both patient education and reminding our patients of their appointments is clearly demonstrated in this audit. Improved attendance rates benefit our patients' ocular health and allow for better allocation of healthcare resources. We also identified a subset of patients who did not attend DRS, further analysis of this group is warranted to identify potential barriers to patient engagement with the diabetic retinopathy screening programme.

Preparation and Characterization of BSA-PVP Stabilized Nanocrystals Using Ultrasonication Assisted Stirring Method

Catherine Cleary, University of Limerick

Abstract

As part of the UL Science and Engineering Summer Bursary programme I was able to complete a 10-week research project within the Bernal Institute.

During this time, I worked with incredible scientists to reduce the size of Celecoxib particles. Celecoxib is used to reduce pain and inflammation in patients with osteo and rheumatoid arthritis. Celecoxib is a class 2 drug meaning it has poor water solubility which can result in many problems for patients such as gastrointestinal issues. A method of combating this is by creating nanocrystals of the drug. Reducing particle size can increase surface area available for absorption and increase the concentration gradient across membranes.

The main aim of the research was to improve solubility and dissolution of the poorly soluble Celecoxib. Firstly, different polymers and surfactants were tested for production of stable Celecoxib Nanocrystals. Many polymers such as PVP, PVA and HPMC were tested. Different concentrations and mixtures of these polymers were tested. Once the appropriate polymers and surfactants were found the process conditions for generation of stable nanocrystals were optimised. To further increase the biocompatibility of the nanocrystals BSA was used as a stabilizer along with other polymers.
The nanocrystals of BSA and PVP proved to be the smallest and most stable nanocrystals. These were formed using solvent-antisolvent precipitation. Small amounts of drug which was dissolved in solvent was dropped into the antisolvent, which contained the stabilisers (BSA and PVP) while stirring at high speeds. This was then sonicated to further reduced particle size to roughly 100nm.

The final nanocrystal formulation was tested using DSC, XRD, and solubility analysis. The nanocrystals proved to be stable, and the saturation solubility of the poorly-water soluble drug was increased.

Lipid based delivery systems – which to choose to formulate a poorly water-soluble drug?

Mikela Cooney, University of Limerick

Abstract

Lipid based drug delivery systems consists of a group of formulation methods which utilize lipids and lipid technologies for transporting drug products to their target site via various delivery routes. LBDDS are at the forefront of formulation strategies for problematic drug molecules, particularly for those with poor aqueous solubility.
Two nanoparticulate colloidal LBDDS, cubosomes and SLN were prepared and loaded with a hydrophobic drug, Valsartan, as a means to compare them in terms of suitability for delivering a poorly soluble drug. MTX was initially selected as the drug of choice however

results found that the drug had a poor encapsulation efficiency and dissolution profile due to no interactions occurring with the cubosomes. Thus, MTX was excluded from the remainder of this study.

Dynamic light scattering was utilized to determine the particle size of unmodified and drug loaded systems. A zeta sizer was used to obtain the zeta potential of the systems to quantify their stability and the effect loading the drug would have on stability. The Encapsulation efficiency of each drug loaded system was found using the centrifugation method. Dissolution studies were completed using a dialysis membrane and UV-VIS spectrometry to determine if the LBDDS had the ability to control the release of the drug. Both systems were lyophilized in order to characterize their behavior upon resuspension.

The results determined that while both cubosomes and SLN yielded similar results in terms of their suitability to load Valsartan, SLN were determined to be more favourable. The zeta potential and particle size results for Valsartan loaded SLN were more promising than the cubosomes. Valsartan SLN also exhibited a higher encapsulation efficiency of 98%. Both systems underwent a biphasic release, with the SLN appearing to control the release rate. The primary mechanism of drug release was determined to be quasi-Fickian diffusion from a non-swellable matrix for both cubosomes and SLN.

Is the cost-of-living crisis driving people from Ireland?

Conor Cronin, Maynooth University

Abstract

This research project was conducted as part of Maynooth University's Summer Programme for Undergraduate Research (SPUR) 2022 where I was awarded a six-week research scholarship to work alongside a faculty member within Maynooth University School of Business.

There are different websites that share the international experiences of members of different diaspora living in host countries. The objective of this research was to explore the experiences of members of the Irish diaspora, who share their stories on public websites. A total of 48 blog posts were analysed where it was discovered that the high cost of living in Ireland was forcing many people to look beyond our shores and emigrate. This research examines cost-of-living factors such as housing, healthcare, childcare, public transportation, and education, and how they are repeatedly cited as reasons to leave Ireland. It was also found that the lack of work and educational opportunities in Ireland are driving many Irish people abroad. This research sheds light on how the fear of missing out (FOMO) is the driver of contemporary migration with Irish people not wanting to miss out on home ownership, or employment and educational opportunities abroad. However, the fear of missing out (FoMO) is also prompting many Irish people to return home. This research explores this further by examining

how family and friends at home remain an integral part of an Irish migrant's life and how they are one of the things they miss the most. The difficulties associated with travelling home (which were heightened during COVID-19) has led to many Irish migrants missing tragic events and important milestones. This research examines whether all of these circumstances have prompted many migrants to change their perspectives regarding their distance from home and whether to stay abroad or return home.

Changing the face of Agriculture, the succession of farms based on gender perspective a study of Europe and the rest of the world

Claire Daly, Atlantic Technological University

Abstract

Women play a vital role in agriculture. They always have even though they never got recognised for it, going back less than a hundred years ago a mother's role in a rural household was to mind her children, keep the house, care for animals, and support her husband. In a rural family farm, they had many different animal's women took up roles such as milking, feeding young calves, looking after poultry and pigs meanwhile also caring for the house and kids.

Women were, and many would still argue still are, the 'invisible farmers'. Women are under-represented in farming organisations, in training programmes, and in politics of farming. The acquisition of land is based on sex, and we see the very foundation of different positions for men and women on farms being formed. Men constitute the constant family line through which land is passed, and women float in and out (Women and Farming Book, 2022).

It is important that more and more women get involved in a farming enterprise, with technology developing constantly this helps persuade women into agriculture also Ireland has produced a new Common Agricultural Policy (CAP) strategic plan which allows women aged 41-55 years old to secure a grant aid up to 60%, they also have a young farmers grant aid from 18-41 years of age which is also up to 60% too. This is a huge step in the right direction, the new CAP Regulations place particular focus on promoting the participation of women in the socio-economic development of rural areas, with special attention to farming (Www.gov.ie, 2021).

During this dissertation secondary qualitative data such as government sources, central statistics office, articles, journals, and websites will be evaluated under three key themes. These themes are cultural factors impacting women's succession of farmlands, recognition for women on farms and factors which will aid women in farming.

ASD and Inflammation

Rebeka Demuthova, University College Dublin

Abstract

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder presenting itself via repetitive behavior and social deficiency. Although observed since 1940's, its causes are still largely unknown, encompassing a wide array of genes and environmental factors. Among those, SHANK3B gene deficiency has been implicated to result in ASD-like behavior in mouse models. Similarly, the increased presence of pro-inflammatory cytokines in serum of ASD patients in comparison to their neurotypical counterparts hints at the presence of inflammation. Multiple studies were carried out to test the combined effect of inflammation and ASD-like genotype, but contradictory results were obtained.

The purpose of this paper is to examine the combined effect of SHANK3B deficiency and CpG-induced sterile inflammation on the severity of ASD-like behavior in mice. Albeit no significant effect was observed, a trend towards aggravation of the symptoms as a result of the combination was observed, hinting at the potential direction of future research.

Assessing Quality of Life in Patients Whose Mesenteries Were Included in Ileocolic Resection For Crohn's Disease

Philip d'Entremont, University of Limerick

Abstract

Background: Surgeons have traditionally assessed post-surgical outcomes using objective metrics such as rates of disease recurrence and mortality. However, recent years have witnessed an increased emphasis on more subjective aspects of the patient's experience, such as perceived health status and overall well-being. This study will compare the quality of life in two groups of patients who have undergone bowel resection for Crohn's disease: one group who also had their mesenteries resected and the other whose mesenteries were left behind. Through increased understanding of the post-surgical experience in these patient populations, this study aims to serve as the basis upon which future surgical interventions for Crohn's disease might be considered. Methods: This project will use the Gastrointestinal Quality of Life Index (GIQLI), a 36-item tool designed to assess the overall health and functional status of patients with gastrointestinal disease. Each item contains a five-point Likert scale and awards 0 to 4 points for each item, with 4 being the most desirable score. A composite score will be generated for all 36 questions. A patient list from

a previous study will be used to contact patients. Results: Provisional results awaited. Pending ethical approval.

The Use of Mineralocorticoid Antagonists in Heart Failure Patients: No Association With Increased Hyperkalaemia

Philip d'Entremont & Jerrid Archutick, University of Limerick

Abstract

Mineralocorticoid receptor antagonists (MRAs) are a class of drugs that work by blocking the effects of aldosterone, a hormone that promotes fluid retention in addition to stimulating the growth of cardiac muscle cells. By blocking these effects, MRAs reduce the afterload the heart has to pump against and prevents the pathologic remodeling of cardiac tissue in conditions such as heart failure. However, one of the potential side effects of MRAs is hyperkalemia, or abnormally high levels of potassium in the blood. Hyperkalemia can lead to cardiac arrhythmias which are associated with increased mortality in heart failure patients. For this reason, MRAs are an underused pharmacological agent in this population.

This project used a retrospective chart review to assess hyperkalemia and MRA use in patients attending heart failure clinics at University Hospital Limerick and Nenagh Hospital between 2019 and 2023. 338 patients were included, of whom 189 were taking an MRA and 149 were not. Hyperkalemia was defined as having at least one hyperkalemic event (greater than 5.4 mmol/L). Chi-squared analysis was used to compare incidence of hyperkalemia in MRA-users and non-MRA-users.

92 of the 338 patients had at least one hyperkalemic event. This group comprised 50 MRA-users and 42 non-MRA-users. A chi-squared analysis found no statistically significant relationship between MRA-users and non-MRA-users with regard to hyperkalemia X^2 (1, n=338) =0.126 p=0.722.

In summary, MRAs were not found to be associated with hyperkalemia. Interestingly, MRA-users were associated with a slightly lower rate of hyperkalemia (26.46%) compared to non-MRA-users (28.19%), although this difference was not found to be statistically significant. While these findings suggest that MRA-use may not be associated with hyperkalemia, further research is needed to explore this relationship.

To Design an Environmentally Conscious Product Using the Stone Waste Generated in an Irish Furniture Manufacturing Company

Barbara Doran, Atlantic Technological University Connemara

Abstract

Manufacturing waste is a huge cause for concern across all industries. Stone is becoming increasingly popular in the furniture industry due to the demand for stone top kitchen counters and bath surrounds. The waste produced when manufacturing stone bath surrounds is up to 75%, which is a problem for the producers as well as the environment. Currently, the only outlet for disposal is landfill. This research aims to design an environmentally conscious product using the stone waste generated in an Irish furniture manufacturing company. Objectives of the research are 1) to access the stone waste produced by the company within a typical year, 2) to design a new product using the stone waste to suit the manufacturing capabilities of the company. A case study approach is used to carry out this research. The case study company uses an engineered stone called Silestone as part of their manufacturing process. Secondary and primary research was undertaken. The assessment of the stone waste produced was found to be of good quality, aesthetically pleasing, of sufficient quantity, frequent in availability and large enough in size to justify its creative reuse. A stone top free-standing bathroom vanity unit was designed to be manufactured using batch production methods in order to make it cost effective for the manufacturer and affordable for the consumer. The impact of finding an environmentally conscious use for the waste stone reduces the quantity going to landfill and the associated cost of disposal for the case study company. Recommendations for further research include 1) to carry out market research to determine the viability and need for the stone top free-standing bathroom vanity unit, and 2) to investigate alternative uses for the solid waste produced from Silestone during the manufacturing process to reduce the waste going to landfill to 0%.

Exploring the Impact of Fine-tuning wav2vec 2.0 on Speech Quality Prediction Using Different Datasets

Mohamed Eltayeb, University College Dublin

Abstract

Wav2vec 2.0 is a self-supervised deep learning model that has been applied to various speech signal applications. It uses unlabelled speech data to train the original model and then can be fine-tuned for such tasks. Fine-tuning this model has been shown to increase its performance in speech quality prediction. Fine-tuning is pretraining a model and then using that as a baseline model to make improvements to improve accuracy and speed of

training/small dataset. In this project, we aim to evaluate the impact of fine-tuning wav2vec 2.0 on different languages and datasets to investigate the effects of different datasets on speech quality prediction. Our goal is to showcase the potential for significant improvement to the model with small amounts of labelled data from different datasets, and how different datasets, hyperparameters and finetuning checkpoints affect model performance. Previous research has explored the influence of fine-tuning using different languages and data sizes, and we aim to further investigate different datasets to compare the results.

The Bioelectrochemistry of Bilirubin Oxidase and Cytochrome C at Polarized Liquid - Liquid Interface

Aaron Foley, University of Limerick

Abstract

This final year project will explore the bioelectrochemistry of Bilirubin oxidase and Cytochrome C at a polarized liquid-liquid interface, the project will follow up and expand on from research carried out by the Scanlon group on the protein Cytochrome C and its interactions at the polarised liquid-liquid interface using electrochemical techniques such as cyclic voltammetry and alternating current cyclic voltammetry. Research on Cytochrome C has demonstrated interfacial electron transfer between the partially exposed heme and a willing electron donor in the organic phase, in this instance decamethylferrocene, thus leading to reactive oxygen species production. In the early stages the aim was to reproduce experimental data on Cytochrome C, while also observing and recording the effects of any alterations that were made to the system. With the intention of potentially applying these conditions upon the enzyme Bilirubin oxidase. Bilirubin oxidase being a well-documented enzyme and multicopper oxidase capable of direct electron transfer, specifically the process in which it can catalyse the four-electron reduction of O_2 to water. Moving forward, the objective of this project will be to: · Observe and document the preferable experimental conditions and requirements of Bilirubin oxidase and its interactions at the polarised liquid-liquid interface. The possible different interactions between bilirubin oxidase and alternative electron donors such as ferrocene. · An analysis of current and future collected data, to assist and determine the potential uses of redox active enzymes such as bilirubin oxidase in the field of biofuel cell technology and biosensor applications.

Presentation of my undergraduate research on the Oscar Wilde trials and its representation in the Irish media

Aaron Foley, University of Limerick

Abstract

This thesis project explores the Irish media and its representation of the three trials of Oscar Wilde in 1895. This project will display evidence as to why the Irish media how the chose to report the information of the trials in a fashion unlike other international publications. Subsequently, the Wilde trials will be compared to both the Parnell Divorce Scandal and the 1884 Dublin Castle Scandal. This will be done to display how the approach of the Irish media towards sexual scandals had changed by the time of the Wilde affair in 1895. This project also seeks to draw a comparison between the Irish media and some international publications. This will help to emphasise the wholly unique fashion in which the Irish media handled the Wilde trial.

Investigation of site-specificity for the WHO10 mobile genetic element

Athaliah Fubara, University College Dublin

Abstract

The HO endonuclease is the central player in mating-type switching in the yeast, Saccharomyces cerevisiae. Recent studies show that HO shares a close phylogenetic relationship with the 'WHO' family of homing endonucleases found in the yeast genus of Torulaspora. WHO genes are homing genetic elements, meaning that they selfishly integrate their DNA sequence into the aldolase-encoding gene, FBA1, by encoding an endonuclease that specifically cleaves FBA1 loci that lack a WHO element. However, all members of the WHO10 sub-family have lost their specificity for FBA1 and instead proliferate to numerous other genomic regions, including the PIC2, PDL32, and LPP1 genes.

Since WHO10 is a newly discovered mobile element, the goal of this project was to investigate its properties and specificity. Two strains of Torulaspora globosa (T. globosa) yeast strains were sequenced using Nanopore Technology to generate high coverage and contiguous genome assemblies, in order to discover additional integration sites which could lead to the identification of a consensus cleavage site for the WHO10 endonuclease. No statistically significant motifs at integration sites were discovered, suggesting that the endonuclease targets random loci because it lacks a specific recognition sequence, unlike other WHO elements that integrate specifically at FBA1. In addition to containing a WHO endonuclease gene, WHO elements carry pseudogene fragments of FBA1 and other protein-coding genes. To investigate the possibility that these fragments originated from previous

integration sites, the fragments present in twenty eight elements from strains of T. globosa were compared.

The analysis revealed the history of most elements, however, questions remain regarding the origin of certain fragments. Overall, the study partially explains how the WHO10 element has lost its site-specificity to become a mobile rather than homing genetic element, which may impact the structure, function, and evolution of the yeast genome.

The effect of spring tides on Microplastic Abundance in Intertidal sediments

Morena Gaudino, Atlantic Technological University Galway

Abstract

The presence of Microplastics (MPs) in our natural environment has significantly increased since their origin in the 19th century. There has been much research on the interactions between MPs and living organisms, and their ecotoxicological effects. MPs are a serious threat to the environment and their movement and distribution is constant. However, little is known about the transportation of MPs and their distribution within the environment. Many questions remain unanswered and focused research on MP mobilisation is necessary to develop strategies that mitigate the impact of MPs on the environment. It is suggested that the process of MP mobilisation is comparable to that of sediment transportation and deposition due to their similarity in size. The presence of MPs in marine intertidal sediments depends on factors such as size, wind, and wave exposure. Furthermore, Spring tides are key moments of inflow of high volumes of water and have the potential to play a role in the transportation of MPs. Therefore, the aim of this study is to investigate the effect of Spring tides on MP abundance within intertidal sediments. Over the course of five weeks in February and March 2023, samples were taken before and after the occurrence of Spring tides from both the high and low tide mark at Spiddal Pier, Co. Galway. Samples underwent density separation and were analysed for a correlation between MP abundance and tidal height. Results of MP size, colour and abundance will be presented to investigate key moments of MP transportation during tidal cycles. This work will aid in improving the understanding of stress points of MP abundance along Irish coastlines.

The role of NLRP3 inflammasomes in the tumour microenvironment of colorectal cancer

Brian Gleeson & Saleem Yateem, University of Limerick

Abstract

Colorectal cancer (CRC) is a disease that develops chronically from outgrowths of the bowel wall called polyps. It is known that many immune cells are involved in the progression of this cancer, including macrophages, dendritic cells, and T cells. Immune cells can be polarised by signalling molecules called cytokines to either promote tumour growth or attack cancer cells. The inflammasome is a large protein complex that drives inflammatory cell death, which is called pyroptosis, in many diseases. One key protein in this complex is nucleotide oligomerisation domain-like receptor 3 (NLRP3). The role of inflammasomes in the progression of CRC is not well understood. Several studies have identified that NLRP3 may drive tumour progression using *in vitro* (cell culture) models of CRC. However, other studies suggest that NLRP3 inflammasomes may be protective against CRC progression *in vivo* in both mouse models and human patients. To investigate the role of NLRP3 inflammasomes in the colorectal tumour microenvironment, we stained tissue specimens (previously obtained from patients at University Hospital Limerick) using a validated immunohistochemistry protocol. We optimised an antibody panel to target T cells (anti-CD3, CD8 and CD103), epithelial cells (anti-CD103), and NLRP3 inflammasomes (anti-NLRP3). We identified that NLRP3 inflammasomes were present in both healthy and cancerous colon tissue, but only in the stromal (surrounding) tissue, not epithelial tissue (where CRC forms). This suggests that NLRP3 inflammasomes may play a negative role in the progression of CRC. We also identified that NLRP3 is expressed by innate immune cells, not T lymphocytes. Future research in this area should elucidate whether inflammasome activation occurs in type 1 (M1) macrophages or neutrophils, two inflammatory stromal cell types that are associated with promoting tumour growth in the colorectal tumour microenvironment.

The Public's Perception on Extreme Weather Events in Ireland in Recent Years

Donna Hannifin, University of Limerick

Abstract

Extreme weather events (EWEs) continue to increase in intensity and frequency in Ireland and throughout the rest of the world as the climate situation worsens. Strategies to decrease the rate of EWEs and climate change are extremely important for survival. Everyone can play an individual role in attempting to alleviate these consequences. The primary aim of this research project is to investigate the public's opinion of EWEs in Ireland throughout recent years and if they are putting measures in place to try and protect themselves from the effects of climate change. The data for this project was collected through creating an online questionnaire and posting it onto online news groups. This study had 1,630 participants and the results outlined that the vast majority of people are aware that EWEs are caused by climate change and are increasing. It was uncovered those aware of EWEs increasing are more inclined to try and reduce the effects of EWEs. Interestingly,

females were more likely to be impacted psychologically from EWEs and males were less likely to believe that Ireland are experiencing EWEs. It is apparent that future studies need to be developed on the opinions of Irish citizens around the subject of climate change, with more awareness on EWEs individual actions can decrease the knock on effects.

Electroanalysis using nanocomposites of conducting polymers with Multi Walled Carbon Nanotubes prepared at a polarised liquid-liquid interface

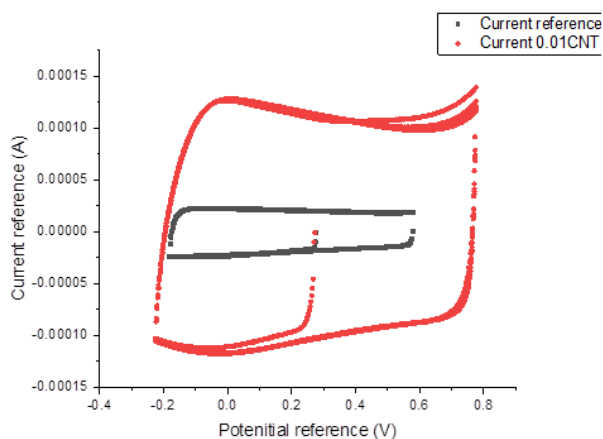Cillian Hickey, University of Limerick

Abstract

The aim of the project was to study the effects of assembling multi-wall carbon nanotubes (MWCNTs) into poly(3,4-ethylenedioxythiophene) (PEDOT) films synthesised at the interface between two immiscible electrolyte solutions (ITIES). PEDOT is a conductivity polymer with increasing uses in a wide range of applications, including energy storage, as it has capacitive properties, making it suitable as a cathode material. The induction of MWCNT increases the charge storage capacity, stability, and life span of pristine PEDOT films by increasing their surface area and strengthening their structure. These PEDOT-MWCNT films can then be used in green energy storage devices.

With the growing concern of nations about the reduction of the use of fossil fuels to reduce our carbon footprint. This is leading to a global conversion to the use of green energy, predominantly solar and wind energy. In Ireland there is a large shift to the use of wind energy and this is very effective for the lowering of carbon footprint, but issues have arisen for temporary blackouts when inadequate energy is not being produced. PEDOT-MWCNT can be used to create the cathode of a supercapacitor that can be more efficient in supplying energy during these small blackouts.

We studied the electrochemical properties of PEDOT-MWCNT films synthesised varying the concentration of MWCNT, which were dispersed in the aqueous phase, using the positively charged surfactant cetrimonium bromide (CTAB). Synthesis of PEDOT-MWCNT composite films was performed in a so-called electrodeless method, in which there is no external source of potential required This approach favours the scale-up process for industrial manufacture as it decreases energetic costs.

The electrochemical performance and stability of the PEDOT-MWCNT composites films were evaluated by galvanostatic charge – discharge (GCD) and cyclic voltammetry (CV). PEDOT films modified with CNTs showed enhanced capacity and longer lifespan compared to those of a pristine PEDOT reference as can be seen below.

Predicting the Properties of Pharmaceutical Materials

Niamh Hickey, University of Limerick

Abstract

Long-acting injectables (LAIs) are a drug strategy that provide a slow, sustainable release of a medication over a number of weeks or months. LAIs have a number of advantages over traditional oral tablets such as effective drug usage, reduction of possible detrimental side effects by avoiding peak plasma concentrations and lessening the frequency of administration of the medication. These advantages all lead to a greater quality of life for a patient. There are two different approach methods for producing particles of this size distribution, a top down approach, or a bottom-up approach. How the particles are produced will influence a number of particle characteristics, such as the size of the particle, the surface properties, the crystallinity (the degree of structural order of a solid, i.e. how atoms and molecules are arranged in a solid. The top-down approach is the industry standard for the production of LAIs, however they can have a number of harmful effects to the material being broken down. Experimental work has been previously been undertaken by a PhD student in the Dept. of Chemistry, Mariana Hugo Silva. The active pharmaceutical ingredient (API) that was used in the experimental work was indomethacin, which is a NSAID (non-steroidal anti-inflammatory drug).

The excipients that were found to be the most successful during the experimental work were dioctyl sulfosuccinate (DOSS), poloxamer-407 and sodium lauryl sulphate (SLS). During the experimental work, there were challenges in controlling the sizes of the particles, the

polymorphism and the growth of the particles. It was decided that the interactions between the API and the excipients needed to be modelled for both the top-down and the bottom-up approaches. My presentation will focus on the modelling of these molecules through softwares such as Avogadro and VASP.

The effectiveness of long-term use of Liraglutide 3.0MG in severe complex obesity management (strive Study): A randomised control trial

Anna Isayeva, University College Dublin

Abstract

Background: Severe and complex obesity (SCO) is defined as the presence of a BMI of >35kg/m2 and the presence of one or more of hypertension, obstructive sleep apnoea, or type 2 diabetes. Liraglutide is a GLP-1 agonist that has been approved by the EMA for the management of type 2 diabetes and obesity. The aim was to examine whether the addition of 3.0mg of Liraglutide with specified stopping points to existing obesity management pathways can help patients with severe and complex obesity achieve 15% weight loss (WL) after 1 year of treatment thereby reducing the impact of their obesity-related complications.

Methods: The study was a 2-year open-label randomised control trial with sites across the UK and Ireland. 124 participants meeting the definition of SCO were recruited and randomised in 2:1 fashion within the Irish site. Randomisation occurred to either the standard obesity-management (n=40) pathway (STD) or to standard management and liraglutide (n=84) pathway (LIRA) with stopping rules at weeks 16, 32, and 52.

Results: Significant ($p<0.0001$) difference was observed between the weight loss achievement by the LIRA group and STD group. Mean WL in STD at week 52 was 6.1% and 11.2% in the LIRA cohort ($p<0.0001$). At week 52, 44.9% of the LIRA group achieved 15% WL and 14.8% of the STD group achieved 15% weight loss. Better glycaemic outcomes were achieved in the LIRA group ($p<0.05$). Improvement in hypertension was only seen in participants losing >15% of baseline weight ($p<0.05$). Improvements in quality of life were noted in participants who lost weight in the STD group ($p<0.05$) and in the LIRA group ($p<0.0001$).

Conclusion: Liraglutide may have a role in improving long term weight loss and rates of associated conditions in patients with SCO. 15% weight loss remains an important milestone for significant improvement of obesity-related complications.

Quantitative Analysis of Intraoperative Post-Mastectomy Indocyanine Green Fluorescence Angiography

Abhinav Jindal, University College Dublin

Abstract

Surgical near-infrared cameras have allowed intraoperative use of indocyanine green fluorescence angiography (ICGFA) in breast cancer surgery for supplementary assessment of post-mastectomy skin flap perfusion, demonstrably reducing postoperative complication rates. Intraoperative recordings are ripe for computational interrogation, opening avenues to explore patterns revealed by quantitative fluorescence. In this endeavour we quantitatively assess post-mastectomy ICGFA videos and compare cases that were followed by postoperative complications to uncomplicated cases. We also explore the application of machine learning (ML) algorithms in predicting postoperative complications.

Intraoperative post-mastectomy ICGFA videos from a retrospective case series (2015 to 2022) collected at a single unit within a clinical trial were obtained, organized, and visually assessed. Procedural data, patient demographics and postoperative outcomes were appended. Recordings with excessive movement, instrument intrusion, or missed inflow were excluded. Whole-breast fluorescence time series data were extracted using a bespoke tracker/quantifier, and arterial inflow milestones were calculated. Subsequently, ML algorithms were applied on an exploratory basis.

N=116 ICGFA videos of nipple-sparing mastectomies (mean age 48 years) were analysed. The perfusion-related postoperative complication rate was 11.2%. Specific dye inflow milestones differed between the complication and non-complication groups. In the complication group, the whole-breast peak brightness was dimmer (p=0.018), was achieved later (p=0.039), and had a shallower inflow gradient (p=0.012).

The digitized dataset was sufficiently robust to enable exploratory applications of ML algorithms. A balanced subset of the data (n=13 with, and n=13 without perfusion-related complications) yielded a sensitivity of 78.6% and a specificity of 83.3% for predicting postoperative complications.

Quantitative analysis of surgical video datasets can serve to supplement clinical observations and offers the potential for developing artificially intelligent predictive models. This work demonstrated quantitatively distinct fluorescent features in nipple-sparing mastectomies that were followed by perfusion-related complications after reconstruction, encouraging further optimisation and validation for intraoperative decision-support tools for cancer patients.

A Qualitative Study on the Perceived Barriers and Facilitators to Breaking and Reducing Prolonged Sitting Periods with Light Intensity Walking at Work with Desk-Based Office Workers: A Preliminary Analysis

Christine Joseph & Essie O'Connell, University of Limerick

Abstract

Desk-based workers remain seated for approximately 70% of their working day. Sedentary behaviour has been linked as a risk factor for chronic diseases and early mortality. This study aimed to understand the perceived barriers and facilitators to interrupting prolonged occupational sitting with light intensity walking during working hours.

One focus group with a research steering committee (RSC) (four staff members) and an online Qualtrics survey (49 responses from staff members (88.5% females and 11.5% males)) was conducted. Inclusion criteria: 30–67 years, primarily desk-based occupation. Exported data was thematically analysed using Microsoft Excel. Participants self-reported occupational sitting, standing, walking and heavy labour using the Occupational Sitting and Physical Activity Questionnaire.

Participants, on average, self-reported sitting 78.0%, standing 7.9% and walking 10.7% per workday (7.8 hours). Findings from the survey responses identified: six themes for barriers and seven themes for facilitators to interrupt prolonged occupational sitting with short bouts of light-walking. Preliminary findings from the RSC focus group identified: seven themes for barriers and eight themes for facilitators to fractionate sitting bouts at work. The most prominent themes for the perceived barriers were workload, deadlines, type of work, lack of facilities in the organisation and habits. The most frequent perceived facilitators identified were reminders to move, improvements to working facilities, reduced workload, accountability/mindset.

This study reports desk-based office workers perceived barriers that prevent workers from taking short light-walking breaks to reduce occupational sitting and the changes that may facilitate the increase of taking regular breaks. These findings may inform future intervention studies to implement an effective strategy that will facilitate and increase the number of walking breaks office workers complete thereby reducing their occupational sitting time and increasing physical activity.

The Philosopher King: Wisdom, Epistemology and Eternal Knowledge in King Alfred's Religious texts

Aaron Keane, University of Limerick

Abstract

Alfred the Great's (871-899) military prowess and legal reforms as King of Wessex (871-886), later King of the Anglo-Saxons (886-899), often overshadows his religious translations in the

scholarship on his work. However, these are equally worthy of discussion and analysis. He can be described as the embodiment of the 'Philosopher King,' owing to the inclusion of epistemology, wisdom, and the immortality of knowledge in his Old English translations. My paper examines King Alfred's Old English *Pastoral Care* (890-7)*, Consolations of Philosophy* (890-) and *Soliloquies* (890's). I am using the translations of Henry Sweet, S. J. Sedgefield, and H. L. Hargrove for the Old English texts. These will be accompanied by the original Latin texts, with translations provided by Michael Foley (2021) and S. J. Tester (1973). My interpretation of these texts focuses on Alfred's use of epistemology, wisdom, and the soul, as these inclusions demonstrate his journey towards spiritual and philosophical enlightenment. This paper engages with a tradition of scholarship, exemplified by the work of Miranda Wilcox (2006), Thomas Shippey (1979), and Antonio Donato (2013) on epistemology and wisdom.

There is an ongoing debate about Alfred's involvement in their translation within the scholarly field. Scholars like Michael Godden (2007) have denied Alfred's authorship, while Janet Bately (2009) argues in favour of Alfred, refuting Godden's claims. However, this paper does not intend to defend or deny his authorship. Alfred's reign is at odds with the popular idea of the 'Dark Age,' as his work reveals a plethora of knowledge, with him at the helm as the king, that was also a philosopher. However, in the modern era, few of Alfred's translations survive in their original manuscripts, notably his *Soliloquies*, where a single copy from the twelfth century remains. Therefore, their significance should be emphasised, and further research conducted.

Identification of gene-sets that define the identity of different cell types of the pancreas

Emma Kelly, University of Limerick

Abstract

Individual studies have shown the rise in type one and type two diabetes worldwide to be progressively getting higher. Many industries have tried to locate the number one cause of the limited to no insulin production within the pancreas. Researchers have endlessly focused on islet gene expression and transcriptomics to help understand the background of why this has been occurring. Most recently focusing on the sex differences within the molecular programs of the pancreatic cells.

Specifically, this project will focus on how the industry of transcriptomics has been redefined by the world of single-cell transcriptomics. This has allowed for the improvement of

detecting different cell types within a tissue. Focusing mainly on analysis of existing single-cell transcriptomic datasets used to identify the genes clearly expressed in each individual cell-type that characterize different cell populations of the pancreatic islets of various endocrine cells such as α-, β-, δ- and γ-cells. This project will look at transcriptomics of single cell RNA sequences of β-cells and how a marker will be used to show these beta cells. As the specific marker used will only show up on the β-cells as opposed to other cells located within the pancreas, this will allow the user to locate the wanted cells and extract them from the tissue.

The main outcomes of this work indicted that a set of robust markers were found, these robust markers can be used for anyone of all ages; healthy/sick, young/old, type 1/type 2/nondiabetic, etc. Some of these markers have not been previously mentioned in public repositories and some are known for their use.

Analysing the role of SERPINE1 network in the pathogenesis of human glioblastoma

Zahra Khosravi, Chandrasekaran Kaliaperumal and Arun HS Kumar, University College Dublin & Royal Infirmary Edinburgh

Abstract

Background Glioblastoma multiforme (GBM) is an aggressive brain tumour with a 5-year survival rate of less than 6%[1,2]. SERPINE1 is a novel GBM receptor that modulates its progression through growth signals and extracellular matrix remodelling [1,3]. We recently reported phytochemicals from Calotropis gigantea as potential anticancer therapeutic leads [4]. We investigated the role of SERPINE1 network proteins in GBM pathogenesis, and assessed targetability with the selected C.Gigantea phytochemicals. Material and methods SERPINE1 network proteins were identified using String Database [https://string-db.org], and affinities analysed using Chimera software. SERPINE1 expression in brain parenchyma was evaluated to correlate its relevance to GBM using the Human Protein Atlas Database [https://www.proteinatlas.org]. Select phytochemicals from C.gigantea were screened using AutoDock Vina to assess SERPINE1 targetability. Results VTN, PLG, TGFB1, VWF, FGF2 and CXCR1 were identified as major SERPINE1 network proteins. The strongest interaction was observed between SERPINE1 and FGF2, and CXCR1. Our results suggest they play a role in GBM progression through brain parenchyma by creating a prime carcinogenesis

microenvironment. The highest SERPINE1 expression was in the brainstem, corpus callosum and spinal cord. This expression was consistent with high-grade GBM. The selected C.Gigantea phytochemicals were observed to have therapeutic binding affinity and predicted efficacy against SERPINE1(table 1). Conclusion SERPINE1 plays a vital role in GBM progression through its network proteins. Currently, temozolomide is a first-line treatment option, however most responding GBM recur [2,3].

Phytochemicals from C.gigantea tested can serve as lead compounds for developing novel anti-SERPINE1 therapeutics for GBM.

	Ki(μM)a	IC50(μM)b
Nicotiflorin	329.6 ± 3.6	659.2 ± 6.1
Mefruside	557.8 ± 2.6	1115.7 ± 8.7
Quercetin	146.1 ± 5.6	292.8 ± 11.3
Zingerone	477.7 ± 4.2	955.1 ± 6.4
Imatinibc	858.8 ± 6.5	1717.7 ± 9.1

aKi is the binding affinity of C.Gigantea phytochemicals and imatinib with SERPINE1 bIC50 is the efficacy of the C.Gigantea phytochemicals and imatinib to inhibit SERPINE1 cImatinib was used as a reference compound

Table 1. Binding affinity of C.Gigantea phytochemicals and Imatinib with SERPINE1

Leave that seaweed alone! The importance of macroalgal wrack on intertidal ecosystems: the meiofauna of an Irish sandy shore as a case study

Alanna Kirwan, Atlantic Technological University

Abstract

Live macro-algae and strandline seawrack casts form a large proportion of in-situ primary production of sandy beaches. While the effects of casts on macrofauna are well established, there is little understanding of the effects on interstitial meiofauna communities. This study investigates the impact of seawrack casts and live seaweed on sediment characteristics and abundance, diversity, and distribution of intertidal benthic meiofauna, and the cumulative effect of tidal zonation on an Irish sandy beach. Location onshore and presence of seaweed (wrack and live) casts significantly affected the abundance, diversity, and distribution of the meiofauna community. The findings confirm cast seaweed play an important role in coastal ecosystems, providing food and habitat for a diverse array of both macro and meiofauna species. Anthropogenic processes which disturb seaweed habitats and cast seaweed

accumulations, such as seaweed harvesting or beach grooming, may have a cascading ecological effect, impacting intertidal food webs and ecosystem functioning.

Inspirational Irish Language Speakers Explored

Lorraine Lally, National University of Galway

Abstract

The focus of the presentation would be to provide a overview of some of the most inspirational Irish language speakers who exhibit the importance of a language in integration and inclusion. The presentation will look at some of the migrant Irish language speakers or non-iris speakers who have shaped a contribution to our culture and importance of language.The significance of inspiring others to find their voice in the Irish language. The potential for the exchange and use of language as a fundamental pilar of social living together. Language is part of our identity and the community are so important in learning and sharing the language. Presentation would be given in English to inspire others to appreciate the language. Irish as a means of communicating values, beliefs and customs, it has an important social function and fosters feelings of group identity and solidarity. Irish culture and its traditions and shared values may be conveyed and preserved. Language is fundamental to cultural identity and can be shared by individuals and communities.

Role of Gα Proteins in the Autism-Associated Gain-of-Function Phenotype of the Serotonin Transporter I425V Mutation

Anotidaishe Manzira, University College Dublin

Abstract

The serotonin transporter (SERT) is responsible for the reuptake of serotonin (5-hydroxytryptamine; 5-HT) into neuronal and glial cells. This terminates signalling by 5-HT at the synapse. SERT function modulation has long been a target for therapeutic and recreational drugs, showcasing its importance in brain function. A rare mutation of isoleucine to valine at position 425 (I425V), which causes increased SERT activity, has been associated with disorders such as obsessive-compulsive disorder (OCD), autism and anorexia nervosa. Interestingly in recent studies, a similar increase in SERT activity was observed in specific brain regions when Gαq, a Gα protein and known interactor of SERT, was knocked out. In this project, we try to elucidate if the I425V mutation causes increased SERT activity due to the

loss of interaction of and/or regulation by Gα proteins with the mutant SERT. Our results show that both the SERT mutation and a Gα protein deficiency increase the transporter's intrinsic transport ability to the same extent but do not affect its affinity to 5-HT. Also, preliminary data suggest that the mutation may reduce Gαq association with SERT. However, Gαq complementation of Gα protein-deficient cells did not cause a significant difference in or reduction of SERT activity in both the wildtype (WT) or mutant SERT. This contradicts the idea that Gαq decreases SERT activity and that it is the cause of the mutation's effect, suggesting different Gα proteins may be involved in the regulation of SERT. Taken together, our findings suggest that loss of Gα protein interaction with SERT may be the mechanism by which the I425V mutation increases SERT activity. However, more work is needed to confirm this.

The End of Gender? A Comparative Analysis of Gendered Marketing Evident in Irish Toy Retailer Websites

Ezme Markham Burton, University of Limerick

Abstract

Debates around gender roles and gender equality have come to prominence in recent years. While there has been welcomed change in policy and education around gender in contemporary Ireland, there remains questions around how children learn about gender within primary socialisation, such as in the family home. Research has shown that toys play a considerable role in the gendered socialisation of children. In particular, there has been a number of studies which have shown how toys and play are significant in teaching children about gender.

As such, this thesis focuses on how gendered marketing is evident in Irish toy retailer websites.. In doing this research a comparative analysis of two independent toy retailers' websites - *Totally Toys* and *Jiminy Eco Toys* - was conducted. Taking a feminist mixed-methods approach, two phases of analysis were conducted using content analysis and semiotic analysis.
This thesis finds that the marketing of toys contributes to narrow understandings of gender in a contemporary Irish context. It theorises that Irish toy retailers market their toys through implicit gendered means. That is, toys are not presented as 'for girls' or 'for boys', yet are signified as such in subtle ways through colour, activity and model representation.
This research is important as this work adds to the growing body of sociology and media studies literature concerned with gender and toys, but also adds to work within Irish studies that traces the development of Irish understandings of gender in a contemporary context.

An bhféadfaí an Ghaeilge ionchuimsitheach a bhaint amach?
Could an inclusive Irish language be achieved?

Karin Mason, University of Limerick

Abstract

Is ann don dioscúrsa faoin gcomhionannas inscne le fada an lá, ach le blianta beaga anuas, tá aird á tarraingt ar an teanga mar uirlis do dhul chun cinn na sochaí i réimse an chomhionannais. Dá bhrí sin, tá an teanga ionchuimsitheach ag éirí níos coitianta. Is éard atá i gceist leis an teanga ionchuimsitheach ná aitheantas a thabhairt do na hinscní ar fad trí úsáid na teanga. Áitíonn mo thaighde go bhfuil ról ag an teanga ionchuimsitheach chun comhionannas insnce a chothú agus chun aitheantas a thabhairt d'fhéiniúlachtaí inscne éagsúla. Is é an sprioc atá leis an bpáipéar seo ná iniúchadh a dhéanamh ar thábhacht, ar dhúshláin, agus ar fhéidearthacht na Gaeilge ionchuimsithí. Tá an páipéar bunaithe ar thionscnamh taighde a d'úsáid anailís shochtheangeolaíoch chun ceisteanna éagsúla a bhaineann leis an nGaeilge ionchuimsitheach a fhiosrú. Taighde cáilíochtúil atá i gceist leis an staidéar seo, agus bailíodh sonraí an taighde ó shuirbhé anaithnid. Nocht na torthaí go mbaineann tábhacht agus tairbhe leis an teanga ionchuimsitheach, agus go bhfuil ról le himirt ag pobal labhartha na Gaeilge agus eilimintí teangeolaíocha chun an Ghaeilge ionchuimsitheach a bhaint amach. Faoi láthair, tá easpa taighde a bhaineann le tábhacht, dúshláin, agus cur i bhfeidhm na teanga ionchuimsithí, sa Ghaeilge ach go háirithe. Cuireann an taighde seo leis an eolas agus leis an tuiscint atá ann cheana féin ar an teanga ionchuimsitheach, ach níos mó ná sin, ar fhéidearthacht na Gaeilge mar theanga mhionlach chun céim chomhaimseartha a thógáil i dtreo na hionchuimsitheachta. Tugann an tionscnamh seo aghaidh ar ghanntanas taighde ar an ábhar, agus aithníonn an taighde tábhacht na teanga ionchuimsithí don Ghaeilge, mar aon le moltaí le haghaidh an teanga ionchuimsitheach a bhaint amach. Is ar an gcaoi sin a bhaineann luach idir acadúil agus phraiticiúil leis an tionscnamh seo.

There has been a consistent discourse regarding gender equality for quite some time, but attention has been drawn, in recent years, to language as a tool in achieving equality. Therefore, inclusive language is becoming more and more common. Inclusive language is, in short, recognising all genders through language use. My research argues that inclusive language has a role to play in cultivating gender equality and recognising different gender identities. The aim of this paper is to investigate the importance, challenges, and feasibility of an inclusive Irish language. The paper is based on a research project that examined certain elements of the Irish language and the Irish language community, through means of a sociolinguistic analysis. It is qualitative research and the data was collected from an

anonymous survey. The results showed that inclusive language is regarded as important and beneficial, and that both the Irish-speaking community and linguistic elements have a role to play in order to achieve an inclusive Irish language. There is currently a lack of research on the importance, challenges and overall implementation of inclusive language, especially in the Irish language. This research adds to the existing information and understanding of inclusive language, but particularly in an Irish language context, as a minoritised language. This project confronts the lack of research in this area, and recognises the importance of inclusive language for the Irish language. My research also gives practical suggestions to attain a more inclusive Irish language. This research therefore has both academic and practical value.

The diagnostic and predictive accuracy of the PRISMA-7 screening tool for frailty in older adults: a systematic review

Claire Mc Cormack, University of Limerick

Abstract

Early identification of frailty in older adults can ameliorate their care and reduce the risk of exacerbation of pre-frail states. There is a need for accurate tools to assess for frailty. Several frailty screening tools have been developed. One such screening tool is the PRISMA-7. It is a simple, 7-item, yes/no questionnaire where a score of ≥3 identifies frail persons.

This systematic review aims to synthesise the totality of evidence regarding the diagnostic and predictive accuracy of the PRISMA-7 at identifying frailty and risk of adverse outcomes.

A systematic literature search was conducted from 2008-2022 in PubMed, EMBASE, CINAHL, EBSCO and the Cochrane Library to identify validation studies of the PRISMA-7 tool. This included prospective or retrospective cohort studies, cross-sectional studies and the control arm of RCTs which have evaluated PRISMA-7's effectiveness in comparison to a reference standard. Study quality was assessed using the QUADAS-2 tool. A bivariate random effects model generated pooled estimates of sensitivity and specificity. Statistical heterogeneity was analysed.

A total of twenty-seven studies were identified for analysis. Quality assessment revealed three studies with one element of high risk of bias. PRISMA-7 's diagnostic sensitivity and specificity was 72 and 87% respectively. While predictive accuracy meta-analysis garnered less applicable findings.

This systematic review will inform future care providers of the effectiveness of PRISMA-7 at identifying frailty in community and hospital settings. Future research should investigate the feasibility of implementation of PRISMA-7 into routine clinical assessment.

The Connacht Suite – an autoethnographic investigation into my compositional identity, style and process as a crossover musician

Roisin McGuinness, University of Limerick

Abstract

This research presents an autoethnography of my journey as a musician and composer to investigate my compositional identity, style and process through the creation of an original musical work entitled *The Connacht Suite*. This suite is a collection of music composed to act as the soundtrack to a five part video series. The video series will promote the province of Connacht and the upcoming launch of my Irish Music, Culture and Tourism business, 'The Irish Rose'. Autoethnography is a research method that involves the investigation of personal experiences to better understand broader social, cultural or political contexts, and the methodology was employed to assess my development as a multi-genre composer and musician. In order to examine this, I investigated different life experiences ranging from traumatic to triumphant, considering how they led to the creation of this music. This discussion is supported with a range of academic sources in a comprehensive literature review. I also used tools such as timelining, journaling, field notes and audio recordings to gather autoethnographic data concerning my compositional identity, style and process; all of which were expressed in the final iteration of *The Connacht Suite*. My findings not only relate to myself solely; I provide evidence demonstrating that composers and musicians in multiple genres have common experiences when creating and playing music despite their standing within their musical industries. This may be a source of encouragement for emerging composers and musicians today.

Remote Patient Monitoring in Respiratory Interventions

Leah McMorrow, Atlantic Technological University

Abstract

Remote patient monitoring is the future of healthcare as more devices are connected to the Internet of Things (IoT). Studies have shown that there are many benefits to patients

using medical devices with remote monitoring capabilities, leading to a reduction in the need for hospitalisations.

The purpose of this study was to implement remote patient monitoring in a medical device. Respiratory intervention was the area of focus for this research, specifically non-invasive ventilation. 3,685 patients suffering from Chronic Obstructive Pulmonary Disease (COPD) are hospitalised annually in Ireland. These spend an average 9.5 days in hospital under high oxygen therapies. A remote monitoring cloud computing system administering high oxygen therapy at home was developed.

Voltage readings of the inspiratory flow sensor of a PB560 Ventilator connected to a test lung were acquired by a digital multimeter. These were mathematically transformed into H_2O pressure and presented on a user interface created in LabVIEW. Inspiratory patient data was chosen as it is a key parameter of a patient's lung functionality. The patient data was sent to a cloud service by the HTTP protocol. A MATLAB script on the cloud service analysed the average readings captured from the ventilator with the intention of emailing a clinician should patient inspiratory pressure decline below a setpoint.

The results of this research showed that it is possible for a care provider to remotely access patient data, make decisions on patient care, and reduce hospitalisations. Email notifications were successfully sent to a clinician should there be a deterioration in a patient's inspiratory capacity. The results also show that exacerbations of patients suffering from COPD may be predicted, which can facilitate a care provider to adjust therapies before the need for hospitalisation.

The acute effects of a pre-exercise carbohydrate meal on bone metabolism

Niamh McNamara & Rory O'Neill, University of Limerick

Abstract

This study investigates if there's a significant effect when feeding a high carbohydrate/low fat (HCLF) meal vs a low carbohydrate/high fat (LCHF) meal prior to a standardised bout of endurance exercise on markers of bone metabolism (BTM). Research in relation to athlete bone health is on females (Sale and Elliott-Sale 2019). Due to the limited research on male endurance athletes, this study is interested in the effect of nutrition in elite male athletes in relation to their bone health. Method. Participants included 12 elite male endurance athletes (age = 18-35) who compete in endurance events. This study implemented a repeated measure, randomised counterbalanced crossover study design, consisting of two trial arms of either a HCLF meal or a LCHF meal prior to a standardised

exercise bout. Study conditions were separated by a 7- day washout period. Firstly, participants attended the physiology lab for preliminary testing including a step incremental test followed by a ramp to VO2 max. Based on the VO2 max scores, the participant returned on two occasions and ran at 70% VO2Max for 120 minutes, whilst secondary measures of RPE (Rate of Perceived Exertion) and heart rate were taken. On arrival a fasted baseline blood sample was taken followed by a sample after the meal. On completion of exercise a postexercise blood sample was then taken, and a further 4 more samples were taken at 1,2,3 and 4 hours post-exercise. Results. Baseline results were significantly different ($p>0.05$,$p=0.077$ HCLF, $p=0.15$ LCHF). P1NP was significant for time ($p<0.05$,$p=0.012$) but not for condition ($p>0.05$,$p=0.748$). CTX was significant for time ($p<0.05$,$p=0.019$) but not for condition ($p>0.05$,$p=0.552$). Conclusions. There was an acute effect of carbohydrate feeding on BTM post exercise. Further research which replicates findings would inform practitioners of practical implications.

Risk factors contributing to depressive symptoms: examining cognitive control and state rumination

Niamh Moore, University of Limerick

Abstract

Depression is one of the leading causes of disability worldwide and has been linked to great individual suffering and societal burden. Understanding the key vulnerability factors and underlying mechanisms that contribute to the development of this disorder is pivotal to advance existing theory and create effective prevention methods. Extensive research has focused on the contributing factor of cognitive control impairments to the development of depressive disorders. Trait rumination has been proposed to be an underlying mechanism in the relationship. Research has indicated that state rumination can be a more accurate predictor of depressive symptoms. This paper investigates whether the relation between cognitive control impairments and depressive symptoms can be mediated by state rumination in response to a stressor. Secondary analyses of a wider trial dataset were conducted on ninety-six participants (N = 96) from an Irish university. The non-adapted version of the Paced Auditory Serial Addition Task (PASAT) was utilised to capture cognitive control abilities and acted as a stressor. PROCESS mediation analysis indicated that lower levels of cognitive control significantly predicted higher state rumination. However, state rumination did not significantly mediate the relation between cognitive control and depressive symptoms, irrespective of age or self-reported motivation. It was also found that cognitive control does not directly nor indirectly affect the risk for depression in this sample. The relation between cognitive control and higher state rumination suggests implications for targeting these factors in at-risk populations.

Limitations of the study are discussed, and recommendations for future research are suggested.

UPSTarT Summer Internship Programme- Preparation of L.E.D. Manufacturing using Thin Film Depositio

Anthony Mullen, University of Limerick

Abstract

During my time interning with the UPSTarT internship, I conducted research aimed at improving current systems that analysed the Current-Voltage relation of LEDs with LabView, gaining a proficiency of LabView in the process. Additionally, I worked on preparing a vacuum chamber for thin film deposition of these LEDs. Thin film deposition is the process of depositing a thin layer of material onto the surface of a substrate, the thickness of which typically ranges from nanometres to a few micrometres. This process was achieved by using an electron beam evaporator which uses electrons to strike and heat up the material inside the crucible to be deposited on the substrate. This process is performed in a vacuum to minimise contamination of the materials. Initially, I began learning LabView, and added save features to the current systems, and programmed an oscilloscope interface using LabView into the programme, so that the computer can receive and save the data and graphs from the oscilloscope directly and adjust the screen of the oscilloscope as well. In addition to this, I altered a vacuum chamber for the thin film deposition of these LEDs, this included installing the power supplies, an electron evaporator, a cooling system for the vacuum pumps and the evaporator and designing a sample holder using CAD drawings to be CNC milled to hold the samples in the chamber as well as preforming calculating to see if the how uniform the deposition would be on the samples. Overall, I think the internship was a great experience that not only actively teaches you new information but also consolidates information that has been covered in the course and acts as an accurate demonstration of one of the possible future career paths that someone of my course can take.

"Penance and partition" the influence of regret on political polarization

Kevin Mulry, University of Limerick

Abstract

What causes us to hold extreme political opinions? With increased political polarization worldwide, the factors driving extreme and divided opinion need to examined. Regret is a driving factor for many people in the search for meaning in life. One way in which individuals can make their life meaningful is a subscription to a political ideology. Specifically, an identification with either left or right-wing beliefs can bolster one's sense of meaning. This study aimed to test the hypothesis that higher amounts of regret were related to higher levels of identification with political ideologies. Our study revealed that higher levels of regret were associated with the search for meaning and subsequent political ideologies in conservative participants, but this effect was not apparent in their liberal counterparts. These results suggest that the search for meaning is formative in the construction of extreme right -wing ideologies but not left-wing. Applications for this finding to real life as well as recommendations for future research are made.

Na Scéalta Iontais Idirnáisiúnta: Anailís ar Ghéarleanúint na mBanlaochra sna hÉicitíopaí Éireannacha

Elaine Murray, University of Limerick

Abstract

Dírítear ar éicitíopaí Éireannacha de na scéalta iontais idirnáisiúnta sa pháipéar seo. Chun aghaidh a thabhairt ar an taighde seo, déantar plé ar an mbean mar dhuine daonna agus na difríochtaí inscneacha a bhí ann idir fir agus mná ag deireadh an 18ú haois agus thús an 19ú haois ach go háirithe. Ina theannta sin, suitear mná mar scéalaithe i gcomhthéacs sochchultúrtha na hÉireann le linn na n-aoiseanna seo chomh maith. Trí mhachnamh a dhéanamh ar an gcúlra agus ar an gcomhthéacs seo, feictear go raibh neamhhionannas idir fir agus mná ag an am. Eascraíonn anailís na scéalta ón smaoineamh seo de bharr go ndéantar géarleanúint ar na mbanlaochra go minic sna scéalta seo. Roghnaítear dhá scéal den tsraith ATU 510A – *Máirín an Fhionnaidh* agus *Ní Mhaol Dhonn, Ní Mhaol Fhionn agus Ní Mhaol Charach* agus dhá scéal a bhaineann leis an tsraith ATU 425 – *Micí na Muc* agus *Scéal an Ghabhairín Bháin* chun tabhairt faoin taighde seo. Déantar mionchíoradh ar na scéalta iontais seo chun tuiscint níos doimhne a fháil ar ghéarleanúint mheabhrach agus fhisiciúil na mbanlaochra. Scrúdaítear conas a sháraíonn na banlaochra an fhulaingt seo fosta. Dá bhrí sin, faightear léargas mionsonraithe ar dhiongbháilteacht agus ar mhisneach na mbanlaochra sna scéalta iontais tofa.

What are the rights of same-sex parents in Ireland and the European Union, and what are the effects of and attitudes towards these rights?

Lynda Nevin, University of Limerick

Abstract

Current Irish legislation protects few and very specific forms of same-sex parenthood. This leads to social imbalances skewed towards heterosexual families, highlighting the difference in treatment by the law and by society of same-sex parents. The European Union has a significant influence on many policy areas of its member states, but in Ireland progress is slow in the development of legislation and the augmentation of attitudes towards same-sex parents. This paper assesses current Irish legislation surrounding same-sex parenting in order to create a document which specifically details the rights that these parents have, and more importantly are still missing, in this prominent European country. This paper also gauges the current level of tolerance in the EU by analysing data which reflects opinions towards LGBTQ+ families, as well as discusses the extent to which families are protected by law in European countries by measuring policy in the areas of family law and LGBT+ rights. This research suggests that the legislation of European countries plays an important role in the wellbeing of same-sex parents, as well as shapes important decisions that they make for their current or future families. This research shows that Ireland is not far behind other European countries in terms of legislation surrounding same-sex parenting, but proves that progress is still to be made in order for all parents to have equal rights regardless of their sexuality.

The Geography of voter turnout in 2020 general Election in Roscommon/Galway constituency

Ana Ní Linneáin, Maynooth University

Abstract

The purpose of the research is to identify the factors which shape the geography of voter turnout in General Election 2020 in the Roscommon-Galway constituency. The research also aims to locate barriers in the constituency that impact a person's ability to vote.
This research utilises the Marked Electoral Register to calculate the most accurate voter turnout data possible. The research aims to better understand the trends around voter turnout in a rural context by analysing the turnout percentage with census data, using tools such as geographical information systems to visualise trends. R Statistics software is used to examine potential trends and associations in a greater level of detail. The use of surveys

provides additional information on motivating/demotivating factors to understand constituents' reasoning for going to vote.

Interviews with local politicians are used to get their input on factors that affect voter turnout in the Roscommon/Galway constituency. The use of other literature in the subject area was utilized to find similarities in research to further support the research around voter turnout in rural areas.

The research found that the voter turnout in the Roscommon/Galway constituency was higher than the national average, showing a higher level of engagement in the area for General Election 2020. The Research found a strong correlation between areas that had high levels of unemployment and a low level of voter turnout. It also found that housing (in)stability is a factor that impacts voter turnout as well as it being a barrier to voting.

Stem Cell Behaviour Characterisation in porcine intestine

Jaime Nunnikhoven, University of Limerick

Abstract

Adult Stem Cells (ASC)s are the focus of major research activity due to their role in tissue homeostasis. A crucial aspect of tissue sustainability is the ability of ASCs to remain in quiescence (exiting the cell cycle) or alternate and re-enter the cell cycle and cell proliferation. The microenvironment of ASCs plays a fundamental role in whether or not the cell undergoes one of these behaviours. However, our understanding of the molecular mechanisms that control quiescence is very limited. The microenvironment surrounding the stem cell niche surrounding is believed to be a determinant in governing persistence, proliferation, differentiation and survival. This includes growth factors, the extracellular matrix properties (collagen, fibronectin and laminin subtypes) and neighbouring cell proximity. For this project there is particular focus being placed on understanding the role of the pERK signalling pathway and its association in promoting stem cell proliferation or quiescence. Thus, implicating its possible influence on the fate of ASC behaviour upon activation of p21, p27, p57 and other quiescence markers normally results in cell dormancy or ki67 which results in cell proliferation. Accordingly, this project aims to explore cellular quiescence by assessing the molecular mechanism of quiescent cell through pERK signalling and cyclin d kinase inhibitor family proteins that are related to quiescence.

To Design an Easy-to-Assemble Wooden Barn Owl Nesting Box Suitable for the Agri-Climate Rural Environmental Scheme

Alex O'Connor, Atlantic Technological University Connemara

Abstract

The barn owl population in Ireland has declined by more than half in the last 50 years due to changes in agricultural practices and reliance by farmers on rodenticides. As part of the country's agri-environmental program, Agri-Climate Rural Environmental Scheme (ACRES), farmers are financially supported to implement measures on their farms that aim to protect and encourage biodiversity. One of these measures is to make their holding more bird friendly by making and erecting wooden nesting boxes, one of which is owl nesting boxes. The aim of this project is to design an easy-to-assemble wooden barn owl nesting box suitable for the ACRES. The objectives of this research are 1) to conduct a needs analysis for a wooden barn owl nesting box and 2) design an affordable flat packed wooden owl nesting box that meets the ACRES regulations and can be assembled and located, in a time efficient manner. Methodologically, primary, and secondary research was applied to help inform the design and prototyping of a wooden owl nesting box. This included identifying and liaising with experts in the field in Ireland and in the UK, where, through their dedication and interventions are in the process of turning the tide on the declining barn owl population. One of the main findings of the research was that for time constraint reasons the proposed flat packed owl nesting box design is more feasible for farmers to assemble than constructing one from scratch. Further testing on the proposed wooden owl nesting box design will need to be carried out with farmers to find out 1) does it attract owls, and 2) does the ACRES payment offset the manufacturing and installation cost and incentivise farmers sufficiently to contribute to reversing the decline in the barn owl population in Ireland.

The Exploration of Sewn Linoleum and its Application in Furniture Products in Response to the European Commission Proposal 'Ecodesign for Sustainable Products Regulation'

Neil O'Donoghue, Atlantic Technological University Connemara

Abstract

On March 30th 2022, the European Commission published a proposal for Ecodesign for Sustainable Products Regulation (ESPR). Applicable to all products on the internal European market, this proposal aims to reduce the negative life cycle environmental impacts of products. One of the challenges the European furniture industry faces to comply with the proposal is the move away from fossil based materials and to promote the use of renewable materials. Linoleum is a sustainable material. This research aims to explore sewn linoleum and its application in furniture products in response to the proposed regulation. Objectives of the research are 1) to review the literature concerning the European

Commission proposal and existing circular economy best practices in the furniture industry, 2) to conduct strength experiments on sewn linoleum and 3) to consider the application of sewn linoleum in furniture products. Secondary and primary research was undertaken, which included a study trip to Dutch Design Week in October of 2022, the largest annual design event in Northern Europe. Upon reviewing the relevant literature, testing was conducted on variables that contribute to seam quality and strength. The findings from the literature indicate that the European furniture industry's main contribution to climate neutrality needs to be the transition from a linear economy to a circular economy. Material choice will play a significant role in achieving this. The research findings suggest that sewn linoleum, combined with the flexibility and structural properties inherent in the material can be utilised to configure durable forms, which can be made use of in furniture products. The mechanical properties of linoleum behave differently from that of fabrics, suggesting limitations for its use in

upholstery. Recommendations for further research include investigating the effect of other sewing parameters on sewn linoleum, along with the compatibility of linoleum with industrial sewing machines.

My UPSTaRT Experience – Prostate Cancer and PSA

Noel O'Gorman, University of Limerick

Abstract

My research project was to investigate the relationship between prostate cancer and elevated PSA (prostate specific antigen). PSA is currently the main biomarker used to check patients for prostate cancer. The current standard practise is that patients with a high PSA are sent for a prostate biopsy. This, however, is a highly intrusive operation that often has high chances of complications following the biopsy. Oftentimes, the biopsy finds the patient is cancer-free. If these biopsies on cancer-free patients did not have to take place, unnecessary stress and possible complications could be prevented. The goal of this project was therefore to look at other biomarkers that could be related to elevated PSA levels. If other biomarkers could explain why a patient had an elevated PSA level, doctors would have more avenues to explore before sending patients for a prostate biopsy. This in turn would reduce the number of biopsies taking place on cancer-free patients with elevated PSA levels. In this presentation, I plan to show my experience in this research process. I will talk about how I used R to visualise the large dataset, looking for differences in the distributions of each biomarker. I will talk about how I collaborated and cooperated with Dr. Shirin Moghaddam, Dr. Amir Jalali and Prof. William Watson to share and compare my findings. I will then display the work I have done on a Tableau dashboard, as well as what

I'm currently working on, an R Shiny app to show the effect of biomarkers on elevated PSA for cancer and non-cancer patients.

Student Post-Exercise Recovery Beliefs and Use of Passive Recovery Modalities

Amy O'Mahony & Ana Cusnaider, University of Limerick

Abstract

Introduction: Athletes must maintain a balance between training stress and adequate recovery to optimise performance. Athletes adopt various recovery strategies that claim to enhance recovery and performance, however, the use of passive recovery modalities (PRMs) does not always align with scientific evidence. There is a paucity of research investigating student-athlete beliefs about post-exercise recovery and influences on recovery practices. Aim: This study aimed to investigate University of Limerick (UL) students' beliefs about post-exercise recovery and the use of PRMs to identify opportunities for education on evidence-based recovery strategies for student-athletes and their coaches. Methods: An online survey was distributed to UL students via email. Participants were required to be over 18 years old and participate in sports or exercise. Results: A total of 217 responses were analysed. Of these, 65 used PRMs. Beliefs about recovery, lifestyle, training, nutrition, and PRMs varied among those who participated in team sports, individual sports, or recreational exercise. Foam rollers, CWI, and massage guns were the most commonly used PRMs. Coaches and physiotherapists were identified as having the greatest influence on recovery modality selection. Conclusion: Student-athletes may benefit from education and individualised support on sleep, hydration, and nutrition for optimal recovery. Owing to the highly influential nature of the coach and athlete relationship, it is recommended that coaches increase their knowledge of the underlying mechanisms by which PRMs claim to work and promote evidence-based recovery strategies among their athletes. Athletes and coaches would benefit from consulting experts such as physiotherapists when choosing recovery strategies.

Metric spaces, the Arzela-Ascoli theorem, and shallow water waves

Connor O Reilly, University College Dublin

Abstract

Partial differential equations allow for the modelling of systems which change based on many factors. Specific examples of PDEs are often motivated by the desire to understand physical, biological, or financial systems. These equations have solutions in the form of functions, rather than numbers. In the same way that we study sets of numbers that solve equations, we would like to then study sets of functions with useful properties. We can study these sets by defining a metric, which provides a way of measuring distance between these functions, in a similar manner to the absolute value between two numbers.

Sequences of numbers that "get very close to" a particular limit number, are often suitable in computational means for finding or approximating this exact limit number. Similarly, we can talk about sequences of functions, and whether these sequences can be used to find limit functions. The Arzela-Ascoli theorem provides conditions for exactly this. This presentation will focus on a generalised form of this result in the case of functions between metric spaces. The Camassa-Holm equation is a non-linear partial differential equation which models the motion of waves in shallow water. Recent work by O'Náirigh, Pang, and Smith [1] uses a metric Arzela-Ascoli result to construct solutions of this equation. This presentation will conclude with a brief discussion of this work.

[1] Lennon O'Náirigh, Khang Ee Pang, and Richard J. Smith. A new convergence analysis of the particle method for the Camassa-Holm equation, 2023. Preprint.

Haematoxylin/eosin (H&E) staining and histology score on liver sections of mice submitted to high fat diet (HFD) and new low caloric sweeteners (LCS) intake

Zoha Panezai, University of Limerick

Abstract

Public health guidelines recommend reducing free sugar consumption across the population, thus aiming to tackle the burden of non-communicable diseases. This scenario has prompted a consumption rise of sugar alternatives, like low caloric sweeteners (LCS). Some artificial LCS have been shown to induce glucose intolerance by altering the gut microbiota; however, little is known about the effect of natural LCS on the gut microbiome and their impact on metabolic regulations. Fibroblast growth factor 21 (FGF21) has emerged as a pleiotropic hormone and is known for its beneficiary roles in managing diabetes and hyperglycaemia. It is thought that FGF-21 may have a protective role in energy metabolism by acting as an insulin sensitiser and stimulating the oxidation of fatty acids, and inhibiting lipogenesis. The liver is noted to be the the main site of production and release of FGF21 into the blood. Previous animal experiment with dietary natural sweetener intervention evaluated effects on the gut microbiome and glucose homeostasis, and metabolic results indicate FGF-21 as a candidate for further evaluations. TAG levels in the liver were also differential for the different LCS. Decreased insulin, and thus glucose,

sensitivity were considered as markers of a loss of gut microbiome. Liver histological samplings were performed on frozen tissue from mice subjected to sugar-water solutions of tagatose, allulose, saccharin, rebaudioside A (LCS) or fructose on a high fat diet. Red Oil O staining and H&E staining protocols were modified to work with tissue sections not preserved in either paraffin wax or PFA. Data analysis from the previous study was compared to the processed tissue samples. The analysis suggested a high-fat diet may have a significant effect on exacerbating liver steatosis, as would traditional sweetening methods such as fructose.

Investigating a Novel Drug Compound as a Neuroprotective Agent in

Alzheimer's Disease

Anupa Sara Paulose, Unviersity College Dublin

Abstract

Alzheimer's Disease (AD) is a debilitating and irreversible neurodegenerative disease affecting approximately 50 million people worldwide. With current disease-modifying therapies focusing solely on plaque formation failing to show significant cognitive improvement, novel therapeutic strategies targeting different pathogenic factors are needed to treat AD. Other hallmarks associated with AD are excessive inflammation and oxidative stress in the brain. Coumarin-Derived Schiff Base Ligand (L4) is a novel drug which demonstrates anti-oxidative activity in yeast and breast cancer cell line. L4 has also exhibited anti-inflammatory properties in brain immune cells during a preliminary study, which suggests its therapeutic potential in AD. Recognising the vital role of oxidative stress in AD pathogenesis, this research aimed to investigate the ability of L4 to act as an antioxidant agent in neuronal cells and attenuate subsequent neuronal death.

An *in vitro* neuronal cell line, called N2a cells, were treated with H_2O_2 in the presence and absence of L4. H_2O_2 is a peroxide that is known to create reactive oxygen species (ROS), a major player of oxidative stress. Exposure to L4 significantly decreased H_2O_2-induced ROS in N2a cells. No discernible difference in the expression of intracellular antioxidant, called glutathione, was observed, suggesting that L4 might directly affect ROS levels rather than promote endogenous antioxidant activities. In light of this finding, we observed that L4 also significantly increased cell viability levels in N2a cells challenged with peroxides H_2O_2 and TBHP. Moreover, L4 significantly attenuated the level of cytotoxicity seen in TBHP-challenged cells.

 This research provides evidence that L4 can act as an antioxidant agent in neuronal cells and convey neuroprotection in response to oxidative damage. When coupled with previous

studies demonstrating the anti-inflammatory and copper-chelating potential of L4, these findings offer support for the potential of L4 to act as a multifactorial therapeutic strategy for AD pathogenesis.

Airbrushing of Crystalline Biomolecular Thin Films for Piezoelectric Applications

Juliette Pinson, University of Limerick

Abstract

When an external stress is applied to a piezoelectric material, the piezoelectric effect takes place, and a voltage is produced. This phenomenon is created by the dipole that forms in the crystal from displacing the molecules and generating positive and negative surface charges on the crystal. When a force is applied to a molecule in the crystal, the positive and negative atomic charges are no longer in equilibrium and an electric field is generated, which can be harvested as a voltage. Piezoelectric materials are used in hundreds of technologies from medical devices to printers to microphones.

In contrast to inorganic materials currently used for piezoelectric applications, using organic materials would not only be beneficial for the environment but would significantly lower the cost of production. It is vital that we conduct experiments and carry out research on how to grow these organic crystals to determine the most efficient manufacturing processes that give the highest piezoelectric performance.

The purpose of this research project was to evaluate the effects of a different deposition method for piezoelectric gamma glycine crystals. When an airbrush tool is connected to an air compressor, it breaks the liquid glycine mixture into tiny droplets. We used the airbrush tool to spray the gamma glycine solution onto aluminium tape squares, then varied the air pressure and height of the airbrush and altered the amount time for crystal solution accumulation. The output variables assessed were the thickness of the film, the piezoelectric constant and the output voltage when a compressive force was applied. My research shows that airbrushed glycine crystal films can generate up to 1.1 Volts of useful electricity, which outperforms many currently used inorganic piezoelectric crystals.

Identification of gene-sets that define the identity of different cell types of the pancreas

Emma Purcell, University of Limerick

Abstract

Individual studies have shown the rise in type one and type two diabetes worldwide to be progressively getting higher. Many industries have tried to locate the number one cause of the limited to no insulin production within the pancreas. Researchers have endlessly focused on islet gene expression and transcriptomics to help understand the background of why this has been occurring. Most recently focusing on the sex differences within the molecular programs of the pancreatic cells.

Specifically, this project will focus on how the industry of transcriptomics has been redefined by the world of single-cell transcriptomics. This has allowed for the improvement of detecting different cell types within a tissue. Focusing mainly on analysis of existing single-cell transcriptomic datasets used to identify the genes clearly expressed in each individual cell-type that characterize different cell populations of the pancreatic islets of various endocrine cells such as α-, β-, δ- and γ-cells. This project will look at transcriptomics of single cell RNA sequences of β-cells and how a marker will be used to show these beta cells. As the specific marker used will only show up on the β-cells as opposed to other cells located within the pancreas, this will allow the user to locate the wanted cells and extract them from the tissue. The main outcomes of this work indicted that a set of robust markers were found, these robust markers can be used for anyone of all ages; healthy/sick, young/old, type 1/type 2/nondiabetic, etc. Some of these markers have not been previously mentioned in public repositories and some are known for their use.

A Coordinate regression-based deep learning model for catheter tracking in cardiac interventions

Muaz Rashid, University College Dublin

Abstract

More than a million minimally invasive percutaneous cardiac procedures are conducted every year to repair structural heart defects. The present study aims to demonstrate the utility and safety of image guidance through a mixed-reality headset. This goal will be accomplished by recording the accuracy to which the novel imaging program can track a catheter during left atrial appendage, patent foramen ovale or atrial septal defect repair operations. The sample size will consist of 30 patients who are already enrolled in these procedures. Intraprocedural vitals will be recorded using respiratory and ECG monitors and all fluoroscopic images will be processed by the program. During the procedure,

monoplane fluoroscopy will be utilised and once the delivery sheath is within the target, bi-plane fluoroscopy will be used to validate the monoplane coordinate predictions. A positive result is recorded if fluoroscopy and the imaging program both indicate that the catheter is in the correct position. A post study questionnaire then will assess the physicians experience with the added monitors and whether they interfered with the operation. As this study is still in the early phases, ethical approval is being acquired to attach the bio-monitors. We expect to prove that the program allows for accurate and safe determination of catheter positioning. The benefit and implications that the findings of this study may provide is that the imaging system has the potential to greatly improve the accuracy of transcatheter cardiac procedures and potentially expand its utility to a diverse array of catheter-based operations.

To Develop a Handbook to Standardise Client Engagements for Furniture Designers and Makers During the Product Development Process in the Irish Furniture Industry.

Ann Marie Reilly, Atlantic Technological University Connemara

Abstract

The ability to communicate and engage with clients during the product development process as a furniture designer and maker is key to success; therefore, it must be approached in a professional manner. The Irish furniture industry has evolved from small traditional companies to becoming increasingly more progressive. Due to the size and fragmented nature of this industry, there is limited information for start-up and existing companies wishing to develop and professionalise their approach to client engagement. This research aims to develop a handbook to standardise client engagements for furniture designers and makers during the product development process in the Irish furniture industry. The objectives of this research are 1) to ascertain current client engagement practices used by established furniture designers and makers, 2) to conduct a needs analysis for a standardised approach to client engagement, and 3) to design a handbook outlining the necessary stages for engaging with a client. Secondary and primary research were carried out to address the overall aim of this research. Four leading Irish designers and makers were interviewed to gain an understanding of their experience and perspective on client engagement, during the product development process. Through interviews, the existing structures for client engagement were documented. While it was found that established furniture designers and makers do have a personalised structure when engaging with clients, it is not formalised on paper and has unconsciously evolved through experience. A clear need for a standardised, accessible approach to client engagement emerged from the research. The handbook contains a framework to support client engagement during the feasibility, concept design, refinement, and costing stages. Further research is needed to determine the feasibility of the

proposed handbook. This handbook represents what could be a multi-stage project, developing a series of handbooks to grow professionalism within the Irish furniture industry.

Determining the PFAS concentration of our environment using PIGE analysis

Sean Roche, University College Dublin

Abstract

Last summer I was chosen to represent UCD as a Research Assistant at The University of Notre Dame, USA. Here I joined Prof. Graham Peaslee's team which focuses on the analysis of PFAS concentrations using a method called particle induced gamma-ray emission (PIGE). Per- and polyfluoroalkyl substances (PFAS) is a chemical family of substances which has been used widely in the production of certain products since the 1950's due to their water-resistant, heat-resistant, and chemical-resistant properties. This is despite their numerous and severely adverse health effects. Reliable PFAS analysis methods are needed to properly quantify the widespread fluorochemical contamination of our environment, bodies, and products. Due to the thousands of PFAS currently known to exist, PFAS levels are better determined by looking for the fluorine which make up their fluorine-carbon bonds rather than searching for individual PFAS compounds. PIGE analysis of fluorine concentrations is currently being performed ex-vacuo at Notre Dame using protons accelerated by the 9S Tandem accelerator on campus. My research over the summer involved operating this accelerator as well as collecting, preparing, and evaluating samples used in different projects that were underway at the time. I also directly overlooked the analysis of my own group of samples (textiles, floor treatment chemicals, ski wax, plastics, and electric tape) as part of a larger comparative study on PFAS detection methods by researchers from a Swedish institution. This presentation will introduce the alarming reality of PFAS contamination in our environment, layout the health risks it poses to us, and provide an overview of the work currently being done at Notre Dame to combat it. The results from my group of samples are outlined and discussed, along with my experience working within a research group at the frontline of a once-in-a-generation ecological epidemic.

The consequences for transgender representation of the cross-casting of Cathy in Caryl Churchill's Cloud 9

Fausto Rodríguez Colodrón

Abstract

Cloud 9 is a play written by Caryl Churchill that was born in a workshop about sexual politics in 1978. Both the workshop and the play attempted to challenge the participants and the public's preconceptions about people with dissident identities and about themselves. To achieve this goal resources and techniques were used both in the text and in the performance of the play. One of them was the cross-casting of certain characters, a decision the author explains in her foreword in the printed version of the play. My research focuses on the consequences the cross-casting of one of the characters, Cathy, has in the preconceptions of people about trans people, specially trans women. While the intention of the play was to be subversive and to give space to dissident identities, the decision regarding the cross-casting of this character arguably reinforces nocive stereotypes and ideas. In this paper I examine the attempted result of the author's decision and its actual consequence, in relation to a tradition of transmisoginy in literature and film. My research focuses on the farcical and ridicule components of having a grown man performing the character of a little girl, and the different matrices of power that work and intersect in this particular case, namely gender and the adscription to the gender assigned at birth, resulting in the categories of women and men; and transgender and cisgender respectively.

Exploring the Efficacy of an Internet of Things (IoT) Device as a Sensory Feedback Tool in Facilitating Learning for Neurodiverse Student

Aoibheann Sims, Atlantic Technological University

Abstract

Neurodiversity is a term associated with individuals who have conditions such as autism, ADHD, dyspraxia, and others. The potential of the IoT to significantly impact people's lives is well-established, and its implementation in the education sector could play a vital role in accommodating the needs of neurodiverse students. This dissertation project proposes the development and implementation of an IoT device in an educational setting with sensors to monitor the room environment and provide feedback to students.

The project aims to address the current gap in available technologies, catering to the specific needs of neurodivergent individuals and promoting greater inclusivity in education. Specifically, the focus is on students with sensory issues who may benefit from extra information to choose a learning environment conducive to their needs. The ultimate goal is to provide accommodations for all university students, enabling them to have a learning environment that optimises focus, retention, and attentiveness, thereby increasing academic retention and success.

The IoT device collects real-time sensor data and transmits it to a mobile application, where the sensory information is presented to the student in a user-friendly format. A sliding scale

of 1-10 for each environmental factor allows for quick and easy sensory feedback. This project has the potential to be an assistive device for educational and work environments, given more time and investment. The study highlights the importance of considering the needs of neurodiverse students in creating inclusive learning environments and demonstrates the potential of IoT technology to support this goal.

Long Covid In General Practice: Exploratory Mixed Method Study

Ka Yuet Emily Siu, University College Dublin

Abstract

Long COVID is a novel condition with wide-ranging clinical presentation. This study aims to explore General Practitioners' perceptions of long COVID care by assessing the feasibility and acceptability of data collection, exploring issues GPs encounter when delivering care, and what could better support them.

This exploratory mixed-methods study is informed by a pragmatic theoretical framework with the STROBE and SRQR guidelines. Fifteen eligible GPs from the Ireland East Network were invited by post with a questionnaire included. In-depth semi-structured interviews were then arranged.

Nine GPs completed questionnaires and interviews. Four GPs agreed, four neither agree nor disagree, and one disagree with the statement 'I am satisfied with the COVID-19-related care at my practice'.

Regarding initiatives, eight GPs wanted closer links with secondary services, eight wanted therapeutic initiatives, six wanted diagnostic supports, five wanted more patient input, two wanted more remote care and one suggested other. Three themes were generated from the interviews – clinical presentation, diagnostic uncertainty, and continual care. Findings suggest a highly variable clinical presentation, with an urgent need for clinical guidelines, assessment tools, a multidisciplinary and integrated approach to optimise patient care.

This research is novel as it focuses on long COVID within the Irish GP setting. Study shows procedures were feasible and acceptable. The findings suggest that long COVID may be debilitating, and GPs are well-placed to address patients' needs. Further research is needed to better understand challenges regarding the assessment, diagnosis, and continuing care of long COVID patients.

Transition of medical students from pre-clinical to clinical education: A scoping review focussing on gender differences

Hayfa Fatima Soobratty, University College Dublin

Abstract

Medical students often describe the transition from the pre-clinical to clinical years as being challenging due to the numerous hurdles which need to be overcome in order to adapt to the new environment. The objective of this study is to identify any possible gender differences in this transition experience.

This scoping review follows the six-staged Arksey and O'Malley framework and aims to "examine the extent, range and nature of research activity" on the topic. The PRISMA-ScR guidelines were followed to ensure completeness. The databases PubMed, Scopus and Embase were searched for the date filter: January 2010 to May 2022. A decision was made to restrict the search results to six journals with high impact factor, as was performed by Teunissen and Westerman in their earlier review on the same topic.

The database search yielded 179 results. After reviewing titles, abstracts and full-texts, 11 articles were found relevant to this transition, of which two articles discussed gender differences. Studies demonstrated higher levels of self-reported anxiety, stress and depression from female students as opposed to their male counterparts. In comparison, males exhibited stronger feelings of excitement and confidence regarding the transition. A decrease in level of empathy in patient care was also observed among female students during the transition while the level for males remained steady.

The findings demonstrate that there exist gender differences, particularly with respect to the psychological impact of the transition. The results are however limited. Hence, the use of more structured psychological scales and diverse gender inclusion are potential future research avenues.

Synthetic Cannabinoids: The Future of Metastatic Uveal Melanoma Treatment

Ellie Swords, University College Dublin

Abstract

The aim of this project is to assess the efficacy of synthetic cannabinoids in the treatment of metastatic uveal melanoma (mUM). Uveal melanoma (UM) is the most common primary intraocular tumors in adults, with an annual incidence of 2-8 cases per million in Europe and 4.3 cases per million in the United States. Resection, radiation therapy, and enucleation are the current first-line UM treatments. However, regardless of the treatment received, metastasis occurs in up to 50% of all UM patients. The median survival after metastasis is 6-12 months, with there being few therapies for mUM. So, there is a clear need

for an effective mUM treatment and synthetic cannabinoids are a promising prospect. Synthetic cannabinoids can inhibit proliferation and induce apoptosis of cancer cells. HU-210, the synthetic cannabinoid used in this project, is an agonist at both cannabinoid receptor 1 and cannabinoid receptor 2. Cell metabolism assays were used to assess the effect of HU-210 alone and in combination with other anti-cancer drugs on mUM cell viability. Colony formation assay was used to examine if HU-210 could inhibit long-term proliferation of mUM cells. The results show that HU-210 reduces mUM cell viability and that HU-210 inhibits long term proliferation of mUM cells. The drug combination results indicate that HU-210 and the drugs tested have an antagonistic effect. Overall, the results indicate that HU-210 has potential as a treatment for mUM.

Exploring Complex Networks

Patrick Treacy, University of Limerick

Abstract

This report introduces the fundamental concepts and characteristics of network science. The applications of network science in our everyday life, as well as the basic terminology surrounding graph theory, or network science, are examined. The way in which a network's characteristics can change depending on its components is also discussed.

The Erdós-Rényi model is examined by dissecting the network model's characteristics and discussing this model's advantages and disadvantages. The Barabási-Albert model is introduced as a counterexample and it is compared and contrasted to the Erdós-Rényi model. Percolation processes are defined and the robustness of these models, as well as real networks, to both random and targeted attacks is discussed.

The way in which degree correlations appear in networks is examined. The metrics and functions used to quantify degree correlations are then examined under the scope of real networks. The application of network science to epidemiology is examined through the introduction of disease modelling and the rate at which a disease spreads in the SIR model is equated to the concept of bond percolation.

Social Media & the Public Sphere: The Threat to Democratic Legitimacy

Eva West, University of Limerick

Abstract

It is difficult to discuss the implications of rising social media use for established democracies without reflecting on the events of 2016. The election of Donald Trump as President of the United States, in addition to the Brexit referendum, triggered a wave of newfound concerns about the potential negative consequences of social media use in democratic societies. As such, the purpose of this paper is to examine the repercussions of widespread social media use on democratic legitimacy, paying particular attention to Jürgen Habermas's conception of the public sphere. I make two key arguments. Firstly, social media have structurally changed and fragmented the public sphere. Secondly, this fragmentation has the potential to undermine democratic legitimacy. I attribute blame to surveillance capitalism, content-curating algorithms and the spread of misinformation. Furthermore, this issue is systemic and rooted in the design choices made by social media companies themselves. Under normal conditions, the purpose of the public sphere is to foster deliberation and generate public opinions. If trust between citizens is lacking, largely as the result of misinformation, then this threatens public opinion formation. Prolific misinformation also prevents voters from basing their arguments on factual information. The data collected by surveillance capitalism and used by algorithms to generate personalised content also leaves participants in the public sphere open to manipulation. This is especially relevant when it comes to demographics that lack digital literacy skills, such as older generations, who may be more susceptible to misinformation or targeted political advertising. Bad actors are also capable of co-opting algorithmically driven content to propel their own personal agendas. These elements are working in tandem to fracture the public sphere and this can profoundly threaten the legitimacy of democratic societies.

Posters

Per- and polyfluoroalkyl substances (PFAS) removal from water by plasma assisted catalysis

Niamh Gurrin, University College Dublin

Abstract

The availability and purity of freshwater is of great concern due to a number of factors including climate change and chemical pollution. Per- and poly-fluoroalkyls (PFAS) are known as 'forever chemicals' due to their persistence in the environment. They bioaccumulate and are toxic to humans. Research into the degradation of PFAS is of increasing interest due to public pressure and legislation.

In this project, the plasma assisted catalytic degradation of aqueous perfluorooctanoic acid (PFOA) (1ppm) was optimised, the mechanism of catalyst reactivity investigated, and the quality of water post-treatment assessed. Parameters investigated for optimisation include catalyst choice, catalyst loading, initial pH, and plasma-parameters such as tip distance, and voltage. Alumina (Al_2O_3) was selected as the optimal catalyst. After optimisation 99.9% degradation of PFOA was achieved in 15 min, compared to 19.5% degradation in the absence of catalyst or optimisation. However low mineralisation was achieved under the same conditions, so although PFOA was degraded, it was not fully oxidised to CO_2, H_2O, and F- by the treatment. The bulk and surface morphology of the catalyst were unchanged by the treatment according to XRD and XPS studies. Radical scavenger studies yielded an unexpected result. A decrease in radical concentration led to an increase in the extent of PFOA degradation, perhaps due to a reduction in the number of recombination events. A change in water quality post-treatment was observed. The water is acidified, and species such as H_2O_2 and NO_2- and NO_3- are generated. The concentration of nitrates increased at the beginning of treatment and reduced during treatment time, suggesting that there is a mechanism through which the treatment is degrading nitrates after they are generated.

A Cloud Tool to Provide an Aggregated View for Billing

Emma Purcell, University of Limerick

Abstract

Organisations increasingly use a mix of public and private clouds to meet their needs. One of the most significant challenges for organisations operating in the cloud is the complexity of billing, particularly for those utilising multiple cloud providers. This complexity makes it

difficult for organisations to comprehensively view their cloud usage and costs, leading to over-provisioning, under-utilization, and unexpected expenses. There is no tooling that allows billing information from public and private clouds to be aggregated into one view and billed against the teams within the organisation that are using the resources. This project developed a working proof of concept for a cloud tool that provides an aggregated view for cloud billing. The tool developed is a web application called Billow. Billow calculates the billing for OpenStack instances and retrieves the billing information from cost explorer for AWS instances. AWS and OpenStack are examples of private and public clouds. The tool renders this information to a webpage, combining the data into one view. The project only renders information to the user depending on their permissions, and the user can only see instance information relevant to them. Currently, no tools provide this kind of interactive way of viewing on one platform. This project shows that it is possible to achieve this, and as a result, it reduces the time spent trying to gather and aggregate this information manually. The project uses Django as its web framework and Python API Clients to collect information from AWS and OpenStack. Implemented is the ability to create, delete, start, and stop instances on AWS and OpenStack from one platform.

How Do Singers in Higher Education Perceive the Impact of the Menstrual Cycle on Voice?

Holly Naughton, University of Limerick

Abstract

Anecdotally, the concept of "period voice" has long been discussed widely among female singers. This study set out to investigate vocalist experiences of how the menstrual cycle can impact the singing voice. The perceived impact of hormonal changes on vocal ability, vocal production, and overall performance was examined using a two-pronged approach:

1) Part 1 used an anonymous online questionnaire to directly capture participants' personal perceptions of hormonal changes on their own voice;

2) Part 2 used VoceVista electroglottographic software to perform spectrogram analysis on weekly vocal recordings across the menstrual cycle for several participants.

For Part 1 (i.e., data collection via online questionnaire) 73.4% of questionnaire respondents asserted that the link between their personal hormone levels and their singing voice was either significantly related (26.7%) or somewhat related (46.7%). The principal vocal changes reported by participants as typical in the run-up to menstruation were loss of vocal stamina, vocal fatigue, and loss of vocal power (reported by 53.3%, 46.7%, and 26.7%, respectively).

The Part 2 portion of the study (i.e., spectrogram analysis of weekly vocal recordings across the menstrual cycle) is currently ongoing and will be reported on by the end of April.

The role of stress reactivity and rumination as mediators in the relationship between attentional control and anxiety

Shauna O'Mahony (Student Researcher) Dr. Elayne Ahern (Supervisor & Principal Investigator) University of Limerick

Abstract

A clear link has been established between poor cognitive control and the experience of mental health disorders. Research has identified a connection between lower attentional control and higher depressive and anxiety symptoms, as well as associations between stress reactivity and ruminative thinking and mental health outcomes. This research study aimed to investigate whether or not the relationship between attentional control and mental health outcomes, particularly anxiety, could be mediated by the presence of perceived stress reactivity and rumination. Quantitative data was collected from a wide demographic (N= 167) and a serial mediation analysis was carried out. A significant serial mediation was observed, in that low attentional abilities predicted high stress reactivity, which in turn predicted high rumination, and overall contributed to increased anxiety symptoms. In a subsequent sensitivity analysis controlling for depressive symptoms, due to high comorbidity with anxiety, this significant serial mediation was maintained. The findings highlight the relevance of perceived stress reactivity and rumination is the relationship between attentional control and anxiety, and also the significance of the pathway irrespective of depressive symptoms. Stress management strategies may be beneficial to help alleviate anxiety symptoms.

Investigating the relationship between countermovement jump performance and lower extremity injuries in Division 1 collegiate field and court athletes

Cara Segal, University of Limerick

Abstract

The physical demands of sports have led to a high-incidence rate of lower-extremity injuries. The continuous monitoring of athletes to help identify at-risk individuals is an essential element of elite sports. A common test used by coaches and practitioners is the countermovement jump (CMJ) – an effective test for monitoring an athlete's physical capabilities, neuromuscular response to training, and readiness to play. The aim of this

study was to examine the CMJ performance and its relationship to concomitant season-long injury epidemiology to identify factors or athletes potentially at-risk of a lower-extremity injury.

This cohort study included 149 Division 1 collegiate athletes, male and female, all of whom participated in a range of team field and court sports, including basketball, ice hockey, soccer, volleyball, and field hockey. Over a 9-month period, all athletes regularly every week performed the CMJ on Hawkin Dynamics dual force plates using a standardised procedure. A bespoke electronic spreadsheet system was created to isolate results for the 48 athletes sustaining an injury, that included the results for four chosen CMJ metrics – average relative propulsive power, CMJ depth, mRSI, and left/right propulsive impulse index, along with the lower-extremity injury data. Temporal data were amalgamated showing jump performance in the 90-days and 14-days prior to injury, and the trends were observed for a relationship between the force plate data and injury data. The most common type of injury (sprain) and location of injury (ankle) were also further analysed.

Findings showed a clear plateau in jump performance within the 14-days prior to injury in comparison with 90-days. These outcomes suggest that the performance in the four chosen CMJ metrics lull as the athlete nears the occurrence of an injury. It is vital to monitor each athlete's CMJ performance throughout the year and identify possible at-risk individuals.